BALTIC SEA ENVIRONMENT PROCEEDINGS

No. 89

THE REVIEW OF MORE SPECIFIC TARGETS TO REACH THE GOAL SET UP IN THE 1988/1998 MINISTERIAL DECLARATIONS REGARDING NUTRIENTS

HELSINKI COMMISSION
Baltic Marine Environment Protection Commission

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THE REVIEW OF MORE SPECIFIC TARGETS TO REACH THE GOAL SET UP IN THE 1988/1998 MINISTERIAL DECLARATIONS REGARDING NUTRIENTS

CONTENTS

EXECUTIVE SUMMARY

Following the Communiqué of the Ministerial Session in 1998 and the decision of the 19th Meeting of the Helsinki Commission, the Technological Committee produced the document "Implementation of the Strategic Goals of the 1988 Ministerial Declaration, in particular with Regard to the 50% Reduction Goal", which was adopted by the Extraordinary Meeting of the Helsinki Commission in September 1999 (HELCOM EXTRA 99, paragraph 5.1, Attachment 6).

According to this document, more specific targets were to be elaborated after the gathering of pollution load data for the year 1987 or another selected base year at the end of 1980s, as well as for the year 1995 concerning the whole Baltic Sea catchment area. Based on these sets of data, every Contracting Party would then have to consider elaborating more specific targets for the national implementation of measures to achieve the 50% reduction goal set in the 1988 Ministerial Declaration. These targets have to be realised before 2005 and reviewed in 2003.

The main purpose of this review is to present the situation with regard to achieving the 50% reduction goal set in the 1988/1998 Ministerial Declaration with regard to nutrients. Another aim is to assess whether the existing plans and programmes set up by the Contracting Parties to reduce nutrient inputs will be sufficient to combat eutrophication in the Baltic Sea. The document is also intended to provide a basis for planning how to continue work on the reduction of nutrient loads.

Finland, Germany, Latvia, Poland and Sweden have submitted information on their plans and programmes to elaborate more specific targets for 50% reductions in nutrient loads, while Denmark has submitted a document containing information on nutrient reduction. For the other Contracting Parties, the information on the national plans presented in the MINDEC-report has been used when elaborating on the compilation document to be presented to the HELCOM Ministerial Meeting.

For the assessment of the nutrient load reductions achieved between the late 1980s and 2000, data from the Contracting Parties has been compiled for the year 2000, and compared to discharge data presented in the MINDEC-report for the years 1985-1995. Bearing in mind that this data is very uncertain, especially concerning agriculture, the reduction figures should be considered with care. The figures presented do, however, give a general picture of the trends in pollution loads from point sources and agriculture, and the progress made by the Contracting Parties.

The results show that with regard to point sources, the targets for phosphorus have been achieved by almost all the Contracting Parties, while there have been more difficulties in reducing nitrogen loads. The results also show that measures to reduce nutrients from agriculture have fallen short of their aims.

Comprehensive official plans to reduce inputs of nutrients to the Baltic Sea have so far been adopted by national governments in Finland, Sweden and Latvia. Plans to reduce nutrient loads in the other Contracting Parties which are or will be EU members mainly focus on the implementation of the related EU Directives, which also contribute the reduction of nutrient inputs into the Baltic Sea.

Based on these findings:

- more efforts must be made to reduce inputs, especially from agriculture

- the relationships between sources and impacts must be evaluated more accurately, in order to facilitate the preparation of more cost-effective measures, some of which can be tailor-made to deal with regional problems

- the existing HELCOM reduction goals for inputs of nutrients must be harmonised with the objectives of the EC Water Framework Directive, *inter alia* the objective to achieve good quality status by 2015.

It should also be borne in mind that other diffuse sources contribute significantly to the nutrient inputs into the Baltic Sea, and there is also a need to reduce airborne inputs of nitrogen from both land-based and sea-based sources. Inputs of nutrients from urban areas, small municipalities and scattered settlements must also be addressed.

1. BACKGROUND

Following the Communiqué of the Ministerial Session in 1998 and the decision of the 19th Meeting of the Helsinki Commission, the Technological Committee produced the document “Implementation of the Strategic Goals of the 1988 Ministerial Declaration, in particular with Regard to the 50% Reduction Goal”, which was adopted by the Extraordinary Meeting of the Helsinki Commission in September 1999 (HELCOM EXTRA 99, paragraph 5.1, Attachment 6).

According to this document, more specific targets were to be elaborated after the gathering of pollution load data for the year 1987 or another selected base year at the end of 1980s, as well as for the year 1995 concerning the whole Baltic Sea catchment area. Based on these sets of data, every Contracting Party would then have to consider elaborating more specific targets for the national implementation of measures to achieve the 50% reduction goal set in the 1988 Ministerial Declaration. These targets have to be realised before 2005 and reviewed in 2003.

The Contracting Parties must report data compiled using the source-orientated approach. It is up to individual Contracting Parties whether they decide to use the load-orientated approach (representing the total load of nutrients from rivers, unmonitored coastal zones and point sources discharging directly to the Baltic Sea) in combination with the source-orientated approach.

The **source-oriented** approach comprise the overall 50% reduction goal for each Contracting Party of the discharges and losses of nutrients and hazardous substances from point and diffuse sources located in the whole Baltic Sea catchment area. Each Contracting Party can set up sector-specific reduction targets to fulfil the overall 50% reduction goal. However, it should be noted that the adoption of a source-orientated approach must not mean that the determination of the percentage reductions needed within each sector is a task for HELCOM to decide upon; as this is a matter for each Contracting Party. When adopting this document, Sweden expressed the view that the document does not fully cover the need to find “the most cost-effective solutions” (HELCOM EXTRA 99, paragraph 5.3).

HELCOM’s Hazardous Substances project team carried out a follow up survey on the 50% reduction goal for hazardous substances, concluding that it is very likely that the 50% target has now been reached for most of the substances. The complete cessation target has now replaced the 50 % target, and will be the guiding objective for all further work on hazardous substances.

HELCOM EXTRA 99 also decided that the Land-based Pollution Group (HELCOM LAND) shall monitor and assess the implementation of the strategic goals set in the Declaration, as well as reporting on the implementation of the Declaration. In order to fulfil this task, the HELCOM project "Evaluation of the implementation of the 1988 Ministerial Declaration regarding nutrient load reductions in the Baltic Sea catchment area" (MINDEC) was established.

The report from the MINDEC-project summarises the national nitrogen and phosphorus source load figures for 1987 (or any other specific year or period in the late 1980s) and 1995, as well as the reductions achieved between these years.

The main purpose of this review is to present the situation with regard to achieving the 50% reduction goal set in the 1988/1998 Ministerial Declaration with regard to nutrients. Another aim is to assess whether the existing plans and programmes set up by the Contracting Parties to reduce nutrient inputs will be sufficient to combat eutrophication in the Baltic Sea. The document is also intended to provide a basis for planning how to continue work on the reduction of nutrient loads.

Finland, Germany, Latvia, Poland and Sweden have submitted information on their plans and programmes to elaborate more specific targets for 50% reductions in nutrient loads, while Denmark has submitted a document containing information on nutrient reduction. In accordance with a decision made at HELCOM LAND 6/2002, the information on the national plans presented in the MINDEC-report has been used by the Secretariat when elaborating on the compilation document to be presented to the HELCOM Ministerial Meeting. Information on national plans and programmes is presented in annexes to this review.

In order to assess the nutrient source load reductions achieved between the late 1980s and 2000 the Secretariat has compiled comparable data as far as possible. Where the Contracting Parties have not been able to submit data comparable with the MINDEC-report, either data produced for PLC-4 has been used (Russia and Lithuania) or other calculations have been used (Polish point source data, Finnish agriculture data). Bearing in mind that the data collected for the MINDEC-report, especially concerning agriculture, was also very uncertain, the reduction figures from the late 1980s until 2000 should only be used with care. The figures do, however, give a general picture of the trends in pollution loads from different sources, and the progress made by the Contracting Parties. It should also be noted that even if the discharges from point sources and losses from agriculture account for the majority of the total load, they do not account for all the total discharges and losses into surface waters within the Baltic Sea catchment area. Important contributing factors not accounted for in this report include discharges connected with small municipalities and urban areas (small settlements without sewerage systems or MWWTP, separate sewers, combined sewer systems) discharges from scattered settlements, and atmospheric deposition into inland surface waters.

2. DISCHARGES/LOSSES INTO SURFACE WATERS WITHIN THE BALTIC SEA CATCHMENT AREA

Nutrients enter the Baltic Sea via rivers, through atmospheric deposition and in direct discharges from pollution sources located on the coastline. The riverine discharges originate both from point sources, such as industrial or municipal wastewater outlets, and from diffuse sources, such as agriculture, scattered dwellings and atmospheric deposition within river basins. It must also be remembered that about 35% of the total input of nitrogen to the Baltic Sea consists of atmospheric inputs.

The major anthropogenic source of waterborne nitrogen is clearly agricultural, while the biggest sources of phosphorus are point sources, mainly municipalities (Figure 1).

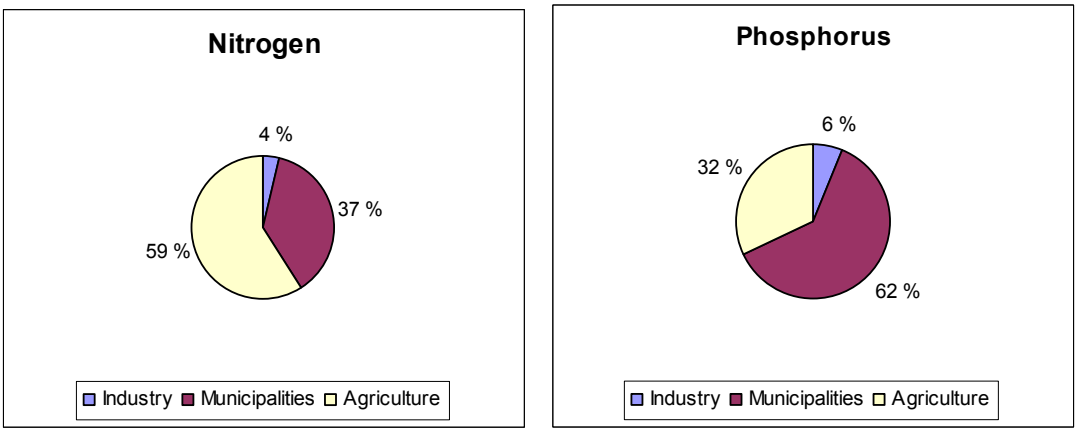

Figure 1. The shares of discharges/losses of nutrients into the surface waters within the Baltic Sea catchment area by sector, 1995.

The main sources of both nutrient discharges from point sources and losses from diffuse sources originate from the Polish catchment area, which contributes more than half of the total phosphorus discharges and losses, and more than one third of the total nitrogen discharges and losses into surface waters in the Baltic Sea catchment area (Figure 2). Most of the phosphorus load in Poland comes from municipalities, but the share of discharges from agriculture is increasing for both phosphorus and nitrogen.

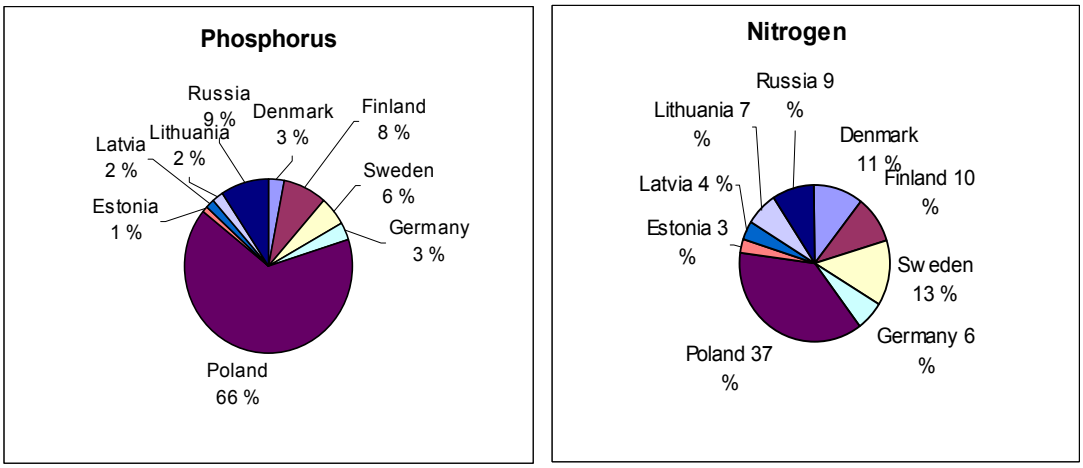

Figure 2. The shares of total nutrient discharges from point sources and losses from agriculture within the Baltic Sea catchment area by Contracting Parties, 2000.

The data presented in Figures 3 and 4 on discharges from point sources and losses from agricultural sources to surface waters for different years are not totally comparable for all sectors in all the Contracting Parties, as the data has been compiled based on various available sources; but the figures do give a general picture of the relative importance of the various sources. The Polish point sources loads for the year 2000 have been estimated based on reductions in riverine load figures. Sweden reports that figures for agricultural loads from 1995 are probably underestimated (see Annex 9). No updated figures were available on agricultural loads in Russia for 2000, so load figures for 1995 have been used. The same applies to Finnish figures for 2000, as the figures for diffuse loads are based on mean values for 1996-2000, and there has not been any significant change since 1995.

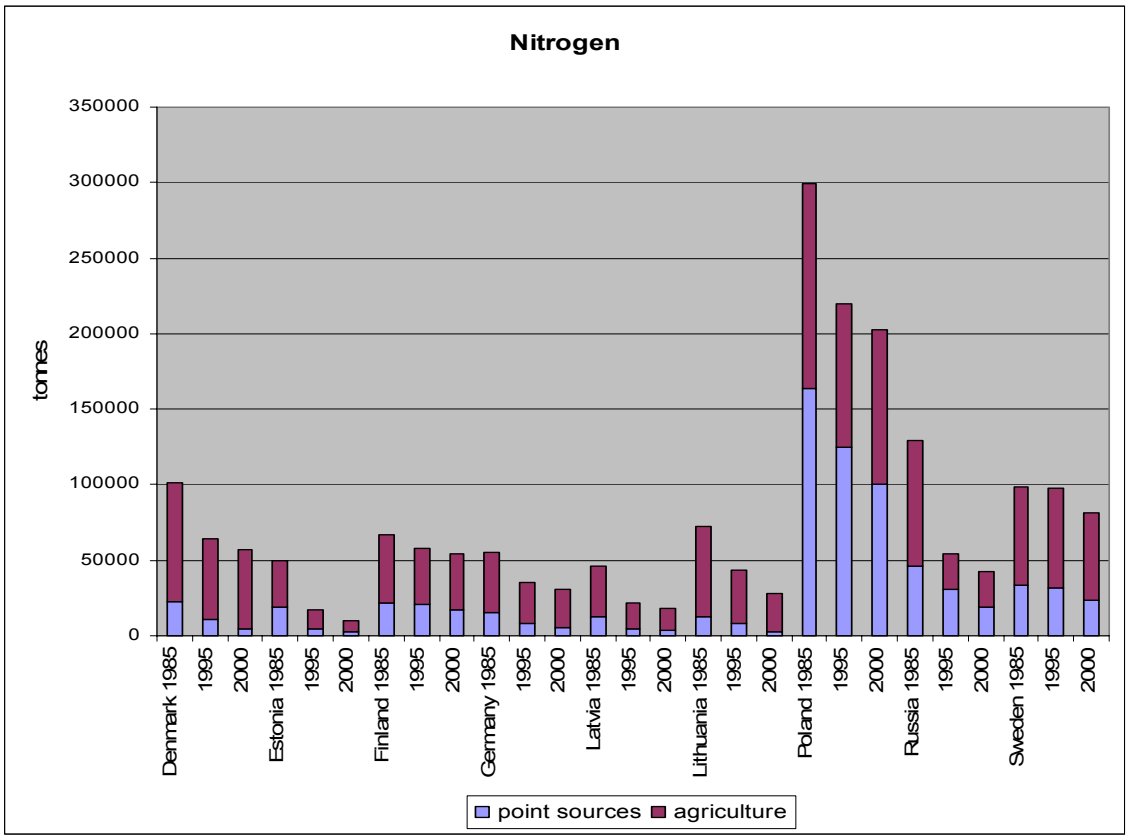

Figure 3. Point source discharges and agricultural losses of nitrogen into surface waters within the whole Baltic Sea catchment area by Contracting Party; 1985, 1995 and 2000.

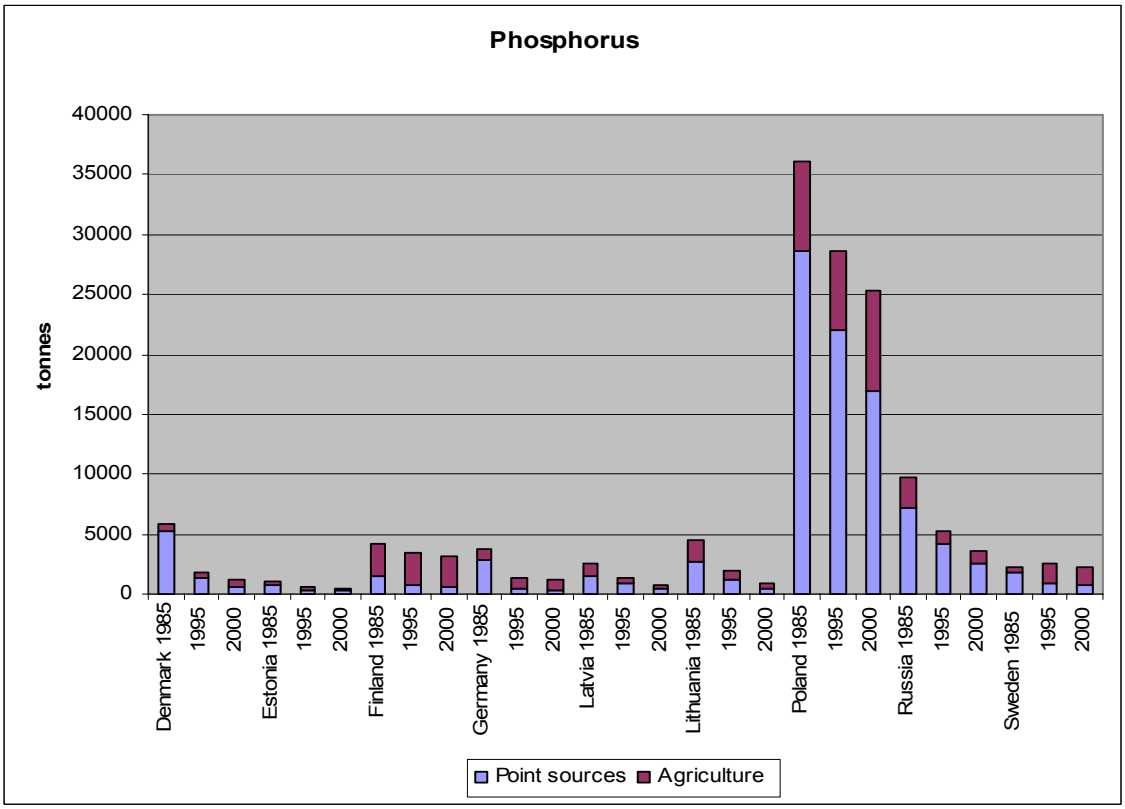

Figure 4. Point source discharges and agricultural losses of phosphorus into surface waters within the whole Baltic Sea catchment area by Contracting Party; 1985, 1995 and 2000.

When the phosphorus discharges from point sources are calculated as unit loads per inhabitant, EU members can be seen to have the lowest unit loads in general, while the highest loads are in Poland (Figure 5). When nitrogen losses from agriculture are calculated per square kilometre of arable land, the EU member countries have the highest loads (Figure 6).

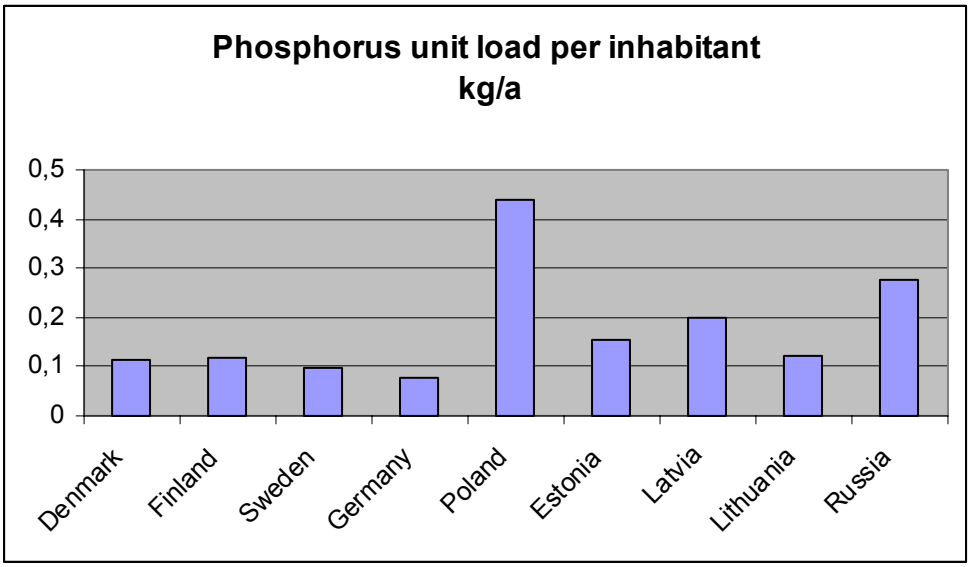

Figure 5. Phosphorus discharges as unit load per inhabitant in 2000 from point sources.

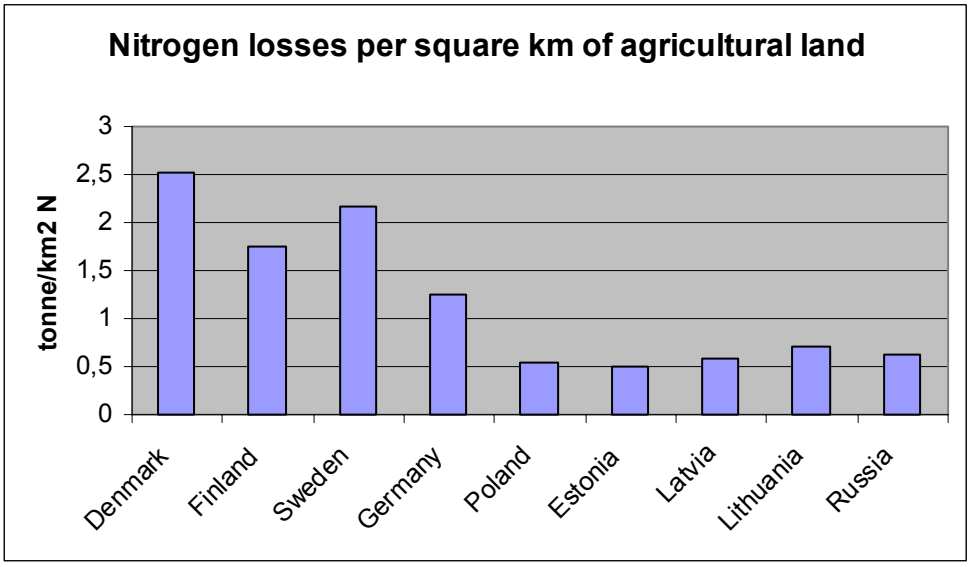

Figure 6. Nitrogen losses from agriculture within the whole Baltic Sea catchment area, per square kilometre of agricultural land, 2000.

The diagrams above have been produced on the basis of submitted load figures for the Baltic Sea catchment area for nitrogen, and on data on area of agricultural land (including grass land and green fields) as presented in PLC-4. (As the area figure in PLC-4 covers a larger area than the total area of arable land alone, a more accurate figure for nitrogen losses from arable land for Sweden is 1.76 tonnes N/km^2).

3. NUTRIENT INPUT REDUCTIONS

Total discharges from point sources and losses from diffuse sources into surface waters within the Baltic Sea catchment area have decreased for both nitrogen and phosphorus by about 40 % between 1985 and 2000.

Reductions in discharges from point sources have been particularly significant, especially regarding phosphorus.

According to the data available for the year 2000, however, there has been relatively little progress in the reduction of losses of waterborne nutrients from agriculture at source within the Baltic Sea catchment area since 1995. In fact losses from agriculture at source appear to have increased in some Contracting Parties, although load figures for agriculture can be uncertain, and have to be used with care.

Reductions at point sources

The 50% reduction target has been achieved for phosphorus discharges from point sources by all the HELCOM countries, except for Poland where an estimated 40% reduction was achieved. With regard to nitrogen, there were difficulties in Finland, Sweden and Poland in reaching the target.

According to the MINDEC-report, the reductions were most significant for point and non-point sources in the EU accession countries and in Russia, largely due to fundamental changes in political and economical systems in the early 1990s. In EU member countries, the observed decreases were usually smaller, and were achieved due to water protection measures implemented during this period. Since 1995, the implementation of water protection measures has also been strengthened in the EU accession countries, and this has further reduced discharges from point sources. Loads from point sources in Estonia, Lithuania and Latvia have decreased significantly for both nitrogen and phosphorus. The riverine load figures from Poland, which are not comparable with source related figures, indicate a reduction of nutrient loads since 1995 in the order of 20% for point sources. These positive developments will probably continue over the next few years in the EU accession countries. The figures from Russia (which are similarly not comparable with source related figures) show a decrease of about 30 % from 1995 levels.

The present EU member countries already achieved reductions in discharges from point sources back in the 1970s and 1980s, and this partly explains why reductions from point sources in these countries between the late 1980s and 1995 were relatively low. Loads from point sources have decreased significantly in Germany and Denmark since 1995. Phosphorus and nitrogen loads from point sources are less than half of their levels in 1995 in Denmark; while discharges in Germany have been reduced by about 40% for nitrogen and about 50% for phosphorus. Nitrogen loads from Swedish point sources have further decreased by about one fourth, while phosphorus loads from municipalities have fallen by about 20% since 1995. Phosphorus loads from Swedish industries have remained at about the same level as in 1995. Nitrogen discharges from point sources in Finland have not decreased significantly, with an overall reduction since the late 1980s of around 20%. Phosphorus loads have however been further reduced since 1995 by about 25%. Further major reductions in the present EU member countries are not foreseen in the nearest future, but the decreasing trend is expected to continue gradually.

Reductions in agriculture

Although the anthropogenic losses from agriculture show smaller decreases than point source discharges, clear reductions were observed, mainly due to the dramatic changes in the numbers of livestock units, a proportional reduction in manure application, and reductions in the usage of mineral fertilisers, especially in the countries in transition. According to national estimates, the 50% reduction targets in agricultural

losses into surface waters have been achieved by Russia and the EU accession countries, except for Poland. The updated data shows an upward trend since 1995 in Poland. However, these results are directly in line with a 17% increase in the outflow of water from Polish territory due to high precipitation. The data from Latvia, Lithuania and Estonia shows continued significant reductions from agriculture since 1995, especially for phosphorus in Latvia and Lithuania, as well as for nitrogen in Estonia. Agricultural production is, however, expected to grow in the EU accession countries, making it more difficult to achieve further decreases in nutrient discharges from diffuse sources.

In Finland, Denmark, Germany and Sweden, no decreases could be discerned in agricultural phosphorus losses into surface waters between the late 1980s and 1995, despite strong reductions in both the use of P-fertilisers, and corresponding phosphorus surpluses on agricultural land. Data for the years 1995-2000 does not show any major decreases. On the contrary, figures from Sweden indicate significantly increased discharges, especially with regard to phosphorus, but the figures for the mid 1980s is thought by experts to be too low. The high usage of phosphorus fertilisers in the 1970s and 1980s in these countries has resulted in a long-term net surplus of phosphorus in the soil, so releases from agricultural areas and soils into river systems are still higher than the “direct” loads from the agricultural sources, and there will be a long time-lag before any changes can be seen in losses.

Where nitrogen is concerned, a similar time-lag is also expected between the implementation of reduction measures and decreases in nitrogen discharges to surface waters. In Denmark and Germany, nitrogen losses from agriculture to surface waters have decreased about one third, and in Finland by about 20 %. Nitrogen losses decreased by about 25 % in Sweden from the late 1980s until 1995, but between 1995 and 2000 losses have stayed at about the same level. The conclusions concerning the reductions achieved for agriculture are uncertain for all Contracting Parties, however, due to inconsistencies in the data, so comparisons of loads in different years are not always possible.

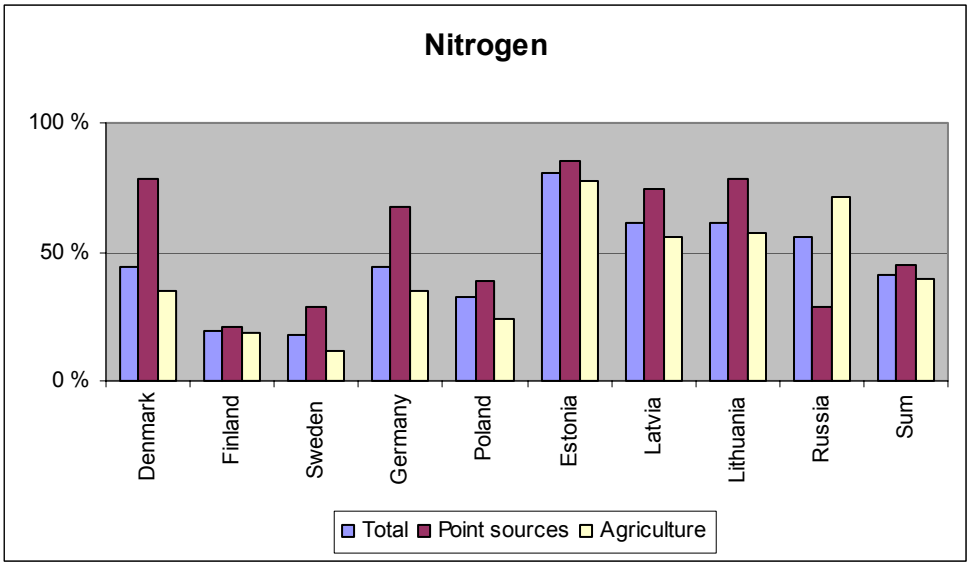

Figure 7. Reductions in anthropogenic nitrogen discharges from point sources and losses from agriculture in the Contracting Parties between the late 1980s and 2000.

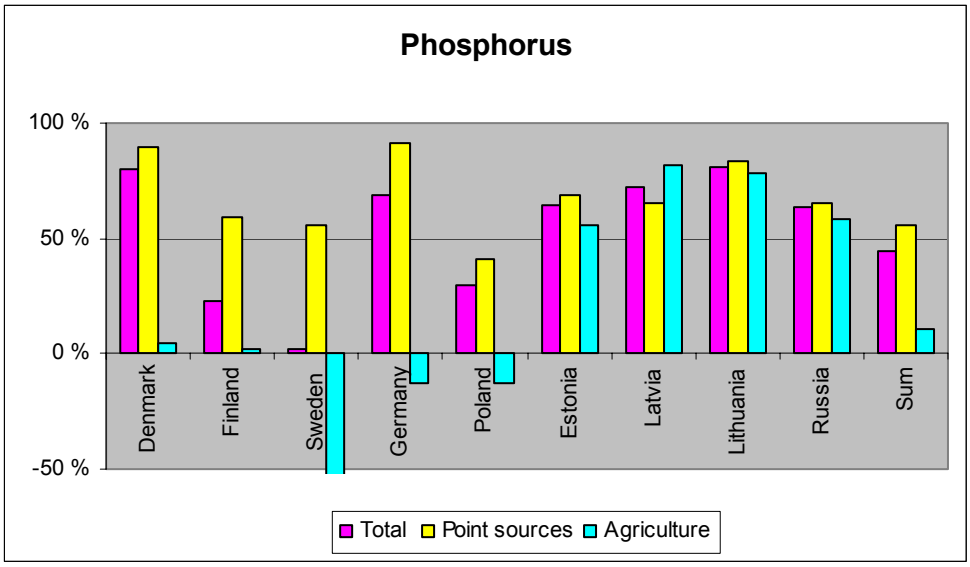

Figure 8. Reductions in anthropogenic phosphorus discharges from point sources and losses from agriculture in the Contracting Parties between the late 1980s and 2000.

Note: The total reductions shown in tables 7 and 8 include aggregated reductions of discharges from point sources and losses from agriculture (but not inputs from atmospheric deposition and other diffuse sources).

4. NATIONAL PLANS AND PROGRAMMES

The MINDEC-report presents information from eight Contracting Parties on national qualitative and/or quantitative targets elaborated in order to implement the 1988 Ministerial Declaration by the year 2005. Finland, Germany, Latvia, Poland and Sweden have also submitted updated information on their plans and programmes to elaborate more specific targets for 50% reductions in nutrient loads (see Annexes for full details). In accordance with the decision at HELCOM LAND 6/2002, information on the national plans presented in the MINDEC-report has been used for Contracting Parties which have not submitted updated information (Estonia, Lithuania and Russia; see Annexes).

Some countries have expressed concern about the 2005 deadline, especially with regard to agricultural loading, since there is typically a substantial time-lag between the implementation of water protection measures in agriculture and any effect on nutrient loads in water bodies in the Baltic Sea catchment area.

In parallel to the implementation of the 1988 Ministerial Declaration, all the Contracting Parties except for Russia will almost certainly be obliged to fulfil EU requirements in water related directives as well as implementing the HELCOM Recommendations concerning municipal and industrial nutrient load reductions. The modernisation of municipal waste water treatment plants in the EU accession countries and Russia require huge investments, and the current timetables extend well beyond 2005. For these reasons it is important to consider any opportunities to harmonise the implementation timetables of water protection measures between the EU and HELCOM. The chances of implementing the 1988 Ministerial Declaration by 2010, should also be discussed, along with the setting of more specific targets by 2005.

Denmark **(see also Annex 1)**

The quality criteria for Danish marine waters were only fulfilled for a limited number of estuaries, coastal regions and open waters. The few coastal areas that meet the criteria are generally non-stratified shallow waters with relatively low nutrient loads from land-based sources. The open sea areas that meet the criteria are the non-coastal parts of the North Sea, the Skagerrak and the Kattegat (Northern and Central). The widespread failure to attain the criteria is primarily a result of continued excessive nutrient loading in combination with oxygen depletion and the effects of TBT. In order to fulfil the criteria for Danish marine waters and achieve significant and sustainable improvements, further reductions in nutrient loads (particularly from diffuse sources) are urgently needed, alongside reductions in the problematic concentrations of TBT and other organic contaminants found in some areas.

In 2001, diffuse sources (including small settlements) accounted for 90% of the total nitrogen load and 65% of the total phosphorus load to the Danish estuaries and coastal waters. The total nitrogen load from Denmark, corrected for inter-annual variations in runoff, has decreased significantly – by about 35% over the period 1990-2001, with 21% due to reductions in loads from agricultural soils, and 14% due to reductions in loads from point sources. During the same period, phosphorus loads decreased by 60%, mainly due to improved sewage treatment. There has also been a reduction of about 15% in atmospheric nitrogen deposition into open waters since 1989. Both the loads from land and the atmosphere vary considerably from year to year, due to variations in precipitation and runoff. The decreasing nutrient loads entering Danish waters are reflected in their nutrient concentrations. Nitrogen concentrations in 2001 were the lowest observed during the period 1989-2001, and equalled loads observed during the very dry years of 1996 and 1997. In open waters (the Kattegat, the Sound and the Belt Sea), runoff-corrected nitrogen concentrations show a steady decrease since 1989. In estuaries and coastal waters, significant decreases were observed after 1997. In the estuaries and coastal waters, phosphorus concentrations have stabilised at low levels following significant decreases in the beginning of the 1990s. Corrected for annual variations in runoff, input of nutrients from estuaries to open waters has decreased, for phosphorus since the mid 1980s and for nitrogen since the mid 1990s. The nutrient exchange between the Baltic Sea and the Skagerrak varied from year to year during the period 1999-2001.

An average annual nitrogen budget for the Kattegat-Belt Sea area for the period 1989-1996 shows that the Danish contribution of the total nitrogen to the total supply from surrounding countries, atmosphere, Skagerrrak and the Baltic Sea amounts to 12%. The Danish contribution increases to 25-32% taking the biovailability of nitrogen from different sources and recycling via Skagerrrak into consideration.

The main antrophogenic loads entering the Baltic Sea are losses from agriculture, and discharges from sewage treatment plants and industrial plants. Atmospheric deposition also makes a significant contribution. Effective sectoral approaches are needed to reduce these loads. In general, loads from point sources have been fairly successfully reduced, while there has been less progress in reducing loads from diffuse sources.

Finland **(see also Annex 3)**

In April 2002, the Finnish government adopted a major programme for the protection of the Baltic Sea, aiming to improve the ecological state of the waters around the Finnish coast. Action will be taken in six sectors. The most urgent action concerns the eutrophication of the Baltic due to excessive nutrient loads. It is estimated that the implementation of Finland's programme will halve eutrophying emissions from Finland. The targets set for reductions in nutrient discharges are based on the Water Protection Target Programme 2005, which sets a goal of a 50% decrease in nutrient discharges compared to in the early 1990s. The measures set out in the programme will be carried

out over the next 10-15 years. The implementation of the programme is expected to require investment from Finland amounting to some EUR 300-370 million. The largest single sum for annual investments consists of environmental subsidies for agriculture. The programme also stresses the significance of Finnish environmental investments in neighbouring countries, particularly investments aimed at improving the state of the Gulf of Finland.

An evaluation of the implementation of the Water Protection Targets for the year 2005 shows that discharges from industry, municipalities and fish farms have been mostly reduced according to targets, but there have been some difficulties in reaching the 50% reduction target for industrial and municipal nitrogen discharges. Nitrogen loads from scattered settlements are larger than those from municipalities and industry. Loads from diffuse sources have not been reduced significantly, and additional measures are still needed to address discharges from agriculture.

Germany **(see also Annex 4)**

In Germany, the elaboration of more specific targets has been closely linked to the implementation of the EU nitrate directive and the EU Water Framework directive, both in terms of national regulations and additional measures taken at federal state level.

The most relevant national regulation concerning meeting the obligations of the EC Nitrate Directive (91/676/EEC) is the Ordinance on Fertilisation a comprehensive action programme currently under revision that also includes a code of "good agricultural practice".

The most important aspects of the German Ordinance on Fertilisation include:

- Regulations concerning BAT for storage facilities and spreading equipment for animal manure[1]

- Regulations concerning the reduction of ammonia volatilisation related to the application of manure on farmland[2]

- Regulations concerning the maximum amounts of nitrogen permissible in manure spread on fields

- Regulations concerning the maximum amounts of nutrients to be applied in fertilisers according to crop requirements and nutrient availability, including limits on the number of times fertilisers may be applied on agricultural land.

Another relevant national regulation forming part of the German Implementation of the Council Regulation No 1257/1999 is the so-called GAK programme (“Common programme for the improvement of the agricultural structure - GAK), which is co-financed by the Federal Government and the Federal States. The GAK is an important tool for the implementation of environmentally sound farming. The GAK aims to ensure that a number of different measures for reducing nutrient losses and other problems are implemented promptly. These regulations also aim to promote the use of better technology to further reduce nutrient losses from agricultural sources. The GAK is an

1 Special ordinances of the Federal States set conditions regarding sufficient storage capacities and environmentally sound construction of storage vessels for livestock manure, as well as for measures to avoid the pollution of waters due to the discharge or percolation of fluids containing manure etc. Additionally, the Technical Instruction Air provides for the coverage of manure containers in animal housing subject to licensing. On the basis of supporting programmes of the Federal States, financial support is given for the construction of slurry containers, manure plates and other slurry storage facilities. Both the Federal States and the Federal Government promote advanced technologies to develop the corresponding equipment for spreading manure close to the ground.

2 The German Government is also planning to introduce a Code of Good Agricultural Practice for the Reduction of Ammonia Emissions.

element in the fulfilment of both national and international obligations, and should also prove to be a key element in efforts to promote sustainable agriculture.

In 2002 the GAK programme was up-dated and extended towards a set of different voluntary measures aiming to reduce diffuse nitrogen losses and other environmental problems.

Financial support will be granted through the GAK programme for the following measures:

- Expansion of crop rotation system
- Cultivation of intermediate crops and catch crops during winter
- Mulching and direct sowing systems
- Investments for machinery for BAT manure spreading equipment
- Cultivation of buffer strips
- Extension of grassland
- Transforming arable land to grassland
- Reductions in livestock densities
- Organic farming.

The German Government has also passed a Strategy for Sustainable Development which contains indicators for the sustainability of agriculture, including nitrogen surplus. The goal is to reduce the nitrogen surplus for the whole of the agricultural sector (i.e. surpluses originating from farmland or animal housing that enter the air, soil or water) to 80 kilograms/ha/a by 2010.

Latvia **(see also Annex 5)**

Since the regaining independence Latvia has substantially reorganised the environmental sector. Major changes have occurred in environmental legislation and the organisation of environmental institutions. Protecting the Baltic Sea is a central element of all environmental protection measures taken in Latvia.

The National Environmental Policy Plan (NEPP) was accepted by the Cabinet of Ministers of the Republic of Latvia on April 25, 1995. The NEPP corresponds to principles of global environmental policy, and forms the basis for further environmental protection policy development in Latvia. The major environmental protection priority areas and problems are defined in the NEPP along with the instruments required for their implementation.

The necessary measures and activities are listed in the Environmental Protection Action Programme (EPAP). This action programme supplements the NEPP, and includes measures for every priority area indicated in the NEPP. The NEPP sets targets for reductions in total nitrogen emissions into waters from point sources of 50% compared to 1995 levels by 2010, and from diffuse sources to and for reductions in the losses of nitrogen, phosphorus and other biogenous substances from fertilisers of up to 50% of 1994 levels by 2010.

Another National Programme approved by the Cabinet of Ministers is “The National Programme for the Protection of the Environment of the Baltic Sea”. This programme aims to implement environmental protection projects in facilities polluting the Baltic Sea and measures to improve the national environmental monitoring programme. The programme includes sub-programmes targeting improvements in water management – (“800+”) and solid waste management (“500-“) and several other projects.

Latvia's forthcoming integration into the European Union has had considerable influence on developments in the environmental sector. With Latvia due to join the EU in May 2004, the transposition and implementation of EU environmental legislation are currently high priorities.

The Cabinet of Ministers will approve a management plan for each river basin district by 22 December 2009, together with special programmes of measures for each basin which should become operational by 2012.

During the last ten years considerable reductions in nutrient loads from major pollution sources have been achieved in Latvia. According to the MINDEC-report, the overall nitrogen load from Latvia was reduced by 54%, while phosphorus loads were cut by 45%. These drastic decreases in pollution from all sources between the late 1980s and 1995 were mainly due to economic trends, however. Latvia's economy started to improve in 1995, but since 1995 there have also been substantial improvements in the environmental sector. The overall declining trend for pollution in Latvia continued through the late 1990s, as has been shown in PLC-4 Project data, which indicates that nutrient loads have been reduced considerably over the period 1995 – 2000, by 16% for nitrogen and 50% for phosphorus. Latvia has thus already achieved the overall 50% reduction target, but there are still plans to cut nutrient pollution further by 2010.

Poland **(see also Annex 7)**

Since the early 1990s Polish environmental policies have been consistent with he principles of sustainable development. The basis of these policies was formulated in the State Environmental Policy adopted by Parliament on 10 May 1991. This document set out the main priorities for environmental policy and water protection::

-reduction of pollution loads discharged by industry and municipalities into rivers by 50% by 2000, partly by increasing the effectiveness of wastewater treatment systems;

-improvement of sanitary conditions in rural areas by supplementing village water supply systems with adequate sanitation solutions.

The currently effective Second National Environmental Policy was elaborated by the Council of Ministers in June 2000, and adopted by Parliament in August 2001. This document sets the course for policy, and defines short-term and long-term priorities and the main tasks to be fulfilled by 2025 to implement the national sustainable development strategy. The integration process with the European Union supports the achievement of the major objectives of this new national policy, which sets out 3 phases towards attaining these goals. The policy contains strategic directions for actions in water protection, including the restoration of surface water and groundwater quality, the protection of surface and marine waters against eutrophication, and the protection of the waters of the Upper Vistula and Upper Odra against salination from mining water.

The total riverine pollution loads discharged to the Baltic Sea have evidently been reduced by 22% for nitrogen and by 26% for phosphorous between 1988 and 2000. Loads from agriculture have increased since 1995 for both nitrogen and phosphorous, while loads from industries and municipalities have decreased substantially. No sector specific figures could be presented for nutrient discharges, however.

The 50% reduction goal for nutrient loads has not been achieved in all sectors. Poland is by far the main contributor of nutrients to the Baltic Sea. There have been significant reductions for municipalities and industries, but the loads from agriculture have not decreased since 1995. Decreases are not expected in the future, either, since agricultural production is expected to grow, and the implementation of the GAP may only succeed in curbing further incremental increases in discharges in the future. There are extensive plans to improve the treatment of municipal wastewater, which should lead to significant reductions over the next 15 years. When the modernisation

programme is implemented, phosphorus loads are expected to be less than half of the levels of today, but for industries the expected reductions are significantly lower. The timetable for these investments is also longer than the HELCOM 2005 target.

Sweden **(see also Annex 9)**

The Swedish Parliament has stipulated 15 national goals for the environment, to be reached within one generation. One of the goals is “No Eutrophication”, which means that the concentrations of nutrients in soil and water should not lead to any negative impacts on human health, biodiversity or the potential use of water and soil. Another goal set for the coastal zone and the sea specifies that the conditions that prevailed during the 1940s should be restored, and that nutrient inputs into the sea should not cause any eutrophication. One of the objectives is also that the ecological status of Sweden's coastal waters, as defined by the Water Framework Directive, should be at least “good”. The programme contains interim targets for Zero Eutrophication, including an action programme in accordance with the Water Framework Directive will be in place by 2009, specifying how to achieve a good ecological status in lakes and streams, as well as coastal waters. By 2010, waterborne anthropogenic emissions of phosphorus compounds into Sweden’s lakes, streams and coastal waters will have diminished continuously from 1995 levels. Strict measures are needed to achieve the interim targets, in particular in agriculture and municipal wastewater treatment.

Total discharges of nitrogen have been reduced by 17% between the late 1980s and 2000, but it must be remembered that the figures for the different years are not always directly comparable. For phosphorus, the figures show significant reductions for municipalities (59%) and industries (45%) between the late 1980s and 2000. Discharges from these sources had already been reduced significantly before the late 1980s. For agriculture, the figures are very uncertain.

Based on the currently available information, the 50% reduction goal for nutrient loads has not been achieved in all sectors. There have been significant reductions in phosphorus discharges from municipalities and industries, but nitrogen loads have not decreased as much, especially in agriculture, and it will be difficult to reach the 2005 target. Future measures in Sweden are expected to focus increasingly on the agricultural sector.

5. PROSPECTS FOR THE FUTURE

Point sources

Further reductions in nutrient discharges from point sources are likely, thanks to the continued implementation of nitrogen and phosphorus removal measures which should decrease municipal loads. Further implementation of BAT will also cut industrial loads.

However, the present EU member countries started to implement water protection measures already before the late 1980s, and by 1995 the phosphorus removal efficiency of municipal wastewater treatment plants was close to 90% in both Sweden and Finland. In Denmark and Germany, phosphorus discharges from industry were reduced by approximately 85% between the late 1980s and 1995; thus further reductions in phosphorus discharges are becoming increasingly difficult to achieve in the present EU member countries. Significant reductions in phosphorus and nitrogen discharges were nevertheless achieved between 1996 and 2000, especially in Denmark and Germany. According to Finnish national water protection targets, further discharge reductions of the order of 50% are possible, but the evaluation concerning nutrient reductions indicates that it will be difficult to reach the target set for 2005.

In the EU accession countries and Russia, the planning and construction of municipal wastewater treatment plants for larger communities (>50,000 PE) was not started until the mid-1980s, or in some cases the early 1990s. Purification efficiencies were low compared to tertiary treatment, particularly with regard to phosphorus. In 1995, the phosphorus removal efficiency rates in the Nordic Countries and Germany were still greater than in the countries in transition. Regarding nitrogen loads, only Denmark, Estonia and Germany had already achieved advanced purification efficiencies by 1995.

There are official plans to reduce nutrient discharges from point sources further in water bodies in Estonia, Latvia, Lithuania and Poland, as well as in Finland and Sweden. The implementation of a programme for the modernisation of municipal WWTPs (implementation of Council Directive 91/271/EEC) in Poland will result in reductions of 40,000 tonnes of nitrogen and 12,000 tonnes of phosphorus from levels of 2000 within 15 years. In percentage terms, this would mean a reduction of about 60% in phosphorus discharges and 30% in nitrogen discharges compared to 1995 levels.

In Russia, further reductions in municipal nutrient loads are anticipated when new wastewater treatment facilities are completed in St. Petersburg (about 30% of the city's sewage is still discharged to the sea without any treatment, while the rest is mechanically-biologically treated), and the more widespread adoption of nitrogen and phosphorus removal technologies. The construction of wastewater treatment plants in the Kaliningrad region will lead to significant reductions in the nutrient loads entering the Baltic proper.

Diffuse sources

Reducing nutrient losses from agriculture is much more complicated than curbing loads from point sources. The implementation of load reduction measures (e.g., Annex III of the Helsinki Convention and the EU's Nitrate Directive) will support further reductions in nutrient losses from agriculture. There is clearly a considerable time-lag between the implementation of agricultural water protection measures and any visible effects on water bodies. This means that reductions in the loads in water bodies will not be observable by 2005, even if all the planned measures are implemented.

Due to economic factors, agricultural nutrient losses from countries in transition (except Poland) declined between the late 1980s and 1995. It has been predicted that agricultural production will rise after EU enlargement, which will probably lead to increased discharges from this sector. According to the targets submitted by Estonia, Latvia and Lithuania, the main goal of the environment protection authorities is to maintain future loading rates at 1995 levels.

Overall conclusions

- The goal to reduce nutrient discharges and losses by 50 % will not be reached for all sectors by 2005.
- There has been good progress in some areas, particularly concerning the reduction of phosphorus discharges from point sources, but there are still excessive inputs of nutrients from agriculture.
- Further reductions in nutrient discharges from point sources are technically feasible, especially in the EU accession countries and Russia. The most significant phosphorus loads today comes from municipalities in Poland, but these discharges are expected to be significantly reduced within 15 years through the implementation of an extensive modernisation programme for municipal wastewater treatment plants. The construction of the new WWTP in St. Petersburg and the upgrading of existing plants are also expected to reduce the nutrient loads entering the Gulf of Finland. There is also a need to focus more on urban wastewater collection and treatment in the EU accession countries.

- Reductions in nutrient losses from diffuse sources are much more difficult to achieve than cuts in discharges from point sources. Phosphorus losses from agriculture have not decreased significantly in present EU member countries. Nitrogen losses have been reduced more significantly, by about one third in Germany and Denmark, and up to about 20% in Finland and Sweden. Calculated as losses per area of arable land, nitrogen loads are still high in the present EU member countries. There is inevitably a long time-lag before any changes achieved through such measures can be seen in reduced loads.
- It can be predicted that agricultural production will rise in the EU accession countries, which will lead to increased discharges if protection measures are not intensified. There is therefore a need to strengthen the relevant measures. The largest proportion of the total nutrient load from diffuse sources today comes from Poland, but there is also a need to address nutrient discharges in all the other Contracting Parties.
- It must also be remembered that almost 35% of the nitrogen input entering the Baltic Sea originates from airborne input, so there is also a need to address these sources.
- Although it was not possible within the scope of this review to consider in detail all the data on diffuse sources, the currently available information clearly shows that an increasing share of the total nutrient discharges now originates from urban areas, small municipalities and scattered settlements with no centralised wastewater treatment.

6. FURTHER WORK ON THE IMPLEMENTATION OF THE 1988/1998 MINISTERIAL DECLARATIONS

1. According to the Ministerial Decision, the Contracting Parties should have more specific targets defined by the year 2005, and comprehensive official plans to reduce inputs of nutrients into the Baltic Sea have so far been adopted by the governments in Finland, Sweden and Latvia. Plans to reduce nutrients in the other Contracting Parties which are or will soon be EU members mainly focus on the implementation of the related EU Directives, which also contribute to nutrient input reductions to the Baltic Sea.

2. According to the requirements set out in the Water Framework Directive (WFD), EU member states have to implement programmes of measures by 2009 in order to achieve “good” quality status for their waters (including coastal waters) by 2015.

- The objectives and implementation timetables for water protection measures should therefore be harmonised between the WFD and HELCOM. Reduction target should no longer be set in percentage terms in future.

3. In many Contracting Parties national measures are unlikely to be sufficient to achieve good quality status for coastal waters, since the situation is often greatly dependent on nutrient inputs received through water exchange from the open sea, as well as from atmospheric deposition.

- It should be acknowledged that in order to combat eutrophication problems nutrient reduction measures should be considered jointly for the whole Baltic Sea region.
- HELCOM and the Contracting Parties should more comprehensively analyse the relationship between the sources and impacts of nutrient loads in the different parts of the Baltic Sea.
- There must be a more detailed evaluation of the relative impact on the coastal and open waters in the different parts of the Baltic Sea of nutrient loads from adjacent

rivers and local sources, nutrient inputs received via the exchange of water from the open sea, releases from the seabed, and atmospheric deposition.

- Feasibility studies should be conducted on the basis of these evaluations to assess what measures are needed, and how they should be targeted (nationally and internationally) in order to achieve cost-effective solutions. To facilitate these evaluations, models such as MARE could be utilised.
- One example of such an approach is Finland's Baltic Sea Protection Programme, where it has become evident with regard to the Gulf of Finland that measures in Finland alone will not be sufficient to combat eutrophication in the open waters of the gulf, as inputs from the River Neva (including wastewater discharges from St. Petersburg) account for about 70% of the total nutrient load entering the Gulf of Finland. A major element of Finland's programme consists of investments for the upgrading of wastewater treatment in St. Petersburg. The programme also acknowledges that national measures are also needed in order to improve the quality of Finland's coastal waters. These national measures are targeted especially to address (at farm level) the most important agricultural nutrient sources along Finnish rivers discharging into the Gulf of Finland.

CONTRIBUTION BY DENMARK

The quality criteria for Danish marine waters were only fulfilled for a restricted number of the estuaries, coastal regions and open waters. The few coastal areas that meet the criteria are generally non-stratified shallow water areas with relativelyr estricted load from land based sources. The open sea areas that meet the criteria are the non-coastal parts of the North Sea, the Skagerrak and the Kattegat(Northern and Central). The failure to attain the criteria is primarily a result of nutrient loading, the occurrence of oxygen depletion and the effects of TBT. In order to fulfil the criteria for Danish marine waters and achieve significant and long lasting improvements in their condition, furtherreductions in nutrient load (in particular fromdiffuse sources), and for certain areas a decrease in TBT and other organic contaminants, are greatly needed.

Nutrient supply

In 2001 the diffuse sources (including small settlements) made up 90% of the total nitrogen load and 65% of the total phosphorus load to the Danish estuaries and coastal waters. The nitrogen load from Denmark, corrected for inter-annual variations in runoff, has decreased significantly. About 35% in the period 1990-2001, with 21% due to the reduction in export from agricultural soils, and 14% due to the reduction in load from point sources. During the same period the phosphorus load has decreased 60%, mainly due to improved sewage treatment. There has also been a reduction in the atmospheric nitrogen deposition to open waters of about 15% since 1989. Both the loads from land and the atmosphere vary considerably from year to year due to variations in precipitation and runoff. An N-budget for Danish internal waters shows that Denmarks share compared to the neighbouring countries of the total-N load is around 12%.

Nutrient concentrations

The decreasing nutrient load to Danish waters is reflected in their nutrient concentrations. The nitrogen concentrations in 2001 were the lowest observed during the period 1989-2001 and at the same level as the very dry years 1996 and 1997. In the open waters (the Kattegat, the Sound and the Belt Sea) the runoff corrected nitrogen concentration shows a steady decrease since 1989. In the estuaries and coastal waters, a significant decrease was observed after 1997. In the estuaries and coastal waters, the phosphorus concentrations have stabilised at a low level after significant decreases in the beginning of the 1990s. Corrected for inter annual variation in runoff, the export of nutrients from the estuaries to the open waters has decreased, for phosphorus since mid 1980s and for nitrogen since mid 1990s. The nutrient exchange with the Baltic Sea and the Skagerrak varied from year to year in the period 1999-2001. An average annual nitrogen budget for the Kattegat – Belt Sea area for the period 1989-96 shows that the Danish contribution of total nitrogen to the total supply from surrounding countries, atmosphere, Skagerrak and the Baltic Sea amounts to 12%. The Danish contribution increases to 25-32% taking the bioavailability of the nitrogen from different sources and recycling via Skagerrak into consideration.

The main antrophogenic load to the Baltic Sea is naturally load and loss from agriculture, sewage treatmentplants and industries with own discharge. In addition comes atmospheric deposition. To reduce these loads effective sectorwise approach is needed. As an overall conclusion the reduction of load from point sources has been a success, while the reduction in the diffuse load lacks behind.

The work in HELCOM to reduce euthrophication should focus on following 3 strategic goals:

1) specific and binding reduction goals for load of nutrients to the marine environment
2) specific and binding environmental objectives for the quality of the marine environment
3) procedures for establishment of additional measures for “trend reversal” if needed.

Ad 1) It is important to convert the present percentage goal to specific reduction targets.

Ad 2) Here coastal waters will be covered by the Water Framework Directive and to some extent by the Habitat-directive. Non-coastal waters possibly by the coming EU marine policy.

Ad 3) Trend reversal should be considered on national level, but could be made part of the convention. Also here the coming EU marine policy is important.

For Denmark the plan (II) for the aquatic environment is being evaluated now. In the end of 2003 a plan (III) for the aquatic environment will be launched, possibly as a part of the Danish implementation of the Water Framework Directive. Also Denmark finds that the work in the HEIG group can contribute to the efforts of the Contracting Parties to the “more specific targets”.

Annex 2

WATER PROTECTION TARGETS IN ESTONIA

Introduction

During the last ten years in Estonia, discharges of nitrogen and phosphorus from point sources were significantly reduced. Decrease of pollution loads in the early 1990s is largely due to decreases in production. Production of pulp, super phosphate, nitrogen fertiliser, etc. was stopped, and production of the food industry decreased. Many industries were restored in later years, but stoppages still occur.

Further decreases in pollution have been achieved through the construction and/or renovation of treatment plants. An essential role has been played by companies who wish to reduce pollution charges by reducing water usage, as well as through the implementation of cleaner technology.

During this time, several other had been occurring. New wastewater treatment plants were constructed in Haapsalu, Tartu, Tapa, Mustvee, Rapla, Lihula, Võsu and in other smaller settlements. Wastewater from the Narva-Jõesuu was discharged to the Narva wastewater treatment plant, and wastewater from Jõhvi was discharged to the Kohtla-Järve wastewater treatment plant. Also, wastewater from the Kehra pulp industry's ash field was discharged to the biological wastewater treatment plant in Kehra. Many industries have been closed: the Räpina and Kohila paper factory, Võhma meat factory, and fish industry facilities in Purtse, Toila, Narva-Jõesuu, Voka and Läätsa. Several treatment plants were renovated, including Kärdla, Antsla, Adavere, Paide, Märjamaa and Roosna-Alliku.

Reduction achieved from the late 1980s to 1999

As described in Section 7.1.2, the 50 % reduction target set by Ministers in 1988 concerning nitrogen was achieved by Estonia by 1995. To achieve the 50 % reduction target for phosphorus Estonia should reduce phosphorus loads by 2 tonnes (0.2 %) by the year 2005. Based on monitoring results Estonia has significantly reduced nitrogen and phosphorus loads between 1995 and 1999. The load figures for nitrogen and phosphorus, calculated using monitoring results, are presented in table 7.14.As indicated in Table 7.14, the goal to reduce nitrogen and phosphorus load to the environment by 50 %, has been implemented by Estonia by 1999. There is therefore no need to set more specific quantified targets to implement the 1988 Ministerial Declaration.

In addition to the implementation of the 1988 Ministerial Declaration, the Estonian Parliament and Government are very much concerned about the sustainable development of the country, and thus implementation of environmental protection measures receives continuous attention.

Table 7.14 Nitrogen and phosphorus load reduction achieved by Estonia between the late 1980s and 1999

Source	Nitrogen load		Reduction		Phosphorus load		Reduction	
	1980s (t/y)	1999 (t/y)	(t)	(%)	1980s (t/y)	1999 (t/y)	(t)	(%)
Direct municipal	4 719	1 163	3 556	75	291	112	179	62
Direct industrial	11 792	337	11 455	95	320	0	320	100
Indirect municipal	1 792	605	1 187	66	282	77	205	73
Indirect industrial	7 304	373	6 931	95	833	4	829	99
Fish farms	160	19	141	88	27	2	25	93
Agriculture	30 240	12 600	17 640	58	360	250	110	31
TOTAL	56 007	15 097	41 910	73	2 113	445	1 668	79

Environmental targets to implement EU Directives and other international agreements

Estonian National Environment Strategy (NES)

To help guarantee sustainable development in Estonia, a National Environmental Strategy was adopted by the Estonian Parliament in 1997. This document defines objectives of environmental protection measures, but defines no quantifiable targets for pollution reduction. The NES specifies the trends and priority goals of environmental management and protection in the new political and economic situation, and establishes the main short-term and long-term tasks to be achieved by 2000 and 2010 respectively.

The Strategy follows major international environmental initiatives: the World Nature Protection Strategy, Agenda 21, the Declaration of the Earth Summit (Rio de Janeiro, 1992), the Environmental Action Programme for Central and Eastern Europe (adopted at the Ministerial Conference in Lucerne in 1993 and revised at the Sofia Conference in 1995), international agreements which have become valid for Estonia, and the White Paper drafting the principal requirements of integration of Central and Eastern European countries with the European Union.

The NES focuses on achieving ten principal policy goals. Since promotion of public awareness and the introduction of environmentally sound technologies are preconditions for solving most existing environmental problems, these are considered to be priority goals of the NES. Another of the priority goals is to reduce negative environmental effects of energy production, which is a cause of major global and local environmental problems. Improvement of air quality, waste management and water protection as well as reduction of past pollution will help to ensure a healthy environment. One of the goals is the protection of surface water bodies and coastal seas.

Protection of Surface Water Bodies and Coastal Seas

Goal: To ensure the ecological balance of surface water bodies and coastal seas, natural regeneration of fish stock and aquatic flora and fauna through the rational use of water bodies.

To achieve this goal, it is necessary to: introduce a countrywide scheme of rational use of water bodies; introduce rational use of water in industry and in households; ensure biological and, if necessary, chemical treatment of wastewater contaminating the environment.

Tasks by the year 2000: To bring the main municipal and industrial wastewater treatment indicators (BOD, phosphorus etc.) in line with the recommendations of the Helsinki Commission (HELCOM).

Tasks by the year 2010: To remove nitrogen compounds from the wastewater of municipalities of more than 5 000 inhabitants in accordance with the HELCOM recommendations, in order to maintain ecological balance of water bodies sensitive to nitrogen content.

National Environment Action Plan (NEAP)

With a view to implement the Strategy, a detailed National Environmental Action Plan (NEAP) was developed between April 1997 and April 1998, and approved by the Estonian Government. The Ministry of Environment is responsible for implementation of the Action Plan.

The objective of NEAP is to enable further progress towards sustainable development through the effective implementation of policy goals stipulated in the Estonian National Environmental Strategy. More than 150 actions within the NEAP (nearly one-quarter of all actions) are orientated (directly or indirectly) to approximate both legal and substantive requirement of EU policies. Of this number, more than 50 actions are directly targeted to specific EU Directives.

Among EU environmental directives, the most frequently addressed by the NEAP are the: Drinking Water Directive (80/778/EEC), IPPC Directive (96/61/EC), Urban Waste Water Directive (91/271/EEC) and others.

Implementation of EU Directives

Estonia has stated its willingness to become a member of the European Union and has expressed its readiness to harmonise its legislation with European Union environmental legislation by the day of accession. The EU Urban Waste Water Treatment Directive 91/271/EEC (UWWTD) is regarded as one of the most expensive directives in the environmental sector.

Targets for reducing nitrogen and phosphorus discharges from municipal sources

Estonia has not declared national targets for reduction of nitrogen and phosphorus discharges from municipal sources. At present, major investments in this area are channelled for implementation of EU Urban Waste Water Treatment Directive 91/271/ EEC. The Urban Waste Water Directive will be fully transposed into Estonian national laws during 2001. The main legal act regulating wastewater treatment, including requirements for collection, is the Water Act. Under the Water Act, the Government establishes limits for wastewater discharges into water bodies and soil. In 2001 the Water Act will be amended to include definitions and monitoring requirements. Requirements on wastewater discharges are in line with the requirements of the EU Waste Water Directive or even stricter, because Estonia has signed the Estonian-Finnish Agreement on water protection and ratified the Helsinki Convention.

Table 7.15 Comparison between Estonian and EU wastewater treatment requirements for agglomerations of 2 000–100 000 PE or more

Parameters	Estonia		European Union	
	Concentration (mg/l)	Minimum reduction (%)	Concentration (mg/l)	Minimum reduction (%)
BOD_5 (in Estonia BOD_7)	15	90	25	70–90
COD	125	75	125	75
Total suspended solids	15	90	35	70–90
Total phosphorous	1.5/1.0*	80	2	80
Total nitrogen	15/10*	70–80	15	70–80

** The requirements for total nitrogen concentration (10 mg/l) and phosphorus concentration (1 mg/l) have been established for Estonian agglomerations where the pollution load exceeds 100 000 PE.*

Sensitive water bodies in Estonia are identified according to the 1998 Ministerial Regulation (RT (State Gazette) I 1998, 346/347, 1432). This Regulation has since been amended to include more sensitive areas. According to the Regulation, most Estonian water bodies and coastal sea are sensitive. These water bodies' catchment areas cover almost all Estonian territory; only a few rivers, mainly in south and southeastern Estonia (Emajõgi, Õhne, Neitsi etc.) are not identified as sensitive. All Estonian agglomerations of 2 000 PE or more must remove phosphorus at least to a concentration of 1.5 mg/l. All agglomerations with a pollution load of 10 000 PE or more are committed to remove nitrogen except Tartu, because the Emajõgi River is not a nitrogen-sensitive water body. Tartu is located more than 150 km away from the Baltic Sea, and only 20–30 % of nitrogen discharged reaches the Baltic. The investigation concerning the need to remove nitrogen in Tartu is ongoing, and relevant information will be sent to the Commission.

In Estonia, 61 agglomerations with a pollution load of 2 000 PE or more have been identified. There are 45 agglomerations with a pollution load of 2 000 to 10 000 PE, and three agglomerations with pollution load of 10 000–15 000 PE. There are 12 agglomerations with a pollution load from 15 000 to 150 000 PE, and 1 agglomeration with a pollution load of more than 150 000 PE. There is more than 3 000 km of sewerage. In addition, about 590 km of sewerage should be constructed and 412 km renovated. There is a need to build 16 wastewater treatment plants and renovate 23 additional plants.

Table 7.16 Compliance in implementing Estonian and EU Directive requirements on the basis of three parameters

Parameters	Agglomerations which are in compliance with Estonian and EU directive requirements	
	Number of agglomerations	%
BOD_7 (15 mg/l)	38	62
Total phosphorus (1.5 mg/l)	27	44
Total nitrogen (15 mg/l)	9	56

There is no need for significant investments for phosphorus removal, but nitrogen removal requires large-scale investments, as there is a need to construct denitrification zones in wastewater treatment plants.

According to estimates, investments of more than 224.8 million euro are needed to renovate and construct wastewater treatment systems in agglomerations with a pollution load of 2 000 PE or more. According to Article 7 of the Directive, it is also necessary to renovate and construct wastewater treatment systems in smaller agglomerations with collection systems, and this would cost more than 100.2 million euro. An implementation plan for the Directive

has been drafted, taking into consideration the following factors: pollution load from agglomerations, discharges into highly sensitive water bodies (surface water bodies, which are used as drinking water resources) or to the soil, and agglomerations located in areas where groundwater is vulnerable (karst areas, alvars). Some agglomerations with a small pollution load are also included in the priority list because of a high risk of environmental pollution.

Implementation of Articles 4 and 5 will be carried out from 2000–2005. The implementation of Article 3 is planned to be accomplished by 2000–2010.

Construction of new and reconstruction of existing wastewater treatment plants according to the existing plans will guarantee the continuous reduction of nitrogen and phosphorus loads to the environment.

Targets for reduction of industrial discharges, agricultural discharges and discharge from fish farms

In last decade essential changes have taken place in Estonia. Economic restructuring, changes in industry management, and domestic water consumption have brought about decreases in pressures on the aquatic environment, which has had favourable effects on rivers, lakes and seas. The revitalisation of the economy will inevitably be accompanied by increases in these pressures.

Preventing pollution through the use of production technology, thus saving water resources and the promotion of suitable wastewater treatment methods and sustainable (“mild”) agriculture, it is possible to preserve the present situation in water bodies.

In Estonia, as a rule industrial and domestic wastewater is treated in a common wastewater treatment plant. Only a small part is discharged directly into surface waters. Estonia has not set any specific targets for reduction of nitrogen and phosphorus discharges from industrial sources. The main focus of environmental measures will be to prevent an increase of nitrogen and phosphorus discharges when industry recovers.

Significant reductions in agricultural and fisheries production occurred in the early 1990s due to land reform and changing market circumstances. Outputs from agriculture and fisheries is expected to increase in the near future. Estonia has not set any specific targets for reduction of nitrogen and phosphorus discharges from agriculture and fisheries for the period 1999–2005, but aims to prevent pollution of aquatic environment in the future.

Estonia intends to implement EU Nitrate Directive and the Code of Good Agricultural Practice. Implementation of the Code will reduce nutrient leaching to surface waters. Introduction of modern fertilisers and manure handling techniques and other measures required by the Nitrate Directive and Code will decrease impacts on the environment.

The HELCOM Recommendations concerning reduction of nutrient discharges from agriculture and reduction of discharges from marine fish farming and fresh water fish farming is also followed.

During the period 1990–2000 more modern fish farming practices were introduced. The efficiency of food production has been improved, and resulted in reductions of environmental impacts. It is realistic that the number and productivity of fish farms will increase in the future. Environmental measures will focus on prevention of further pollution.

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Annex 3

PLANS AND PROGRAMMES IN FINLAND FOR THE IMPLEMENTATION OF THE MINISTERIAL DECLARATION WITH REGARD TO THE 50 % REDUCTION TARGET OF NUTRIENTS

1.The Programme for the protection of the Baltic Sea

The Finnish government adopted in April 2002 a programme for the protection of the Baltic Sea, which main aim is to influence the state of the waters around the Finnish coast. In order to achieve a good ecological state of the Baltic sea, action will be taken in six sectors. These are combating eutrophication, reducing risks caused by dangerous substances, curbing damages resulting from the use of the Baltic Sea, preserving and increasing biological diversity, increasing environmental awareness, and research and follow-up. The most urgent action refers to the eutrophication of the Baltic due to nutrient loads, the risks caused by increased transports of oil and chemicals, and the threats for man and nature caused by dangerous, accumulating and persistant substances.

The goals for decreasing discharges are based on the Water Protection Target Programme 2005, which sets the goal of 50 % decrease in nutrients emissions in nutrient discharges compared with the level in early 1990's. The measures set out in the programme will be carried out over the next 10-15 years. It is estimated that the implementation of Finland's programme will halve the eutrophying emissions from Finland. Indications of such decrease will first come in coastal waters and near pollution sources. The state of the open sea will also be considerably improved, but more slowly.

The implementation of the programme is expected to require Finnish investment amounting to some EUR 300-370 million. The largest single sum for annual investments, however, consists of environmental subsidies for agriculture. The programme also stresses the significance of Finnish environmental investments in neighbouring countries, particularly investments aimed at improving the state of the Gulf of Finland.

2. The Finnish water protection targets for the year 2005

On 19 March 1998, the Finnish Council of State issued a Decision-in-Principle on Water Protection Targets to 2005. The main goals of the Decision-in-Principle are the reduction and prevention of eutrophication. The general objectives of water protection are to (1) prevent further deterioration in the state of the Baltic Sea and inland waters caused by human activities and (2) improve the conditions of those watercourses that have already been contaminated. The quality and quantity of groundwater must, in general, be maintained at least at present levels and improved in locations where its quality has been degraded by human activities. Water pollution is prevented primarily by actions that reduce waste loads at the source. The anthropogenic load of phosphorus shall be decreased by about 45 % and nitrogen by about 40 % of the levels in the period 1991–1995. Targets are also set for biological oxygen demand and for substances causing harmful effects in water.

Achieving the Water Protection Targets established by the Finnish Council of State will be part of the implementation of the 1988 Ministerial Declaration to reduce the load of pollutants most harmful to the ecosystem of the Baltic Sea by 50 percent of total discharges. The targets also support the 1998 Ministerial Communiqué, in which the Ministers reaffirmed their commitment to achieve the strategic goals of the 1988 Ministerial Declaration, and to define a series of more specific targets to be achieved before 2005 and reviewed in 2003.

2.1 Loading from different sectors

Urban areas

Wastewater discharges into inland waters and the Baltic Sea concerning phosphorus input should be cut by at least 35 percent, and nitrogen inputs 14 percent, compared to 1991–1995 average levels. In urban areas, phosphorus and nitrogen discharges should be cut and wastewater should be treated with biological-chemical or similar processes. The requirements concerning biological-chemical or similar processes and more effective nitrogen removal are based on the Finnish Council of State Decision on "the Treatment of Wastewater entering Water Areas through the Public Sewerage System and from Certain Industrial Sectors and Industrial Wastewater Entering the Public Sewerage System", by which the urban wastewater directive was incorporated in Finnish legislation. The requirement concerning more efficient phosphorus removal is based on the need to combat eutrophication. The modernisation and careful maintenance of sewerage networks are important for groundwater protection, but also reduce fluctuation in the amounts and quality of wastewater caused by infiltration water, which complicates the treatment process. By 2005, wastewater treatment plants should be able to handle around 94 percent of the oxygen demand and remove 96 % of phosphorus. To reach targets for nitrogen loads, the wastewater of about 1.6 million residents should be treated with an average nitrogen removal rate of 60 percent. The target program is estimated to reduce municipal discharges into water as follows:

Nutrient	Load in 1995 (t/y)	Load in 2005 (t/y)
Phosphorus	244	170
Nitrogen	14334	12500

Scattered dwellings

The need to improve wastewater treatment in scattered dwellings was taken into account in the new environmental protection act. Earth closets and water-saving applications should be given priority when waste management alternatives are considered. At present, there are no nitrogen removal technologies suitable for treating wastewater in rural areas and thus it is essential to develop and test such technologies. Water protection should be promoted with education, dissemination of information, increasing use of professional water and waste management, land use planning, and incentives for housing repairs and renovation. These measures should reduce water pollution by rural areas and holiday homes as follows:

Nutrient	Load in 1992 (t/y)	Load in 2005 (t/y)
Phosphorus	415	300

Industry

Nitrogen and phosphorus discharges flowing into the Baltic Sea and inland waters should both be reduced by at least 50 % compared with 1995 levels. Industrial water protection practices should focus on the largest polluters and introduce environmentally-friendly operating and production methods, as well as efficient methods for treating waste and wastewater. To meet targets set for industry, both new plants and plants undergoing modernisation should incorporate the best available technology to reduce discharges and environmental impact as comprehensively and effectively as possible.

To reduce nutrient loads from the pulp and paper industry, the process-related use of chemicals containing nitrogen and phosphorus should be optimized and the maintenance,

control and use of industrial wastewater treatment plants should be made more effective, for example when adding nutrients to biological treatment plants. Targets set for other industries are based on their readiness to adopt process and treatment technologies that reduce discharges.

In the following table, discharges from industrial plants subjected to statutory monitoring in 1995 are compared with the targets for the year 2005:

Nutrient	Load in 1995 (t/y)	Load in 2005 (t/y)
Phosphorus	358	170
Nitrogen	4334	2500

Agriculture and rural business

Crop cultivation and animal husbandry

Phosphorus and nitrogen discharges into inland waters and the Baltic Sea should both be reduced by at least 50 % from 1990–1993 average levels. Nutrient discharges should be cut, in particular by introducing cultivation techniques that decrease field erosion and provide for the more efficient use of nutrients. For more efficient water protection, the use of fertilisers should be in keeping with the conditions at the site and nutrient requirements of the crops. Nutrient utilisation requirements can be assessed using farm-specific nutrient balances. Leaching of nutrients from animal husbandry into water areas should be reduced by introducing environmentally efficient methods of manure treatment, storage and spreading. Liquid manure, other liquid organic fertilisers or uncomposted dry manure should not be spread in important or potentially important groundwater areas, if the spreading may affect groundwater quality. Nitrogen discharges should be reduced in accordance with the Council of State Decision on Restriction Discharges of Nitrates from Agricultural Sources into waters. Under the Environmental Program for Agriculture to be launched in the year 2000, partly funded by EU, support is made conditional on the implementation of water protection measures. The target program is estimated to reduce agricultural discharges into water as follows:

Nutrient	Load in 1995 (t/y)	Load in 2005 (t/y)
Phosphorus	2600	1545
Nitrogen	37000	15435

Forestry

Targets for the forestry sector are based on the Environmental Program for Forestry approved by the Ministry of the Environment and the Ministry of Agriculture and Forestry in 1994, which defines targets for the year 2005. Phosphorus and nitrogen discharges into inland waters and the Baltic Sea should both be reduced by at least 50 percent from estimated 1993 average levels. The measures are specifically aimed at reducing phosphorus and nitrogen losses in forest soils, which should be achieved by reducing erosion of nutrients and surface deposits. Fertilisers should be used to compensate for nutrient losses in forest, but should not be applied to low-yield peatland which is unable to absorb phosphorus and is unsuitable for tree planting. The Environmental Program is estimated to reduce forestry discharges into water as follows:

Nutrient	Load in 1993 (t/y)	Load in 2005 (t/y)
Phosphorus	340	170
Nitrogen	3330	1670

Fur farming

Phosphorus and nitrogen discharges into inland waters and the Baltic Sea should both be reduced by at least 55 % from estimated 1993 average levels. To achieve the targets set for fur farming, wastewater and drainage systems at existing farms should be modernised, and new farms should be equipped with watertight waste treatment systems and efficient systems for treating runoff. Watertight waste treatment systems for the cage structures include waste collection bins or waste troughs, watertight ground or floor structures or other arrangements preventing excrement or feed waste from entering surface water and groundwater. Co-operation between fur farms and agriculture should be encouraged, with a goal of more efficient utilisation of fur animal manure as fertiliser. The Environmental Programme is estimated to reduce discharges into water as follows:

Nutrient	Load in 1993 (t/y)	Load in 2005 (t/y)
Phosphorus	45	20
Nitrogen	430	190

Fish farming

Phosphorus and nitrogen discharges into inland waters and the Baltic Sea should both be reduced by at least 30 % from estimated 1993 average levels. To met these targets, better-quality feed and improved feeding methods should be introduced, and farms should reduce their discharges. This can be achieved by modernizing existing plants that rely on net closures and tanks during their useful life or at their closure. The farms to be modernised should be equipped with sophisticated feeding systems and, to bring about significant cuts in discharges, their closuresequipped with more efficient sludge removal systems. With these measures and careful maintenance, the nationwide specific load produced by fish farms can be reduced to an average of 7 g phosphorus and 44 g nitrogen for each kilogram of live fish produced. If there are no significant changes in the number of fish farms, discharges into water are expected to decline as follows:

Nutrient	Load in 1995 (t/y)	Load in 2005 (t/y)
Phosphorus	290	200
Nitrogen	1260	1100

2.2 Summary of targets to achieve the 50 % reduction regarding nutrients

Finland established sector-specific reduction targets for nutrients taking into account pollution loads in 1987, using the source-orientated approach to fulfil the 50 % reduction goal adopted by the ninth meeting of the Helsinki Commission.

Table 1. Draft Specific Targets for Finland to Achieve 50 % Reduction of Nitrogen by 2005

Pollution source	Load in late 1980's (t/a)	Load in 1995 (t/a)	Reduction achieved by 1995 %	Specific target reduction (t)	Reduction to be achieved to 2005 (%)	Load to be achieved in 2005 (t/a)
Urban Areas	14505	14334	1	1834	13	12500
Industries	5824	4334	26	1834	42	2500
Fish Farms	1740	1260	28	160	13	1100
Agriculture	14500	37000	19	19895	54	17105
Forestry	5000	3330	33	1660	50	1670
Fur Farming	500	430	14	240	56	190
Total	72069	60688	15	25623	42	35065

Table 2. Draft Specific Targets for Finland to Achieve 50 % Reduction of Phosphorus by 2005

Pollution source	Load in late 1980's (t/a)	Load in 1995 (t/a)	Reduction achieved by 1995 %	Specific target reduction (t)	Reduction to be achieved to 2005 (%)	Load to be achieved in 2005 (t/a)
Urban Areas	452	244	46	74	30	170
Industries	834	358	57	188	53	170
Fish Farms	210	290	-38	90	31	200
Agriculture	2650	2600	2	1055	41	1545
Forestry	500	340	32	170	50	170
Fur Farming	50	45	10	25	56	20
Scattered dwellings	415	415	0	115	28	300
Total	5111	4292	16	1717	40	2575

2.3 Economic impact

Water protection costs arise from project-specific measures, which are usually developed in conjunction with the processing of water and environmental permits. This Resolution does not entail any direct costs, because the target program is not binding on Water Rights Courts, the judicial authority granting project-specific permits. The public administration is expected to take the program targets into account in its decision-making processes, however, and thus the Resolution is essentially designed to function as a mechanism to guide and promote protection measures. The proposed target program gives industry and business sufficient time to harmonise their environmental protection operations in accordance with the program's objectives. With long-term and well-focused water protection efforts, human and economic resources can be put to more efficient use and misdirected investments be avoided. As a result, significant savings can be achieved compared to a short-sighted approach to water protection. As the water protection targets are of a general nature and comprise a broad range of activities, it is difficult to estimate the overall costs of the Resolution. In internal production-related measures, it is difficult to distinguish between water protection investments and investments aimed at making the production process more efficient, and thus it is difficult to give an accurate assessment of the precise economic impact of the program. In keeping with the "polluter-pays" principle, the polluter is responsible for covering the cost of upgrading water protection. This means that the cost of improved water protection is ultimately transferred to the price of water-pollution services and commodities. An exception to this rule in the EU member states is agriculture, for which environmental subsidies are granted under the EU agrienvironmental program and agricultural investment subsidies provided to finance water protection projects. In calculating polluter-specific costs, total investments have been converted into annual costs using an annuity method with an amortisation period of between 10 and 20 years (depending on the type of investment) and an annual interest rate of 6 %. When examining economic effects, annual water protection costs are usually compared with the total annual production value of the polluting activity. The purpose of this approach is to examine water protection costs as part of the overall operations and facilitate the comparison of the economic costs of water protection borne by different sectors.

2.4 Environmental effects

The program is expected to increase the area of waters classified as being in very good condition by 600 km2, from the present 10 200 km2. The total area of lakes classified in the "good" category should decline by almost 300 km2, from 11 400 km2. This is because more water areas will move up to the "very good" category than are likely to drop down to the "satisfactory" category. The area of lakes of satisfactory water quality should decrease by about 300 km2, from 5 150 km2, and the area of lakes with adequate water quality by 30 km2, from 1 040 km2. The total area of lakes with poor water quality, 140 km2, should remain unchanged. The program should halt the decline in water quality in rivers. The total length of rivers with adequate water quality should increase by 20 km, from 3 800 km and the total length of good quality rivers should also increase by 20 km, from 4 300 km. It is estimated that a reduction in phosphorus discharges into sea areas will markedly improve water quality in the inner parts of archipelagos. The high content of inorganic nutrients and an effective nutrient cycle in coastal waters and open water areas would prevent any wider impact. Decreases in nutrient discharges could reduce eutrophication in some parts of the Archipelago Sea and the Gulf of Finland. A rapid 25 % reduction in the discharges flowing to the Bothnian Bay would bring the phosphorus content of this sea area down to the 1980s level in 30 years. Nitrate content, however, would come down much faster and could actually drop below levels of the 1960s.

Annex 4

MORE SPECIFIC TARGETS FOR REDUCTION OF NUTRIENT POLLUTION LOAD FROM GERMANY TO THE BALTIC SEA

This report presents possibilities to further reduce the nutrient loads from agricultural sources from Germany to the Baltic Sea. While the target of a 50% reduction was already reached for phosphorus, for nitrogen this target has not been achieved within the considered time period.

Between 1985 and 2000 the total amount of nitrogen emissions into surface waters from point and diffuse sources within the German Baltic Sea catchment area decreased by 43% (or 26180 t/a) to 34120 t/a. The decrease is mainly due to a reduction at point sources. The reduction of all diffuse sources amounts only one third. The emissions from groundwater and drainage (agricultural origin) are still the dominant sources while the emissions from all the other diffuse sources (erosion, paved urban areas, surface run-off and atmospheric deposition on surface waters) are all together lower than 15% of the total emissions. That is the reason why the nitrogen loads from diffuse agricultural sources are increasingly becoming the main source of nitrogen pollution in the German Baltic Sea catchment area. The main reason of the nitrogen accumulation which has been observed for years in ground and surface water is the rise of intensive agricultural crop production and livestock farming, and the resulting nitrogen surpluses. The nitrogen surplus is currently stable at a high level[3]. The spatial distribution reveals the largest diffuse sources in areas with high livestock densities and soils which are prone to leaching.

Figure 1 shows the long-term change of the nitrogen surplus of the field balance on arable land separately for the four Federal States located in the German Baltic Sea catchment area. These nitrogen surpluses have decreased by 40% (in Schleswig-Holstein) to 50% (in Mecklenburg Western-Pomerania, Brandenburg and Saxony) since its peak in 1987. For the Federal States Schleswig-Holstein and Mecklenburg-Vorpommern, which represents the main part of the German part of the Baltic Sea catchment, a similar development for the nitrogen surplus in the agricultural areas could be observed up to the end of the eighties. Since 1990 this development is quite different. Caused by the political and economic changes in Mecklenburg-Vorpommern and in the other Federal States of the former GDR the nitrogen surplus decreased dramatically mainly because of reduction of livestock and lower application rates of mineral fertilizers. Since 1993 the nitrogen surplus is increasing again up to a level of 60 kgN/(ha·a) at the end of 90's. In Schleswig Holstein a more continuous decrease from 130 to 95 kgN/(ha·a) can be observed over the whole decade.

3 Many of the effects on nutrient inputs to waters and the recent improvements in water quality are reflected in the national nutrients balance sheet. Two different approaches exist to calculate the nutrient surplus. The surplus calculated on the basis of the field balance on arable land is a parameter of potential inputs to water bodies. The surplus in the farm-gate mineral balance for agriculture is an indicator of the overall environmental stress caused by nutrient use in farming. The latter nitrogen surplus is higher by gaseous losses from manure into the atmosphere of about 30 kg/N/ha/a.

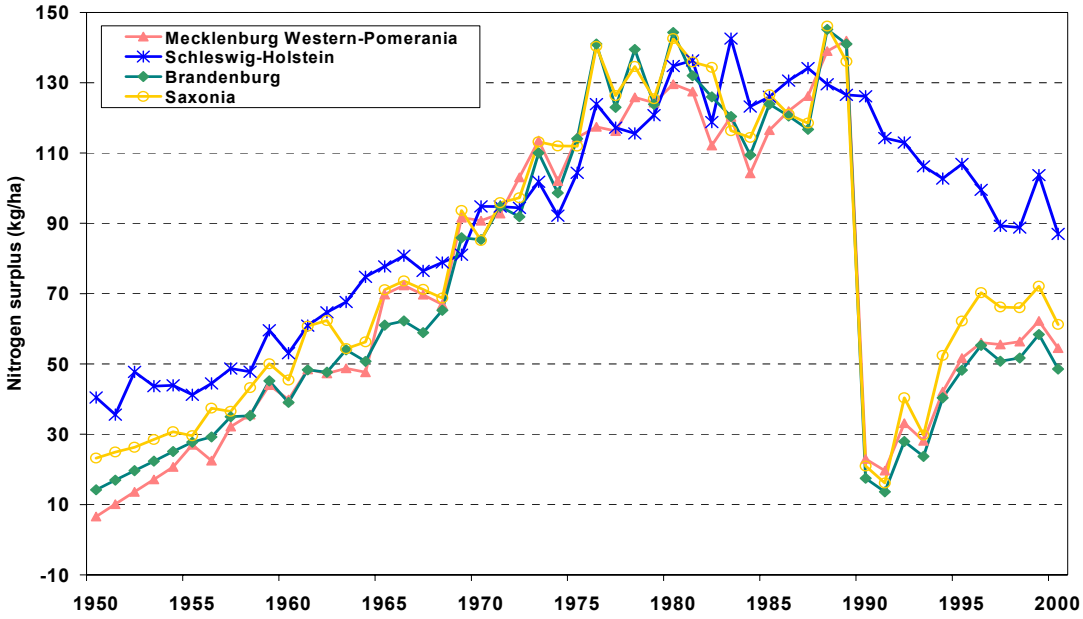

Figure 1: Development of Nitrogen Surpluses of Farmland (Surface Balance) in the Baltic Sea catchment area from 1950 to 2000

Elaboration of more specific targets

Concerning the HELCOM Ministerial Meeting and Joint HELCOM/OSPAR Ministerial Meeting at HOD 9/2002 (LD 15) Contracting Parties were requested to elaborate specific targets to reach the strategic goals set up in the 1988/1998 Ministerial Declarations with a view to present them to the HELCOM Ministerial Meeting 2003 for adoption.

In Germany the elaboration of more specific targets are closely linked to the implementation of the EU nitrate directive and the EU Water Framework directive respectively its national regulations as well as additional measures at federal states (Laender) level.

The most relevant national regulation to meet the obligations of the EC Nitrate Directive (91/676/EEC) is the German Ordinance on Fertilization (Duengeverordnung). The Ordinance on Fertilization which is currently under revision is considered to be a comprehensive action programme including a code of "good agricultural practice" in terms of the EC Nitrate Directive (91/676/EEC).

Main aspects of the German Ordinance on Fertilization are:

- Regulations concerning BAT for storage facilities and spreading equipment for animal manure[4]

4 Special ordinances of the Federal States (Laender) settle conditions regarding sufficient storage capacities and environmentally sound construction of storage vessels for livestock manures as well as for measures to avoid the pollution of waters due to the discharge or percolation of manure-containing fluids or others. Additionally, the Technical Instruction Air provides for the coverage of manure containers of animal housing works subject to licensing. On the basis of supporting programmes of the Federal States (Laender), financial support are given for the construction of slurry containers, manure plates and other slurry storage facilities. Further the Federal States and the Federal Government promote advanced technologies to develop the corresponding equipment for spreading manure close to the ground.

- Regulations concerning the reduction of ammonia volatilisation from field application of manure[5]

- Regulations concerning maximum amount of nitrogen contained in animal manure to be spread on the fields

- Regulations concerning maximum amount of nutrients to be applied according to the crop requirements and nutrient availability as well as determination of the times fertilizers may be applied on agricultural land.

Another relevant national regulation and a part of the German Implementation of the Council Regulation No 1257/1999 is the so-called GAK programme ("Common programme for the improvement of the agricultural structure - GAK) which is co-financed by the Federal Government and the Federal States (Laender). The GAK is a main tool for the implementation of environmental sound farming. The GAK aims to ensure that a number of different measures for reducing inter alia nutrient losses are implemented within a short space of time. A further intention is to promote the use of better technology such that developments in this area lead to further reduction of nutrient losses from agricultural sources. The GAK is an element in the fulfilment of both national and international obligations and should be also a key element of efforts to promote sustainable agriculture.

In 2002 the GAK programme was up-dated and extended towards a set of different voluntary measures aiming inter alia to reduce diffuse nitrogen losses to the environment.

Financial support by GAK programme will be given i.a. for the following measures:

- Enlargement of crop rotation system

- Cultivation of intermediate crops and catch crops during winter

- Mulching and direct sowing systems

- Investments for machinery for manure spreading equipment according BAT

- Cultivation of buffer strips

- Extensification of grassland

- Transforming arable land to grassland

- Animal reduction in areas with high animal density

- Organic farming.

In addition to the above mentioned the German Government has passed a Strategy for Sustainable Development which includes indicators for the sustainability of agriculture. As one reference point for the sustainability of agriculture the nitrogen surplus was taken. The goal is to reduce the nitrogen surplus for the whole of the agricultural sector, i.e. surpluses arising on farmland and in animal housing, passing into air, soil and water, to 80 kilograms/ha/a by 2010.

5 Additionally the German Government will pass a German Code of Good Agricultural Practice for the Reduction of Ammonia Emissions.

PLANS AND NATIONAL GOALS OF LATVIA FOR IMPLEMENTATION OF 1988 MINISTERIAL DECLARATION

1. REDUCTION OF NUTRIENT LOAD 1990 - 2000

During the last ten years considerable reduction of nutrient load from main pollution sources (Fig. 1, 2, 3) has been achieved in Latvia.

According to "Evaluation of the implementation of the 1988 Ministerial Declaration regarding nutrient load reductions in the Baltic Sea catchment area" /1/, the overall **nitrogen** load from Latvia was reduced by 24 800 t or **54%** and load from **phosphorus** – by 1 102 t or **45 %**. So drastic decreasing of pollution from all sources from late 1980ties until 1995 was mainly achieved by economic reasons in country. Economical situation in Latvia started to improve in 1995 and at the same time since 1995 substantial improvements were achieved in the environmental sector. Major changes were experienced in the environmental legislation and environmental institutions infrastructure.

The overall tendency for reduction of pollution in Latvia continues also during years 1995 to 2000 and are justified by PLC-4 Project data, which shows that the reduction of nutrient load into the environment in years 1995 - 2000 are 3391 t (**16%**) for **nitrogen** and 688 t (**50%**) for **phosphorus** (Fig.1, 2, 3 and more detailed information in Attachment, tables 5.1; 5.2; 5.3; 5.4).

Industrial discharges
According to PLC-4 data, from 1995-2000 direct and indirect industrial discharges of **nitrogen** have reduced by **94%** and **43 %,** respectively. Similar situation is with **phosphorus** – reduction by **94%** (direct) and **57%** (indirect) discharges (Tables 2.1; 2.2; 5.1; 5.2).

Discharges from fish farms
Pollution load to the Baltic Sea from Latvian fish farms are relatively small due to fact that up to now all fish farms in Latvia are inland fish farms, marine fish farms as well as farms on shore discharging directly to the Baltic Sea in Latvia do not exist.

Discharges from agriculture
Estimated discharges of **nitrogen** and **phosphorous** from agriculture in 1995-2000 shows reduction by **13%** (2265 t) and **65%** (332 t), accordingly (more detailed information in Attachment, tables 4.1 and 4.2). Agriculture anymore is not a main source of phosphorous discharges in 2000. So significant decrease of pollution from agriculture in Latvia and setting the programs for further reduction of negative impact of agriculture was the reason for the deletion of Hot spot Nr.40 – Agriculture and Livestock farming (HELCOM PITF 19/2002, LD 3).

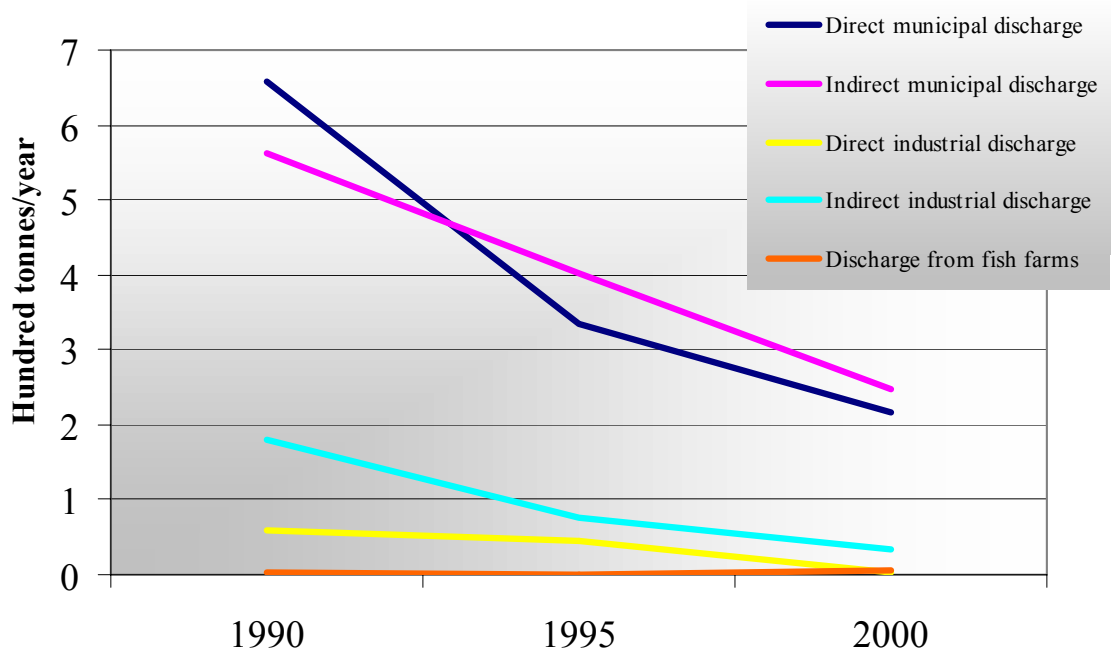

Fig.1 Total discharges of phosphorus from point sources in 1990, 1995 and 2000

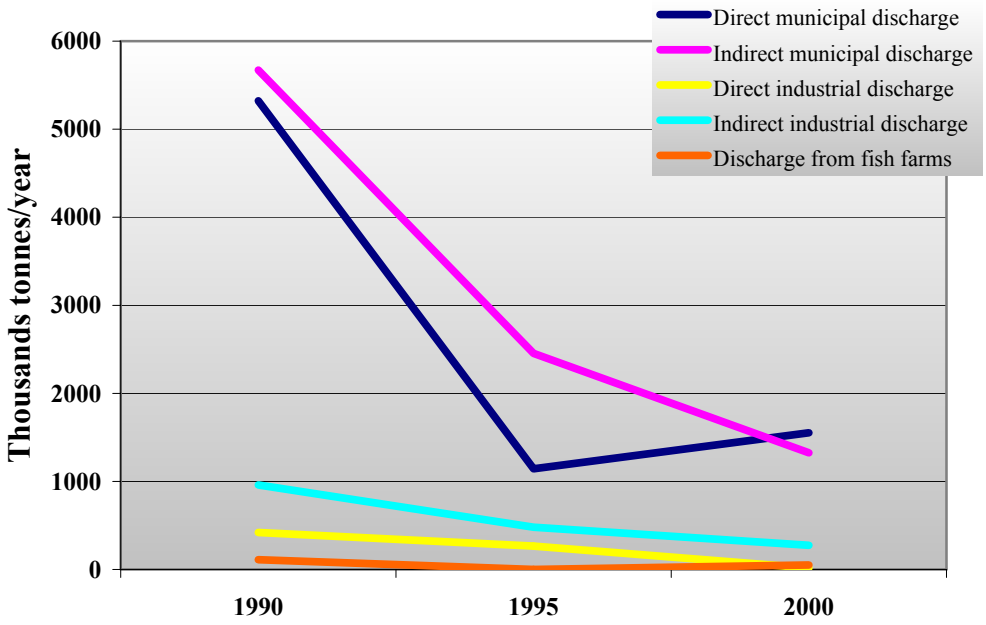

Fig.2 Total discharges of nitrogen from point sources in 1990, 1995 and 2000 *

* Increase of direct municipal discharges of nitrogen in 1995/2000 can be explained by installation and regulation of the new equipment in "Daugavgriva" WWTP, which constitutes the main part of direct municipal discharges in Latvia. During the period of reconstruction and acquisition of the new equipment (1999-2002) higher maximum permissible concentrations in wastewater were allowed. Renovation and extention of the "Daugavgriva" WWTP is one of the sub-projects of the "Riga Water and Environment Project".

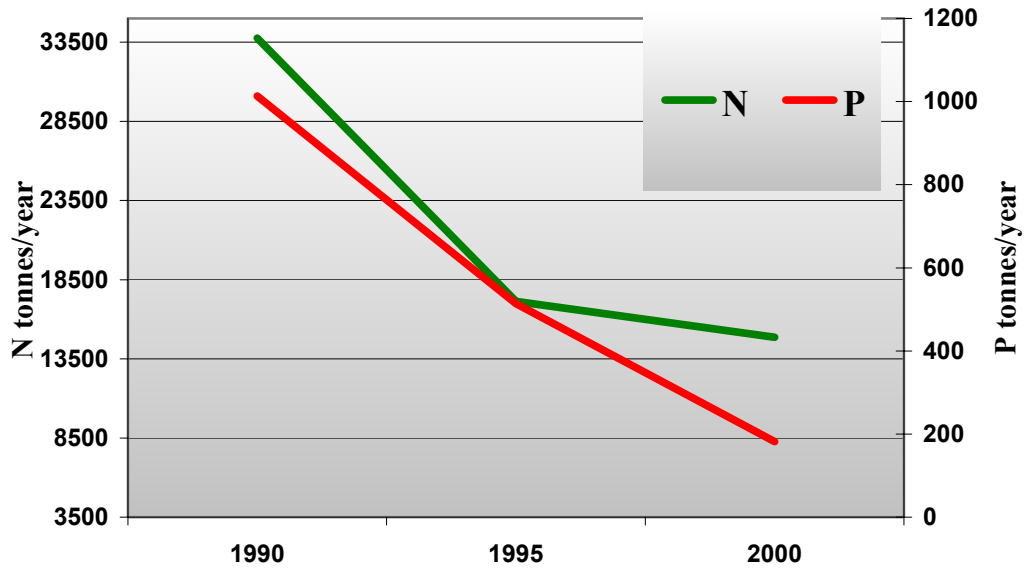

Fig.3 Total discharges of nitrogen and phosphorus from agriculture in 1990, 1995 and 2000

2. PLANS AND NATIONAL GOALS TO REACH THE TARGETS

Since the reestablishement of independence Latvia has substantially organised the environmental sector. Since 1990 and especially since 1995 substantial improvements were achieved in the environmental sector. Major changes were experienced in the environmental legislation and environmental institutions infrastructure.

2. 1. National Plans and Programmes

National Environmental Policy Plan (NEPP*)* was accepted by the Cabinet of Ministers of the Republic of Latvia on April 25, 1995. /2/.

NEPP corresponds to principles of global environmental policy and forms the basis for further environmental protection policy development in Latvia. The major environmental protection priority areas and problems are defined in the NEPP along with the required instruments for their implementation.

Needed measures and activities are enlisted in the **Environmental Protection Action Programme (EPAP)**. This is an action programme supplementing the NEPPP, where respective measures are foreseen for every priority indicated in the NEPPP to achieve instigated aims. These are short-term actions that ensure operative control over the implementation, and if this proves to be necessary, certain actions are replaced by more effective ones. It's implementation and the efficiency of selected implementation instruments is being monitored and assessed each year.

The water quality and degradation of inland aquatic ecosystems and the Baltic Sea are ones of the prior environmental problems mentioned in the NEPP.

The main goal for the water protection is to reduce pollution load from different types of activities (households, industry, agriculture, forestry etc.).

The NEPP sets the targets by year 2010 to reduce the total nitrogen emission into water from point sources to 50% of the year 1995 level and from diffuse sources - to

reduce the losses of nitrogen, phosphorus and other biogenous substances from fertilisers used on arable lands by up to 50% of the amounts lost in 1994.

Measures of NEPP on water protection targets are described in chapter 10.2.2. “Evaluation of the implementation of the 1988 Ministerial Declaration regarding nutrient load reductions in the Baltic Sea catchment area” /1/.

The need to supplement and update the NEPP becomes obvious since the development of a free market economy and the increase of the share of local investments attracted for the environmental protection sector, as well as Latvia’s active integration into the EU. It is planned to adopt an updated NEPP during 2003.

Among National Programmes approved by the Cabinet of Ministers is also **“The National Programme for the Protection of the Environment of the Baltic Sea”** /3/.

The programme comprises all programmes connected with waters discharged into the Baltic Sea and the Gulf of Riga, as well as general improvement of the coastal area.

The aim of the programme is to implement environment protection projects in facilities polluting the Baltic Sea basin and measures of the state environmental monitoring program. The Programme also comprises implementation of a sub-programme on water management improvement programme - “800+”, solid waste management programme “500-“ and other projects. Project “Development and Strengthening of the Blue Flag Movement in Latvia” focussed on improving beaches is also quite significant.

2.2. Environmental investment strategy

2.2.1. Investment programmes

Investment programmes in the environmental sector is a direct and natural result of implementation of the NEPP and the EPAP. Investigation of priority environmental problems helps to prepare relevant strategies for their solution and to attract required investments to improve the state of environment in Latvia. These programmes are designed to attract foreign and local investments, goal-directed use of foreign grants and to ensure regular interest payback on state guaranteed foreign loans.

Availability of investments is one of the main pre-conditions for development of both national economy and each separate sector.

During the period of 1996-2000 Gross National Product (GDP) in Latvia increased by 25,6% or an average by 4,7% per year. In 2000, GDP increased by 6,8% but during the 2001 by 7,7%. Macro-economic development scenario foresees that economic development in 2002 will remain at a high level – GDP in comparative prices will increase by 6,0%, but in medium term it will reach increase by average 5,9% per year. It may be forecasted that macroeconomic indicators and thus investment environment will be stable.

Latvian economy will be supported by the accession of Latvia into the European Union, which could take place already in 2004. If there are no external shocks annual GDP growth in the medium term may equal to 5-7%. /3/.

The wish to ensure state`s economic growth and to improve the welfare of its people should not cause excessive reduction of nature resources, increase of environmental pollution, loss of biological diversity since it may threaten state`s sustainable development. Therefore, improvement of economic infrastructure, i.e. also improvement of environmental protection infrastructure, as well as balanced and sustainable development of the state`s territory are

set as priorities in **Latvia`s Long-term Economic Development Strategy** and **National Development Plan**. /3/.

The Ministry of Environment has set the following priorities:
- Water management improvement (Programme “800 +” – Water Supply and Waste Water Treatment in Small and Medium Size Towns”);
- Solid waste management (Programme “500-“ – “Development of Solid Waste Management System”);
- Hazardous waste and radioactive waste management (“Development of Hazardous Waste Management System”);
- Nature protection (National Programme for Biodiversity);
- Tourism development (National Programme for Tourism Development).

State support for investments in environmental protection, nature protection and tourism development is being ensured through **Public Investment Programme** (PIP) that is a set of infrastructure investment projects included in a project list approved by the government.

Latvia expressing the wish to join the European Union has made the decision to improve environmental protection infrastructure in compliance with the requirements of the EU Directives:
- Water management till 2015;
- Solid waste management till 2012;
- Hazardous waste management till 2004.

This means that comprehensive financial and material resources will be necessary for the improvement of environmental infrastructure.

When planning investments it is essential to balance the necessities in the field with the state budget capacity and foreign financial assistance to the state budget, including the EU funds (ISPA, PHARE). For the years 2000 - 2002, total financial assistance to Latvia amounts to around EUR 35 million annually from Phare, EUR 22,2 million from SAPARD, and between EUR 36,4 and EUR 57,2 million from ISPA. Latvia will have to ensure co-financing to environmental protection investment projects that will be financially supported by the EU funds for the introduction of the EU Directives and for ensuring performance of international commitments. Developing investment strategy the biggest contribution is supposed to come from the EU Cohesion fund as a foreign assistance to the state budget in environmental protection that will be available when Latvia will join the European Union. The rest of project costs shall be covered from the municipal or enterprise funds.

EU finacincial support for the environmental protection sector has increased by almost 4 times during four years from 1999 till 2001.

2.2.2. Water management development projects

Evaluating implementation programmes of separate sectors the biggest investments from 2003 till 2006 are necessary in the improvement of water management – 143,5 million LVL, as well as in the development of solid waste management system – 40,6 million LVL. Altogether in environmental protection, nature protection and tourism development 223,2 million LVL are to be invested over the period of four years. /4/.

Economic activities in Latvia increase the inflow of biogenic substances in Latvia`s lakes and rivers, as well as in Gulf of Riga and the Baltic Sea, considerably speeding up natural eutrophication. Three largest cities in Latvia – Riga, Daugavpils and Liepaja are identified as hot spots within the Baltic Sea Joint Comprehensive Environmental Action Programme.

To fulfil commitments made under the Helsinki Convention investment projects in these three largest cities of Latvia were initiated in the early 90ties: "Riga Water and Environment Project" (1st Phase 1996 - 2001, completed, 2nd Phase started), "Daugavpils Water and Sewarage Project" (1996 –2010, under implementation) and "Liepaja Environment Project" (1st Phase 1995 – 1999, completed, HELCOM and EU requirements fulfilled).

Wastewater treatment quality complies with the requirements of the EU Directives totally in 21 towns with PE 10 000 – 100 000 in year 2002.

By the end of 2002, water management projects in the implementation phase are in 31 towns and projects for 27 towns are in preparation phase.

Totally around 116,15 million LVL were invested in water management sector during 1995 – 2001. Around 13,25 million LVL were invested for construction of WWTPs from 1996 till 2002. /Source: Investment Department, Ministry of Environment, 2003/.

National Environmental Policy Plan sets the following environmental protection priorities in water sector – prevention of eutrophication and degradation of water eco-systems, promotion of rational use of water resources and provision of drinking water quality. Improvement of water management development projects deal with both – drinking water preparation and water supply, and wastewater collection and treatment according to Programme "800+" (developed in 1996) that covers technical, institutional, financial, economic and project management factors.

Evaluating the strategy "Water Supply and Waste Water Treatment in Small and Medium Size Towns", "800+" and developing water management plans in big cities, taking into account state and municipal financial capacity, paying capacity of inhabitants and requirements of the EU directives, 88 towns of Latvia (PE > 2000 or number of inhabitants > 1000) are divided in three categories according to the terms for introduction of the EU directives:

1) agglomerations with PE bigger than 100 000 (Riga, Daugavpils, Liepaja – total number of inhabitants 0.968 million) – directives are to be implemented by 2008;
2) agglomerations with PE from 10 000 to 100 000 (20 agglomerations - total number of inhabitants 0.460 million) - directives are to be implemented by 2011;
3) agglomerations with PE from 2000 to 10 000 (65 agglomerations - total number of inhabitants 0.250 million) - directives are to be implemented by 2015.

In accordance with adopted quality standards of services, approximately 95% of inhabitants in the mentioned towns shall be ensured with centralised water supply and wastewater collection.

Required investments for wastewater treatment and collection – 350 million LVL, required investments for water supply – 310 million LVL. /4/.

2.2.3. EU supported projects and programmes

In 2000, the European Commission approved the ISPA National Strategy for the Environmental Sector. This strategy will be the basis for investment planning and procurement of financing from the EU ISPA Fund.

The biggest part of financing has been provided by ISPA fund. Totally 8 projects in environmental sector are accepted by European Commission until year 2001 - seven investment projects and one technical assistance project. Among them is the project "Development of Water Services in Municipalities of Eastern Latvia River Basins" accepted in 2001. Total costs of the project are 71,737 mill EUR.

Implementation of this project will improve water services in 18 municipalities in the Gauja River, the Salaca River and the Daugava River basins, which comprise about 8% from all inhabitants of Latvia./5/.

Among main components of the Project are:
- construction of 12 new and renovation of existing drinking water treatment plants
- renovation of water supply system
- construction of 4 new WWTPs
- reconstruction of 11 WWTPs
- renovation and extention of sewarage collection system.

The pollution load to the Baltic Sea will be decreased significantly after the implementation of the project by year 2005:
- BOD by 251 tons per year (7% from all pollution load from Latvia in year 2000);
- COD by 455 t/y (3,3%);
- Suspendid solids by 352 t/y (9,9%);
- Nitrogen – 286 t/y (9,0%);
- Phosphorus – 63 t/y (12,6%).

Preparation of Project proposals for EU co-financing for "Development of the Salaca River Basin management plan" as well as for the II phase (19 municipalities) and III phase (15 municipalities) of "Development of Water Services in Municipalities of Eastern Latvia River Basins" will be carried out during year 2003.

By the end of 2008 Latvia will finish improvements to the waste water collection and drinking water supply in the largest cities with a population equivalent above 100 000. During this time, the requirements of EC Directives will be put in place, covering 65% of Latvia`s population.

Elaboration of additional studies for full compliance with EC Directives in water sector in Riga (Project Phase II), Liepaja, Daugavpils (by year 2008) and Ventspils (by year 2011) started in year 2001. Phase II of "Riga Water and Environment Project" includes, besides others, such components as improvement of storm waters collection system and construction of wastewater sludge depository (EBRD loan).

There will be constructed new WWTP in Jurmala city according to BAT and with full compliance with EC Directives, using ISPA financing for the project "Development of Water Services in Jurmala". Commissioning of the WWTP is planned in 2005 /5/.

In order to ensure **water resources management according to river catchment basins** that is at the basis of Water Framework Directive, further on in evaluation of water management investment projects the following approach will be supported – towns will be grouped in one project according to river basin management area. Improving wastewater treatment in several towns simultaneously, pollution load in river catchment basins is considerably decreasing; the efficiency of investments increases ensuring water quality in the respective rivers. Besides, uniting water management projects the EU financial support can be allocated to those municipal projects that separately do not reach the amount of 5 million EUR /4/.

Substantial influence on further development of the environmental sector was caused by Latvia's political movement towards the integration into the European Union (EU). Until 1997 Latvia mainly successfully followed other EU states in terms of introduction of environmental technologies and attraction of investments. Since 1997 the integration of EU legislation into the national legal system (incl. environmental sector) has become the required prerequisite for EU accession negotiations.

2.3. Agriculture

Only four districts (Riga, Bauska, Jelgava and Dobele) with most intensive agriculture were designated as vulnerable zone in the central part of Latvia, assuming that in future this part of the country may be most relevant to the provisions of the Nitrate Directive. The Ministry of Agriculture and the Ministry of Environment are the responsible state institutions to supervise and monitor the implementation of the Nitrate Directive. The development of action programmes for vulnerable zones was started in April 2002.

To improve the use of environmentally friendly technologies in agriculture and promote the education of farmers, since mid 1990-ties several international projects supported by the Nordic countries have been started and are still in continuation. Efforts in the education of farmers, control, and management should be focused on the remains of the former large-scale farms as well as on the new private farmers whose level of education, knowledge and farming skills are limited.

Most important for agriculture was Regulation of Cabinet of Ministers on the “Protection of Water and Soil from Pollution Caused by Nitrates from Agricultural Sources”. Legislation without financial support will not ensure a fulfilment of requirements, e.g. such measures as construction of manure storages and purchase of the advanced manure application equipment are very expensive. The EU SAPARD programme for Latvia started in December 2001. SAPARD payments include support for agri-environmental measures. Most likely, the sub-measure of SAPARD’s environmental programme could start in the 2003. /6/.

One of the aims of this program is the protection of rural environment. The program plans investments of about 27.1 million EUR during 2000-2006. It is important to promote the SAPARD programme through elaboration and implementation of legislation according to the EU requirements. The national and SAPARD financial support covering farmers expenses for agricultural equipment promotes application of better agricultural technologies and indirectly leads to less pollution due to more efficient use of the nutrients in the formation of crop yield. /3/.

The Code of Good Agricultural Practice /7/ was for the first time elaborated and approved in Latvia in 1999. The requirements of the GAP Code are not obligatory for farmers. However, in connection with education for environmentally friendly farming, it could promote a voluntary implementation of HELCOM recommendations by farmers. Step by step, some of the GAP Code points are included in the legislation today. However, there is still a need for a further development of this process.

Implementation of the legislation - transposition of EU directives could be relevant background for further decrease of agricultural pollution in Latvia and consequently, decrease of nutrient load to the Baltic Sea.

Structural changes in agriculture and economical situation caused significant reduction of the agricultural production. Due to this, even without special measures, the environmental impact of agriculture as a “hot spot” has decreased.

The above-mentioned conditions were sufficient grounds for deletion of the Hot Spot No 40 Gulf of Riga - Agriculture and Livestock farming (HELCOM PITF 19/2002, LD 3). /6/.

2.4. Legislation

Since Latvia is moving towards EU (joining is planned in May 2004), transposition and implementation of the EU environmental legislation into national laws is priority at the moment. It is planned to be in compliance with the requirements of the EU Directives on:

- Water management till 2015;
- Solid waste management till 2012;
- Hazardous waste management till 2004.

The main principles of the following EU directives were transposed to national water protection legislation:

- *Water Framework Directive 2000/60/EC*
- *Directive 96/61/EC On Integrated Pollution Prevention and Control*
- *Nitrates Directive 91/676/EEC*
- *Dangerous substances Directive 76/464/EEC, and its daughter directives,*
- *Groundwater Directive 80/68/EEC*
- *Urban Wastewater Directive 91/271/EEC.*

2.4.1. Latvian Parliament has approved **Water management law** (12.09.2002) transposing basic principles of *EU Water Framework directive*.

Purpose of the law
is to establish a framework for the protection and management of surface water and groundwater, which, inter alia:

1. promotes sustainable and rational use of water resources therefore ensuring a long-term protection of the water resources and provision of the sufficient supply of good quality surface water and groundwater to the population;
2. improves protection of the aquatic environment, progressively reduces emissions and losses of the priority substances, as well as ensures cessation of emissions and losses of the priority hazardous substances;
3. ensures protection of Latvian marine waters;
4. contributes to the achieving the objectives of relevant international agreements, in order to prevent and eliminate pollution of the marine environment, to cease or phase out discharges of the priority hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for synthetic man-made substances.

A new approach in water management was introduced by activities of Latvian –Swedish "The Daugava river basin project" (Daugava project) which is based on the policy of EU Water Framework Directive. Implementation of the new policy requires changes both in legislative and institutional water management systems. Latvia as an accession country for EU has to be ready for such policy and Daugava project is one of the first steps towards it.

The River Basin Management Planning in Latvia will be carried out for 4 established river basin districts and environmental objectives for surface water bodies will be established, including transitional and coastal waters.

It is planned to transpose the annexes of WFD by means of several Cabinet of Ministers regulations, subordinate to the above-mentioned law.

The Cabinet of Ministers will approve a management plan for each river basin district. The management plan shall be updated at least once in six years. Management Plans shall be approved and published by the 22nd December 2009. To achieve the environmental objectives determined by this law, the Minister of Environment shall approve a programme of measures for each river basin district or for the part of an international river basin district lying within the territory of Latvia. The programme shall be co-ordinated with the

corresponding river basin management plan. Programmes of measures shall be approved by the 22nd December 2009. The measures provided for therein shall be made operational by the 22nd December 2012.

Regarding the *Water Framework Directive 2000/60/EC*, adoption of relevant laws and regulations will be completed by December 2003. This date corresponds with that provided in the directive. The current status of transposition efforts demonstrates that he work will be completed as planned.

2.4.2. The requirements of Latvian water protection legislation are being harmonised also with the provisions of the *Directive 96/61/EC On Integrated Pollution Prevention and Control.* **The Law on Pollution** (adopted on 15 March 2001) determines the basic requirements for pollution prevention, including control over emissions into air, water and soil. Law on Pollution also gives a mandate for establishment of the environmental quality standards for surface and ground water and for definition of wastewater emission limit values.

IPPC permits should be issued for the current approximately 59 IPPC installations before 2007 and IPPC Permitting for all new IPPC installations and substantial changes in existing installations in Latvia (is a requirement) was introduced from 1 January 2002, according to the Law on Pollution.

According to the Law on Pollution the Cabinet of Ministers issued **Regulation "On the Protection of Water and Soil from Pollution Caused by Nitrates from Agricultural Sources"** (*transposition of EU Nitrate directive*) entering in force on December 29, 2001.

The Cabinet of Ministers **Regulations "On Water Emissions of Pollutants"** combines the requirements of the *Dangerous substances Directive 76/464/EEC*, and its daughter directives, as well as those of the *Groundwater Directive 80/68/EEC* and the *Urban Wastewater Directive 91/271/EEC*. Full transposition of the above-mentioned Directives has been achieved. Besides the other provisions, the Regulations identify the **entire territory of Latvia as sensitive area according to the requirements of the urban wastewater directive.**

The UWWT directive sets a number of implementation deadlines for the member states for provision of sewerage systems, sewage treatment plants and sewage effluent standards, which need to be achieved.

The capital costs for full compliance will need to be invested over a number of years. Taking into account affordability constraints and present investment rate achieved, it is considered that full compliance will at best be achieved assuming a completion target at 2015.

In accordance with the selected implementation scenario Latvia has set three deadlines for achieving the Directive requirements:

- by 2008 for municipalities above 100 000 PE (3 cities, 58% of population covered by the directive);
- by 2011 for municipalities with PE 10 000 – 100 000 (20 towns, 27% of population covered by the directive);
- by 2015 for municipalities with PE. 2 000 - 10 000 (65 towns, 15% of population covered by the directive). /8/.

2.4.3. In order to implement in Latvia the requirements of *Nitrates Directive 91/676/EEC*, key steps have been performed:

1. Adoption of the Regulations "On the Protection of Water and Soil from Pollution Caused by Nitrates from Agricultural Sources", creation of the Nitrate Board and designation of vulnerable zones (December 2001);

2. Preparation and implementation of the Action Program in vulnerable zones (2002-2004);
3. Implementation of the Code of Good Agricultural Practice for Latvia in the territory of the whole country (2002-2004);
4. Preparation and implementation of the Water Monitoring Program relevant to the provisions of the EU Nitrate Directive and Water Framework Directive (2002-2004). /6/.

CONCLUSIONS

All the actions in environmental protection in Latvia at the same time are the actions for the protection of the Baltic Sea.

Substantial influence on further development of the environmental sector was caused by Latvia's political movement towards the integration into the European Union (EU).

Since Latvia is planning to join EU in May 2004, transposition and implementation of the EU environmental legislation into national laws is priority at the moment.

The National Environmental Policy Plan sets the targets regarding

- **point sources: by 2010, reduce the total nitrogen emission into water to 50% of the year 1995 level.**
- **diffuse sources: by 2010, reduce the losses of nitrogen, phosphorus and other biogenous substances from fertilisers used on arable lands by up to 50% of the amounts lost in 1994.**

Full transposition of the EU Directives has been achieved. However, effective compliance with a number of pieces of legislation (e.g. urban waste water treatment, drinking water, aspects of waste management and air pollution legislation) could be achieved only into the long term and would require a significant increase in environmental investment, as well as a major effort to reinforce the administrative capacity. Latvia has been granted transitional arrangements with regard to urban waste water treatment and drinking water (end 2015), existing integrated pollution prevention and control installations (end 2010), temporary storage of hazardous waste as regards landfill of waste (end 2004).

Significant pollution load reductions and improvement of the ecological state of the Gulf of Riga has been achieved, which has resulted in deletion of two hot spots of the Baltic Sea Joint Comprehensive Environmental Action Programme – The Gulf of Riga Mgt (hot spot Nr.37, in year 2000) and Agriculture and Livestock Farming (Hot Spot Nr.40, in year 2002).

The **River Basin Management Planning in Latvia** will be carried out for 4 established river basin districts and environmental objectives for surface water bodies will be established, including transitional and coastal waters.

The Cabinet of Ministers will approve a **management plan for each river basin district** by the 22nd December 2009. To achieve the environmental objectives determined by the Water management law, the Minister of Environment shall approve by the 22nd December 2009 a programme of measures for each river basin district or for the part of an international river basin district lying within the territory of Latvia. The programme shall be co-ordinated with the corresponding river basin management plan. The measures provided for therein shall be made operational by the 22nd December 2012.

One of the main principles for the implementation of Latvian environmental policy is in keeping of the balance between the environment and the national economy. It means that national economic development should take into account the capacities of ecosystems. **The Strategy for Sustainable Development** (based on the Rio Declaration) was adopted in August 2002./9/ A Council for Sustainable Development was established in March 2002, chaired by the Prime Minister. Environmental issues have been included in strategic

documents of other sectors (such as agriculture, energy and fisheries). Latvia is continuing to implement the action programme for sustainable development adopted within the framework of “Baltic 21”. /10/.

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Plans and National Goals of LATVIA for Implementation of 1988 Ministerial Declaration

Attachment

1. Municipal discharges

Table 1.1 Total discharges of nitrogen and phosphorus from municipalities entering directly to the Baltic Sea

	NITROGEN			PHOSPHORUS		
	N-TOT in 1995 [t]	N-TOT in 2000 [t]	Reduction [%]	P-TOT in 1995 [t]	P-TOT in 2000 [t]	Reduction [%]
TOTAL	1143	1552	-36	334	216	35

Data sources: 1, 2, 3, 4, 5

Table 1.2 Total discharges of nitrogen and phosphorus from municipalities entering into surface freshwater in the Baltic Sea catchment area

Size class	NITROGEN			PHOSPHORUS		
	N-TOT in 1995 [t]	N-TOT in 2000 [t]	Reduction [%]	P-TOT in 1995 [t]	P-TOT in 2000 [t]	Reduction [%]
TOTAL	2455	1326	46	403	246	26

Data sources: 1, 2, 3, 4, 5

2. Discharges from industry

Table 2.1 Total discharges of nitrogen and phosphorus from industries entering directly into the Baltic Sea

Industries	NITROGEN			PHOSPHORUS		
	N-TOT in 1995 [t]	N-TOT in 2000 [t]	Reduction [%]	P-TOT in 1995 [t]	P-TOT In 2000 [t]	Reduction [%]
Chemical	0.05			0.25		
Food processing	37	13.6	63	7	2.33	67
Pulp and paper	95			16		
Other industry	133	2.6	98	23	0.33	99
TOTAL	265	16.2	94	46.25	2.6	94

Data sources: 1, 2, 3, 4, 5

Table 2.2 Total discharges of nitrogen and phosphorus from industries entering into surface freshwater in the Baltic Sea catchment area

Industries	NITROGEN			PHOSPHORUS		
	N-TOT in 1995 [t]	N-TOT in 2000 [t]	Reduction [%]	P-TOT in 1995 [t]	P-TOT in 2000 [t]	Reduction [%]
Chemical industry	116	71.24	38.32	21	4.61	77.8
Food processing	88	71.01	16.26	21	18.79	11.16
Pulp and paper	60	1.56	97.39	9	0.02	99.75
Mining and metal		0.09			0.03	
Leather and textile		77.07			2.22	
Other industry	217	52.85	75.66	26	7.27	71.88
TOTAL	480	273.82	42.97	77	32.96	57.29

Data sources: 1, 2, 3, 4, 5

3. Load from fish farms

Table 3.1 Estimated discharges of nitrogen and phosphorus from freshwater fish farms

Source	Load in 1995 [t]	Load in 2000 [t]	Reduction [t]	Reduction [%]
N-TOT	0,7	50	-49.3	-98.5
P-TOT	0,1	6.3	-6.2	-98.7

Data sources: 4, 5

4. Load from agriculture

Table 4.1 Estimated discharges of nitrogen and phosphorus from agriculture

	Load in 1995 [t]	Load in 2000 [t]	Reduction [t]	Reduction [%]
N-TOT	17130	14865	2265	13.22
P-TOT	514	182	332	64.59

Data source: 6, 7

Table 4.2 Supplementary indicators concerning the anthropogenic load from agriculture

		1995	**2000**	Reduction [t]	Reduction [%]
Arable land (ha)		1 713 000	**1 819 500**	-106 500	-6.22
Number of livestock (animal units)		627 000	**387 013**	239 987	38.28
Tot. numb. of cattle		537 000	**367 000**	170 000	31.66
Tot. numb. of pigs		553 000	**393 000**	160 000	28.93
N	Consumption of fertilizer (t/a)	20 566	**22 909**	-2 343	-11.39
	Consumption of manure (t/a)	26 758	**21 833**	4 925	18.41
	Use of fertilizers and manure (kg/ha)	28	**51**	-23	-82.14
	Annual discharge (t/a)	17 130	**14 865**	2 265	13.22
	Discharge kg per ha/a	10	**8.17**	1.83	18.3
	Losses %	36.2	**16**		
P	Consumption of fertilizer (t/a)	8 565	**6 168**	2 397	27.99
	Consumption of manure (t/a)	8 078	**6 592**	1 486	18.4
	Use of fertilizers and manure (kg/ha)	10	**15**	-5	-50.00
	Annual discharge (t/a)	514	**182**	332	64.59
	Discharge kg per ha/a	0.3	**0.1**	0.2	66.67
	Losses %	3.1	**0.6**		
	Riverine run-off 10^6 m^3/a	31 346	35 850	-4 504	-14.37
	N-tot load from rivers	80 811	29 554	51 257	63.43
	P-tot load from rivers	1 555	871	684	43.99

Data sources: 6, 7, 8

5. Overall reduction of nutrient load into the environment achieved

Table 5.1 Total discharge of nitrogen into the environment in 1995 and 2000

Source	Load 1995 [t]	Load 2000 [t]	Reduction [t]	Reduction [%]
Direct municipal discharge	1143	1552	-409	-36
Indirect municipal discharge	2455	1326	1129	46
Direct industrial discharge	265	16.2	248.8	94
Indirect industrial discharge	480	273.82	206.18	43
Discharge from fish farms	0,7	50	-49.3	-98.5
Discharge from agriculture	17130	14865	2265	13.22
TOTAL	21474	18083	3391	15.79

Data sources:1, 2, 3, 4, 5, 6

Table 5.2 Total discharge of phosphorus into the environment in 1995 and 2000

Source	Load 1995 [t]	Load 2000 [t]	Reduction [t]	Reduction [%]
Direct municipal discharge	334	216	118	35
Indirect municipal discharge	403	246	157	26
Direct industrial discharge	46	2.6	43.4	94
Indirect industrial discharge	77	33	44	57.29
Discharge from fish farms	0,1	6.3	6.2	-97.8
Discharge from agriculture	514	182	332	64.59
TOTAL	1374	686	688	50

Data sources: 1, 2, 3, 4, 5, 6

Table 5.3 Total discharge of nitrogen into the environment in 1990, 1995 and 2000

	1990 [t]	1995 [t]	2000 [t]
Direct municipal discharge	5322.00	1143	1552.00
Indirect municipal discharge	5671.00	2455	1326.00
Direct industrial discharge	420.00	265	16.20
Indirect industrial discharge	960.00	480	273.82
Discharge from fish farms	111.00	0.7	50.00
Discharge from agricultu-re	33760.00	17130	14865.00
TOTAL	46256.00	21473.7	18083.02

Data sources: 1, 2, 3, 4, 5, 6

Table 5.4 Total discharge of phosphorus into the environment in 1990, 1995 and 2000

	1990 [t]	1995 [t]	2000 [t]
Direct municipal discharge	658.00	334.00	216.00
Indirect municipal discharge	561.00	403.00	246.00
Direct industrial discharge	60.00	46.00	2.60
Indirect industrial discharge	180.00	77.00	33.00
Discharge from fish farms	3.00	0.10	6.30
Discharge from agricultu-re	1013.00	514.00	182.00
TOTAL	2475.00	1374.10	685.90

Data sources: 1, 2, 3, 4, 5, 6

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Annex 6

WATER PROTECTION TARGETS IN LITHUANIA

Methodology for setting targets for water protection

Lithuania has not quantified national targets for water protection. General targets for water protection are established in national strategic documents. The most important strategic document defining national goals and priorities for environmental protection is the National Environmental Protection Strategy.

Environmental Protection Strategy

The Lithuanian Environmental Protection Strategy was adopted in 1996 by the Parliament of Lithuania. The Strategy defines environmental protection goals, sets environmental protection priorities, describes environmental policies, principles and strategy implementation instruments. However, pollution reduction goals and targets are not quantified.

The reduction of water pollution is one of the most important environmental protection goals extensively addressed in the Strategy, which defines following actions in the field of water protection:
- reduction of pollution by industrial and agro-industrial wastewater,
- reduction of ground water pollution,
- reduction of non-point source pollution to water bodies,
- reduction of pollution load into the sea,
- reduction of soil pollution with organic and mineral fertilisers and other agricultural chemicals, and
- prevention of further degradation of river valleys and lakes as well as marine biocenoeses.

The Environmental Protection Strategy sets the highest priority for protection of water quality. It states that along with treatment of municipal wastewater, measures should be implemented to reduce non-point source pollution of ground and surface waters, to restructure financial mechanisms for the wastewater sector by introducing the "polluter/consumer pays" principle. Promotion of ecologically sustainable farming is mentioned among the priorities in the landscape protection area.

Legal framework

The legal system of water resources management in Lithuania consists of laws and regulations. Laws establish general management principles, while regulations delineate the detailed requirements for implementing the requirements established by law. The main laws related to protection of aquatic environment are:
- Law on Environmental Protection (1996) defines the main principles of environmental protection in Lithuania. This framework law defines the rights and responsibilities of private and legal persons with respect to the environment, the use of natural resources, regulation of economic activities, and introduces general principles for use of economic instruments for protection of environment.
- Law on Water (1997) is the primary law which regulates the management of water resources. The water law defines the main principles of management, use, protection and ownership of water resources (except for marine waters).
- Law on Protection of Marine Environment (1997) defines the main principles of the protection of marine environment: protection from pollution from vessels, liquidation of incidents, regulation of economic activities in the sea, etc.

• The Underground Law (1995) establishes requirements for protection, control and exploitation of underground resources (including water).
In addition to these main laws there are a number of other laws regulating water management in Lithuania, such as:
• Law on Monitoring of the Environment (1997) establishes and sets requirements for implementation structure of the environmental monitoring in Lithuania,
• Law on Protected Areas (1993),
• Law on Environmental Impact Assessment (1996), and
• Law on Land (1994).

Abstraction of water and discharge of effluents in Lithuania is regulated via permit system established by the Order of the Ministry of Environment on Issuing of Operational Permits (LAND 32–99). All abstractions of water greater than 10 m3/ day and discharge of effluents greater than 5 m3/day are subject to regulation via the permit system. In addition, these water users are required to supply statistical data about use of water and discharge of effluent to the Ministry of Environment.

The quality of receiving waters in Lithuania is regulated by controlling the concentration of pollutants in effluents. The Order of the Ministry of Environment on Waste Water Pollution Standards (1995) sets requirements for the treatment of effluents (concentrations of nutrients and dangerous substances). The Waste Water Pollution Standards are currently under revision.

Diffuse pollution of surface waters is controlled via the Regulation on Special Conditions for Use of Land and Forest (1992) and the Order of the Ministry of Environment and Ministry of Agriculture on Requirements for the Management of Manure and Waste Water at Farms (LAND 33–99).

The State Environmental Monitoring Programme (1998) defines sampling points, frequencies, and parameters for monitoring of surface, ground and coastal waters.

EU accession

In recent years the process of EU accession has become an important factor for the establishment of targets for water protection. Implementation of EU environmental requirements will be an important driving force for water protection in Lithuania.

In June 1995, Lithuania signed an Association Agreement with the European Union and aims to implement requirements of the EU Directives. Under the Association Agreement, Lithuania has made a commitment to approximate its legal framework with the laws of the European Union. The Ministry of Environment has elaborated a National Environmental Approximation Strategy (1998). In the field of water protection, top priority was assigned to the implementation of the EU Urban Waste Water Treatment Directive and Nitrates Directive.

EU Urban Waste Water Treatment Directive 91/271/EEC

The EU Urban Waste Water Treatment Directive 91/271/EEC (UWWTD) is regarded as one of the most expensive directives in the environmental sector. Lithuania has recently developed a national plan for implementation of the Directive. The objective of the plan is to achieve compliance with the standards of the Directive by the end of 2009. Estimated costs for implementation of the plan total nearly 290 million euro.

The plan covers 84 agglomerations larger than 2 000 person equivalents (PE) in which requirements for wastewater treatment will be achieved:
• 7 agglomerations larger than 100 000 PE
• 31 agglomeration between 10 000 and 100 000 PE
• 46 agglomerations between 2 000 and 10 000 PE.

After implementation of the plan the load reductions in Table 11.13 will be achieved.

Table 11.13 Expected reductions of municipal discharges of nitrogen and phosphorus due to implementation of the UWWTD

Nutrient	**1987 (t/y)**	**1995 (t/y)**	**2010 (t/y)**
Nitrogen	9 724	6 869	3 070
Phosphorus	2 210	942	261

The expected reductions of nitrogen and phosphorus load presented in the table above were calculated by multiplying the volume of effluents discharged (using 1999 data) and the concentration of nitrogen and phosphorus to be achieved according to the requirements of the UWWTD.

EU Nitrates Directive 91/676/EEC

Reduction of diffused pollution from agricultural sources is another area targeted by the activities related to EU accession. The Ministry of Environment has recently developed a Strategy for Implementation of the Nitrates Directive that aims to improve the environmental performance of agricultural activities. The main focus of the measures is to prevent increases in pollution of the environment as Lithuanian agriculture develops.

The priority actions defined in the Strategy for Implementation of the Nitrates Directive in Lithuania (2001) aim to introduce Good Agricultural Practices and modern management techniques for livestock manure. The first four-year action programme for implementation of the Nitrates Directive will be developed in 2002–2003. Measures will be implemented to improve the uptake of nutrients by crops and to reduce leakage of nitrogen and phosphorus to the environment. It is estimated that costs for the installation of manure storage facilities and the purchase of manure spreading equipment may be as high as 400 million euro.

Lithuania has not set official targets for reducing nitrogen and phosphorus discharges from agriculture. Since the late 1980s the input of nutrients in Lithuanian agriculture in terms of mineral fertiliser and livestock manure has decreased by more than 50 % compared to the late 1980s, and significant improvements in fertiliser management have been observed. The present agricultural output in Lithuania should be regarded as low compared to output levels in the late 1980s and agricultural output in Western European countries.

The agricultural sector of Lithuania is still undergoing large-scale reforms. It is expected that agricultural output and livestock density will not increase significantly by the year 2005. The main objective of environmental protection measures in the agricultural sector is to maintain discharges at the level of the late 1990s, and to prevent increases in pollution as agriculture in Lithuania recovers.

EU Water Framework Directive

In the near future additional requirements and targets for water protection will be established for the implementation of river basin management, with the objective to achieve good surface water and very good groundwater status. A number of pilot projects were started in

international river basins aiming to improve co-operation with neighbouring countries in the field of protecting the water environment.

Recent trends in reduction of nitrogen and phosphorus discharges

Discharges from municipal and industrial sources

During the last decade discharges of nitrogen and phosphorus from point sources (municipal sources and industry) were significantly reduced. Several reasons for the decline should be mentioned: the decline in industrial pollution, substantial investments in wastewater treatment facilities in large cities and smaller towns, increased efficiency of wastewater treatment, and increased taxes for use of water and discharge of pollutants.

The majority of industrial wastewater in Lithuania is discharged into municipal sewers, and only a small part is discharged directly into surface waters. Large-scale restructuring of industry and changes in technological processes occurred after the collapse of the Soviet Union in early 1990s. The decline of industry and the introduction of water meters in households has resulted in decreased usage of water and discharge of effluents. Since the late 1980s, the treatment of municipal wastewater has improved significantly.

During the last decade volume of effluents discharged from urban agglomerations was constantly decreasing. It is assumed that water consumption has stabilised and it is expected that it shall stay at the level of 1999.

Tables 11.14 and 11.15 below show the decline in total nitrogen and total phosphorus discharges from municipal and industrial sources.

Table 11.14 Discharges of total nitrogen and total phosphorus from municipal sources in Lithuania

	1987 (tonnes/year)	**1995 (tonnes/year)**	**1999 (tonnes/year)**	**Reduction (%)**
N-TOT	9 724	6 869	3 395	65
P-TOT	2 210	917.5	617	72

The table above shows that during the period between 1987 and 1999 Lithuania has reduced municipal discharges of total nitrogen and total phosphorus by 65 % and 72 % respectively. The 50 % reduction target for phosphorus discharges was achieved already in 1995.

Table 11.15 Discharges of total nitrogen and total phosphorus from industrial sources in Lithuania

	1987 (tonnes/year)	**1995 (tonnes/year)**	**1999 (tonnes/year)**	**Reduction (%)**
N-TOT	2 001	662	528	74
P-TOT	304	167.8	133	56

The table above shows that during the period between 1987 and 1999 Lithuania has reduced industrial discharges of total nitrogen and total phosphorus by 74 % and 56 % respectively. The 50% reduction target for nitrogen discharges was already achieved in 1995.

Discharges from agriculture

Land reform, privatisation and changing markets have led to significant decrease in livestock density in Lithuania. During the period between 1989 and 1999, the number of livestock has decreased by more than 50 %. The use of fertilisers has also decreased more than four times.

As overall density of livestock per hectare of arable land is relatively low, environmental measures will focus on reducing point source pollution from agricultural sources. It is expected that introduction of modern manure handling techniques will increase the efficiency of plant uptake of nutrients and decrease local environmental impacts.

Lithuania aims to implement EU Nitrate Directive and has adopted the Code of Good Agricultural Practice (2000). Phased implementation of the Code will improve management of nutrients on the farm level and reduce nutrient leaching to surface waters.

The input of nutrients in agriculture has decreased by more than 50 %. However, monitoring data does not indicate a rapid decrease of nutrients in receiving waters. In fact washout of nutrients calculated per hectare of land varies from year to year even though the input of nutrients is steadily decreasing. This can be due to following reasons:
• There is a time lag between reduction of pressure on the environment and response due to internal recycling of nutrients within the ecosystem. In other words, the effects of environmental measures taken in early 1990s are still expected to come in the future.
• Leaching of nutrients from areas covered by natural vegetation is higher than estimated in previous studies (share of nutrients due to nitrogen fixation, atmospheric deposition, decomposition of vegetation).

An assessment of nitrogen discharges from agricultural sources in the late 1990s was carried out by the consultants in a Danish bilateral assistance project “Longterm Assistance in Transposition and Implementation of the Nitrates Directive in Lithuania”. During the study, discharge of nitrogen was calculated for selected nature-dominated and agriculture-dominated watersheds. Washout of nitrogen from agricultural land was calculated using data on daily flow and concentration´of nitrogen in the streams and data on land use of the watersheds. The results of the study indicate that average nitrogen load from agricultural areas during the years 1997 and 1998 was 10 kg/ha y. Phosphorus load from agricultural areas was similar to the load from nature-dominated areas.

The results of the study indicate that discharges of total nitrogen from agricultural sources in Lithuania in 1997–1998 were 29 400 t/ N y.

Table 11.16 Discharges of total nitrogen and total phosphorus from agriculture 1987 (tonnes/year) 1995 (tonnes/year) 1999 (tonnes/year) Reduction (%)

	1987 (tonnes/year)	**1995 (tonnes/year)**	**1999 (tonnes/year)**	**Reduction (%)**
N-TOT	59 455	35 500	29 400	51
P-TOT	1 809	887	880	51

The table above shows that Lithuania has implemented the Ministerial Declaration and reduced nitrogen discharges by 51 %, and phosphorus discharges by 51 % during the period 1987–1995.

References

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PROPOSAL OF "MORE SPECIFIC TARGETS" FOR THE REDUCTION OF POLLUTION DISCHARGED INTO THE BALTIC SEA FROM POLAND

1. Preface

The aim of the work is to elaborate proposal of more specific targets for the reduction of the pollution discharged to the Baltic Sea from Poland, according to the Ministerial Declaration 1988 (50 % reduction goal).

Information on nutrients load discharges from Polish territory to the Baltic Sea catchment area in 1988 and 1995 have been applied to elaborate a proposal.

Development of more specific targets was based on the following documents, which created new framework for the implementation of the 1988 Declaration:

- new Water Law adopted in 2001;
- Law on Environmental Protection adopted in 2001;
- Second Environmental Policy adopted by Sejm (lower chamber of Polish Parliament) in 2001;
- results of the EU accession negotiations in the chapter "Environment", especially considering transition periods for the implementation of Council Directive 91/271/EEC of 21 May 1991 (Urban Wastewater Directive) as well as Council Directive 91/676/EEC of 12 December 1991 (Nitrate Directive).

The important sources of additional data and information were as follows:

- publications of State Statistical Office;
- assumptions to "National Program of municipal wastewater treatment" to be elaborated in 2003 by the Ministry of the Environment;
- results of 4th Pollution Load Compilation (PLC-4);
- conclusions of "Strategy and measures for reduction of municipal discharges" (part of a research project carried out by Environmental Protection Institute).

The paper presents proposal of more specific targets – expressed as expected nutrients load reduction – for implementation of Ministerial Declaration 1988.

2. Determinants of emission

A. Water consumption

Since late 1980s nitrogen and phosphorus load discharged to the surface water bodies is decreasing. Reduction of pollution loads is observed for all kinds of sources, namely municipal, industrial and agricultural ones. This trend results from both the economical transformation and implementation of the State's environmental policy.

25-% reduction of water consumption in industry and municipalities (Table 1) was one of the reasons of decrease of nutrients load from point sources in the years 1988-2000.

Table 1. Water consumption for industrial, municipal and agricultural purposes in 1988, 1995 and 2000 (State Statistical Office, Environmental Protection Year-book 1989, 1996, 2001).

	Volume [hm^3/a]		
	1988	**1995**	**2000**
Industry	10,116.6	8,431.6	7,637.9
Municipalities	3,066.1	2,457.1	2,350.1
Agriculture (irrigation, husbandry)	1,622.7	1,176.8	1,060.6
Total	**14,805.4**	**12,065.5**	**11,048.6**

B. Municipal and industrial wastewater

Volume of municipal and industrial wastewater requiring treatment, discharged to surface water bodies has been significantly reduced. Volume of industrial wastewater discharged was reduced by 49 %, while the volume of untreated wastewater decreased from 492.9 hm^3 in 1988 to 50.8 hm^3 in 2000.

Volume of wastewater from municipal sources was reduced as well. Amount of untreated sewage decreased from 1,171 hm^3 in 1988 to 250.6 hm^3 in 2000, *i.e.* by 80 %. The number of inhabitants served by wastewater treatment increased by 40 %, from 13,494 th. in 1990 to 18,928 th. in 2000. Beginning from the 1995 increase of wastewater stream treated with biological methods with enhanced nutrients removal can be noticed (Table 2).

Table 2. Volume of industrial and municipal wastewater (requiring treatment) discharged to surface water bodies in 1988, 1995 and 2000 (State Statistical Office, Environmental Protection Year-book 1989, 1996, 2001).

Wastewater stream / Treatment method	Volume [hm^3/y]		
	1988	**1995**	**2000**
Industrial wastewater (excluding cooling water)	**1,988.5**	**1,167.2**	**1,007.5**
- Treated	1,495.6	1,061.8	956.8
- Untreated	492.9	105.4	50.8
Municipal wastewater	**2,478.1**	**1,852.4**	**1,494.0**
- Treated	1,307.1	1,257.6	1,243.4
▪ biologically	766.2	878.5	705.8
▪ with enhanced nutrients removal	-	81.1	450.5
- Untreated	1,171.0	594.8	250.6
Total	**4,466.6**	**3,019.6**	**2,501.5**
- Treated	2,802.7	2,319.4	2,200.2
- Untreated	1,663.9	700.2	301.3

C. Agriculture

The main reason for the reduction of nutrients load from agriculture for the years 1988-1995 was the decrease of mineral fertilisers containing nitrogen and phosphorus by 30 and 58 % (Table 3), respectively, together with decrease of animal husbandry by 35 % (State Statistical Office, Agricultural Year-book 2001).

Table 3. Consumption of mineral fertilisers in agriculture (State Statistical Office, Environmental Protection Year-book 2002).

Mineral fertilisers	Consumption (calculated as N and P) per year		
	1989/90	**1995/96**	**2000/01**
Containing nitrogen			
th. ton (N)	1274.0	852.0	895.5
kg N / ha agricultural area	68.9	47.6	50.3
Containing phosphorus			
th. ton (P_2O_5)	752.0	301.7	317.9
kg (P_2O_5) / ha agricultural area	40.7	16.9	17.9

A stable level of fertilisation and production is observed since 1994.

Table 4. Nutrients emission to surface water bodies from agricultural sources (results of PLC-4 included).

	Nutrients emission [t/a]		
	1988-1989	**1995**	**2000**
Total nitrogen	135,100	94,600	102,500
Total phosphorus	7,390	6,650	8,330

The PLC-4 results indicate the increased nutrients emission form agriculture when compared the year 1995. However, this results directly from 17 % increase of rainwater outflow from the territory of Poland.

3. Nutrients load discharged to the Baltic Sea via rivers

Changes of nutrients load discharged in Poland to the surface water bodies in the Baltic catchment area shortly discussed above reflect changes of riverine load discharged to the Baltic.

Total nitrogen load discharged via rivers in 1988 and 2000 was 243.0 and 188.7 th. tons respectively, while phosphorus load reached 16.7 and 12.3 tons, respectively. It should be stressed that the hydrological conditions in 1988 and 2000 were comparable and total riverine outflow was approx. 70 km^3.

Due to increase of emission from agriculture mentioned in chapter 2, all the positive changes in total nutrients load discharged via rivers result from the reduction of the pollution load from the point municipal and industrial sources.

Table 5. Riverine pollution load discharged to the Baltic Sea from Poland.

	Load [th. tons/a]		
	1988	**1995**	**2000**
Nitrogen (t/rok)	243.0	202.1	188.7
Phosphorus (t/rok)	16.7	13.1	12.3

4. Legal regulations in force

A. National Environmental Policy

Beginning from early 1990s Polish environmental policy is consistent with sustainable development principles. Basis of the policy was formulated in the State Environmental Policy adopted by the Parliament on the 10 May 1991. The document defined main rules of national environmental policy, including:

- indication of institutions and authorities responsible for environmental protection;
- priorities of environmental protection;
- instruments of environmental protection;
- basic rules of international co-operation.

As regards water protection **Article 59** set the following priorities:

- Reduction of pollution loads disposed of by industry and municipalities into the rivers by 50 % through the decrease in the amount of untreated industrial and municipal sewage from 0.4 billion and 0.9 billion m^3 at present to 0.1 billion and 0.6 billion m^3 by the year 2000 respectively, as well as increasing the rate of highly effective wastewater treatment systems (biological and chemical) in the overall sewage treatment from the present 47 % to 70 % in the year 2000.
- Improvement of sanitary conditions in rural areas by supplementing village pipeline water supply systems with adequate sanitation solutions.

Second National Environmental Policy at present in force was elaborated by the Council of Ministers in June 2000 and then adopted by the Parliament in August 2001. The document sets the course of policy, defines priorities and main tasks to be fulfilled until 2025.

The most important provisions of the Second National Policy regarded as key for implementation of Ministerial Declaration are described below.

According to **Article 11** the major objective of New National Environmental Policy is to provide for environmental safety of the Polish society in 21st century, and to create the basis for elaboration and implementation of the national sustainable development strategy. The integration process with the European Union brings about important support to achieving major objective of this new national policy. It assumes 3 phases to attain the goals. The first phase, the implementation of short-term objectives, will take place within the period of application to the European Union membership (2000-2002, according to assumption adopted by the Government to attain the readiness to the membership in 2002); the second phase, the implementation of medium-term objectives within initial period of the European Union membership, that assumes the transition periods and the implementation of approximation programmes (2003-2010); and the third, long-term phase to be implemented in the framework of the „Strategy for Poland's Sustainable Development by 2025".

Article 89 sets the following strategic directions for actions in water protection:

- Restoration of the quality of surface and ground waters (their physical, chemical, biological, and ecological indicators) to the state resulting from their assumed utilisation and needs related to their environmental functions.
- Protection of surface and marine waters against eutrophication; this refers in the first instance to the Lake Districts, protected areas, and fragile to eutrophication waters of the Gdansk Bay, Szczecin Lagoon, and Vistula Lagoon, and further to the open waters of the Baltic Sea and other waters in Poland, including transboundary waters.

- Protection of waters of the Upper Vistula and Upper Odra against salination from mining water.

According to **Article 90** short-term priorities (the years 2000-2002) concerning improvement of water conditions and water quality include *i.a.*:

- Development of a strategy for water management and water quality improvement, as well as implementation programmes to achieve goals required by individual community legal acts concerning problems of water quality improvement.
- Implementation of a modernised system of monitoring of pollutant emission and water quality, with reference to the European Union standards.
- Significant advancement in implementation of programmes for improvement of water and waste water management in the “hot spots” (“List of 80” polluting enterprises, and waste water treatment plants in the Baltic catchment area as listed in documents of Helsinki Commission).
- Completion of preparation of a new Water Law and publication of all ten necessary executive acts and their final harmonisation with the European Union directives concerning water and waste water management and water quality.

According to **Article 91** in the medium-term time horizon (the year 2002-2010) it will be necessary to:

- Eliminate untreated (raw) sewage discharges from towns and industrial sites; reduce the load of pollutants discharged to surface waters from industry by 50 per cent, from municipal sector by 30 per cent (from the area of towns and human settlements), from surface run-off by 30 per cent, against the 1990 levels. This will ensure that waters will meet the quality standards in force in the European Union.
- Reduce water-intensity of industrial production by 50 per cent (calculated per unit of the production sold), against the 1990 level.
- Complete implementation of the programmes for improvement of water and wastewater management in the ”hot spots” (“List of 80”, and waste water treatment plants in the Baltic catchment area, listed in the Helsinki Convention).

In a long-term perspective (the years 2010-2025) – **Article 92**— it will be necessary to:

- Implement a programme for construction, extension, and modernisation of wastewater treatment plants, with intensified nutrient removal process, in cities of equivalent population over 10,000 (by 2015).
- Implement a programme of construction of sewage systems and waste water treatment plants in 48 smaller cities and their extension in 822 small towns and rural settlements of the equivalent population over 2,000 and the dense housing areas (by 2015), which will allow to meet by the year 2015 the Community requirements concerning the existence of sewerage systems and wastewater treatment plants in all towns of equivalent population of over 2,000 inhabitants.
- Further reduce the load of pollutants discharged to waters by industry, including salt water from coal and salt mining industry; eliminate hazardous substances from waste discharged to surface waters in order to fulfil all national and European Union emission standards.
- Solve the problem of water protection against pollution by agricultural nitrates; implement action programmes for the prevention of pollution with nitrates from agricultural sources in the areas sensitive to pollution.
- Find a comprehensive solution to a problem of sanitation of sites of disperse housing in rural and urban areas.

B. Legal regulations concerning water protection in force in Poland

Following the Second Environmental Policy from 2000 through 2002 national law has been updated to transpose EU regulations in the field of waster protection.

Law regulations presented below enable to implement, according to agreed timetable and transition periods, the following EU regulations:

- Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment;
- Council Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States;
- Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life;
- Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water;
- Council Directive 91/676/EEC of 12 December 1991 concerning the protection of water against pollution caused by nitrates from agricultural sources.

The following national regulations concerning water protection are in force:

- Water Law of 18 July 2001 (2001 Journal of Laws No. 115, it. 1229), with the amendments (2002 Journal of Laws, No. 233, it. 1957);
- Environmental Protection Law of 27 April 2001 r. (2001 Journal of Laws, No. 62 it. 627), with the amendments (2001 Journal of Laws No. 233, it. 1957);
- Law Act of 20 July 1991 r. on State Inspection for Environmental Protection (2001 Journal of Laws No. 77 it. 335), with the amendments (2002 Journal of Laws No. 233, it. 1957);
- Law Act of 29 June 1995 on State Statistics (1995 Journal of Laws No. 88 it. 439), with the amendments;
- Law Act of 26 July 2000 on fertilisers and fertilising (2000 Journal of Laws No. 89 it. 991). It regulates rules of marketing and application of fertilisers; protection of animal and human health as well as environment against threats resulting from transport, storage and application of fertilisers, agrochemicals;
- Law Act 7 June 2001on collective water supply and collective sewage disposal (2001 Journal Laws No. 72, it. 747);
- Executive Order of the Minister of the Environment of 4 October 2002 on the requirements for inland waters being natural habitats for fish life (2002 Journal of Laws No. 176 it. 1455);
- Executive Order of the Minister of Health of 16 October 2002 on the requirements for bathing water quality (2002 Journal of Laws No. 183 it. 1530);
- Executive Order by the Minister of the Environment of 27 November 2002 on the quality required of surface water intended for the abstraction of drinking water (2002 Journal of Laws No. 204 it. 1728);
- Executive Order by the Minister of the Environment of 29 November 2002 on the conditions to be fulfilled when discharging wastewater into the water bodies or soil and on the substances particularly hazardous for water environment (2002 Journal of Laws No. 212 it. 1799);
- Executive Order by the Minister of Environment which transposed provisions of the 91/676/Directive of 23 December 2002 on criteria for designation of water sensitive for

pollution with nitrogen compounds from agricultural sources (2002 Journal of Laws No. 241, it. 2093);

- Executive Order by the Minister of Environment of 23 November 2002 on detailed requirements to be fulfilled by the action programmes aiming at the reduction of nitrogen run-off from agricultural sources (2003 Journal of Laws N. 4, it. 44);
- Executive Order of the Council of Ministers on the fees for the use of the environment (2001Journal of Laws, No. 130 it. 1453, with the amendments (2001 Journal of Laws No. 151, it. 1703; Journal of Laws No. 161, it. 1335);
- Executive Order by the Council of Ministers on the specific fines for the violation of permits for wastewater discharging into the water bodies or soil (2001 Journal of Laws No. 146 it. 1649);
- Executive Order of Council of Ministers of 19 May 1999 on wastewater discharge into the municipal sewerage systems (1999 Journal of Laws No. 50, it. 501);
- Announcement by the Minister of Environment of 15 October 2002 on the fees for the use of the environment in 2003 (2002 *Monitor Polski* No. 49, it. 715).

C. Most important legal instruments of management and control

Fees

According to the Water Law and the subsequent Executive Order of the Council of Ministers on the fines for the use of environment all commercial consumers of surface or underground water and dischargers of wastewater into the water bodies or soil are required to gain water-law permit for special use of water. Companies are requested to measure the volume of water used and wastewater discharged (together with wastewater quality). The company itself calculates the fee level basing on the fares set in the Executive Order. Fees are paid to provincial self-governments. When the company uses the environment without the permit required the fee rises by 100 %. The basis for fee calculation is concentration of pollution in discharged wastewater decreased by the concentration in the abstracted water.

Fines

According to Law Act of 20 July 1991 r. on State Inspection for Environmental Protection (further amended) Provincial Inspectorates for Environmental Protection (PIEPs) are required to monitor the implementation of regulations concerning environmental protection and sustainable use of natural resources as well as to control the compliance with the permits for the use of various compartment of the environment.

PIEPs' duties include controlling of volume and quality of discharged wastewater with an aim to check the compliance with conditions set in water-law permits. Once the excessive volumes or loads of pollution are determined Provincial Inspector inflicts a fine, according to the Executive Order by the Council of Ministers on the specific fines for the violation of permits for wastewater discharging into the water bodies or soil.

Statistic obligations

According to Law Act of 29 June 1995 on State Statistics (further amended) State Statistics Office (SSO) collects data on the volume and quality of wastewater discharged by municipal and commercial enterprises into the water bodies. Companies are obliged to provide SSO with appropriate reports on the annual basis. Municipal enterprises (operators of WWTPs and sewerage systems) collect and submit data on 5 parameters, while other companies – on 15 ones. In each case nitrogen and phosphorus are included.
Summarised and elaborated information is published in year-books.

Surface water monitoring

Chief Inspector for Environmental Protection co-ordinates State Environmental Monitoring, according to Law Act of 20 July 1991 r. on State Inspection for Environmental Protection (further amended). Surface water monitoring is conducted by Institute of Meteorology and Water Management, Provincial Inspectorates for Environmental Protection and Environmental Protection Institute.

The present monitoring program covers 9 lakes and 365 sampling points on rivers. Nutrient levels are determined obligatory for all the sampling points. Sampling frequency for rivers varies between 12 and 24 times per year.

Access to the information on the state of environment

On 1 January 2001 Law Act on the access to the information on the state of the environment and environmental impact assessments entered into force. Provisions of the Act were later included in the Environmental Protection Law. The chapter on the access to the information transposes into the national law the provisions of the Council Directive 90/313 and confirms that everybody has the access to the information irrespective the citizenship and legal interest. The Act also introduced public participation in the procedures concerning environmental issues, including the right to make comments and proposals in the decision making processes and other specified procedures.

5. Investment program and expected ecological results

A. Investment scope and financial sources

According to Water Law of 2001, Article 43, Paragraph 3, Minister of the Environment is obliged to elaborate in 2003 “National Program of Municipal Wastewater Treatment” which further is supposed to be adopted by the Council of Ministers by the 31 December 2003 (Water Law, Art. 208 Para 2).

Implementation of the Program will be based on the Second National Environmental Policy as well as on the commitments of the Polish Government made within the EU negotiations on implementation of Council Directive 91/271/EEC concerning urban wastewater treatment. Ministry of the Environment estimates that implementation program will need the mobilisation of resources, construction and reconstruction of WWTPs in more than 1,500 agglomerations.

Financing will be given mainly by the local self-governments and water companies. The program is estimated to cost approx. 28.5 bln PLZ (7.1 bln EUR) to be spent until 2015. The overall costs include:

- 18.303 bln PLZ (4.6 bln EUR) for sewerage systems;
- 10.217 bln PLZ (2.5 bln EUR) for WWTPs:
    - 2002–2005: 4.513 bln PLZ (1.1 bln EUR),
    - 2006-2010: 3.082 bln PLZ (0.8 bln EUR),
    - 2011-2015: 1.622 bln PLZ (0.4 bln EUR).

TOGETHER: 28.520 bln PLZ (28.5 bln EUR).

Draft “Program for equipment of agglomerations with sewer systems and municipal wastewater treatment plants” of 24 October 2001 elaborated by the Environmental Protection Institute includes results of the EU accession negotiations in the chapter “Environment” and presumes *i.e.*:

- Construction of 408 municipal wastewater treatment plants with capacity over 2,000 PE (including 2 agglomerations of the equivalent population over 100,000).
- Extension or/and modernisation of existing municipal WWTPs with capacity over 2,000 PE to fulfil requirements of 91/272/EWG Directive.
- Construction of sewerage systems in approx. 400 agglomerations and extension or/and modernisation of sewage systems in 1,100 agglomerations.

According to the documents closing EU accession negotiations and draft Accession Treaty the requirements of 91/271/EWG Directive (Urban Wastewater Directive) with a scope of equipment of agglomerations with sewage systems and wastewater treatment plants will be fulfilled by the 31 December 2015 taking into consideration the following mediate aims:

- Until 31 December 2005 the wastewater in 674 agglomerations will be treated according to the Directive’s requirements, what constitutes 69 % of the total load of biodegradable substances.
- Until 31 December 2010 the wastewater in 1,069 agglomerations will be treated according to the Directive’s requirements, what constitutes 86,0 % of the total load of biodegradable substances.
- Until 31 December 2013 the wastewater in 1,165 agglomerations will be treated according to the Directive’s requirements, what constitutes 91 % of the total load of biodegradable substances.

Transition period to fulfil requirements of a Directive with regard to WWTPs in food and agriculture industry will last until 31 December 2010.

According to the preliminary estimations included in the elaboration mentioned above, all together it will be necessary to construct, extend and/or modernise 961 municipal WWTPs in years 2002-2015, including:

- 45 WWTPs with capacity exceeding 100,000 PE;
- 208 WWTPs with capacity 15,000-100,000 PE;
- 708 WWTPs with capacity 2,000 – 15,000 PE.

Equipment of agglomerations with sewage systems will require:

- construction of sewerage in 376 agglomerations of the equivalent population 2,000-10,000;
- construction of sewerage in 3 agglomerations of the equivalent population 1,000-15,000;
- construction of sewerage in 1 agglomeration of the equivalent population over 15,000;
- extension and/or modernisation of sewage systems in 1097 agglomerations.

Table 6. Effects of investments in water protection against pollution caused by municipal wastewater in the years 1990 to 2001 (State Statistical Office, Year-book 2002).

Specification	1990	1996	1997	1998	1999	2000	2001
Wastewater treatment plants							
Total number, Including those:	299	435	392	419	366	324	262
equipped with biological treatment	215	231	218	234	188	135	129
equipped with enhanced nutrients removal		26	36	42	53	40	25
Treatment capacity, dam^3/d	**1,003**	**717**	**1,066**	**694**	**858**	**1,098**	**642**
Mechanical WWTPs	642	289	449	144	164	253	156
Chemical WWTPs	93	11	33	50	63	76	1
Biological WWTPs	268	210	458	318	311	405	173
WWTPS with enhanced nutrients removal		207	126	182	320	364	312
Individual WWTPs (adjoining a farmstead)							
Number		469	875	1,284	717	578	639
Capacity, m^3/d		777	1,472	1,606	758	502	729
Sewerage system, km							
Conveying wastewater		2,596	3,199	3,322	4,108	4,758	4,210
Conveying stormwater		303	363	306	395	343	437

B. Assumptions for the proposal

The proposal for more specific targets to reduce the pollution load discharged to the Baltic Sea is based on the following assumptions:

- Second National Environmental Policy is the most important legal basis for elaboration of targets. The document, as adopted by the Council of Ministers and the Parliament, defines and schedules priorities concerning water protection to be implemented by 2025. Articles 89-91 thereof contain transitions periods for the implementation of EU Directives listed in the chapter 4 as negotiated with the Commission.

- Expected reduction of the nutrient load is presented following the conclusions of "Strategy and Measures for reduction of municipal discharges" (part of the research project Research Project PBZ-28-02 carried out by Environmental Protection Institute in 1996), however timeframes for measures planned therein for 2010 were changed to 2015.

- Discharge of nutrients from industrial sources requires detailed analysis of each specific sector. However, the expected reduction is significantly lower than that in municipal sector. Thus industrial sources are not considered in the analysis.

- Stabilisation of fertilisation and production level in agriculture may be observed. On the other hand there are no direct methods of monitoring the nutrients emission level from agricultural sources. Taking these into account it is assumed that improvement of wastewater management in agriculture, implementation of "Code of Good Agricultural

Practice" and intensification of agricultural production from 2003 to 2015 will not result in considerable increase of nutrient load from the sector when compared to the reference year 2000.

C. Proposals for targets

To reflect the present situation and the scope of planned investments in 2002 - 2015 the information on the population presently served by the WWTPs, served by plants requiring modernisation and intended to be connected to new plants is presented in the Table 7.

Table 7. Population inhabiting agglomerations served by WWTPs and intended for connection (State Statistical Office, Year-book 2002).

Agglomeration size	**Total**	**Below 5,000**	**5,000-9,999**	**10,000-19,999**	**20,000-99,999**	**Over 100,000**
Number of inhabitants in 2000 (thousands)	23,876.5	882.9	1,285.2	2,680.2	7,581.3	11,446.9
Served by WWTPs (Total)	**19,297.5**	**557.4**	**927.0**	**2,117.9**	**6,448.1**	**9,247.1**
Served by mechanical WWTPs	1,166.7	4.6	20.7	82.0	111.8	947.4
Served by biological WWTPs	9,822.4	457.7	613.1	995.8	2,819.7	4,936.0
Served by WWTPs with enhanced nutrients removal	8,271.3	93.5	293.1	1,039.7	3,481.4	3,363.6
Served by WWTPs planned for modernisation	9,918.1	4.6	20.7	1,077.8	2,931.5	5,883.5
Planned to be served by new WWTPs to be constructed	4,579.0	325.5	358.2	562.3	1,133.2	2,198.9

In 2001 12.4 % of total rural population was served by WWTPs. It is necessary to connect approx. 1,800 th. inhabitants to double the rate up to 25 % by 2015.

"Strategy and Measures for reduction of municipal discharges" (part of a research project carried out by Environmental Protection Institute) contains detailed calculation of nutrients discharged reduction resulting from the implementation of program of construction and modernisation of WWTPs (implementation of Council Directive 91/271/EEC). As it comes from the analysis, implementation of the Program within 15 years will result in 40,000 t and 12,000 t annual discharge reduction of nitrogen and phosphorus respectively.

Provided the results are directly proportional to financial resources mobilised and program timetable is kept, the final environmental effect is as presented in Table 8.

Table 8. Environmental effects resulting from the investments in municipal wastewater treatment.

Years	**Investments Mill EUR**	**Environmental effect**	
		Nitrogen reduction, t/y	**Phosphorus reduction, t/y**
2002 – 2005	4,513	17,600	5,300
2006 – 2010	3,082	12,000	3,600
2011 – 2015	2,622	10,400	3,100
Together in 2002-2015	10,217	40,000	12,000

6. Conclusions

Proposal presented hereby are preliminary one and the aim is to identify the general scope of expected reduction of discharges.

Elaboration and implementation of more specific targets for the reduction of the emission from point sources requires significant improvement of monitoring system. Data collected for statistical and administrational purposes at present are based on hard to verify reporting system.

The most important and reliable source of information on the trends of pollution discharges is State Programme of Monitoring of rivers, co-ordinated by Chief Inspectorate for Environmental Protection according to Law Act of 20 July 1991 on State Inspection for Environmental Protection. Monitoring data indirectly but evidently indicate the reduction of nitrogen and phosphorus discharges into the rivers within the Baltic Sea catchment area.

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WATER PROTECTION TARGETS IN RUSSIA

In 1998 the "National Environmental Action Plan of the Russian Federation for 1999 to 2001" (NEAP) was prepared. The NEAP was developed to determine effective ways to improve the environmental situation in Russia and was adjusted to reflect the main provisions of the long-term economic and social policy of the country. The purposes of the NEAP include: improvement of the environmental situation in the Russia Federation, unfavourable health impact abatement, conservation of the life-supporting function of the biosphere, and strengthening the participation of Russia in international environmental protection activities.

The NEAP included provisions to:
• decrease of polluted wastewater discharges to water bodies providing their self-restoration;
• stabilise storage volumes of household and industrial wastes and decrease storage volumes of hazardous wastes that cause secondary pollution of soils and waters.

Therefore NEAP contributed to the environmental improvement in the Baltic Sea catchment area (including natural complexes of the Onezshkoye and Ladozshkoye Lakes and the Neva Bay). In addition to the NEAP the following activities have been planned and are under implementation in the Kaliningrad region, St. Petersburg and the Leningrad region.

Kaliningrad Region

To reduce nutrient discharges from the territory of the Kaliningrad region in the period 1995–2000, the following programmes and actions were planned:
• a programme for reduction of discharges to water bodies in the Baltic Sea catchment area envisages construction of biological wastewater treatment plants (BWWTP) in the following towns: Kaliningrad, Sovetsk, Neman, Gvardeisk and others.
• a comprehensive programme for the total elimination of untreated wastewater discharges to water bodies envisages the construction/reconstruction of sewer systems and treatment plants in the following towns of the region: Kaliningrad, B. Isakovo, Nivenskoye, Mamonovo, Gvardejsk, and Krasnogvardejsk.
• a programme of measures to transfer pulp-and-paper mills to environmentally clean technologies.
• an Action Programme for prevention of the environment pollution by wastes from livestock and maintenance of 45 treatment plants, arrangement of 35 burial grounds for animal refuse.

Leningrad Region

In order to improve the environmental situation in the region, the Administration of St. Petersburg and Leningrad oblast developed different programmes which are now being implemented:
• The Environment Protection Action Programme for 1996–2005. The Programme envisages development of laws concerning:
– Neva River protection.
• Neva River Bay protection and use;
– the Gulf of Finland protection and use;
– Saint-Petersburg inland channels protection and use;
– Leningrad region ground waters protection.
• The Programme for construction of water protection facilities in order to protect the Baltic Sea according to the international commitments of the Russian Federation.
• The Programme for construction of anti flooding facilities in St. Petersburg. Along with these measures, a more effective reduction of nutrient discharges is hampered by lack of sufficient

municipal wastewater treatment capacities. This problem can be solved after the Southwestern Waste Water Treatment Plant is put into operation in St. Petersburg. As far as prospective plans for nutrient loads reduction are concerned, reduction activities in the Russian part of the Baltic Sea area are planned within the framework of the Federal Programmes “Ecology and Natural Resources of the Russian Federation” (for the period 2002–2010) and “Social and Economic Development of the North-Western Administrative Region of Russia” (up to 2010). These programmes will be adopted by the Russian Government this year. According to preliminary information, the Federal Government will be responsible for 10 % of the total expenses of the programme. The remaining 90 % of the expenses should be covered by regions.

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MORE SPECIFIC TARGETS IN SWEDEN AIMED AT MOST COST-EFFECTIVE SOLUTIONS FOR THE 50% REDUCTION GOALS FOR NUTRIENTS

Introduction

The Swedish Parliament has stated 15 national goals for the environment, which shall be reached within one generation. One of the goals is "Zero Eutrophication", which means that the concentrations of nutrients in soil and water shall not lead to any negative impact on human health, biodiversity or the possibilities for the overall use of water and soil. Nutrient levels in coastal and sea areas should be broadly similar to those that existed in the 1940s. Releases of nutrients into the sea must not cause eutrophication, therefore:

- releases of nutrients to coastal waters should in the long term not exceed levels that cause an adverse impact on health, biological diversity or the possibility of versatile use.

- discharges of nitrogen from Sweden to the Baltic Sea south of the Sea of Åland must be reduced by 40% compared with the baseline year1995.

The outcomes within a generation for the environmental quality objective Zero Eutrophication should include the following:

- Nutrient inputs do not cause adverse effects to human health and are not detrimental to biological diversity.

- Nutrient concentrations in coastal waters and seas are essentially the same as in the 1940s, and nutrient inputs into the seas do not cause eutrophication.

- The ecological status of Sweden´s coastal waters, as defined by the Water Frame-work Directive, is good.

National targets to reach the environmental goal will be reached by interim targets, measures and strategies which were decided upon by the Swedish Parliament in 2001. As interim targets the Parliament decided that i.a.:

- by 2009 an action programme in accordance with the Water Framework Directive will be in place, specifying how to achieve good ecological status in lakes and streams, as well as coastal waters.

- by 2010 waterborne anthropogenic emissions in Sweden of phosphorus compounds into lakes, streams and coastal waters will have diminished continuously from 1995 levels.

- by 2010 waterborne anthropogenic nitrogen emissions in Sweden into the sea south of Åland Sea will have been reduced by 30% compared with 1995 levels, i.e. to 38,500 tonnes.

Total load from Sweden

For years early 1980s, late 1980s and 1995 we had to the MINDEC report neither a complete information about the Swedish load figures of nitrogen and phosphorus to the different sub-areas of the Baltic Sea, nor any figures for the retention of phosphorus. Since then we have updated the figures for 1995 in the same way as for PLC4. In PLC4 and the updated figures for 1995 the agricultural area is bigger because thesey relate to agricultural land (including pasture, semi-natural grasslands, fallow etc) and not only to arable land. There are however still a minor difference between the figures.

There is also a major difference between the calculation methods concerning the figures related to 1980 and 1995 (new figures) and year 2000. It is therefore not possible to compare figures for nitrogen or phosphorus from 1980 with 1995 (new) or year 2000.

Table 1. Total discharge of nitrogen. Sweden reported figures for late 1980´s for the MINDEC report. These data are based on other calculation methods than the 1995 and 2000 data. The table presents both gross load in the drainage basin and actual net load input to the Baltic Sea (i.e., including retention).

Source	Load in late 1980s (t/y)	Load in 1995 (t/y)	Load in 2000 (t/y)	Reduction (tonnes) 1995-2000	Reduction (%) 1995-2000
Gross municipal Discharge	25635	26620	18850	7770	29
Net municipal discharge	21335	22760	16050	6710	30
Gross industrial discharge	7388	5364	4850	514	9
Net industrial discharge	6278	4750	4250	500	11
Gross load from arable land	65100	65600	57400	8200	13
Net load from arable land	33700	38400	34900	3500	9
TOTAL GROSS LOAD	97858	97584	81100	16484	17
TOTAL NET LOAD on the sea	61018	65910	55200	10710	16
BACKGROUND GROSS			66600		
BACKGROUND NET			53900		

Table 2. Total discharge of phosphorus. Sweden reported figures for early and late 1980´s for the MINDEC report. These data are based on other calculation methods than the 1995 and 2000 data. No retention calculated.

Source	Load in early 1980s (t/y) - MINDEC	Load in late 1980s (t/y) - MINDEC	Load in 1995 (t/y)	Load in 2000 (t/y) - PLC-4	Reduction (%) 1995-2000
Municipalities	2000	1030	530	425	20
Industries	>773	773	380	390	3 (increase)
Agriculture	>390	390	1700	1370	19
Total	>3163	2193	2610	2185	16
Background				3520	

The figures concerning agriculture year 2000 are from 1999. The meteorological conditions are mean values over the period 1985-1995. The background values are flow-normalised.

Environmental conditions in the different parts of the Baltic Sea

GULF OF BOTHNIA

The environmental situation in the Gulf of Bothnia is good as a whole. In general, phosphorus is the limiting factor for eutrophication. The winter concentrations of both nitrogen and phosphorus in the surface water are low. In some areas the oxygen content in bottom waters has decreased slightly during the past ten years. This is probably due to the in-transport of nutrient rich waters from the Baltic Sea through the Archipelago Sea. This transport is calculated to be some 18000 tonnes of nitrogen annually.

The Swedish total load of nitrogen to the Bothnian Bay is 56250 tonnes, whereof the anthropogenic part is 18450 tonnes. The total load of phosphorus is 3670 tonnes, whereof 750 tonnes is anthropogenic.

In the open sea part of the Bothnian Sea the environmental conditions are good as well. However, in some coastal areas with a limited water exchange there is a need to further reduce the discharges of phosphorus. In one coastal area both nitrogen and phosphorus should be reduced.

Conclusions

The situation in the Bothnian Bay is good and it is not cost-effective to take further measures, neither for the open sea, nor for the coastal areas. Relevant cost-effective measures within the catchment area of the Bothnian Sea will be taken when implementing the Water Framework Directive.

BALTIC PROPER

The environmental situation in the surface waters of the Baltic Proper has improved since 1980 concerning winter nitrogen and phosphorus concentrations, but the situation in deep waters have changed dramatically since 1995. The total amount of phosphorus and silica has increased by some 20%, but the nitrogen content is about constant. The main reasons are increased oxygen depletion due to lack of intrusions of oxygen-rich North Sea water, and a stable halocline. At the time when the halocline stability decreases, nutrient concentrations in the surface water will probably increase and the phosphorus excess may then result in increased blooms of nitrogen-fixating cyanobacteria. Obviously, it is still a need for further load reductions for nitrogen and phosphorus within the catchment area of the Baltic Proper.

The total Swedish load to the Baltic Proper is 28100 tonnes of nitrogen, whereof 22800 tonnes are of anthropogenic origin and 610 tonnes of phosphorus whereof 390 tonnes are of anthropogenic origin. The main sources are agriculture and municipalities.

Conclusions

The environmental situation in the Baltic Proper is still very serious and there is a need for substantive reductions of nitrogen, but also for phosphorus.

The situation along the Swedish coastline is dependent on the water exchange with the open sea. In local areas where the water exchange is slow, measures within relevant catchment areas will improve the situation. However, in areas with a high water exchange Sweden is totally dependent on the situation in the open sea. The upcoming EU Marine Strategy will be important. The further reduction measures needed, will be mainly taken within the framework of the Water Framework Directive. In this work the issue of cost-effectiveness will be taken into consideration in order to fulfil the environmental goals of the directive.

In Subarea 1 of the Baltic Proper, the Swedish anthropogenic load from municipal sewage treatment plants is the main source of nitrogen and phosphorus. The total load of nitrogen is 12900 tonnes, whereof 10800 tonnes are anthropogenic and 760 tonnes of phosphorus, whereof 640 tonnes are anthropogenic. In this area there are many big cities where nitrogen and phosphorus reduction is installed at the sewage treatment plants. Within this area we have also archipelagos and other enclosed areas with limited water exchange. Reduction measures within these catchments areas give effects in these closed areas. The atmospheric deposition of nitrogen on lakes and rivers is rather high.

Conclusions

Further measures are needed in order to meet the Swedish environmental objectives as well as those of the Water Framework Directive in closed coastal areas. For open coastal areas the environmental situation is dependent on the situation in the open sea, which means that all countries surrounding the Baltic Proper have to reduce the current load.

In Sweden, further measures have since year 2000 been taken in the agricultural sector. However even further measures could be needed to meet the environmental objectives as well as those of the Water Framework Directive. The deposition of nitrogen onto the sea surface is also of big importance.

In Subarea 2 of the Baltic Proper, the Swedish anthropogenic load of nitrogen and phosphorus to the sea is lower due to the relatively low number of people living in the catchment area, together with relatively small agricultural activities and less atmospheric deposition due to the lack of big lakes. The total Swedish load of nitrogen is 3700 tonnes, whereof 2500 tonnes are of anthropogenic origin and 180 tonnes of phosphorus, whereof 120 tonnes anthropogenic. The Swedish coast comprises both some areas with small and medium water exchange and some open coastal areas. Measures within the catchment area with small and medium water exchange will effect the situation in these areas. For the open coast the environmental situation is totally dependent on the situation in the open sea. The agricultural sector is the main polluter in this area and some further measures may be needed to reduce the anthropogenic load of nutrients.

Conclusions

Some further measures will be implemented within the framework of the Water Framework Directive.

In Subarea 3 and 4 of the Baltic Proper the Swedish anthropogenic load is around 8500 tonnes of nitrogen and 300 tonnes of phosphorus and the background values are some 2000 tonnes for nitrogen and 60 tonnes for phosphorus. The main source is the agricultural sector.

Conclusions

Most of the coast is open and the main measures taken will not affect the Swedish coast, which is almost entirely dependent on the situation in the open sea. Further measures have since year 2000 been taken in the agricultural sector. However, even further measures could be needed to meet the environmental objectives as well as those of the Water Framework Directive.

THE SOUND

The Swedish anthropogenic load to the Sound is dominated by the agricultural sector with some 4500 tonnes of nitrogen and 80 tonnes for phosphorus. The municipal and industrial taken together is around 1150 tonnes for nitrogen and 45 tonnes for phosphorus. The total Swedish load is 6600 tonnes of nitrogen and 160 tonnes of phosphorus.

Conclusions

The environmental situation in the Sound is not as serious as that in the Baltic Proper. This is due to the big water exchange between the Baltic Proper and the Kattegat. The load to the Sound will affect both the Baltic Proper and the Kattegat. Further measures have since year 2000 been taken in the agricultural sector. However, even further measures could be needed to meet the environmental objectives as well as those of the Water Framework Directive.

KATTEGAT

The total Swedish nitrogen load to Kattegat is 38000 tonnes, whereof 21800 tonnes is anthropogenic and 1400 tonnes of phosphorus, whereof 1010 tonnes anthropogenic. The main sources are agricultural and the nitrogen deposition on lakes (mainly lake Vänern) and rivers with some 5300 tonnes. The background value is also rather high, 10100 tonnes of nitrogen and 370 tonnes of phosphorus, due to a big catchment area. The Gothenburg municipal sewage treatment plants have nitrogen removal.

Conclusions

The anthropogenic load is rather high especially from the agricultural sector, partly due to the prevailing soil conditions. Measures have been taken, but there is a need to take further measures. Within the OSPAR framework this area is declared as sensible to eutrophication. The environmental situation along the Swedish side of the Kattegat is mainly dependent on the situation in the open sea, due to high water exchange, except for some smaller areas. The open sea is considered as eutrophicated and oxygen depletion in the bottom waters occurs regularly in the late summer months.

HEAVY METALS AND OTHER HAZARDOUS SUBSTANCES

Introduction

The Swedish Parliament has stated 15 national goals for the environment, which shall be reached within one generation. One of the goals is "A Non-Toxic Environment", which should include the following quality goal and target:

- The environment must be free from man-made substances and metals that represent a threat to health or biological diversity. This means that the levels of substances that occur naturally in the environment must be close to background levels, with the levels of man-made substances to be close to zero. This goal is based on the Esbjerg Declaration, according to which discharges of hazardous substances into the North Sea must cease by year 2020.
- The pollution of the Baltic Sea, its catchment areas, and the North Sea must be terminated by a process by which discharges and leakage of hazardous substances must be reduced gradually to zero by year 2020.

Load situation in Sweden

Sweden, already in 1989, reported to Helcom concerning inputs to water of substances that are persistent, toxic or liable to bio-accumulate. In this report and in the Action Programme of the Swedish Environmental Protection Agency (1993), there are information that Sweden will fulfil the 50% reduction goal by 1995 for heavy metals and hazardous substances measured as AOX and dioxins in the beginning of 1990.

In the PLC-4 Sweden has reported the following figures based on measurements in river-mouths. These figures include background values (see Table 3.).

Table 3. Metal load on sea-basins year 2000, based on measurements in river-mouths and area-based calculations for non-monitored areas (tonnes)

Area	Cu	Zn	Cd	Pb	Hg
Bothnian Bay	61.5	182.4	0.65	10.6	0.384
Bothnian Sea	113.6	492.4	1.27	28.4	0.298
Baltic Proper	46.4	87.5	0.87	8.2	0.047
The Sound	1.4	3.1	0.02	0.4	0.002
Kattegat	42.3	138.6	0.46	12.2	0.099
Skagerrak	8.0	27.2	0.10	2.2	0.022
Sweden	279.0	950.0	3.43	63.1	0.861

Conclusion

Sweden has fulfilled the 50% reduction target for heavy metals and other hazardous substances, as spelled out in the 1988 Ministerial Declaration.

BALTIC SEA ENVIRONMENT PROCEEDINGS

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