Suomen ympäristökeskuksen moniste

5

Markku Puupponen (ed.)

Euro-workshop, Helsinki, Finland, 19-20 June 1995

European water research and technology development with emphasis on cooperation in the Baltic Sea region

SUOMEN YMPÄRISTÖKESKUS

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Helsinki 1995
FINNISH ENVIRONMENT AGENCY

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PREFACE

This report summarizes the papers presented at the Euro-workshop on "European Water Research and Technology Development with Emphasis on Cooperation in the Baltic Sea Region", held in Helsinki, 19–20 June 1995. This occasion concluded the second series of Euro-workshops, which was organized by the TECHWARE Association in cooperation with its hosting member organizations. In this case, the Finnish Environment Agency was responsible for local arrangements.

The Helsinki workshop was focused on two main topics: European water policy, and environmental development in the Baltic Sea region. The first issue was emphasized in all previous Euro-workshops, and it could be considered as an overall framework of the meeting. The second main theme, the development of the Baltic Sea region, is a major environmental issue also in the European scale. The workshop was aimed at finding important linkages between the two main topics in order to clarify coordination of research and development programmes.

On behalf of the Local Organizing Committee, I would like to thank Professor Andre Van der Beken, the coordinator of the TECHWARE Association, for the possibility of organizing the workshop in Finland. My thanks are also due to our good cooperation during the workshop preparations.

Among the local organizers, I want to mention four colleagues at the Finnish Environment Agency who have given great assistance in the arrangement of the workshop: Dr. Lea Kauppi, Dr. Matti Melanen, Ms. Sirkka Haunia, and Dr. Juha Sarkkula. I wish to express my grateful acknowledgement to the chairpersons and invited speakers for their valuable contribution.

The workshop had three sponsors: (1) Standards, Measurements and Testing Programme of the European Commission, (2) The Finnish VALUE Relay Centre and (3) The Finnish IHP Committee.

Helsinki, 11 December 1995

Markku Puupponen

Chairman, Local Organizing Committee

EURO-WORKSHOP, HELSINKI, FINLAND, 19-20 JUNE 1995

PROGRAMME

Monday 19 June

10.00 Opening

* Mr. Kaj Bärlund, Director General, Finnish Environment Agency
* Professor Andre Van der Beken, Coordinator of TECHWARE

10.20 Session 1

European water policy, Chair: Dr. Matti Melanen, Finnish Environment Agency

4th RTD Framework Programme and 5th Community Action Programme on the Environment

* Dr. Paul Gray, Director DG XII - Environment Research, European Commission

Highlights of the Finnish water policy

* Dr. Hannele Nyroos, Ministry of the Environment, Finland

Water resources of the Baltic Sea region

* Dr. Esko Kuusisto, Finnish Environment Agency

12.00 Lunch

13.30 Session 2

The role of harmonization and quality assurance, Chair: Dr. Guy Söderman, Finnish Environment Agency

Standards, Measurements and Testing Programme

* Professor Veikko Komppa, Technical Research Centre of Finland

Goals and programmes of the European Environment Agency

* Dr. Niels Thyssen, European Environment Agency

Environmental data network in Finland's nearby areas

* Mr. Väinö Malin, Finnish Environment Agency
* Dr. Leo Saare, Estonian Environment Information Centre

Quality assurance in pollution load compilation

* Ms. Irma Mäkinen, Finnish Environment Agency
* Dr. Ilze Kirstuka, Latvian Environment Data Centre

16.30 Departure for technical excursion and buffet

Helsinki area water treatment plants (17.00-18.30)

Boat cruise & buffet (19.00-21.00)

EURO-WORKSHOP, HELSINKI, FINLAND, 19-20 JUNE 1995

PROGRAMME

Tuesday 20 June

09.00 Session 3

Projects and programmes of interest, Chair: Dr. Hannele Nyroos, Ministry of the Environment, Finland

Water pollution control action programmes - examples on bilateral and multilateral programmes

* Mr. Kaj Bärlund, Director General, Finnish Environment Agency
* Mr. Rolf Annerberg, Director General, Swedish Environmental Protection Agency
* Dr. Niels-J. Seeberg-Elverfeldt, Helsinki Commission

MAST Regional Seas - The Baltic Sea

* Professor Pentti Mälkki, Director General, Finnish Marine Research Institute

Programme on Cooperation with Third Countries and International Organizations

* Ms. Mirja Arajärvi, Ministry of Education, Finland

Finnish Research Programme for Climate Change

* Ms. Pirkko Heikinheimo, The Academy of Finland

Water programmes of UNESCO and WMO

* Dr. Risto Lemmelä, Finnish IHP Committee

12.30 Lunch

13.30 Session 4

Round-table discussion and summary, Chair: Dr. Lea Kauppi,Finnish Environment Agency

Round-table discussion: Development of RTD cooperation in the Baltic Sea region within a European framework

* Professor Andre Van der Beken, TECHWARE
* Professor Ain Lääne, Tallinn Technical University
* Dr. Matti Melanen, Finnish Environment Agency
* Dr. Niels-J. Seeberg-Elverfeldt, Helsinki Commission

Can we define European dimensions in water issues? - summarizing conclusions of the Euro-workshops

* Professor Andre Van der Beken, TECHWARE

15.30 Closing of the workshop

EURO-WORKSHOP, HELSINKI, FINLAND, 19.-20. JUNE 1995

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OPENING ADDRESS

Kaj Bärlund
Director General, Finnish Environment Agency

Director General Mr. Kaj Bärlund, Finnish Environment Agency

EURO-WORKSHOP, HELSINKI, 19-20 JUNE 1995
OPENING SPEECH

Dear participants of this Euro-workshop, ladies and gentlemen,

On behalf of the Finnish Environment Agency I have the pleasure to welcome all of you to Helsinki and to this workshop.

The first series of Euro-workshops was organized in 1993 under the subtitle "Water management". The main objective of these meetings was to take an active part in the planning of the European Commission's 4th Framework Programme. The present meeting here in Helsinki will be the last one in a new series of Euro-workshops on "integrated European water environment research and technology development", held during 1995. These meetings have focused on concrete programmes and projects more clearly than the previous workshops. All of the Euro-workshops have been arranged by the TECHWARE association in cooperation with its hosting member organizations.

The general aims of the Euro-workshops have been related with water policy, especially the role of research and technology development. One of the goals has been the definition and clarification of European water management. What are the major water related problems in Europe and what kind of actions should Europe take, locally and globally? It will be interesting to see how much this concept has been clarified during the process, and what is our present understanding of the common measures and specific tasks which should be carried out. I hope that as a newly reorganized research and development centre also we in the Finnish Environment Agency would have something to give to the European community in this respect.

Various programmes of the European Union have played a central role in the previous Euro-workshops by setting a framework for the activities. The meetings have outlined coordination activities for the specific programmes of the 4th Framework Programme and the 5th Community Programme, and several officers of the European Commission have participated in the workshops. As this cooperation has been one of the corner stones of the Euro-workshops, I am especially glad that the Commission is represented here at a high level.

The present workshop will continue discussions on the above programmes. At the moment, we know much more about the structure of the programmes than before. Yet, it is still possible to participate in many of the programmes by making good proposals which fill gaps of knowledge and activities. As a new member state of the Union Finland is willing to take an active role in this field.

In addition to the general European development, discussed above, local organizers of the Euro-workshops have always presented their own aspects and projects, and special fields of activity which they consider to be worth discussing. In this respect it would be especially valuable to highlight issues which most probably will have wide importance in the future. During the planning of the present workshop, many of our concerns seemed to focus on the environmental aspects of the Baltic Sea region.

The environmental development of the Baltic Sea region is no doubt a major European issue, and its weight will most probably increase in the near future. The Baltic Sea is a unique brackish water area, also at the global scale. Some progress has been achieved during the last few years, and in this workshop we will hear about this development. On the other hand, environmental threats in the drainage area, in river systems and in the Baltic sea are extremely severe. In order to solve these questions we have to be able to unite our resources in the best possible way. From a wider European point of view, it would be important to understand that many of the common problems, for example in the Baltic sea and in the Mediterranean, can be solved by using the same kind of management and technical solutions.

Today, the Baltic Sea region is situated between countries of the European Union and countries of Central and Eastern Europe. In this situation it is very important to emphasize international data exchange and harmonization, standardization and quality assurance actions. Also in this respect, the Baltic Sea region offers a challenge to the European Community.

I hope that in the present workshop we would be able to state what are the essential linkages between the two main topics of this meeting: the European water policy and the problems of the Baltic Sea region. Any actions which would strengthen these linkages by utilizing some existing networks or creating new ones, could turn out to be most beneficial. I believe that improvement of this understanding could be one of the main results of this workshop.

I would like to thank TECHWARE for good cooperation during the last two years and for the possibility of organizing the last Euro-workshop here in Finland. As a newly reorganized agency and as a new member state of the Union we are very glad of this opportunity. I would also like to thank our local organizers for their successful work.

This Euro-workshop has three cosponsors and coorganizers: (1) the Standards, Measurements and Testing Programme of the European Commission, (2) the Finnish VALUE Relay Centre and (3) the Finnish IHP Committee. I want to express my gratitude for these organizations for their cooperation and valuable assistance.

Finally I would like to thank all of the outstanding decision makers and experts who have been willing to participate in this meeting. I believe that the invited speakers will create a good basis for further discussions during the workshop. I also believe that these discussions will lead to new proposals for future cooperation.

Ladies and gentlemen, I hope that this Euro-workshop will forward environmental research and sustainable development on a large European scale. Thank you.

4TH RTD FRAMEWORK PROGRAMME AND 5TH COMMUNITY ACTION PROGRAMME OF THE ENVIRONMENT

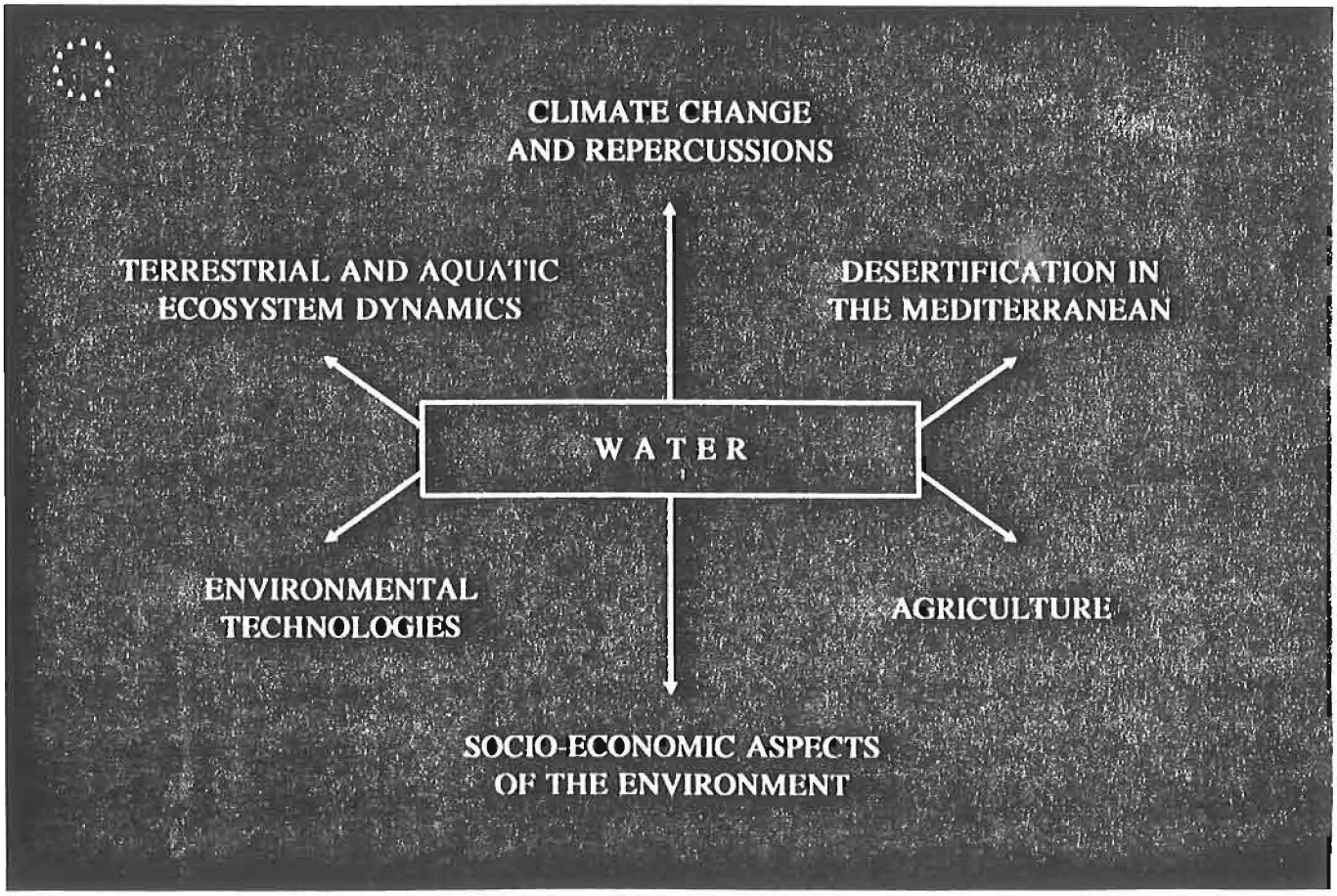
Paul Gray
Director DG XII - Environment Research, European Commission

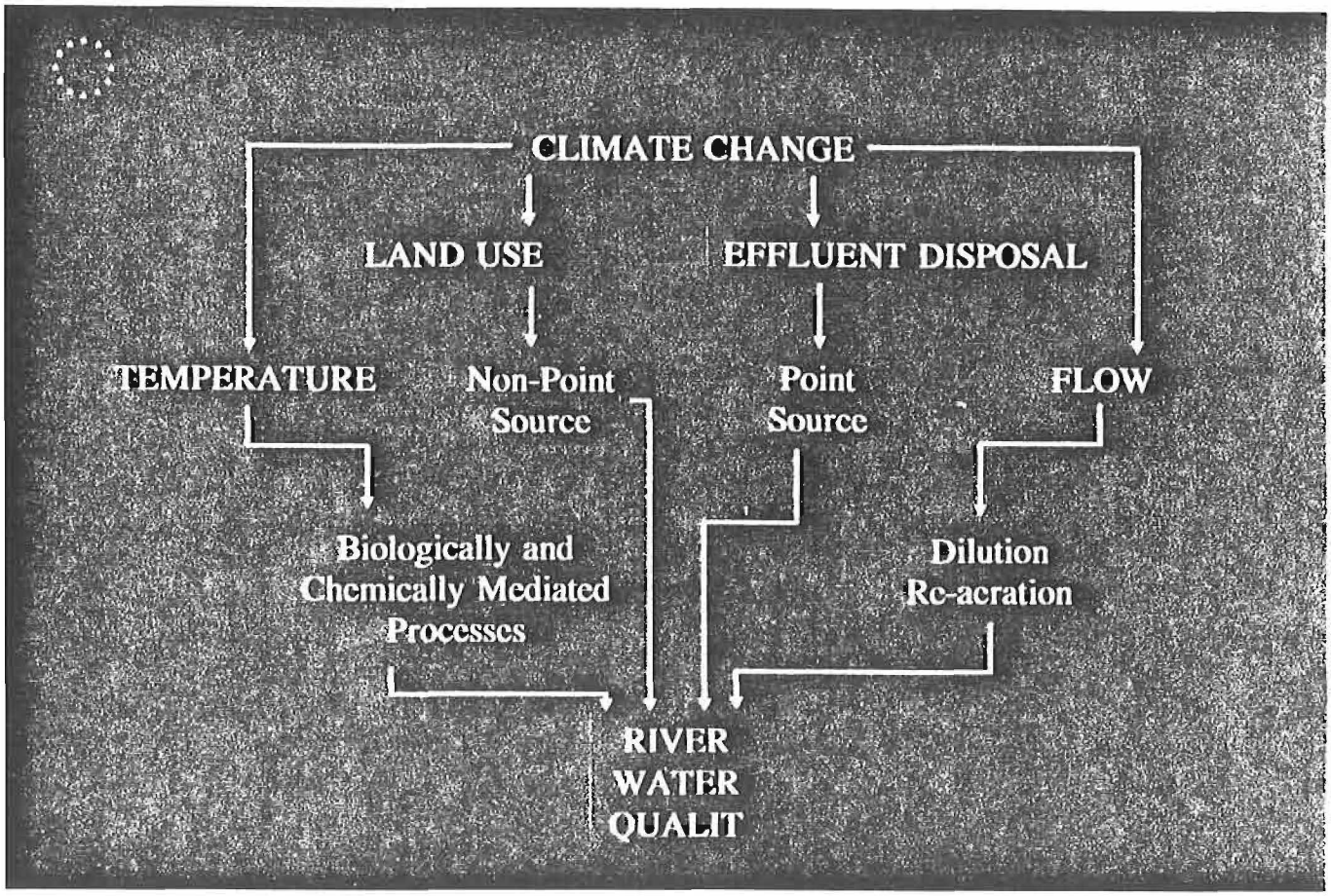
ENVIRONMENT & CLIMATE PROGRAMME

Water Resource

Objective

To improve knowledge of the probable effects of climate and other environmental change (including changing human demands and demographic pressure) on surface and underground water resources, in terms of quality and quantity, with a view to both improving understanding of the underlying processes and providing a basis for informed development of strategies for their future management.





FACTORS INFLUENCING THE QUANTITY AND QUALITY OF WATER RESOURCES

Demography

The many uses for water

Human activities and water resource management

Climate change

INDICATIVE BUDGET ENVIRONMENT AND CLIMATE

	Mio ECU	
Total	852	
JRC + other DG's	320	
Shared Cost actions	532	(482)
A. Natural Environment	47%	
B. Environment technologies	25%	
C. Space techniques	20.5%	
D. The human dimension	7.5%	

Research Areas

1. Research into the natural environment, environmental quality and global change
2. Environmental technologies
3. Space techniques applied to environmental monitoring and research
4. The human dimension of environmental change

OBJECTIVES

- Strengthening the scientific research basis of EU environment policy
- Contribution to worldwide research programmes into global change
- Development of environmental technologies
- *Scientific and technological cooperation and integration*

IMPLEMENTATION

- Shared-cost actions
- Concerted actions
- Technology stimulation
- Preparatory, accompanying and support measures
- Training and mobility grants

HIGHLIGHTS OF THE FINNISH WATER POLICY

Hannele Nyroos
Ministry of the Environment, Finland

Topics of presentation

Water resources generally

Main water quality problems

Milestones in Finnish waterpolicy

Main features of water policy

Future challenges

Water resources

188 000 lakes
Mean depth 7 meters
Volume 230 km^3
Mean discharge to sea 3 100 m^3/s
59 m^3/day/each Finn

Groundwater resources

Total amount 6 - 8 milj. km^3/day
Present use 0,6 milj. km^3/day

Main water management problems

Eutrophication

Acidification

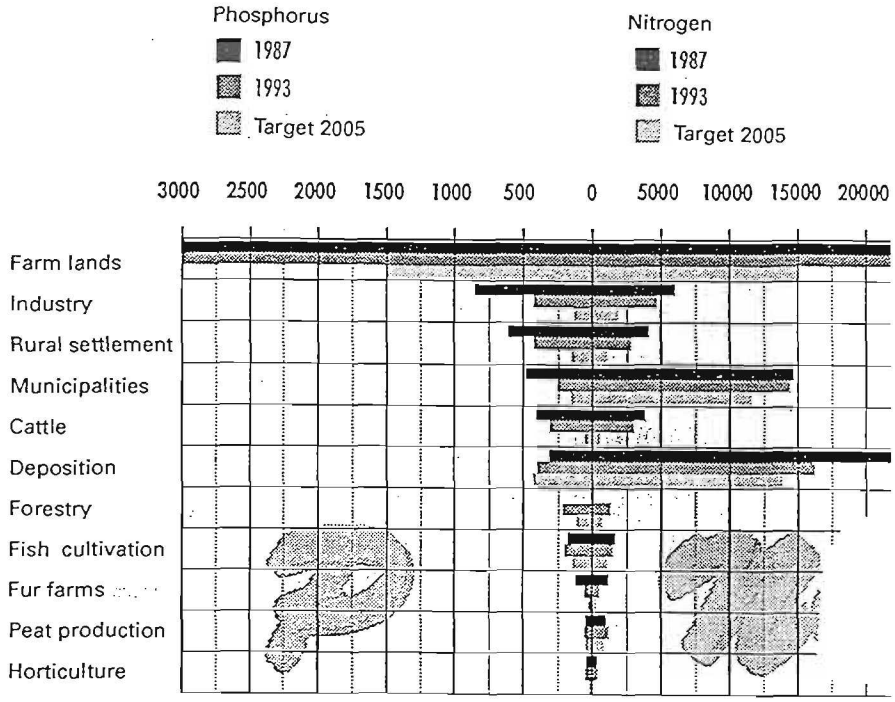
Deterioration of groundwaters

Unproper land use

Regulation of flows and lake levels

Increase of risk factors

Phosphorus, and nitrogen discharges in 1987 and 1993 and targets to 2005



INSTITUTIONAL "MILESTONES"

1962 Water Act (major revision)

1970 Establishment of National Board of Waters and regional offices

1983 Establishment of the Ministry of the Environment

1987 Revision of Water Act

1994 EEA (1995 membership in EU)

1995 Reorganisation of Environmental Administration

Finnish Environmental Administration Employees

Ministry of the Environment	310
Finnish Environmental Agency	430
Regional Environment Centres	1 460
Total	2 200

WATER MANAGEMENT PLANNING

- ❒ Finnish Environmental Policy Plan (1995)
- ❒ National Water Protection Programmes (1974, 1988, 1995)
- ❒ Long -term sectoral policy programmes (e.a. for Water Supply and Sanitation 1990, Environmental Programme for Agriculture 1992 and for Forestry 1994)
- ❒ Regional Water Management and Water Protection Plans

Two approaches to water management

- ❒ Uniform discharge controls
- ❒ Water quality targets or objectives defined for waters receiving discharges leading to local discharge standards

Aspects influencing conditions defined in permits

- Characteristics, protection and use of the watercourses in question,
- Extent of environmental impacts,
- Existing treatment installations and water protection standard
- Available treatment methods.

EC Directives

- ❒ User based Directive (Bathing Water)
- ❒ EQO based (List II)
- ❒ EQO or discharge based (List I)
- ❒ BATNEEC type (Urban waste water treatment)

Future Challenges in Water Policy

- ❒ Better integration of land use and water management (Agriculture and forestry)
- ❒ Integration of environmental legislation and permit procedures
- ❒ BAT, life-cycle approach
- ❒ International cooperation to solve the environmental problems in the neighbouring areas
- ❒ Better understanding of environmental cause-effect relationships
- ❒ Broader use of environmental instruments (Economic instruments, Ecoauditing, EIA, environmental awareness)

HYDROLOGY AND HYDROENERGETICS OF THE BALTIC DRAINAGE

Esko Kuusisto
Finnish Environment Agency

HYDROLOGY AND HYDROENERGETICS OF THE BALTIC DRAINAGE

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ABSTRACT

The annual precipitation, evaporation and runoff of the Baltic Drainage were estimated to be 728, 449 and 279 mm, respectively. As taken over the whole drainage area, the average annual ranges of snow, lake and underground water storages are equivalent to 100, 25 and 85 mm, respectively.

The annual heat energy required to maintain evaporation from the Baltic Sea and its drainage was estimated to be 2.46×10^{21} J. Of this energy, 21% is consumed by evaporation from the sea and 5% by lake evaporation.

The amount of energy required to melt all the snow falling on the Baltic Drainage amounts to 0.12×10^{21} J per year. This is 1.5 times the annual absorption of thermal energy by the lakes, and eight times the energy required to melt lake ice.

The energy used by the 80 million people of the Baltic Drainage area would be sufficient to melt all the lake ice in a mild winter. The hearts of these people pump blood at the rate of 8000 $m^3 s^{-1}$, half of the mean runoff into the Baltic.

TWO WATER PARCELS

The most pristine river basin within the Baltic Drainage is located in the northeastern extremity, as a finger pointing towards the White Sea.

The Ileksa Basin with an area of 3950 km^2, comprises forests, wetlands, lakes – all with the common feature that human impact has always been minimal. The forests have never been cut, and wetlands have developed in complete tranquility since the Ice Age.

Today a national park, established in 1991, covers most of the Ileksa Basin. Extensions of the park area have been planned; at the same time there is a risk of unauthorized timber cutting within the park itself.

Let one cubic metre of water flow into the Ileksa River near its source, Lake Kalgazinskoye. When does this water enter the Baltic?

If the water parcel flows the shortest way, it should travel 700 km before reaching the Baltic. However, it has to be mixed in seven lakes, two of which are the largest in Europe. The average residence time of inflowing water in both of these lakes, Ladoga and Onega, is about 12 years (Data Book 1991).

Fig. 1 shows the destiny of the water parcel by assuming a complete mixing in each of the seven lakes. After 20 years, about 40% of the volume of the parcel has reached the Baltic. Some 30% has evaporated, most of this loss occurring from the shallow upstream lakes in the two first summer seasons. The rest, another 30%, will still be part of the water storage of Lakes Onega and Ladoga, two decades later.

Let another cubic metre of water enter the uppermost source creek of River Vistula in the Carpathian Mountains. It has to travel a distance of 1100 km to the Baltic, but practically no lakes delay its journey. One month later, a clear majority of the water molecules has reached the Baltic. A minority has evaporated or been used for farming and by riverside communities.

The average retention time of the rivers in the Baltic Drainage is much closer to that of the Vistula than to that of the Ileksa. The true delay of water precipitating on land is naturally much longer than the retention time within watercourses.

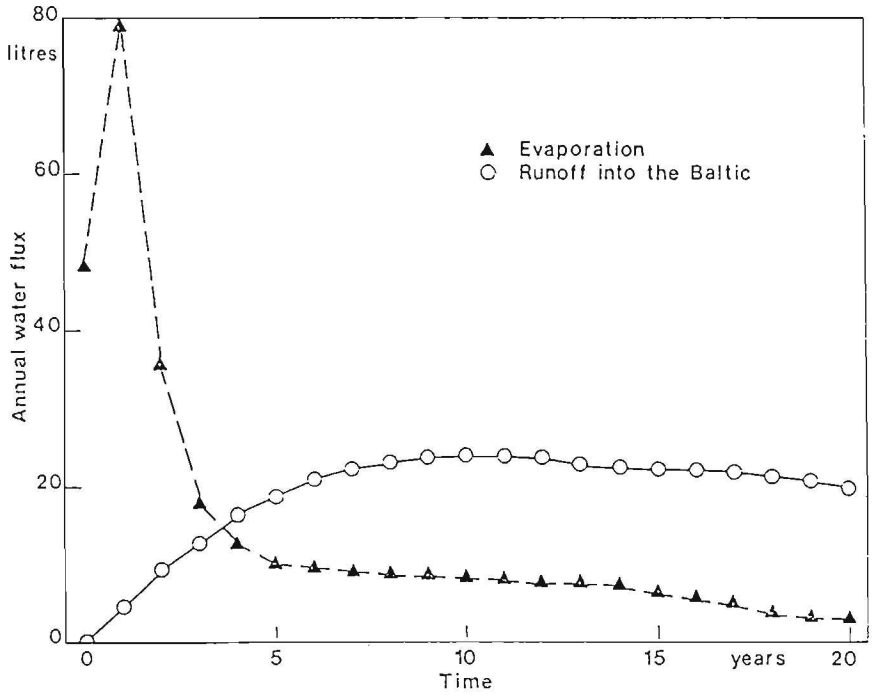

Fig. 1. Annual evaporation and annual runoff into the Baltic from a 1000 litre water parcel entering the Ileksa River.

WATER BALANCE OF THE BALTIC DRAINAGE

The runoff into the Baltic has been analysed thoroughly for the years of 1950–90 (Bergström & Carlsson 1993). The annual average for this period, including inflow into the Danish Sounds and Kattegat, was 15 306 $m^3 s^{-1}$, which is equivalent to 8.85 l s^{-1} km^{-2}, 4 830 $km^3 a^{-1}$ or 279 mm a^{-1}.

The total area of the Baltic Drainage was measured from a digitized map. Including the basins flowing into the Danish Sounds and Kattegat the area is 1 732 000 km^2. The contributions of different counties are as follows (%): Sweden 25.3, Russia 18.7, Poland 17.8, Finland 17.5, Belarus 4.9, Lithuania 3.8, Latvia 3.7, Estonia 2.6, Denmark 1.7, Germany 1.5, Ukraine 0.9, Slovak Republic 0.8 and Norway 0.8 (Sucksdorff 1995).

The accuracy of the runoff calculations can be considered good. Data from altogether about 200 discharge stations have been used, representing 86% of the total drainage basin. Runoff from the remaining areas has been estimated on the basis of specific runoff for neighbouring stations (Bergström & Carlsson 1993). Strong coastal gradients of precipitation may induce some uncertainty in these estimates.

The direct groundwater inflow into the Baltic is still largely unknown. Along the shoreline of Finland and most of Sweden, this component is probably insignificant. In the contrast, the contribution of coastal aquifers in Poland and in the Baltic countries should be investigated.

The ten largest river basins are as follows:

River	Basin area (km^2)	Mean flow ($m^3 s^{-1}$)
Neva	281 000	2 460
Vistula	194 400	1 065
Odra	118 900	573
Neman	98 200	632
Daugava	87 900	659
Narva	56 200	403
Kemi	51 400	562
Göta	50 100	574
Torne	40 100	392
Kymi	37 200	338

These ten basins are shown in Fig. 2. They account for 59% of the total area, and their flow amounts to 50% of the total runoff of the Baltic Drainage.

The true precipitation and actual evapotranspiration of the Baltic Drainage have not been estimated accurately. At least in Sweden and Finland, water balances have been analysed for the period of 1961–90 (Brandt *et al.* 1994, Hyvärinen & Solantie 1995). Authors of these reports, however, have a realistic understanding of the problems encountered in precipitation corrections, and of other uncertainties.

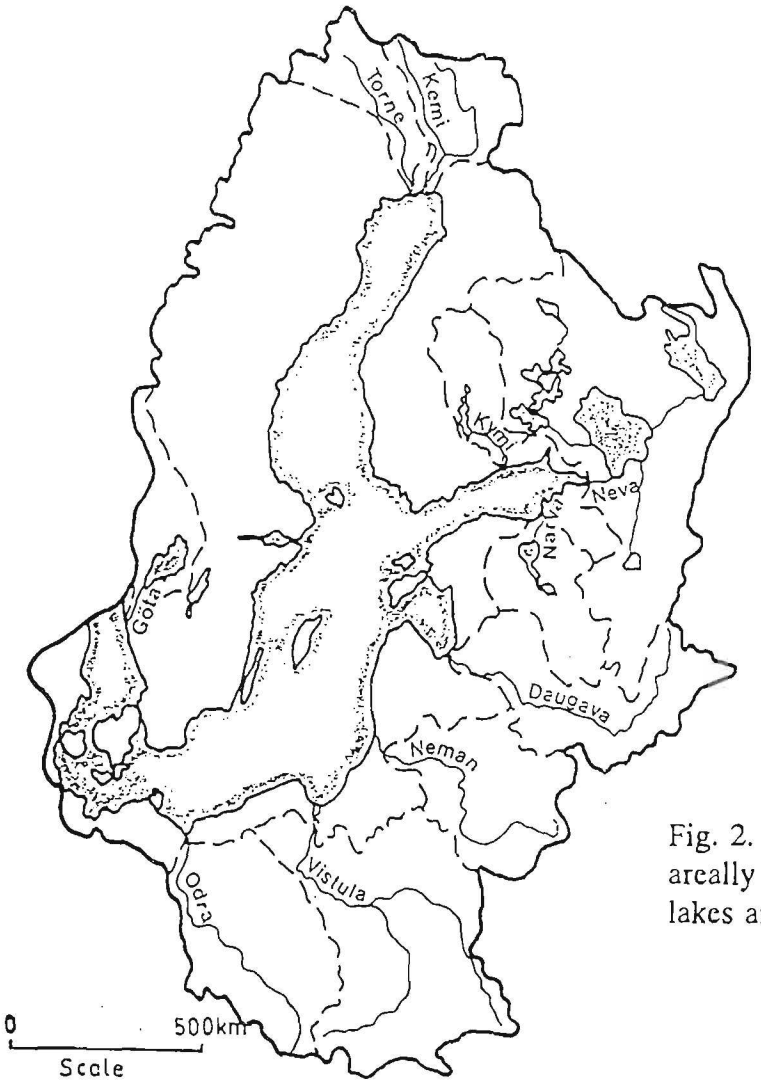

Fig. 2. The Baltic Drainage with the ten areally largest river basins. The ten largest lakes are also shown.

An approximate water balance of the Baltic Drainage can be compiled on the basis of various national and international sources. Precipitation data are abundant, and estimates of actual evapotranspiration have been presented for major river basins (e.g. UNESCO 1978, Petrova & Terzhevik 1992).

Fig. 3 shows the mean monthly values of the water balance components of the whole Baltic Drainage. The annual estimate of corrected precipitation is 728 mm, actual evaporation being 449 mm and runoff 279 mm. The rainiest month is August (82 mm), while evapotranspiration is greatest in June (96 mm) and runoff in May (38 mm).

The annual inflow hydrograph of the Baltic is relatively flat; the greatest monthly runoff is only 2.2 times the lowest value. This is an obvious consequence of the different hydrologic regimes spreading over the area. For instance, Rivers Vistula and Odra often have their highest flood peak in winter months, when many of the northern rivers have their minimum flows.

To make a comparison between two vital flow phenomena, the hearts of the 80 million people living in the Baltic Drainage pump blood at the rate of 8000 $m^3 s^{-1}$. If all of these people would simultaneously perform a hard physical work, their blood pumping could easily double, thus reaching the mean inflow into the Baltic.

The areal distribution curves of runoff and evaporation are shown in Fig. 4. The tenth having the highest specific runoff generates 20% of the total runoff, while the opposite extreme tenth generates only 5%. By far the largest runoff values, in excess of 1000 mm a^{-1}, occur in the two mountain ranges bordering the Baltic Drainage: the Scandic and Carpathian Mountains. In the middle of the Polish plains annual runoff is only 50 – 100 mm (UNESCO 1978).

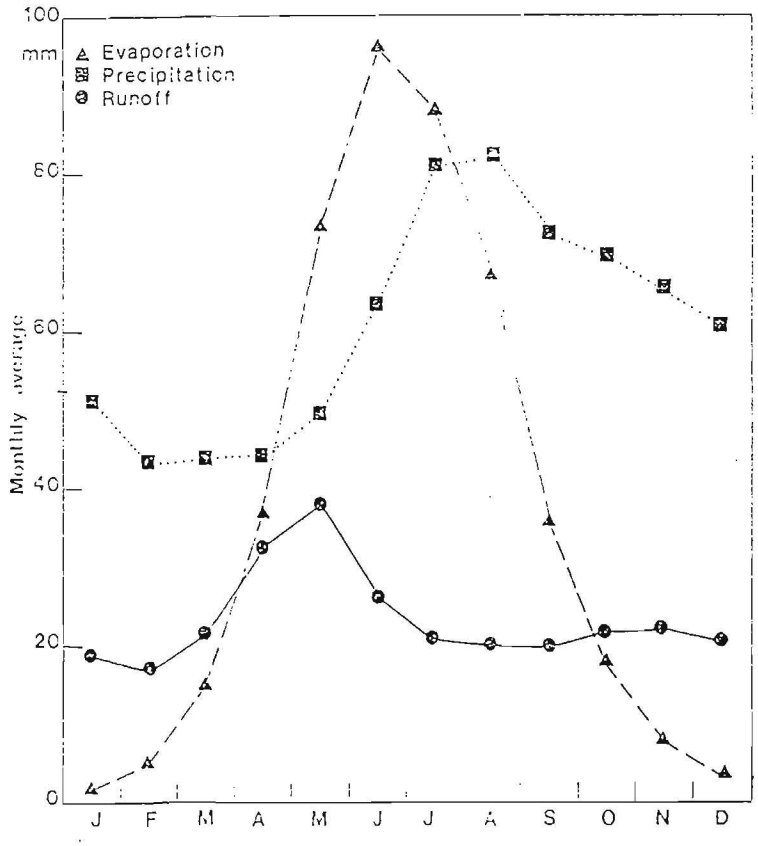

Fig. 3. The average monthly water balance of the Baltic Drainage.

It is interesting to compare the evaporation from the Baltic Drainage with that of the Baltic Sea itself (Fig. 5). When 74 mm evaporates from the drainage area in May, the evaporation from the Baltic lingers near the annual minimum of 10 mm. In January, the cold land surface has a minimal vapor flux, while 44 mm evaporates from the Baltic – more than in July. Even in absolute amounts the Baltic evaporates more in November–February than its drainage. The area of the sea is one quarter that of the drainage.

The total energy required to maintain the total evaporation is about 2.46 x 10^{21} J a^{-1}. Of this energy, 21% is consumed by evaporation from the Baltic itself and 5% by lake evaporation. The total energy requirement is seven times the annual energy use of mankind. The energy use of the 80 million people living in the Baltic Drainage is equivalent to the energy involved in the evaporation from the Lake Onega.

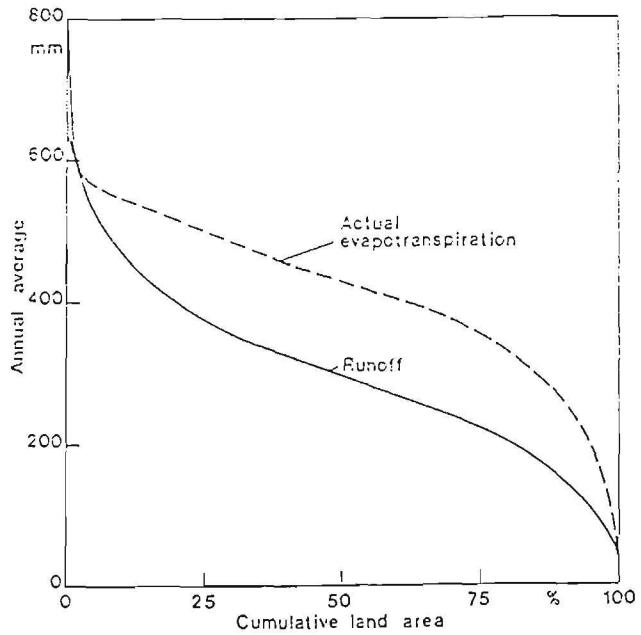

Fig. 4. The areal distribution curves of runoff and actual evapotranspiration of the Baltic Drainage.

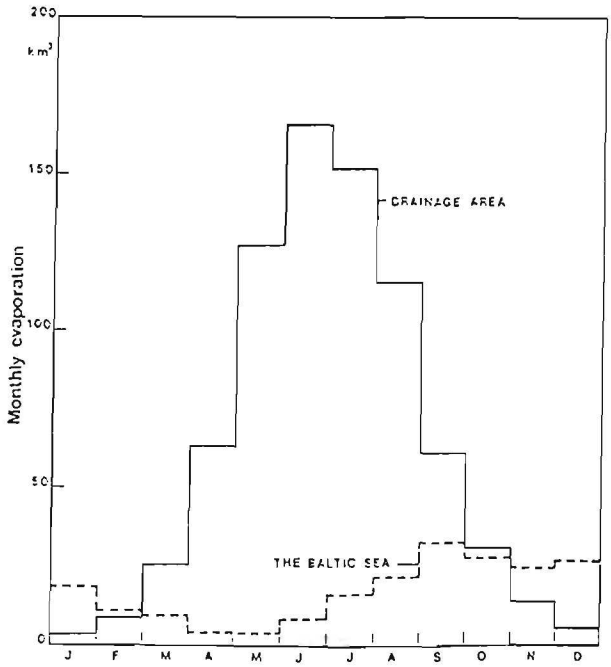

Fig. 5. The average monthly evaporation from the Baltic Sea and its drainage.

STORAGE COMPONENTS

Three seasonally varying storages have a considerable influence on the monthly water balances of the Baltic Drainage:.

- the snow cover
- lakes and reservoirs
- underground water (soil moisture and groundwater)

The two first terms can be calculated with reasonable accuracy, and the third can be estimated from the monthly water balance equation. The result is obviously inaccurate, because it contains the errors of all the other components.

Fig. 6 summarises the snow conditions of the Baltic Drainage. The total areally averaged snowfall is 210 mm a^{-1}, 29% of annual precipitation. The absolute amount of snowfall is highest in December, 42 mm, the relative amount in January, 78%.

Snowmelt rates are by far highest in March–May, but a considerable amount of thawing occurs throughout the snow season. Therefore, the average water equivalent of snow on the whole Baltic Drainage barely reaches 100 mm on 1st April, although accumulated snowfall by that date is 160 mm.

The monthly changes of the total water volume of lakes and reservoirs in the Baltic Drainage was estimated on the basis of water level observations and various inventories (e.g. Dysenius & Nilsson 1994, Kuusisto 1992, Kaufmana 1990). This component is dominated by the strong and regular variation in Swedish and Finnish lakes, with a considerable human enhancement by regulation. In Lakes Ladoga and Onega, the seasonal water level variation is relatively slight. In contrast, the absolute water volume of Lake Ilmen varies strongly, the range being almost as wide as that of Lake Ladoga, although the average volume of the latter is a hundred times greater.

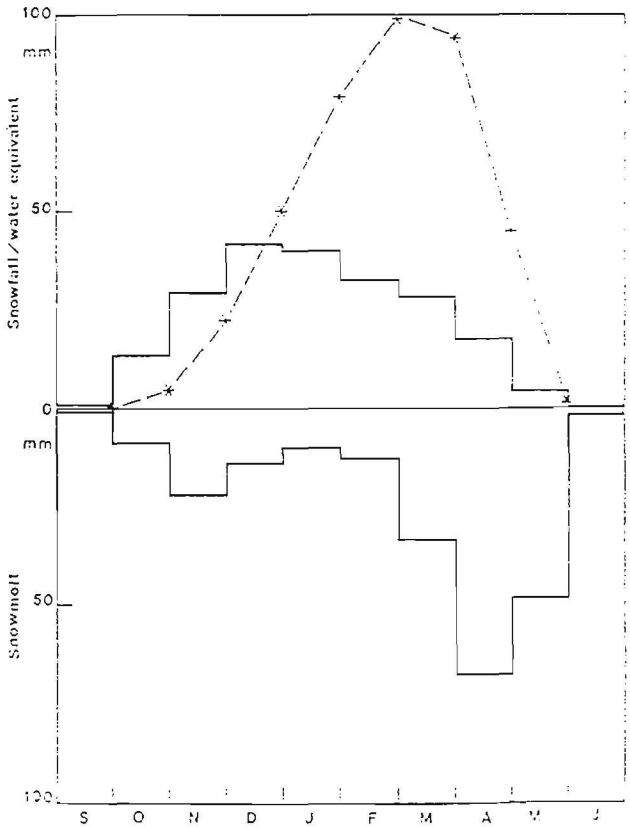

Fig. 6. Monthly snowfall, snowmelt and cumulative water equivalent of snow in the Baltic Drainage.

Because of the different rhythms of the Baltic rivers, the total monthly variations of lake volume remain rather modest (Fig. 7). The largest increase, in May, amounts to only 35 km³, equivalent to 20 mm over the whole Baltic Drainage. In July–September and January–March, the storage declines by 5...10 km³ per month.

The change of underground storage ΔG has been estimated from the equation

$$\Delta G = P - (E + Q + \Delta S + \Delta L)$$

where P = corrected precipitation
E = actual evapotranspiration
Q = runoff
ΔS = change of snow storage
ΔL = change of lake volume

According to Fig. 7, the underground storage is increased during nine months and depletes during only three months, from May to July. The greatest depletion, almost 60 mm, occurs in May.

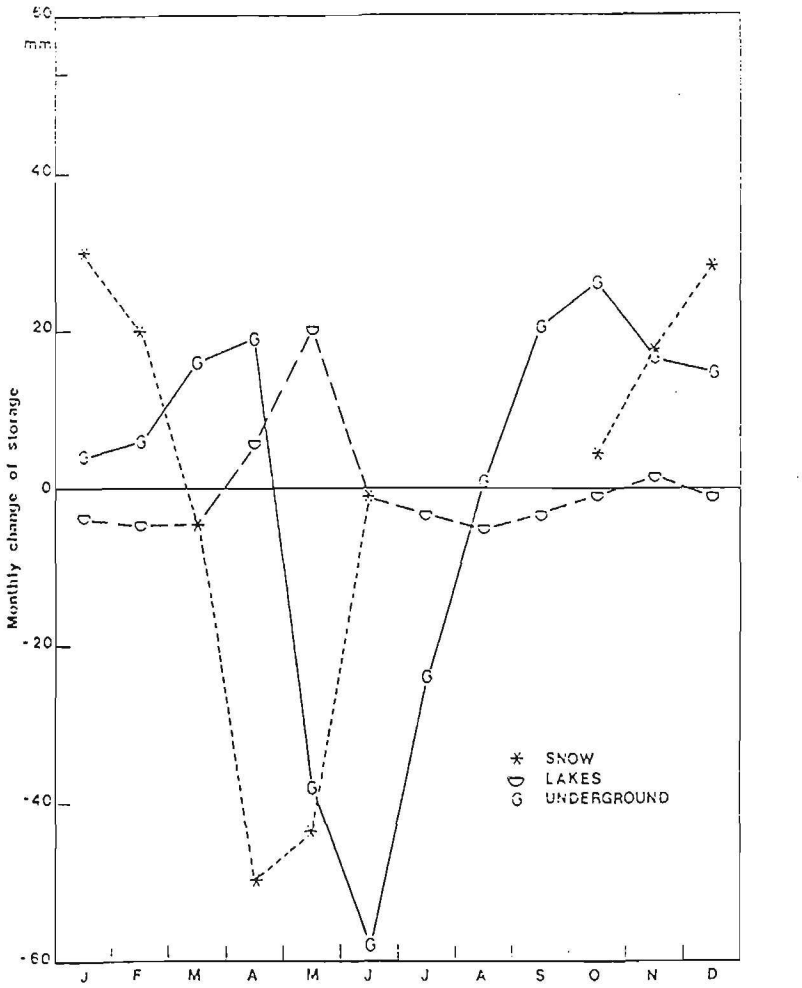

Fig. 7. Monthly changes of water stored in snow cover, lakes and underground in the Baltic Drainage. All values are given as the depth of the water layer over the whole area (1.73×10^6 km²).

LAKES

The Baltic Drainage has about 80 lakes with a surface area exceeding 100 km². The number of lakes larger than 1 km² totals almost 10 000; of them 4300 are located in Sweden and 2300 in Finland. The total area of all the Baltic lakes is estimated to be 123 000 km² and their volume 2110 km³.

Table 1 contains data on ten largest lakes in the Baltic Drainage. Five of them are located in the Neva River basin, all the others being in different basins. Altogether these ten lakes make up 40% of the area and as much as 73% of the volume of all Baltic lakes. Lake Ladoga alone contains 43% of all the fresh surface water in the Baltic Drainage.

Table 1. The ten largest lakes in the Baltic Drainage.

Lake	Area (km²)	Depth (m)		Volume (km³)	Residence time (a)	Shoreline length (km)
		Mean	Max			
Ladoga	18 130	50	230	908	12	1 570
Onega	9 890	28	120	280	12	1 810
Vänern	5 648	27	106	153	9.0	1 940
Greater Saimaa	4 380	12	82	53	3.0	14 850
Peipsi	4 300	6	15	25	2.3	
Vättern	1 912	39	128	74	56	642
Ilmen	1 350 [1]	7 [1]	12 [1]	9.4 [1]	0.7	
Mälaren	1 140	11.9	61	13.6	2.2	1 410
Päijänne	1 116	16.2	95	18.1	2.3	2 248
Pielinen	960	9.4	60	9.0	1.5	1 372

[1] considerable annual variation; e.g. areal range 600 ... 2100 km², mean depth range 3 ... 11 m.

There are only a few large lakes in the southern river basins of the Baltic Drainage. However, the largest lake in Poland, Lake Sniardwy, has an area of 110 km², and the total Polish lake area is over 8000 km². The largest lake in the German part of the Baltic Drainage is Lake Müritz, 117 km² (Data Book 1989).

Most of the lakes in the Baltic Drainage are shallow. The median depth on the lake volume curve is 16 m; only Lake Ladoga has a considerable water volume (45 km³) deeper than 100 m (Petrova & Terzhevik 1992). Because the water surface of all the largest lakes is below the elevation of 100 metres (Lake Ladoga only 5 m), almost half of the total water volume is beneath sea level (Fig. 8).

The seasonal variation of the total lake volume is 40–50 km³. This is only 30–40% of the cumulative annual volume variation of individual lakes. The decadal variation, also considering lakes individually, amounts to 200–300 km³.

The annual amounts of energy involved in lake evaporation in the Baltic Drainage is 14×10^{19} J. This is about the same as energy required to melt all snow from the entire area. The energy required to melt lake ice, equivalently released in the formation of ice, is one tenth of the lake evaporation energy. The annual absorption of thermal energy of lake water is 7.6×10^{19} J, of which 81% is stored in May–July and 95% lost in September–December (Fig. 9).

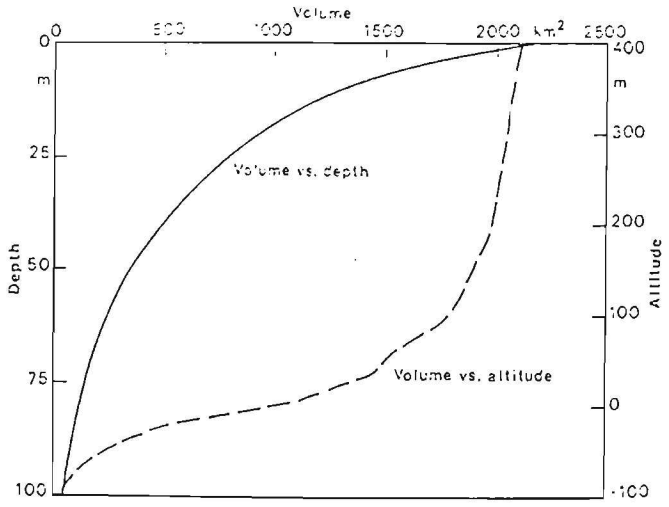

Fig. 8. The distribution curves of the lake volume in the Baltic Drainage as functions of depth and altitude from sea level.

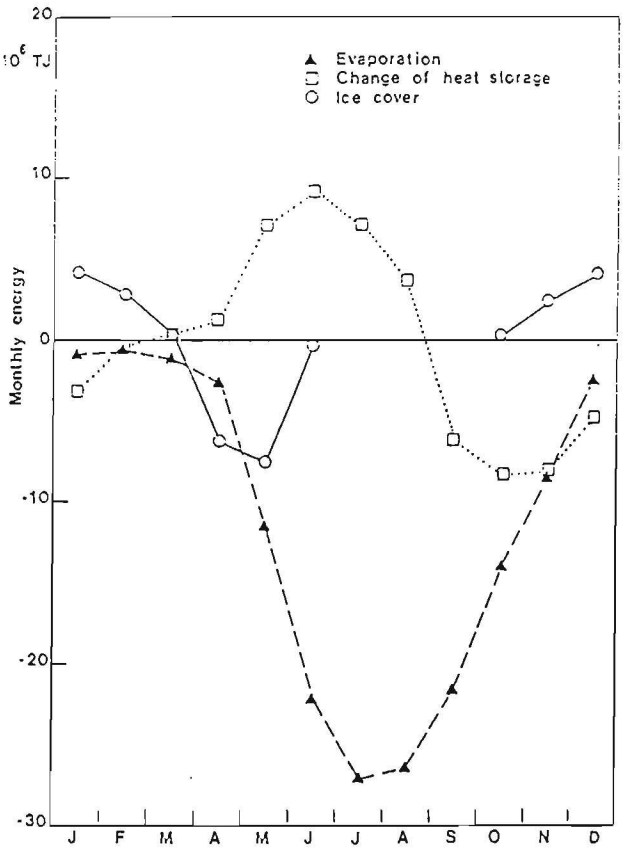

Fig. 9. Monthly amounts of energy required or released in processes of lake evaporation, change of heat storage and formation/melting of the ice cover.

LAND AND SOIL

Forests cover about 54% of the land area of the Baltic Drainage. Agricultural land use amounts to 26%, built-up land to 4% (ECE 1993).

Wetlands are a hydrologically important feature of the Baltic Drainage. Depending on the definition used, they account for 15–25% of the total land area. A considerable proportion of wetlands has been drained and is today classified as forests or agricultural lands.

Detailed data on land use, vegetation and soils will be important to several BALTEX-subprograms. An essential element to receive this data will be the BGIS project, started in January 1995. This project includes e.g. the mapping of land cover and soil types over the whole Baltic Drainage. A digital terrain model and drainage basin subdivision shall also cover the entire area (EDC 1994).

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STANDARDS, MEASUREMENTS AND TESTING PROGRAMME

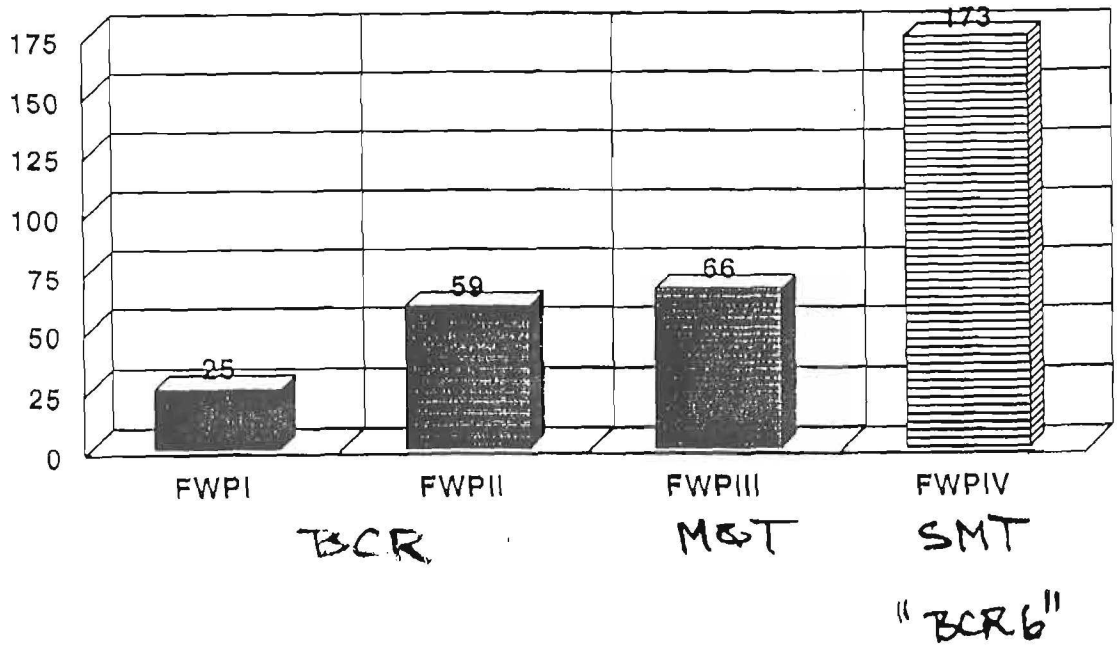
Veikko Komppa
Technical Research Centre of Finland

BASIS FOR THE SPECIFIC RTD PROGRAMMES (1994-1998)

- European Union Treaty (policies)
- European Commission White Paper (growth, competitiveness, employment)
- IV Framework Programme (themes, rules, budget)
- Specific programmes, history and experience

PROGRAMME RELATED TO STANDARDS, MEASUREMENTS & TESTING

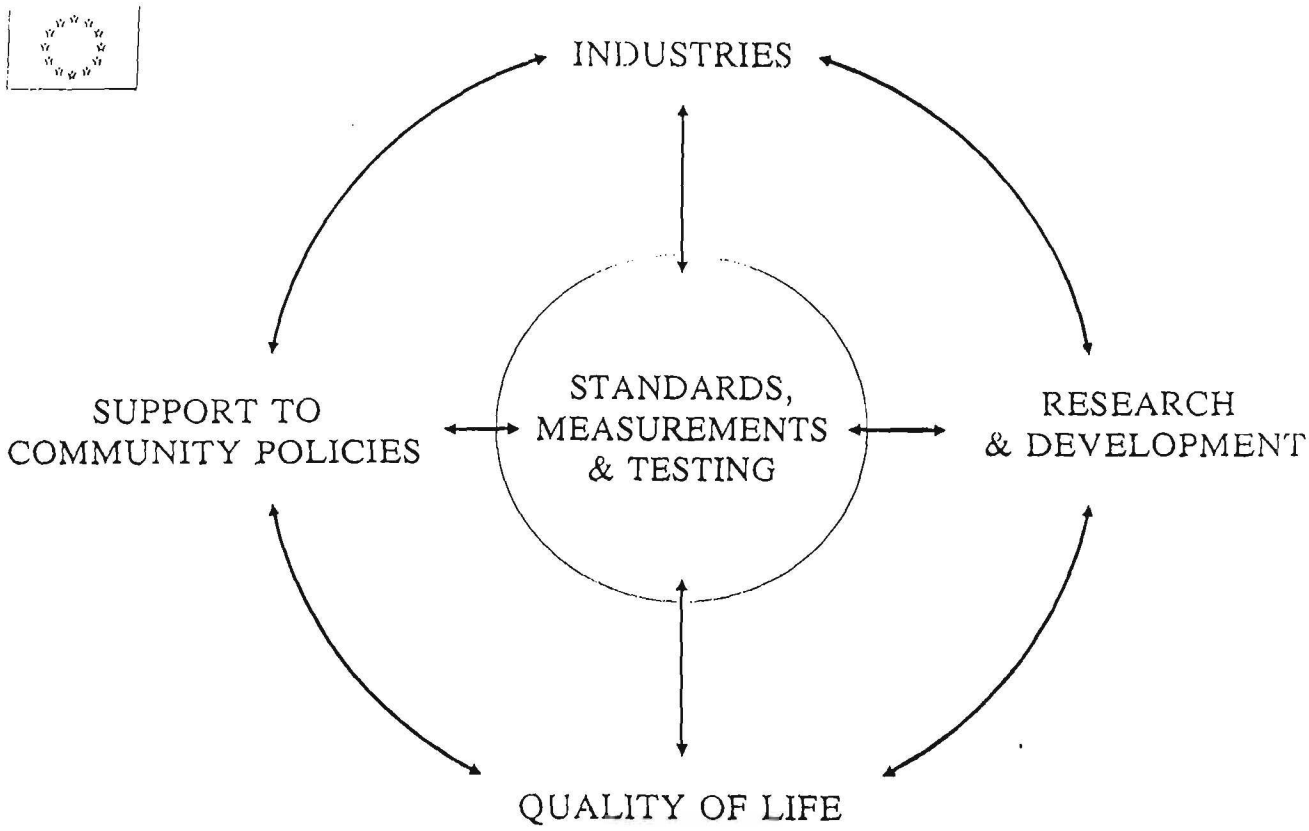
Evolution of the budget in MECU



Without harmonized measurements and standards:

- production is difficult
- product quality is variable
- trade disputes are common place
- health care becomes empirical
- the quality of life declines

N.B.: Advanced societies spend up to 6 % of their GNP on measurement related operations



STANDARDS, MEASUREMENTS & TESTING PROGRAMME (1994 - 1998)

★ Measurements for Quality European Products including Written Standards for Industry

★ ★ Research related to Written Standards and Technical Support to Trade

★ ★ ★ Measurements related to the Needs of Society

STANDARDS, MEASUREMENTS & TESTING PROGRAMME (1994 - 1998)

☆ Core Theme I:

"Measurements for Quality European Products including Written Standards for Industry"

Development of measurement methods and instrumentation in support of:

- research phase
- industrial development phase
- control of production
- quality assurance in industry

STANDARDS, MEASUREMENTS & TESTING PROGRAMME (1994 - 1998)

☆ ☆ Core Theme II:

"Research related to Written Standards and Technical Support to Trade"

Support to

- legislation and trade
- mutual recognition and accreditation
- customs laboratories

Promotion of a European measurement infrastructure

EUROPEAN MEASUREMENT AND TESTING INFRASTRUCTURE

LABORATORY QUALITY ASSURANCE AND ACCREDITATION

OBJECTIVES:

To give support to laboratory quality assurance and accreditation systems

KEY AREAS INCLUDE:

- Development of sampling strategies
- Assessment of new or improved measurement methods (via intercomparisons, etc.)
- Development of methods for the testing of instrumental software and guidelines for calculation of uncertainty
- Technical criteria for the accreditation of laboratories
- Technical support for establishment of proficiency testing

CUSTOMS LABORATORIES

Development of rapid methods for the detection of:

- unsafe consumer products
- diseases, pests or parasites in plants, animals, feeds, etc.
- illegal products (e.g. drugs, explosives) or illegal transports (e.g. toxic waste)
- detection of fraud and falsification of trade marks

STANDARDS, MEASUREMENTS & TESTING PROGRAMME (1994 - 1998)

☆ ☆ ☆ Core Theme III:

"Measurements related to the Needs of Society"

Health and Safety

o Environmental Monitoring

Protection of the Cultural Heritage

Justice System

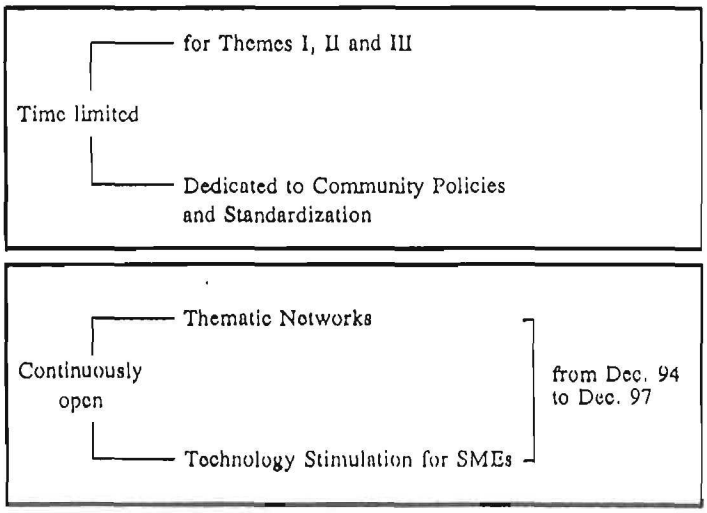
ENVIRONMENT

Development of methods or instruments to improve the comparability in:

- environmental hygiene (air, water, soil, noise control, etc.)
- effluent monitoring (compliance testing)
- waste management (sorting/recycling, disposal, combustion/destruction)

MECHANISMS AND ACTIVITIES

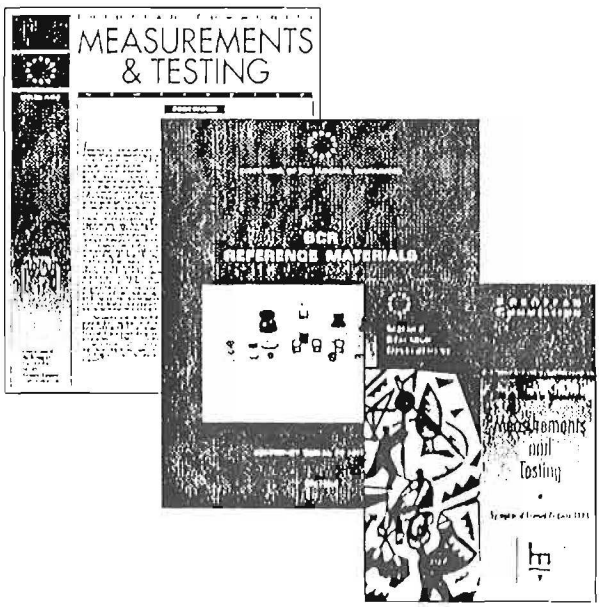
CALL FOR PROPOSALS



STANDARDS, MEASUREMENTS AND TESTING
FINANCIAL PROVISIONS AND CALLS FOR PROPOSALS

	Indicative contracts budget (MECU)	Call opens	Deadline
SHARED COST ACTIONS			
Dedicated Calls in Support of Community Policy including written standards	34	First Call December 1994 Quarterly thereafter as required	March 1995
Theme I : Measurements for Quality European Products & Written Standards for Industry - first call	22	15 December 1994	April 1995
Themes II & III: Technical Support to Trade & Measurements Related to the Needs of Society - first call	24	June 1995	November 1995
Theme I : Measurements for Quality European Products & Written Standards for Industry - second call	20	June 1996	November 1996
Themes II & III: Technical Support to Trade & Measurements Related to the Needs of Society - second call	21	June 1997	November 1997
Technology Stimulation: Exploratory awards and Cooperative research	15	15 December 1994	Continuously open until end of 1997
COORDINATED ACTIVITIES			
Concerted actions	4	15 December 1994	Continuously open until end of 1997
Networks	6		
ACCOMPANYING MEASURES	8.5		
PROGRAMME ADMINISTRATION	18.5		
TOTAL MECU	173		

HOW TO KEEP IN TOUCH WITH THE PROGRAMME



http://www.cordis.lu
WORD FILES
ALL RTD Programs

GOALS AND PROGRAMMES OF THE EUROPEAN ENVIRONMENT AGENCY

Niels Thyssen
European Environment Agency

THE EUROPEAN ENVIRONMENT AGENCY BASES AND PROSPECTS

REGULATION (EEC) 1210/90 (in force 30.10.1993)

☛ **AIMS AT THE SETTING UP OF A**

EUROPEAN ENVIRONMENT
INFORMATION AND OBSERVATION NETWORK (EIONET)

☛ **ESTABLISHES**

THE EUROPEAN ENVIRONMENT
AGENCY (EEA)

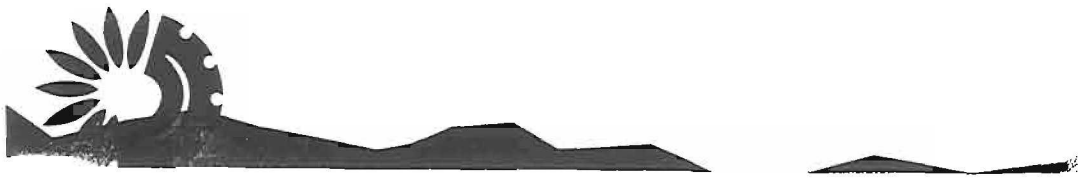
☛ **WITH THE OBJECTIVE**

TO PROVIDE THE EUROPEAN UNION AND MEMBER STATES:

- WITH: OBJECTIVE - RELIABLE - COMPARABLE - INFORMATION (THAT CAN BE DIRECTLY USED = EFFICIENT)
- ENABLING THEM:
  - TO TAKE THE REQUISITE MEASURES TO PROTECT THE ENVIRONMENT
  - TO ASSES THE RESULTS OF SUCH MEASURES
  - TO ENSURE THAT THE PUBLIC IS PROPERLY INFORMED ABOUT THE STATE OF THE ENVIRONMENT

☛ **TO ACHIEVE**

THE AIMS OF THE ENVIRONMENTAL PROTECTION LAID DOWN BY TREATY AND SUCCESIVE ACTION PROGRAMS ON THE ENVIRONMENT (THE 5TH.)



THE EEA TASKS

☛ ESTABLISH WITH MEMBER STATES AND COORDINATE THE EUROPEAN INFORMATION AND OBSERVATION NETWORK

☛ PROVIDE EU AND MEMBER STATES WITH INFORMATION FOR FRAMING AND IMPLEMENTING ENVIRONMENT POLICIES AND EU WITH INFORMATION FOR ITS TASKS (MEASURES - LEGISLATION)

☛ RECORD AND ASSESS DATA AND PROVIDE ASSESMENT CRITERIA AND DRAW EXPERTS REPORTS

☛ ENCOURAGE HARMONISATION OF MEASUREMENT METHODS AND HELP TO ENSURE DATA ARE COMPARABLE

☛ ENSURE DISSEMINATION OF INFORMATION AND INCORPORATION IN INTERNATIONAL MONOTORING

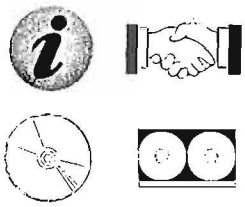
☛ PUBLISH 3 YEARS REPORT

☛ STIMULATE :

- FORECASTING TECHNIQUES AND PREVENTIVE MEASURES
- METHODS TO ASSESS ENVIRONMENTAL COSTS

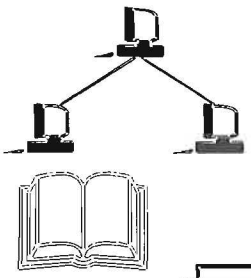
EXCHANGE OF B.A.T

Programme Group - ANALYSIS AND INTEGRATED ASSESSMENTS
Part I: Exploitation of existing information, reports and guidelines



1. DISSEMINATION AND POOLING OF EXISTING INFORMATION AND KNOW-HOW

By offering a clearing house facility the Agency will act as an interface between producers and users of technical information



2. PERIODICAL REPORTS ON THE STATE OF THE ENVIRONMENT

Publishing periodical reports on the state of the environment in Europe is a central task, drawing upon activities from all other programmes, and focusing on regular products with a large audience

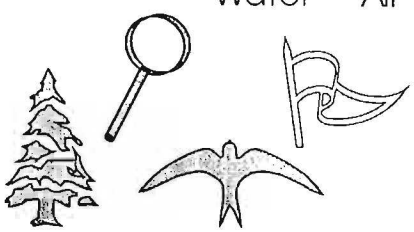
3. GUIDELINES FOR REPORTS/ ASSESSMENTS/DATA PROCESSING OF SPECIAL INTEREST AT EUROPEAN LEVEL

Stimulating consistent development of policy oriented reports and assessments facilitates the building of comparable information at European level

Programme Group - MONITORING AND DATABASES

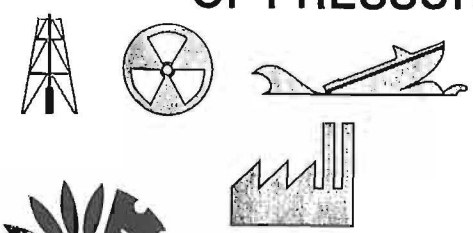
4. MEDIA ORIENTED MONITORING. ASSESSMENT OF THE STATE AND TRENDS OF THE ENVIRONMENT.

Water - Air - Nature - Soil



Promoting consistency between national monitoring activities and ensuring the compiling of EU wide thematic databases will lead to the economic formation of efficient comparable information

5. SOURCE ORIENTED MONITORING. ASSESSMENT OF PRESSURES.



Source oriented products are essential to implement preventative policies. Long term success will depend, among others upon the achievements of the environmental statistical programme.

Part II: Integrated assessments, scenarios and challenges

6. INTEGRATED ENVIRONMENTAL ASSESSMENT - PROBLEMS, AREAS AND SECTORS

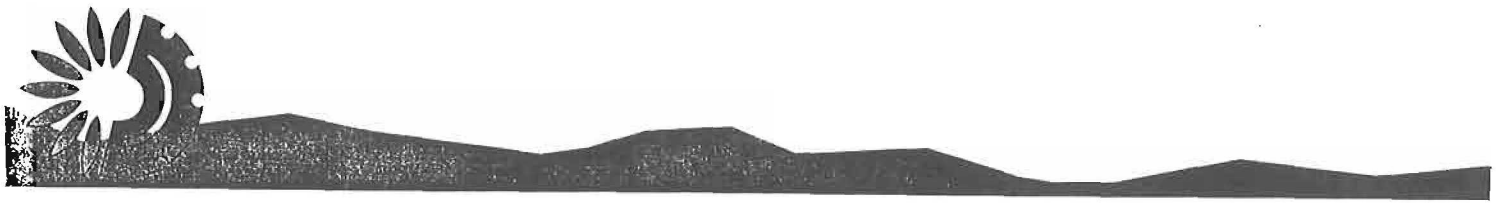
This programme promotes the integration of data and the use of models to supply information for policy development concerning priority environmental issues. The results will further the integration of environmental objectives into policies in economic sectors and areas.

7. SCENARIOS FOR ENVIRONMENTAL IMPROVEMENT

Implementation of environmental policies requires assessment of impacts of measures contemplated both on the environment and on human activities. To that end, tools need to be developed, pilot tested and implemented on urgent issues.

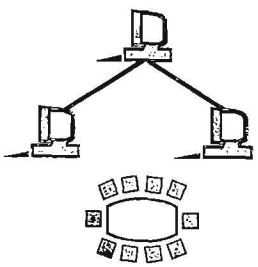
8. INSTRUMENTS AND CHALLENGES FOR ENVIRONMENTAL POLICY DEVELOPMENT AND IMPLEMENTATION

By collecting available data at national level, this programme aims to provide information to facilitate the analysis of the application of new principles guiding European environmental policy, the use of such principles at national level and of the instruments already being developed in this respect.



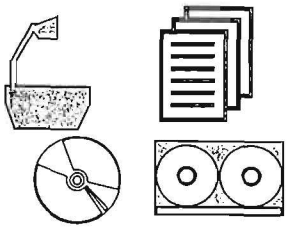
Programme Group - OPERATIONAL BASE & INFRASTRUCTURE, PUBLICATIONS & INFORMATION

9. CAPACITY BUILDING

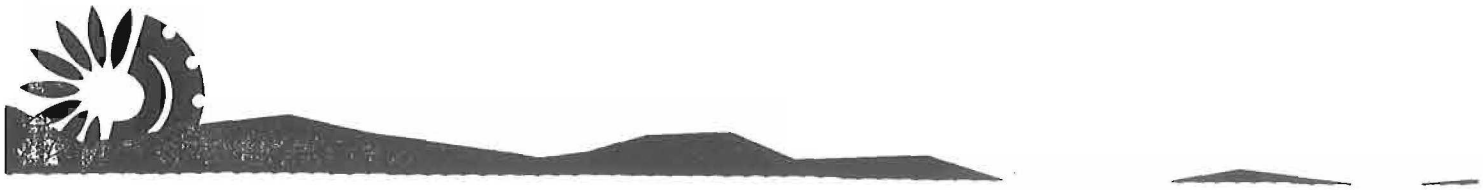


Projects of a horizontal nature which condition the operation of the EEA and its network as well as the consistent further development of the EEA's information system.

10. EXCHANGE AND DISSEMINATION OF INFORMATION



Products and services of the EEA should benefit a large range of users - all forms of information dissemination, conferences, stagiers and wide ranging information exchange schemes.



EUROPEAN TOPIC CENTRE ON INLAND WATERS

Formed from a merger of the two major bidders :-
Water Research Centre (WRc) and CEDEX/IOW

Management control and responsibility lies with the enlarged Management Committee:

Dr Tim Lack WRc Chairman
Dr Alfredo Iglesias ITG (Spain) Deputy
Dr Wilhelm Vogel AWW (Austria)
Snr Carlos Escartin CEDEX (Spain)
Snr Manuel Lacerda INAG (Portugal)
M Dominique Preux IOW (France)
Mr Torben Moth Iversen NERI (Denmark)
Ms Merete Johanessen NIVA (Norway)
Dr John Huylebroeck VMM (Belgium)

EUROPEAN TOPIC CENTRE ON INLAND WATERS

Work Programme Summary

Project MW1

Review current European legislation and International Conventions
Suggest approach to coordination and improvement of monitoring across EEA area

EUROPEAN TOPIC CENTRE ON INLAND WATERS

Work Programme Summary

Project MW2

Inventory of current and planned water resources monitoring procedures and practices with particular emphasis on groundwater quality/quantity and surface water quantity
Evaluate how existing networks meet requirements of the policies and priorities identified in MW1

:UROPEAN TOPIC CENTRE ON INLAND WATERS

Vork Programme Summary

Project MW3– Design of a freshwater monitoring network for EEA area

Analyse need for different types of monitoring stations
Evaluate representativeness of existing networks
Identify gaps in current national and international monitoring networks
Determine requirements for density,frequency,analytical methods,quality assurance,data storage and estimate costs
Design of a freshwater monitoring network
Assess water resource databases for supporting needs of
Identify commonality between needs and current databases
Recommend procedures, formats and software applications

EUROPEAN TOPIC CENTRE ON INLAND WATERS

Work Programme Summary

Project MW3 continued

Analyse and evaluate data from large rivers and their catchments
Relate water quality to human activities
Consideration of water use and the requirement to promote high aquatic ecological value
Transform the elements of Ecological Quality into operational indicators for all types of surface waters
Assess interrelations between water quality and quantity and groundwater and surface water

EEA COOPERATION WITH 3rd COUNTRIES

Article 19 of the EEA Regulation

"The Agency is open to countries which are not members of the European mmunities but which share the concern of the Communities and the Member ates for the objectives of the Agency under agreements concluded between them d the Community following the procedures of Article 228 of the Treaty."

Memberships currently being dealt with by the European Commission

Activities extending beyond member countries require:

- co-operative agreements
- additional resources
  - PHARE, TACIS
- use of existing Member States
  - Mediterranean Action Plan

Current activities which include non-Agency countries

- The Dobris Assessment and the Sofia Programme
- CORINE

ENVIRONMENTAL DATA COOPERATION BETWEEN FINLAND, RUSSIA AND ESTONIA

Väinö Malin
Finnish Environment Agency

ENVIRONMENTAL DATA COOPERATION BETWEEN FINLAND, RUSSIA AND ESTONIA

Väinö Malin
Finnish Environment Agency
19.6.1995

Environmental data network for neighbouring regions

The environmental data network for Finland's neighbouring regions - project started in 1991. This project covers environmental data cooperation between the environmental administrations of the Murmansk region, the Republic of Karelia, St. Petersburg and Leningrad region, Estonia and Finland. Regional environmental centres in these areas act as a link to other environmental administrations within this cooperation. Authorities in Finland and neighbouring regions have agreed to exchange environmental information.

An increased need for exchange of environmental data was one of the main reasons to start this project. At the same time the understanding of need for standardization of environmental data became evident in different regions. Data collected by different organizations, in different areas, at different times, should be comparable.

First phase of this cooperation was completed when St.Petersburg joined to the project at the end of 1994. During years 1991 - 1994 Finland has supplied partners participating in this cooperation in Russia and Estonia with the data equipment and environmental monitoring data system. Finns have also been responsible for hardware and software installation and basic training. The development of the network has been carried out together with other organizations participating in the project lead by Finnish Environment Agency (earlier National Board of Waters and the Environment).

The interface where the regional centres are connected to each other and the Finnish environmental administration by a network is planed to be completed by the year 2000. Due to the quick development of Internet, we already have connectins with our partners. This has helped our work significantly.

Environmental Monitoring Data System

Finnish Environment Agency has built an Environmental Monitoring Data System (EMDS) for the project for storing and retrieving data used for research, monitoring, control, planing and assessment of the environment. This integrated system has been primarily planed for regional use to act as a local environment data system. EMDS has been built using Ingres software package.

First version of EMDS, completed in January 1993, contained applications for data on water quality, soil chemistry and hydrology. The second version, completed in spring 1994, includes also applications for data on effluent and airborne emissions, water supply, water use and air quality. Data from different mediums stored in EMDS can be linked by standardized concepts and codes following principles used in Finnish Environment Data System.

In EMDS concept site is essential. The site in which an observation or investigation has taken place, is obligatory information. All the measurements and observations are connected with site. Sites must be identified in relation to the subprogramme (e.g. water quality, hydrology, air quality), exact geographical position (x, y and sometimes z coordinate, coordinate system), river basin, administrative district etc.. This ensures that data stored in EMDS can easily be used e.g. in geographic information systems.

In EMDS several code lists are used to standardize and coordinate the data. Observation has a reference to the institute which has taken the sample, values have a reference to the analytical laboratory, phenomenon (e.g. sea water, running water, gravel) is reported when necessary, parameter codes are used to refer to the element, pretreatment and determinant etc.. Widely used code lists such as Code List DA (Analytical Determinands, Nordic Code Centre), are used in EMDS.

Organizations which take part in this cooperation

Estonia:
Ministry of the Environment, Environment Information Centre, Tallinn

Finland:
Ministry of the Environment, Helsinki
Finnish Environment Agency, Helsinki
Southeast Finland Regional Environment Centre..Kouvola
North Karelia Regional Environment Centre, Joensuu
Lapland Regional Environment Centre, Rovaniemi

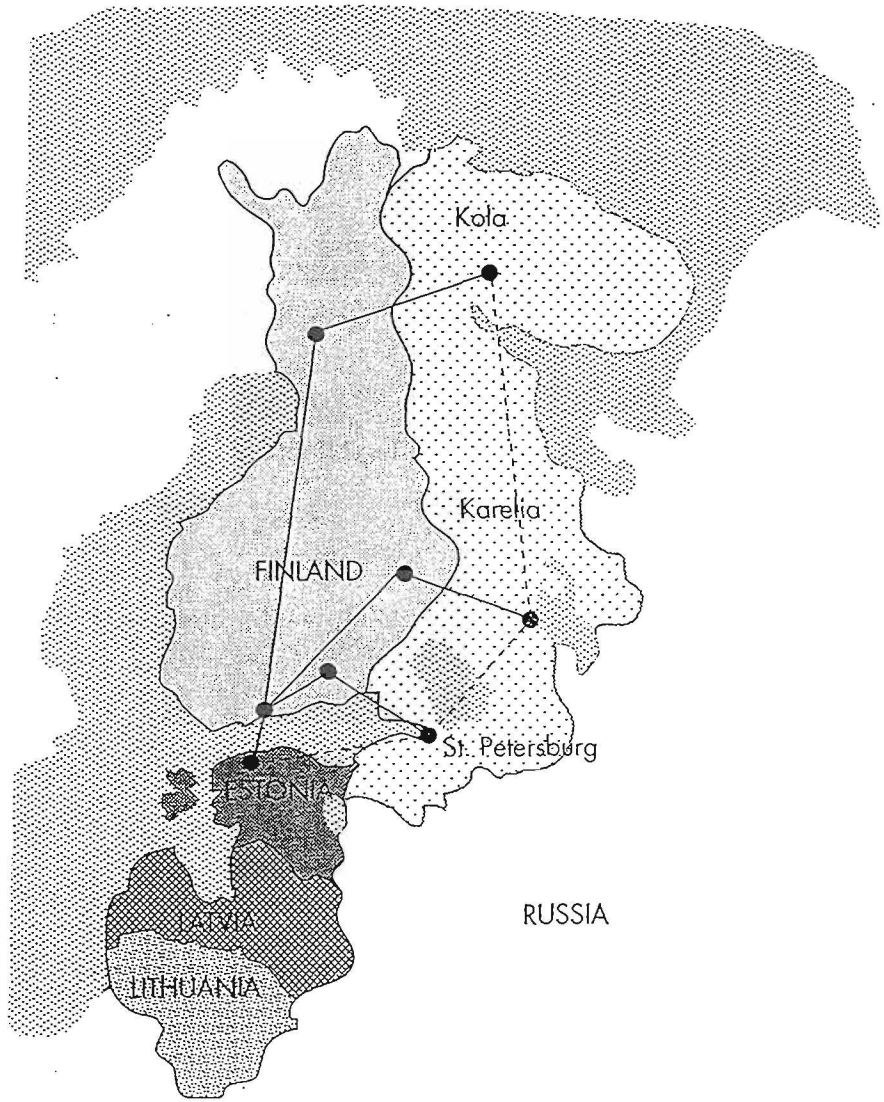
Russia:
Institute of the Industrial Ecology Problems of the North, Apatity, Murmansk region
Republic of Karelia Ministry of Ecology and Natural Resources, Petrozavodsk
Committee on Ecology and Nature Resources for St.Petersburg and Leningrad Region, St.Petersburg

* a need for exchange of environmental data

* a need to compare data collected by different organizations, in different areas, at different times

* re-use of data collected in one investigation, at a different time and for a new purpose

* a need for standardization of environmental data



ENVIRONMENTAL DATA NETWORK IN FINLAND'S NEARBY AREAS

Leo Saare
Estonian Environment Information Centre

VAX - History in Estonia.

In. October 1992. was 2 our specialists in Finland at the system administration training.

In November 1992. 3 our specialists in Finland at the INGRES software training and Environment Monitoring Data System (EMDS) training at the EDC.

At the same month 1992. the microVAX 3100 was installed to Infocentre.

In January 1993. was official deliver ceremony.

Continued cooperation with EDC. We tested the EMDS version 2.
Now the program running without errors.

EMDS-program for Vax can process following:

I. Air quality data (data from our laboratories)
II. Emissions into air (total annual emissions by State statistics)
III. Hydrology data
IV. Soil chemistry and sediment data
V. Waste water loads data (annual loads from point sources, State statistics)
VI. Water extraction data (State statistics)
VII. Water use data (State statistics)
VIII. Water quality data (data from laboratories)

Estonian Data at the EMDS:

1. List of Estonian territory units
2. List of economical branches
3. List of rivers and lakes
4. 600 000 observations from 138 hydrological stations beginning from the year 1902.
   (appr. 85% data are transferred)
5. Data from 1415 enterprises water discharge, water extraction and water use in 1994. are under transferring.

VAX/EMDS technology transfer to Estonia
Conclusions

1. Real work with the data has begun 1.5 years after the technology transfer. The reason - the original version of EMDS did not take into account all specific aspects of Estonian situation. It means that in the process of EMDS seeding to the new site at least 1 year should foreseen for adapting the system to the local situation.

2. Data on hydrological records is relatively easy to handle and lots of historical data has been raised from the archive. On the same time, data of water consumption and waste water discharge is much more difficult to manage. Thus, only data for the last year is operational in the EMDS. Adding older records needs remarkable efforts.

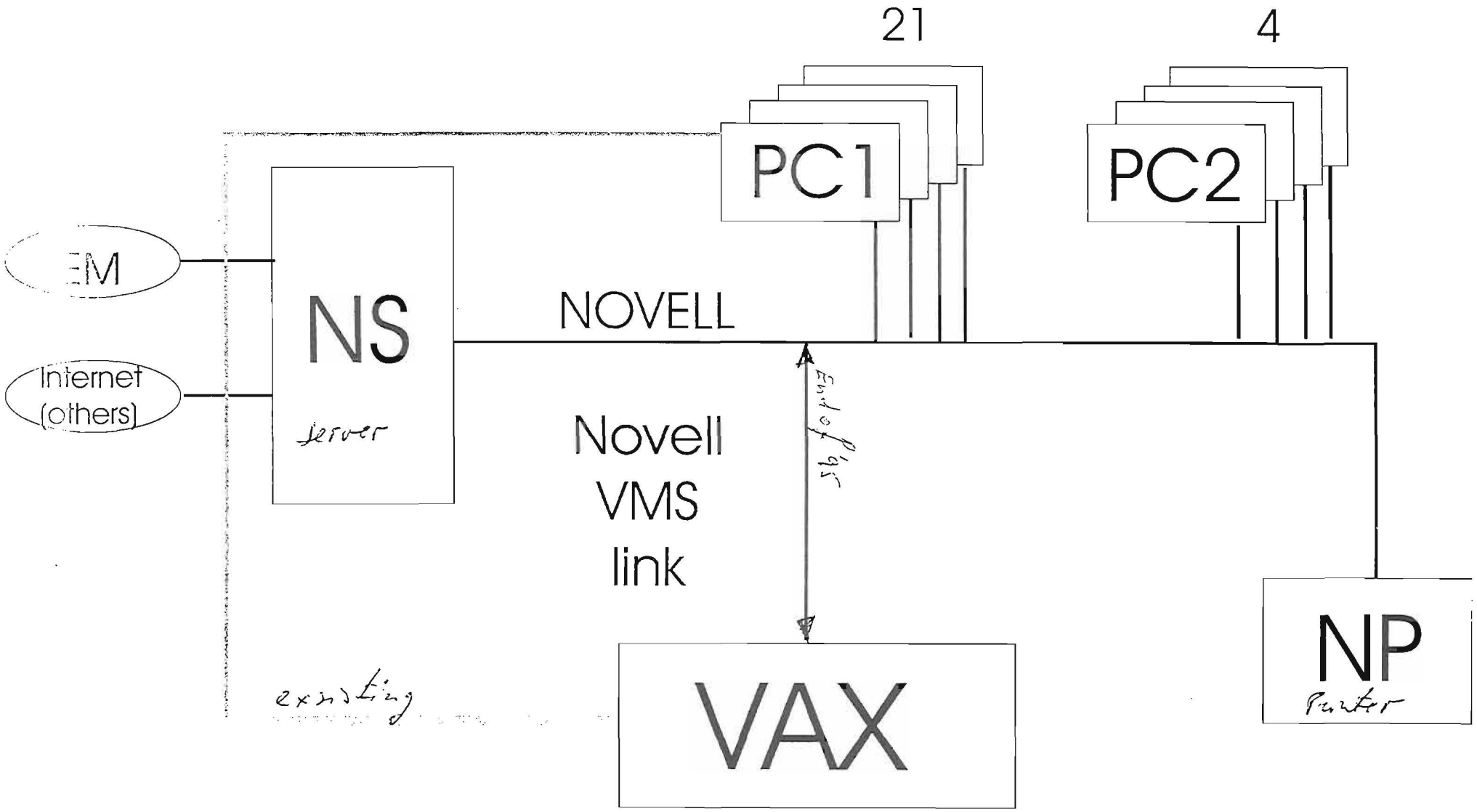
3. Estonian vision of local EMDS installation is an on-line data base for the network access. However, due to local specialities (not covered by EMDS) and various changes in the water management, some parts of the data system will stay outside EMDS i.e. on other data servers.

4. In Estonian case, the computing power of particular VAX model is exhausted by now. To continue, more capable (faster) computer should be planned.

5. **Benefits for Estonia:** Introduction of EMDS put Estonia water data first time in to the same data system. This allows access to **all data in one work session**. However, data is easily accessible only through VAX terminals, while **connection to PC computers is weak.** This is one of the major drawbacks of EMDS in PC-oriented Estonia. It means that there are very limited users because the connections are only through KERMIT.

6. **Benefits for Estonia:** Data transfer in to EMDS performs automatically control of the data quality.

Finally - The EMDS project is useful for us to integrate abroad, but the same time we must work furthermore to have the EMDS obtainable to our users.


21
4
PC1
PC2
EM
Internet
(others)
NS
server
NOVELL
Novell
VMS
link
existing
VAX
NP
Printer

ESTONIAN ENVIRONMENT 1994

BASE AND CONSTRUCTION OF MONITORING

By O. ROOTS and L. SAARE

Ministry of the Environment of Estonia,
Environmental Information Centre,
EE0006 Tallinn Mustamäe Str. 33, ESTONIA

BASE AND CONSTRUCTION OF MONITORING

By O. Roots and L. Saare

The main purpose of the Estonian Environmental Monitoring Program (EMP) is to monitor the long-term and large-scale changes in the environment and thus identify the problems, the solving of which calls for quick countermeasures or complementary studies in the future.

Environmental Monitoring is a long-time activity, the aim of which is to guarantee prolonged data series of high quality. Therefore, the necessary stability and continuity must be given to data collection, but at the same time the environmental monitoring system must be flexible in order to evolve with the increase of knowledge.

Since results of state monitoring constitute a base for political decisions undertaken by the state and local authorities, we must focus particular attention to the quality control, which holds in itself much more than just control over sampling and analyses. The quality control plan is based on the quality policy, which means that the system of environmental monitoring can be characterized by three words: relevance, reliability and accessibility.

The general objectives for the Estonian Environmental Monitoring Program are as follows:

- to provide data for determining the current state of environment and making quick updates available for short-term reporting
- to monitor long-term and large scale trends in the environment and in that way to identify the problems, that require research efforts or direct countermeasures
- to keep trach on exchange of pollutants with adjacent countries for estimating Estonian role in formation of regional pollution

load, carry out comparisons with other countries and compile the national budget of transboundary pollution
- to develop and continuously improve the system of environmental indicators for generating information from the EMP data

Our aim is to connect the improving of the monitoring programs at the scientific level with the routine quality work at monitoring stations and laboratories. The scientific part should include the selection of monitoring subjects and new monitoring problems, selection criterions for monitoring programs as well as for the monitoring network and for all the measured parametres, analysis of the obtained results, determining the current state of environment etc. Unfortunately, the realization of this work is obstructed by the shortage of finances and insufficiency of legislation. In the near future it is necessary to elaborate the "Estonian State Monitoring Law", which would state the part and engagement of state, local authorities and private owners in the realization of state monitoring.

MONITORING - HOW IS IT DONE AND BY WHOM

The fragmented character of environmental monitoring activities in the former Estonian SSR still influences the present situation of environmental monitoring in the Estonian Republic.

In 1993, Estonian monitoring gained legal ground. All monitoring, that was carried out in 1994 was funded by the state budget as ordered monitoring work. In 1994, Estonian State Monitoring Program was financially supported with 6,788,000 Estonian crowns from the national budget.

MONITORING COUNCIL

A decree by the Minister of the Environment from October 25, 1993 provides for the formation of a Monitoring Council (MC).

MC was given the task to:
- elect the projects and responsible institutions (and persons) for the implementation of monitoring
- confirm the costs of all projects. It would also look over all applications concerning additional funding.

All the monitoring projects are confirmed by the Chancellor of the Environment Ministry of Estonia. After that, the Estonian Environment Information Centre signs contracts with responsible institutions. The responsible implementors have to guarantee either alone or with sub-contractors the collection, primary processing and preservation of the data.

Chancellor of the Environment Ministry of Estonia leads the Monitoring Council. Members of the council are the heads of departments of the Environment Ministry, directors of various sub-establishments of the Ministry (like institutes, etc.) as well as representatives from the Ministry of Economy, Health Protection Centre, State Control and starting from this year, a representative from the Ministry of Agriculture.

MONITORING COORDINATOR

According to a decree nr. 93 on October 25, 1993 by the Minister of the Environment, Estonian Environment Information Centre (EEIC) was appointed to be a general leader and coordinator of the Estonian Environmental Monitoring Program.

A WORKING GROUP OF LABORATORIES

A working group of laboratories participating in monitoring, led by the Estonian Central Environmental Research Laboratory Ltd., was formed in order to coordinate the works concerning the taking, analysing and intercalibration of the samples.

ESTONIAN ENVIRONMENTAL MONITORING PROGRAM (EMP)

A national monitoring strategy is just being prepared. Analysis of the existing monitoring network and methods and determination of ways for improvement are under way.

The Estonian Environmental Monitoring Program includes of four main programs:

- Meteorological Monitoring
- Physico-Chemical Monitoring
- Biological Monitoring
- Integrated Monitoring

These four programs are divided into numerous sub-programs (Table) and different institutions are responsible for data collection which finally should be available in the EEIC.

PROGRAM/SUBPROGRAM

1. METEOROLOGICAL MONITORING
    - 1.1. Meteorological Monitoring
2. PHYSICO-CHEMICAL MONITORING
    - 2.1. Groundwater Monitoring
    - 2.2. Surface Water Monitoring
        - 2.2.1. Monitoring of Lake Peipsi
        - 2.2.2. Determination of Riverine Runoff
        - 2.2.3. Hydrochemical monitoring of rivers
    - 2.3. Marine Water Monitoring
        - 2.3.1. Marine Physics
        - 2.3.2. Marine Chemistry
        - 2.3.3. Harmful Substances
        - 2.3.4. Marine Biology
        - 2.3.5. Radiation (sediments)
    - 2.4. Coastal Survey
    - 2.5. Air, Aerosols and Precipitation Chemistry
        - 2.5.1. Local (urban) Air Monitoring

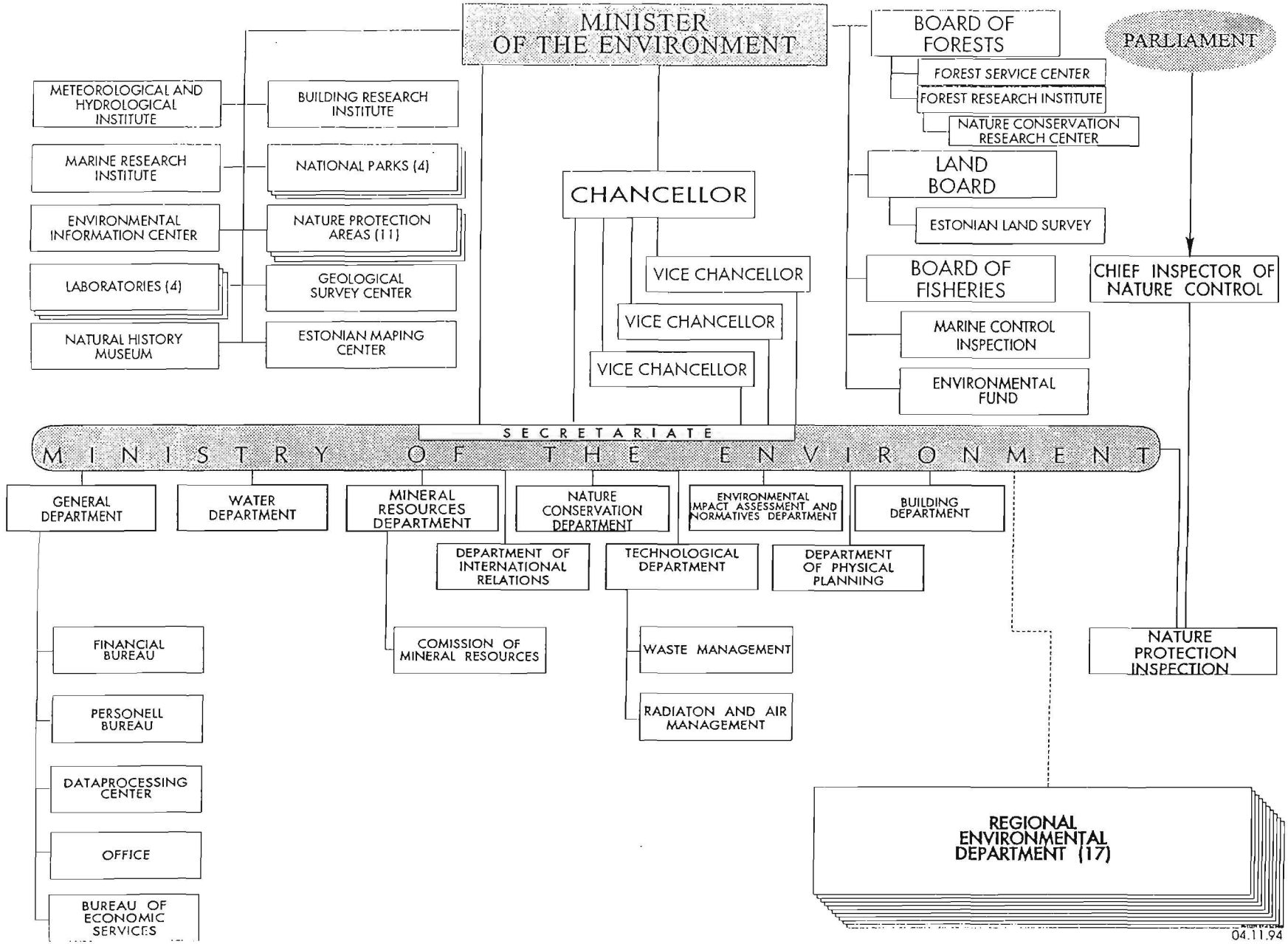
2.5.2. International Air Monitoring
2.5.3. Precipitation Chemistry
2.5.4. Bioindication (heavy metals in mosses)
2.5.5. Radiation Monitoring in Air
2.5.6. Monitoring of Radon in Cities Tallinn and Kunda
2.6. Soil (Geochemical) Monitoring
2.7. Seismic Survey
2.8. Pollution Load Control
3. BIOLOGICAL MONITORING
3.1. Forest Monitoring (+ Forest Soil)
3.2. Monitoring of Marine Biota
3.2.1. Coastal Sea Fishes
3.2.2. Open Sea Fishes
3.2.3. Bottom animals and plants
3.3. Monitoring of Freshwater Biota
3.3.1. Biota of Rivers
3.3.2. Biota of Lakes
3.3.2.1. Biota of Lake Peipsi
3.3.2.2. Biota of Lake Võrtsjärv
3.3.2.3. Biota of Small Lakes (12 Lakes)
3.4. Species and Community Composition*
3.4.1. Plant Communities
3.4.2. Plant Species Composition
3.4.3. Birds
3.4.4. Macromammals
3.4.5. Micromammals
3.4.6. Invertebrates
3.5. Aerobiological monitoring
4. INTEGRATED MONITORING
4.1. Vilsandi station
4.2. Saarejärve station

* - includes 47 subprograms and projects

There were 16 responsible contractors of monitoring programs in 1994 - among those were 12 institutions and 4 regional

laboratories of the Ministry of Environment, situated in Tallinn, Tartu, Pärnu and Jõhvi.

Creation of meta-database was also started in the beginning of 1994. It contains data concerning monitoring programs (objective of programs, who is responsible for conducting the program and carrying out measurements, where are the obtained results kept, etc.), monitoring stations (coordinates, names, etc.) and various changing quantities (where, how often and using what methods are the measurements done, etc.). The greatest obstacles on the way of creating this database were the defects in determining the accurate coordinates of monitoring stations. The work aiming to improve the database is conducted continously. To sum up we can say, that the "birth year" of the Estonian State Monitoring was hard, but during that year a base was laid for following activities.


MINISTER OF THE ENVIRONMENT
PARLIAMENT
BOARD OF FORESTS
FOREST SERVICE CENTER
FOREST RESEARCH INSTITUTE
NATURE CONSERVATION RESEARCH CENTER
METEOROLOGICAL AND HYDROLOGICAL INSTITUTE
BUILDING RESEARCH INSTITUTE
MARINE RESEARCH INSTITUTE
NATIONAL PARKS (4)
CHANCELLOR
LAND BOARD
ESTONIAN LAND SURVEY
ENVIRONMENTAL INFORMATION CENTER
NATURE PROTECTION AREAS (11)
LABORATORIES (4)
GEOLOGICAL SURVEY CENTER
VICE CHANCELLOR
BOARD OF FISHERIES
CHIEF INSPECTOR OF NATURE CONTROL
VICE CHANCELLOR
NATURAL HISTORY MUSEUM
ESTONIAN MAPING CENTER
VICE CHANCELLOR
MARINE CONTROL INSPECTION
ENVIRONMENTAL FUND
SECRETARIATE
MINISTRY OF THE ENVIRONMENT
GENERAL DEPARTMENT
WATER DEPARTMENT
MINERAL RESOURCES DEPARTMENT
NATURE CONSERVATION DEPARTMENT
ENVIRONMENTAL IMPACT ASSESSMENT AND NORMATIVES DEPARTMENT
BUILDING DEPARTMENT
DEPARTMENT OF INTERNATIONAL RELATIONS
TECHNOLOGICAL DEPARTMENT
DEPARTMENT OF PHYSICAL PLANNING
FINANCIAL BUREAU
COMISSION OF MINERAL RESOURCES
WASTE MANAGEMENT
NATURE PROTECTION INSPECTION
PERSONELL BUREAU
RADIATON AND AIR MANAGEMENT
DATAPROCESSING CENTER
REGIONAL ENVIRONMENTAL DEPARTMENT (17)
OFFICE
BUREAU OF ECONOMIC SERVICES
04.11.94

QUALITY ASSURANCE IN POLLUTION LOAD COMPILATION

Irma Mäkinen
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Irma Mäkinen
Finnish Environment Agency

QUALITY ASSURANCE IN POLLUTION LOAD COMPILATION

INTRODUCTION

The Pollution Load Compilation (PLC) is an international project within the fra mework of the Helsinki Commission (HELCOM). HELCOM needs reliable data on inputs into the Baltic Sea from land-based sources, in order to develop its environmental policy and to assess the effectiveness of measures taken to abate the pollution. This data is also required for evaluation of the state of the open sea and coastal waters.

The task of PLC has been carried out in the stages, PLC-1 in 1985 and PLC-2 in 1990. PLC-2 provided valuable experience to be taken into account in preparation of the next stage, PLC-3, which has just commenced this year. One of the main lessons from PLC-2 was an urgent need to establish a quality assurance system, in order to avoid various uncertainties and weak points in the future.

QUALITY ASSURANCE IN PLC-3 PROGRAMME

Comparison tests before PLC-3

A quality assurance system before PLC-3, was financially supported by the Helsinki Commission and it was established as follows:

1) National reference laboratories (NRLs) had to be established in each country e.g. in order
to provide interlaboratory comparison tests on a national level.
2) The international comparison test and a training workshop had to be conducted among the national reference laboratories.

Futhermore the overview of the national comparison tests in the Baltic countries was decided to be prepared separately.

Before distribution of samples for the interlaboratory comparison test, two check samples with known concentrations were distributed to the laboratories in Estonia, Latvia, Lithuania, Poland, Russia and Belarus. The comparison test was conducted among the reference laboratories in June 1994. The participating laboratories are presented in Table 1 and the samples distributed in Table 2.

The comparison of the bias and the performance of the laboratories was made using Z-scores. Z-scores were calculated for each laboratory per each parameter and per each sample (Fig. 1 and 2). Z-scores can be regarded to show the results to be as

follows:

| Z | < 2	'satisfactory'
2 < | Z | < 3	' questionable'
| Z | > 3	' unsatisfactory'.

The summary from the performance of the laboratories per sample and per para meter are presented in Tables 3, 4 and 5.

The data of the international comparison test showed, that some national reference laboratories need –
1) careful testing and evaluation of their methods (also testing of new methods)
2) control of calibration procedure
3) new equipment
4) reagents and deionized water of proper quality
5) systematic internal quality control carried out dayly.

Especially in the determination of low values of different compounds, the perfor mance of the laboratories was not satisfying. Of course, there were differences in performance between different laboratories.

The workshop on QA was conducted for participating laboratories of the compa rison test in Helsinki in 1994. In the workshop information on the quality system, quality assurance and quality control, analytical methods validation and standardi- zation of methods as well as calibration of instruments, was provided.

The laboratories seem to be eager to work towards a better quality of data, but in many cases the main problem seems to be the lack of money i.e. to buy proper equipment, reagents, purification systems for water.

Generaly it can be said, that the deficiencies obtained from the PLC-3 are based on a better quality of data than the results obtained in PLC-2. Unfortunately, the time period was too short to solve all deficiencies proved before PLC-3. Due to the limited budget resources, the comparison test was only the first step towards improving national data quality and their comparability.

OTHER ACTIVITIES

EU-PHARE-programme

EU-PHARE/QA-support work for Eastern Baltic national reference laboratories was started in 1995, to assist the eastern Baltic countries ((Estonia, Latvia, Lithua nia and Poland) with their activities under the PLC-3 Programme. In this project EC and HELCOM financially assist the laboratories to improve their capabilities, through the provison of equipment and laboratory consumables, and provide trai- ning in analytical quality assurance. The laboratories in Denmark, Scotland and the Netherlands coordinate this work. The representatives of these laboratories have visited the NRLs. The coordinators have visited the NRLs and are now preparing the report on national requirements. A workshop on QA and reference laboratory activities is scheduled in August 1995.

From the Baltic countries participating in PLC the labortories in Russia are not

coverd by the EU- PHARE-programme. Therefore, HELCOM has asked Finland to provide assistance to the NRLs in the St. Petersburg region, in line with the EU-PHARE-programme before the Finnish-Estonian-Russian Programme 'The Gulf of Finland Year 1996'.

EQUATE-programme

Within the framework of the 1994 Copernicus programme of the EU the EQUATE programme has been given a grant. EQUQATE is an acronym for 'equal quality of water-related analyses throughout Europe. The programme consists of three themes. 1) quality management, 2) reference materials and interlaboratory studies and 3) quality improvment programmes.Two laboratories from the Netherlands coordinate the programme. Institutes and labortories in twenty European countries will collaborate in the EQUATE programme (Fig. ?). It promotes regoinal cooperation within Central and eastern Europe as well as cooperation between Western and Central/Eastern Europe. The introductory workshop for the project will be held in Budapest this week.

The Baltic Integrated Monitoring - QA-programme

This project is financially supported by the Nordic Council of Ministries. The goal is to gurantee the production of qualified IM data during all stages of work. This is done by point support of various kinds in Estonia, Latvia and Lithuania, such as providing equipment and reagents by BIM especially, when the project was started in the Baltic countries in 1992. The NRLs can participate in some comparison tests conducted by the Nordic laboratories this year. The training consists of soil research and hydrology in Denmark and Sweden this autumn. The budget resources are quite limited, especially for this year.

During this project, it has been presented, that the Baltic countries (Estonia, Latvia, Lithuania) could also conduct interlaboratory comparison tests among each other.

(International Co-operative Programme on Integrated Monitoring on Air pollution Effects)

Other supports

EPA (USA) has evaluated monitoring activities in the Baltic countries and intends to support the Baltics in this field, in coordination with other donor parties (countries, programmes, organisations).

Furthermore, cooperation between the Nordic countries and the Baltic countries is quite intensive today. It has contibuted in many different ways to improve the quality of data and the comparability of the results produced, for national and international purposes.

Summary

There are currently many activities supporting the Baltic countries in the field of water monitoring. PLC-3/QA-project conducted by Finland, was one of the first

steps towards improvment of data quality for monitoring of pollution loads in the Baltic countries. It does not solve the problems existing in the laboratories, but it shows the most serious defects regarding the analytical work.

It is essential to coordinate the support for the Baltic countries in the immediate future in order to avoid the overlapping and duplication of resources.

QUALITY ASSURANCE WITHIN POLLUTION LOAD COMPILATION PROGRAMMES IN LATVIA

Ilze Kirstuka
Latvian Environment Data Centre

QUALITY ASSURANCE
WITHIN POLLUTION LOAD COMPILATION PROGRAMMES IN LATVIA

Ilze Kirstuka

19-20 June, 1995 **EURO-WORKSHOP, Helsinki, Finland**

The present report has been prepared taking into account national experience as well as recommendations of US EPA specialists.

Now the Cabinet of Ministers of the Republic of Latvia has adopted the ***National Environment Policy Plan*** that sets forth the environmental goals for the Republic as well as the priority environmental problems that need to be addressed in the immediate future. The Ministry of Environmental Protection and Regional Development (MEP&RD) is concurrently developing a monitoring strategy to support this plan and International Conventions and Programmes ratified in Latvia. There are several monitoring programmes dealing with environmental problem solution on the regional scale: Baltic Sea Marine Monitoring Programme, Pollution Load from Coastal Zone Compilation Programme within the Helsinki Convention, ICP Integrated Ecosystems Monitoring Programme within the Convention on Long-range Transboundary Air Pollution, Early Warning System and Monitoring of Artificial Radioactivity etc.

Institutional Framework

Up to this time primary environmental monitoring functions of the country are administered through two separate state institutions in different ministries: the MEP&RD and the Ministry of Transportation. The State Hydrometeorological Agency (SHA) of the Ministry of Transportation is responsible for ambient air and water monitoring, but the Regional Committees that support the MEP&RD with discharge and emission monitoring of pollution sources. The obtained experience shows unsuitability of such system. Segmentation of environmental monitoring responsibilities makes it difficult to develop comprehensive monitoring programmes that are responsive to environmental goals and priorities. It is proposed in the nearest future to reconstruct institutional basis and the management of the state monitoring system. It will be consolidated under the MEP&RD, responsible for development and implementation of the country's overall environmental programmes. In addition, the Regional Committees structure, Latvian Environment Data Centre (LEDC) and overall laboratory support

already available in the MEP&RD system provides the framework on which to build future monitoring programmes. Without such incorporation, the current problems associated with programmatic overlap and inability to directly link ambient monitoring to environmental objectives will become increasingly difficult to address.

The MEP&RD currently has a network of 9 Regional Committees that do the vast majority of sampling of pollution sources. Each Regional Laboratory have sufficient basic equipment to support pollution source monitoring for most routine sampling in both the air and water media. Analytical capabilities include detection of ***organic matter, nutrients, oil products*** and some ***heavy metals***. Laboratory Department of LEDC is the location where complex analyses for ***organic toxics*** and other parameters not routinely monitored can be performed. This laboratory is a coordinator of the system of environmental pollution analytical laboratories. It is used for national quality control and laboratory accreditation programme for regional and private laboratories in the country. The laboratory operates as National Reference Laboratory within Helcom Pollution Load Compilation Programme.

Water Pollution Load Compilation Programmes

Surface water quality monitoring is conducted routinely at ***122 sites*** around the country. Water chemistry is tipically analyzed on a monthly basis for ***organic matter, suspended solids*** and ***nutrients. Heavy metals*** are analyzed 6 times per year.

Point source discharges of pollution discharged directly to surface waters and to municipal wastewater treatment plants are periodically monitored by Regional Committees supporting programmes of the MEP&RD. Frequency of monitoring is dictated by the size and significance of the pollution source as well as the resources of Regional Committees.

In general, surface water monitoring has been designed to provide water quality data on:

- locations upstream and downstream of significant points of discharge,
- areas of recreation or public water supply withdrawal,
- points at which waters enter or leave the country,
- locations and sources that are covered by the Helcom and other international agreements.

While these programmes provide an extensive data base, the use of these data sometimes is limited because of the lack of clearly defined ambient water quality network that can be used to define reference conditions. The ambient network should be designed to provide general coverage of the waters of the country while

avoiding localized pollution sources or other impacts. Sometimes it is advisable to develop subnetworks to complement the ambient network. An example of such a subnetwork that already exists is the surface water monitoring programme in the agricultural areas of the country where pesticide monitoring is conducted.

Surface water ***sampling*** is currently done primarily by individuals responsible for one station and conducting certain field analyses (dissolved oxygen, temperature, pH, conductivity, etc.) and transporting the sample to Regional Laboratories for further analyses. There are problems with sampling protocol consistency and general quality control when such a large number of sample collectors are involved. As parameter coverage at individual sites is expanded to include pollutants measured at very low concentrations, the issues of quality control and sampling consistency will become even more important. A relatively small staff of samplers should be used, each with a circuit of assigned sampling sites that are visited on routine basis (generally once per month) to collect, analyze and transport samples to the laboratory. This approach could allow more comprehensive training and quality control than can be provided under the current system. Samples collected by regional samplers should be routinely compared with industrial and municipal samples for consistency. In addition, according our legislation system dischargers will be required to participate in National Testing Laboratory Accreditation and Quality Control Programmes.

Monitoring of discharges from industrial and municipal sources is conducted primarily to document compliance with the natural resource tax system. This provides good general information on pollutant releases covered by the tax system, but should be supplemented to the extent that resources allow to document ***water quality impacts***. Both current and long-term priorities should be considered in ***selecting parameter coverage***. Expanded coverage of toxics, particularly substances that bioaccumulate in fish and sediment, should be provided. Both regional sampling and monitoring requirements imposed on industrial discharges to municipal sewer systems should be expanded to include parameters that could pass through or interfere with biological treatment processes.

It is also advisable to expand the use of ***bioassays*** to provide a screening tool to identify toxic components in the discharge that may not otherwise be found through chemical analyses. The Laboratory Department of LEDC currently has limited capability to perform bioassays using Daphnia. These facilities should be expanded to provide adequate capacity to do bioassays for all major discharge sources at least once per year and to cover other representative aquatic species.

Air Pollution Load Compilation Programmes

SHA performs routine ambient air monitoring at about ***20 sites*** (posts) in 10 cities. These measurements are predominantly manual methods with associated laboratory analyses. The Regional Committees of the MEP&RD collect ambient samples in support of field inspections. The primary responsibility of MEP&RD at present is industrial source emissions (stack) monitoring, that is mainly carried out by LEDC Laboratory Department staff by traveling throughout the country to test industrial facilities.

The cities of Riga and Ventspils each operate one ambient air monitoring and meteorological monitoring station. These stations are real-time, continuous monitoring sites that automatically processes and report hourly results to their respective city offices.

Latvia, because of its low level of industrialization and population only 2.7 million, emits relatively small amounts of ***sulfur dioxide, carbon monoxide*** and ***nitrogen oxide*** when compared to its European neighbours. Three obvious air quality problems were recognized to be present in Latvia:

- general airborne ***dust*** concentrations,
- ambient ***lead*** levels in high traffic areas and
- impact from the ***oil refinery*** at Mazeikiai.

The country's overall air monitoring network design should address these three concerns as a high priority.

Air quality monitoring objectives include measurement of peak concentrations near significant emission sources, assessment of population exposure in areas of elevated concentrations, evaluation of air pollutant transport from other countries, determination of trends in air pollution and monitoring to meet Baltic Region inter-country agreements. To meet these objectives, an ambient air monitoring network has been deployed across the country. Generally, each station has been equipped to provide the same type of measurements for the same pollutants (SO2, NOx, CO, particulates). Some of the stations include other measurements specific to nearby sources, e.g., methanol, isopropyl alcohol, hydrogen sulfide or chloride).

The quality of data generated by air monitoring network is sometimes suspect due to the following reasons:

- the use of obsolete and unvalidated sampling and analysis methods,
- inadequate or poor quality sampling reagents and supplies, both in the air monitoring network and in the analytical laboratories,
- lacking of the quality assurance programme, criteria for precision/accuracy testing, reference methods, sampling probe siting, recognized NBS/ISO standards and interlaboratory comparisons,
- the use of data acquisition, validation and reporting techniques that are not matched to programme needs.

The air monitoring programme in Latvia is just beginning the process of developing a quality assurance programme that is an essential element of any monitoring effort. In the nearest future we must adopt specific quality assurance requirements within the air monitoring programmes that include at least

- network design,
- standard methodologies,
- quality assurance criteria,
- probe siting criteria.

Quality Assurance System Development

Definite Regulations have been adopted to develop ***National Testing Laboratory Accreditation Programme*** and ***Quality Control Programmes*** in Latvia according European Standards EN 45000, as well as consistent analytical procedures. At present there is established ***National Accreditation Council*** and ***National Accreditation Bureau***, responsible for above mentioned programme coordination and management on national level.

A comprehensive programme to insure both consistency and quality of sampling and laboratory procedures is in development. There are developed documents defining sampling and report protocols, accepted laboratory analytical procedures and required quality control/quality assurance activities.

Since 1990 on regular basis (2-3 times per year) there have been organized ***interlaboratory comparison tests*** by LEDC Laboratory Department for all Regional and plant laboratories carrying out measurements within the monitoring programmes. Since 1993 we have experience in international interlaboratory comparison tests. The most important of them was interlaboratory comparison test within the framework of Helcom Pollution Load Compilation Programme in 1994.

Coordination of the monitoring and quality assurance programmes with other Baltic countries as well as the European Community is essential to insure effect data sharing.

Institutional Framework for Monitoring Programmes

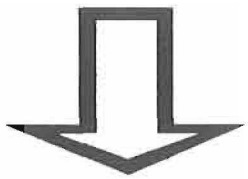
Ministry
of Environmental Protection
& Regional Development
of the Republic of Latvia

Ministry
of Transportation
of the Republic of Latvia

Latvian Environment
Data Centre

State Hydrometeorological
Agency

Regional Committees

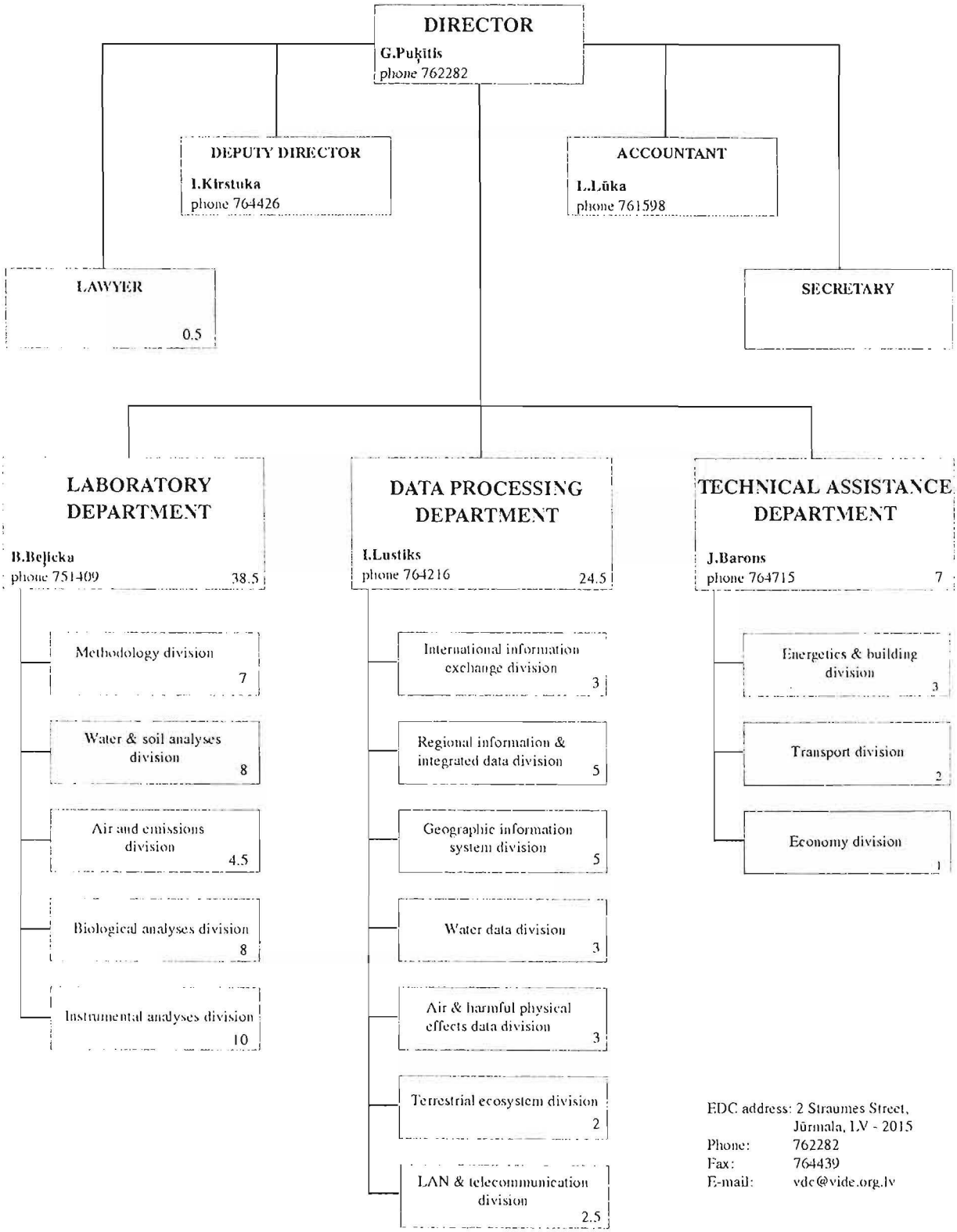


DISCHARGE
monitoring
EMISSION

AMBIENT AIR
monitoring
WATER

LVDC

Latvian Environment Data Centre



EDC address: 2 Straumes Street,
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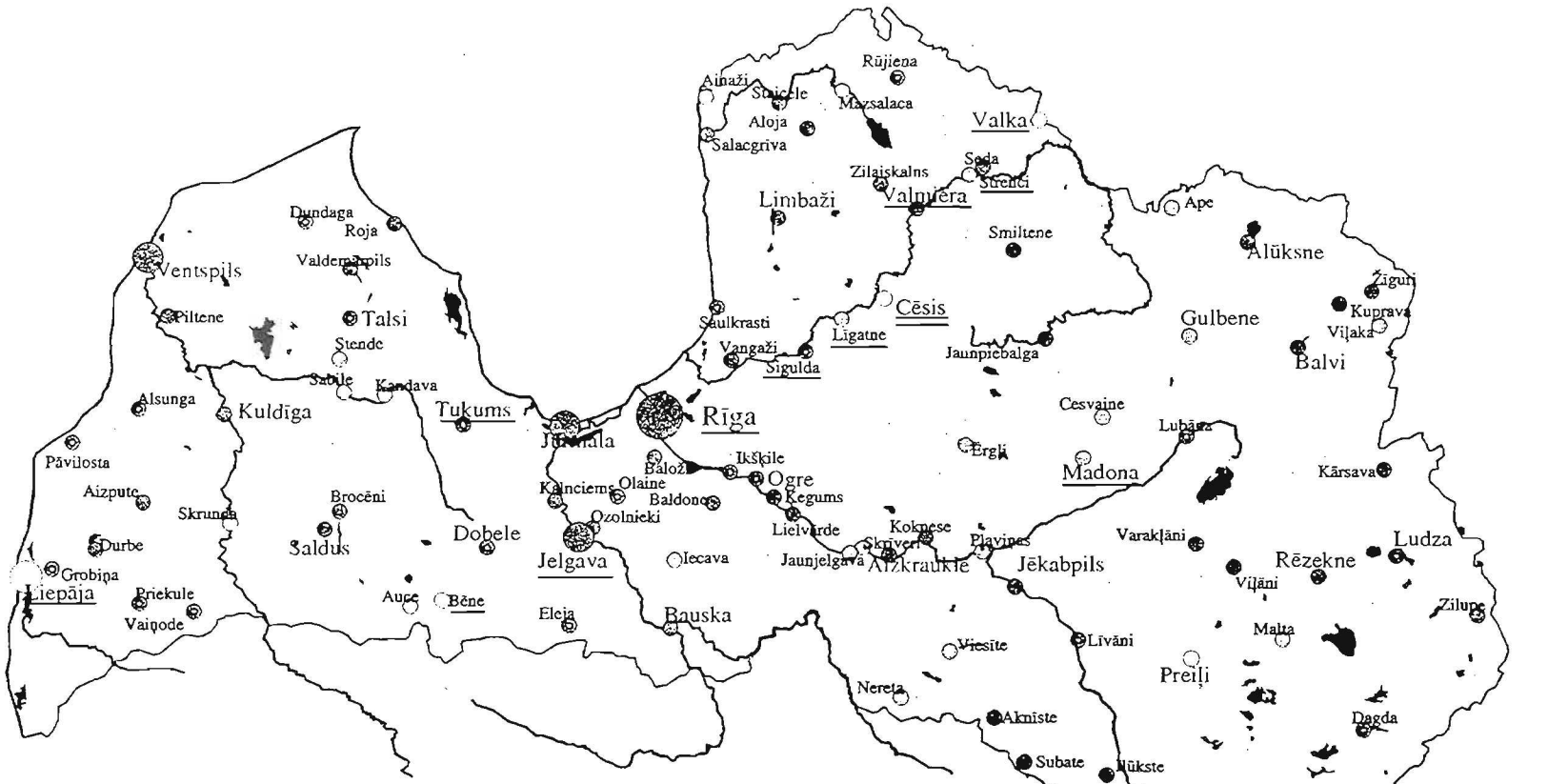
E-mail: vdc@vide.org.lv

Municipal wastewater treatment plants in Latvia, 01.01.93.



BUILDING OF BIOLOGICAL WASTEWATER TREATMENT PLANTS

MUNICIPALITIES WITH MECHANICAL WASTEWATER TREATMENT PLANTS; PARTICULARLY ACTUAL WASTEWATER TREATMENT PLANT EXTENSION BY CHEMICAL AND/OR BIOLOGICAL FACILITIES

OVERLOADED MUNICIPAL BIOLOGICAL WASTEWATER TREATMENT PLANTS

ALL MUNICIPAL WASTEWATERS COMPLETELY TREATED IN BIOLOGICAL WASTEWATER TREATMENT PLANTS

Bēne — STATE FINANCING FOR BUILDING AND RECONSTRUCTION OF WASTEWATER TREATMENT PLANTS IN 1994

Strenči — FINANCIAL SUPPORT OF FOREIGN COUNTRIES FOR BUILDING AND RECONSTRUCTION OF WASTEWATER TREATMENT PLANTS

Latvian Environment Data Centre, Straumes iela 2, Jūrmala, Latvija, LV 2015. Tel.: +371-(2)-762282 Fax: +371-8-820442, +371-(2)-228159 E-mail: vdc@vide.org.lv

WATER POLLUTION CONTROL ACTION PROGRAMMES - EXAMPLES ON BILATERAL AND MULTILATERAL PROGRAMMES

Kaj Bärlund
Director General, Finnish Environment Agency

EURO-WORKSHOP, Helsinki, Finland, 19-20 June
Session 3: Projects and programmes of interest
Tuesday 20 June

Gulf of Finland Year 1996

Gulf of Finland Year 1996 (GOF 96) is a Finnish-Russian-Estonian joint program studying the state of the Gulf of Finland and its developement, the relevance of different loading factors and sources, as well as the possibilities to decrease the discharges. One important task through the whole project is to enhance the reliability and comparability of the water quality data and to improve the exchange of information between the three countries. The Gulf of Finland Year will be carried out between the responsible environmental authorities and research institutes of the riparian countries.

The Gulf of Finland is one of the most polluted basins of the Baltic Sea, especially taking its volume into account. The typical depth in the coastal regions is 20-40 m and the maximum depth is slightly over 100 m. The major part of the pollution load is discharged to the easternmost part of the Gulf (St. Petersburg area). Thus the interaction between this part and the rest of the Gulf is of utmost importance for the condition of the whole basin. Another important factor affecting the state of the Gulf is the water exchange with the Baltic Proper. It regulates, together with weather conditions, the vertical mixing of water masses and, consequently, the oxygen and trophic conditions.

Present state and problems of the Gulf of Finland

Today the high phosphorus and nitrogen load to the Gulf of Finland is the most serious pollution problem. The coastal area as well as some parts of the drainage area of the Gulf of Finland are densely populated and heavily industrialized. There are altogether more than 7 million inhabitants and 24 cities bigger than 10 000 PE (person equivalents) that discharge their wastewater directly (treated or untreated) into the Gulf of Finland. The main industrial branches are pulp and paper, chemical and metal industry. Industrial discharges contain both nutrients and harmful substances e.g. metals and halogenated organic compounds. There are also several big oil, chemical and cargo harbours around the Gulf of Finland. The heavy marine transport cause direct emissions and releases as well as accident risks.

A big part of the pollution load enters the Gulf of Finland via rivers. The riverine load includes discharges from industry and municipalities as well as agricultural and natural runoff. Especially in Finland the share of nutrients from agriculture has risen, while nutrient load from industry and communities has decreased. The input of airborne nitrogen and heavy metals to the Gulf of Finland is significant.

There are severe lacks in the data on the pollution load to the Gulf of Finland. Under the umbrella of HELCOM big efforts were made to compile available information on the pollution load in 1990 to the Baltic Sea. The published data and the primary data files include valuable information, but unfortunately the measurements of especially nitrogen in some of the big rivers were too incomplete to allow reliable estimates of the total load to the Gulf of Finland. Also the estimates from some important direct point sources are probably too rough. In addition to the total pollution load via rivers to the Gulf of Finland more detailed information on the pollution sources within the drainage area is needed to reach the goals of GOF 96.

Due to the high nutrient load the nitrogen and phosphorus concentrations are rather high in the Gulf of Finland. This causes high trophic degree, detected e.g. as increased algal blooms. Phosphorus concentrations have not increased during the last 20 years, but nitrogen concentrations have grown continuously. It is likely that the significant eutrophication process during the 1970s and 198os is due to the rise of the nitrogen concentration, as a result of increased nitrogen load or decreased natural denitrification activity, or both.

FIG. 1. Summer average chlorophyll-a concentrations (relative to phytoplankton biomass)

The blue green algae are dominating in late summer. Blue-green algal blooms occur not only in the easternmost Gulf of Finland, but also elsewhere, typically in late summer after strong winds and mixing of water masses. The potential toxicity of the blue-green algae makes the blooming especially harmful. Also the spring bloom, which is very intensive in the whole Gulf of Finland every year, may contain toxic algae species.

The easternmost Gulf of Finland seems to be able to filter a large part of the loads by fixing nutrients and harmful substances in the living organisms and in the sediments. Generally the concentrations of heavy metals and chlorinated organic compounds in the living organisms have decreased in the Gulf of Finland during the last two decades.

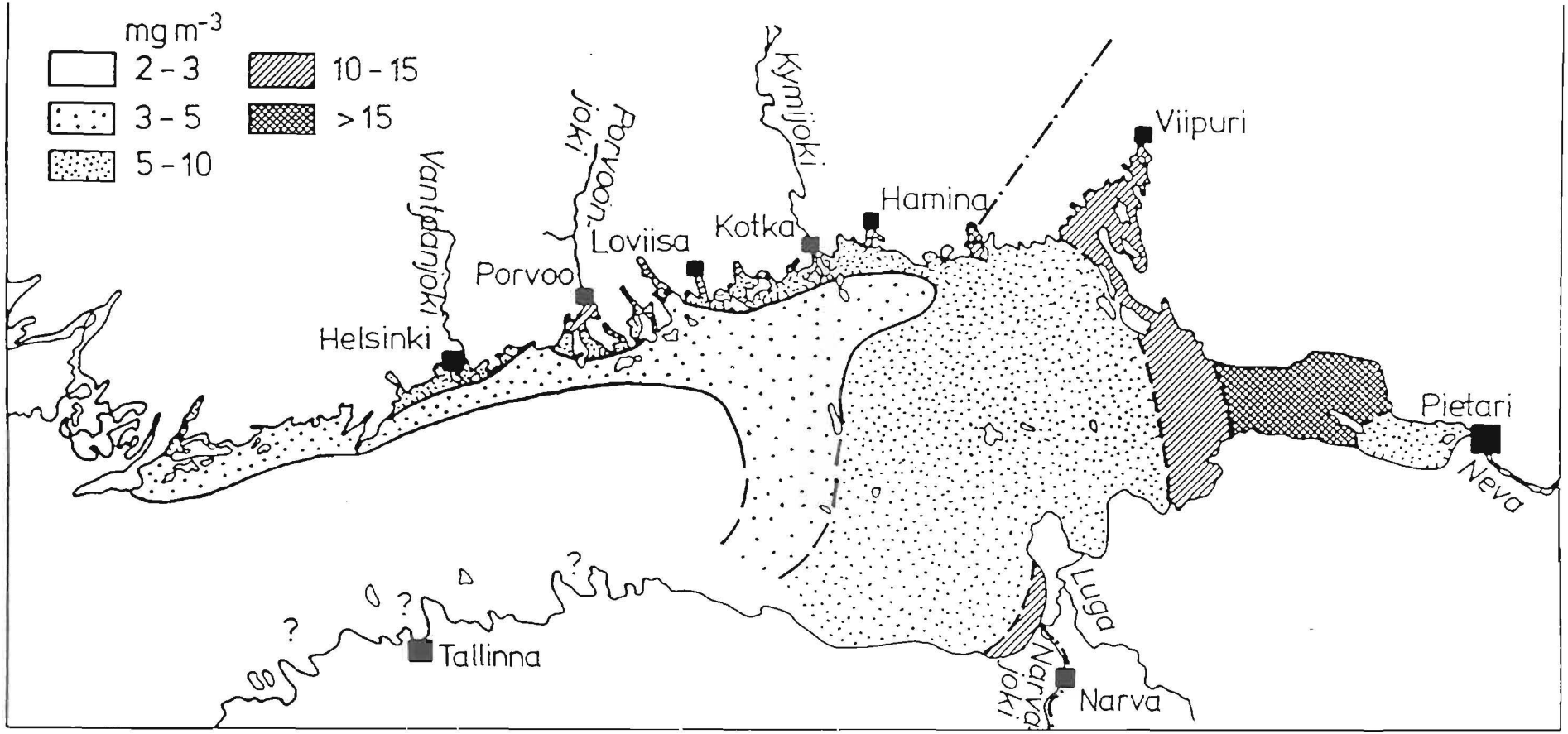


Figure 1. The Gulf of Finland; chl-a concentrations (summer average).

The major tasks of the Project GOF-96

The present state of the Gulf of Finland is clearly unsatisfactory, even alarming. Changes in the industrial and agricultural production as well as in the traffic density will be significant especially in Russia and Estonia but also in Finland. The environmental policy has to create readiness to face the economic growth and to promote an environmentally aware and sound pollution control.

The purpose of the project is to define

* pollution load criteria for a sustainable development in the Gulf of Finland;

* the priorities of pollution control measures.

The GOF-96 project aims at creating a common concept

* of the state of the Gulf of Finland and the factors affecting it;

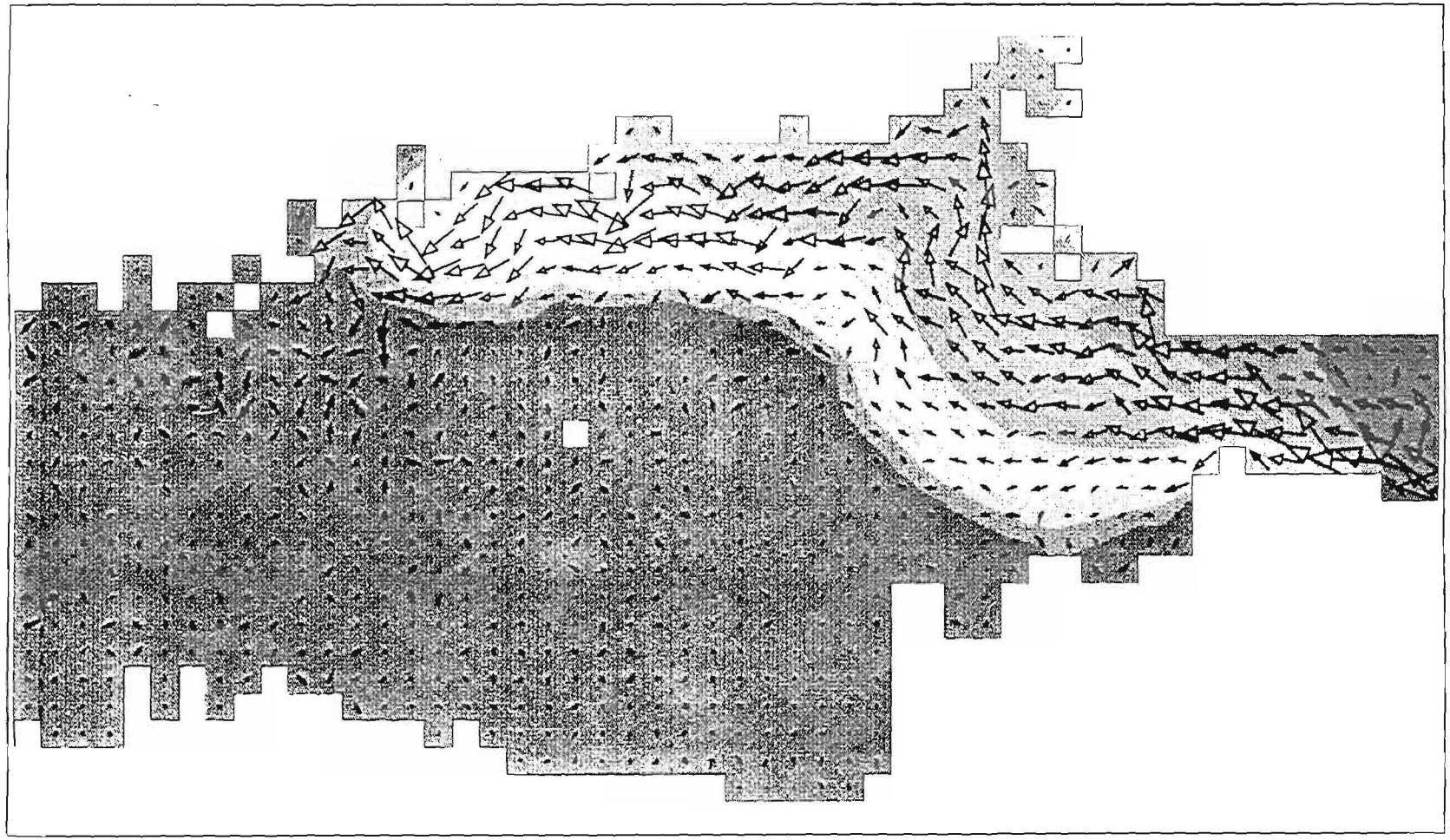
* of the possibilities to reduce discharges.

This work will include collection and evaluation of the existing data and research concerning both the pollution loads and their impacts in the sea. The knowledge of the behaviour of the ecosystem is crucial for correct conclusions on the necessary and effective pollution reduction measures. A persistent collaboration and communication network between the riparian countries will be established. An important step will be the evaluation and unification of the monitoring programs, concerning both the water quality of the sea as well as the pollution loads from diverse origins.

Water ecosystem models will be used for creating a systematic background for data processing, gathering of supplementary data and assessment of the pollution load impacts related to future scenarios. Models build also a framework for demonstrative display of the results. The models are far from being automatic result generators, just the opposite; they will be used in tight contact with field studies and expert evaluation.

Gulf of Finland Year can help to create a uniform and strong Finnish-Russian-Estonian organisation for collecting the existing resources to reach the commonly agreed goals. A pivotal ? task is to set joint priorities for the reduction of the discharges in the Gulf. Especially in that respect we have

to do our utmost to inform the decisionmakers of the research results and the conclusions of the Gulf of Finland Year 1996 Project. In the end, we need strong political committments from three governements in all three countries in order to achieve our most crucial goals.



Annex 1. The Gulf of Finland: flow field under the ice (model result).

COOPERATION ON THE GULF OF BOTHNIA

Rolf Annerberg
Director General, Swedish Environmental Protection Agency

EUROPEAN WATER RESEARCH AND TECHNOLOGU DEVELOPMENT WITH EMPASIS ON COOPERATION IN THE BALTIC SEA REGION

Cooperation on the Gulf of Bothnia
Rolf Annerberg

OH1 havsmiljöbild (Seskarö i Haparanda skärgård)

The Finnish-Swedish cooperation in the Committee for the Gulf of Bothnia has now existed for nearly a quarter of a centaury. People around the Gulf have, however, cooperated ever since the beginning of history. Our close common history is thus one of the reasons for a successful cooperation. Another reason is the great public awareness of the environment in both Finland and Sweden.

OH2 kommitténs uppgifter (enligt avtalet)

As a sign of the joint responsibility for the Gulf of Bothnia, Finland and Sweden in 1972 signed an Agreement of Cooperation. The Institute of Marine Research and the Finnish Environment Agency (at the time the National Board of Waters) in Finland and the Swedish Environmental Protection Agency are partners in the agreement. In Sweden the National Fishery Board, the Swedish Meterological and Hydrological Institute and Umeå Marine Research Centre also actively take part in the cooperation.

The tasks of the Committee are:
1§: to initiate and coordinate research work concerning the Gulf of Bothnia, especially:

- take note of the long-term changes in the hydrochemical, biological and sedimentological conditions
- investigate the state of pollution of the sea
- study the material balances of the sea

4§: to report on activities and research results to the authorities in both countries

OH3 tabell med belastningen av vissa metaller från industrier.

One of the major tasks is thus to compile and present data as a common basis for measures. In 1978 a first report on the total input of nutrients and pollutants to the Gulf of Bothnia was made. The reports has since then been revised regularly.

The reports includes figures on river discharge, municipal discharge, industrial discharge and estimates of atmospheric deposition. This example shows the industrial discharge of some metals (arsenic, chromium, copper, nickel, zinc and cobalt) in 1982 to 1984. Although compiling of monitoring data is necessary, it is, of course, not sufficient. The data must be further analysed and the state of the environment must be coupled to measures. Therefore, several program for decrease of discharges have been presented, for example from the pulp and paper industry in 1988.

OH 4 Presentation av metallrapporten (Valfrid Paulsson och Simo Jaatinen)

This example is from our annual meeting in 1989, when the Committee presented a report on the input of metals to the Bothnian Sea. The headline says: Strong measures against discharges. We see Valfrid Paulsson and Simo Jaatinen, two of the founders of the Committee in the picture. In 1989 and 1993, comprehensive programs for total environment in Bothnian Bay and Bothnian Sea respectively, were also presented to the Nordic ministers for the environment.

Another major task is to initiate and coordinate research. One way of stimulating both bilateral and interdiciplineary research has been the organization of scientific seminars in Vasa 1978, in Luleå 1981, in Pori (Björneborg) 1984, and 1994 in Umeå. Finnish and Swedish scientist have presented their ongoing research at these seminars and their presentations were published in seminar proceedings. Equally important have been the opportunities for informal discussions and exchange of information.

In 1985 the Committee´s work of the prevous fifteen years of cooperation was evaluated. It specially said that:
- the close Finnish-Swedish cooperation has given a more coordinate environmental policy between the countries
- the close coupling between scientists and authorities in the Committee, has given an short step from study to measure
- environmental problems in the Bothnian Sea have been given a higher national priority because they were put on the agenda by the Committee

Although there have certainly been some disagreements between the countries, the positive factors have by far outweigted the negative ones. Our annual Committee meetings are characterized by many pleasant and fruitful discussions in a genuinely warm atmosphere.

OH5 Bottniska viken damen

Finally I will say a few words about what the Committee has focused on in the last years. At the Pori-symposium, in 1984, it was suggested that Finland and Sweden should give special priority to national research to the Gulf of Bothnia during one year - the Gulf of Bothnia Year 1991.

OH6 programrubriker

As result of seminars, a Finnish and Swedish management group outlined frameworks for a research program. The aim of the program was to stimulate co-operation between scientists from both countries and from different scientific disciplines. The aim was also to create a powerful database for future measures against the deterioration of the marine environment. The central issue was to study fluxes of nutrients and pollutants as well as their effects within the marine environment.

The various elements of the programme included:
- input of compounds from the drainage area as well as deposition directly on the sea surface
- physical transport within the marine system and exchange with the Baltic Sea, but also the distribution of pollutants from different sources.
- the ecology, focused on critical chemical and biological processes regulating the internal turnover of nutrients, and especially how the processes changed from south to north and from coast to open sea.
- environmental toxins, especially how they are transported in the food web and their ecological effects.
- stock assessment of fish and studies of the food quality.

In the end, all data was put into a common data base - and ecological modelling was used to synthesise the research.

In 1991, about 100 Finnish and Swedish scientists were engaged in the program. Most of the funding came from the authorities represented in the Committee, but also research councils, local and regional authorities, industry and government put substantial resources into the program.

The results were reported and discussed at a symposium in Umeå last March. It was an open symposium for scientists, industry, regional and local authorities. What did we learn? A few examples:

OH7 tillförsel av miljögifter industri/atmosfär + spridning

The input studies confirmed that point sources are of decreasing importance for the level of pollutants in the sea. To an increasing extent deposition of long range transported pollutants directly at the sea surface is becoming an important source. The upper figures shows decreasing discharge of AOX (Adsorbable Organic Halogens) from paper and pulp industry, and in red the estimated annual input of chlorine by deposition, about 1000 ton per year.

But within the Bothnian Sea substances are also transported to a higher degree than we expected, as shown in the lower figure. Buoys placed close to the cost of Sweden ended up in Finland, instead of drifting southward along the Swedish coast as expected.

OH8 transporter av fosfor till/inom/från Bottniska viken

The huge amount of data collected throughout the year made it possible to estimate an annual budget of nutrients, and we see that phosphorus transported from the Baltic Proper to the Bothnian Sea even exceed the total input from land and atmosphere. Some phosphorus is even transported further north to the phosphorus-limited Bothnian Bay.

OH9 transporter av kväve till/inom/från Bottniska viken

The surplus of nitrogen from the Bothnia Bay is, on the other hand, transported southward to Bothnian Sea. Thus, the Bothnian Sea receives phosphorus from the Baltic proper and nitrogen from the Bothnian Bay. The Bothnian Sea today acts as i sink for nutrients.

OH10 näringsväv

Basic studies have taugth us that there are greater differences in the marine environment between the Bothnian Bay, and the Bothnian Sea, than we had perhaps realised before. The large input of organic material from the rivers in the Bothnian Bay is, via bacteria, brought into the food web. At the same time it colours the water, which decreases the light necessary for phytoplankton growth. Thus in the Bothnian Bay a larger proportion of the food web is, via bacteria, based on riverine organic material than in the Bothnian Sea. As one of the scientists concluded, that is why the Bothnian Bay-herring has a natural flavour of pine - its food chain is mainly based on material from the surrounding forests, instead of on phytoplankton.

In summary:
During the last 25 years the point sources for pollution have decreased drastically, much due to successful measures in both Finland and Sweden. The work of the Committee has contributed to strengthen this process.

Today, both Finland and Sweden are building up comprehensive national monitoring programs. There is a well established network between local authorities and scientists from both countries. Perhaps more emphasis should now be put into increased international cooperation - both on a European and worldwide scale, for problems such as air transported pollutants, and on a regional Baltic scale, for problems such as transports within the Baltic Sea.

We must also face new environmental problems, for example the reproductive failure in fish, which is most well known is the death of salmon fry, which demand a continued input in monitoring and research. It also reminds us to maintain a humble attitude to the environment, and perhaps particularly to the vulnerable ecosystems in the Gulf of Bothnia and other parts of the Baltic Sea.

ACHIEVEMENTS OF THE HELSINKI COMMISSION IN IMPLEMENTING THE BALTIC SEA JOINT COMPREHENSIVE ENVIRONMENTAL ACTION PROGRAMME

Niels-J. Seeberg-Elverfeldt
Helsinki Commission

ACHIEVEMENTS OF THE HELSINKI COMMISSION IN IMPLEMENTING THE BALTIC SEA JOINT COMPREHENSIVE ENVIRONMENTAL ACTION PROGRAMME (JCP)

by Dr. Niels-J. Seeberg-Elverfeldt, Programme Coordinator, Helsinki Commission

Introduction

The Helsinki Commission co-ordinates the implementation of the 1974 Helsinki Convention on the protection of the Baltic Sea. The nine Baltic Sea riparian states and the European Community are Contracting Parties. The Convention covers all possible sources of man-made pollution to the Baltic Sea and makes provision for a whole series of measures to tackle pollution of this highly sensitive, semi-enclosed water body with its brackish water and salinity stratification. The Convention served with its established framework as a model of regional cooperation. Around 80 million people live in the drainage area and 30 million of them lack proper waste water treatment. Eutrophication, toxic and bioaccumulating substances like heavy metals and persistent organic compounds cause major environmental difficulties for the Baltic Sea. The new 1992 Helsinki Convention coincides principally in form and substance with its predecessor but strengthened the obligations of the Contracting Parties. It involves the whole drainage area as far as relevant measures to prevent and eliminate pollution of the sea are concerned. It calls for introduction of Best Available Technology and Practice as well as the Polluter Pays Principle. It reflects developments in international environmental policy and environmental laws since 1974 and takes also nature conservation into account.

Activities

Several committees work within the frame of HELCOM to reduce the pollution of the Baltic Sea: the Environment Committee monitors, evaluates and assesses the state of the Baltic Sea, while the Technological and Maritime Committees develop recommendations aimed at limiting pollution from land-based sources and maritime traffic. The Combatting Committee plans for and organizes Joint Combatting activities and the Baltic Sea Joint Comprehensive Environmental Action Programme shall speed up the process of implementing the above Conventions and restore the Baltic Sea to a sound ecological balance.

The Baltic Sea Joint Comprehensive Environmental Action Programme (JCP)

The JCP was launched by the Baltic Sea Prime Ministers in 1990 and adopted by a Diplomatic Conference in 1992. It is expected to last at least 20 years with the cost of implementation projected at about 18 billion ECU. The long-term Programme for specific actions has six elements:

1. Policy, Legal and Regulatory Measures
2. Institutional Strengthening and Human Resources Development
3. Investment Activities
4. Management Programmes for Coastal Lagoons and Wetlands
5. Applied Research
6. Public Awareness and Environmental Education

The JCP focuses on investment activities to delete point and non-point sources of pollution, particularly 132 hot spots of a mainly industrial and municipal nature identified in its preparation. This JCP element is complemented by the other five elements.

It was prepared on the basis of national plans and pre-feasibility studies covering the entire drainage area of the Baltic Sea. The international financial institutions (IFIs) acted as Executing Agencies for these studies and played thus already in the preparation of the JCP a major role.

HELCOM Programme Implementation Task Force (HELCOM PITF)

A special body - HELCOM Programme Implementation Task Force (HELCOM PITF) - initiates, co-ordinates and facilitates the implementation of the Programme. HELCOM PITF consists of representatives of:

- the Contracting Parties to the Helsinki Convention (Denmark, Estonia, European Community, Finland, Germany, Latvia, Lithuania, Poland, Sweden and Russia);
- Belarus, the Czech Republic, Norway, the Slovak Republic and the Ukraine;
- EBRD, EIB, NEFCO, NIB, and World Bank*) and the International Baltic Sea Fishery Commission as well as
- observer organizations (particularly CCB, CRE, EUCC, ICLEI, UBC and WWF**).

HELCOM PITF shall take a proactive role in the development, implementation and monitoring of the Programme including improved co-ordination at all levels and assure an interactive role with multilateral banks, bilateral financial institutions and/or national, regional, municipal governments, non-governmental organizations and the private sector. The presence of international financial institutions (IFIs), donor and recipient countries alike within HELCOM PITF is particularly apt to serve these objectives. The investment prone cooperative mode of working helps to speed up JCP implementation.

HELCOM PITF appointed Lead Parties (a PITF member country and/or observer organization) for individual JCP elements with the responsibility to co-ordinate activities for JCP implementation.

Status of JCP implementation

General

When looking at the implementation of the JCP in general it can be noted that the creation and implementation of a legal and policy framework needed for effective environmental protection is progressing in the countries in transition in the Baltic Sea region. Regarding the institutional framework and human resources development the countries in transition have or

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*) EBRD = European Bank for Reconstruction and Development, EIB =European Investment Bank, NEFCO = Nordic Environment Finance Corporation, NIB = Nordic Investment Bank)

**) CCB = Coalition Clean Baltic, CRE = Standing Conference of Rectors, Presidents and Vice-Chancellors of the European Universities, EUCC = European Union for Coastal Conservation, ICLEI = International Council for Local Environmental Initiatives, UBC = Union of the Baltic Cities, WWF = World Wide Fund for Nature

have recently established a national ministry of environment. All of these entertain meanwhile quite a number of experts. On the regional and local level many more experts are still needed. Area Task Teams (ATTs) established by a Working Group of HELCOM PITF have started to develop management plans for coastal lagoons and wetlands. For public awareness and environmental education a HELCOM PITF Working Group has elaborated a series of concrete projects, e.g. a campaign to reduce diffuse discharges and TV-broadcasting "Environmental Visions". Nine out of the thirteen priority projects agreed upon have already started with preparatory activities while for three financing has already been secured.

Deletion of point sources of pollution

The following Tables specify progress made. The 9 completed investment activities, i.e. 8 pulp and paper mills in Sweden and Finland and 1 waste water treatment plant in Germany, all comply with HELCOM Recommendations. HELCOM PITF removed those of Finland and Sweden from the list of hot spots, thus leaving 124 of the initial 132. The total of some 2.3 billion ECU reserved or allocated funds equals about 24 % of requisite investments for all hot spots, estimated at almost 10 billion ECU, only after two years of this 20 year Programme. The main part of the allocated and reserved funds is related to municipal waste water treatment and only 23 % to industry.

Status of the Technical Assistance Activity at the Hot Spots [1)]

14 February 1995

Status	Number of Hot Spots				
	Agri-cultural	Industrial	Municipal	Waste treatment	Total
Ongoing	8	12	31	1	52
Needed	5	12	13		30
Completed	3	10	9	1	23
No information	1	16	9	1	27
Total	17	50	62	3	132

1) Technical Assistance
the provision of resources aimed at the transfer of technical and managerial skills and know-how or of technology for the purpose of building up national capacity to undertake development activities, without reference to the implementation of any specific investment project(s)

Status of Investment Activity at the Hot Spots

14 February 1994

Status	Number of Hot Spots				
	Agri-cultural	Industrial	Municipal	Waste treatment	Total
Ongoing	4	9	34	1	48
Needed	12	17	18	1	48
Completed		8	1		9
No information	1	16	9	1	27
Total	17	50	62	3	132

Finances allocated

15 February 1995

	Estimated Investment cost *) Million ECU	Allocated/reserved Resources **) Million ECU
Priority	6381.2	817.3
Total	9841.1	2324.6
Industry	2265.7	539.0
Municipal	4716.2	1624.1
Agricultural	2683.3	138.5
Waste treatment	175.9	23.0

*) The Baltic Sea Joint Comprehensive Environmental Action Programme (Table 5-3, pages 5-33 - 5-38) presented 1993
**) Allocated/Reserved resources are not necessarily immediately available

Clean water supply and consumption determines the ultimate waste water treatment capacity needed and must, therefore, be addressed as well. Basically all municipal waste water projects under the JCP involve clean water supply.

Unfortunately, non-comparability of data and also simply lack of information make it not possible to report precisely on the reduction of the pollution load achieved. On the other

hand, it can be pointed at the results of a recent Danish study which gives an updated estimate of pollution at the 47 priority hot spots identified by the JCP. These data relate to BOD_5, nitrogen and phosphorous.

Here a reduction of the pollution load can be noted as between 1991 when the first pre-feasibility studies in preparation of the JCP were made and 1994 of BOD_5 (about 100000 t/year) and of nitrogen (about 12000 t/year). Regarding phosphorous a reduction cannot be noted.

Deletion of non-point sources of pollution

In January 1995, the Lead Party for Traffic, Germany, has hosted a Workshop on the Reduction of Emissions from Traffic in the Baltic Sea Area with experts from Ministries of Environment and Traffic alike from the Baltic Sea riparian countries. The Workshop has developed a series of proposals to tackle with emissions from traffic, of a strategic, technical and legal nature. Member countries of HELCOM PITF have offered to host seminars on important strategic issues as proposed by the workshop. These initiatives are instrumental for the state of the Baltic Sea as well since the impact of pollution from transportation is very substantial.

Lessons

The JCP identifies requisite activities very concretely. Through the high level political support the JCP implementation could gather momentum from the very outset. Basically all involved learnt quickly that JCP implementation can only be sped up through parallel activities. There is no time to wait with the implementation of one JCP element until the previous is completed. This can be noted best when looking at the hot spot activities undertaken in parallel. Step-wise approaches - it must not necessarily be Best Available Technology at once - and cost effective methods increase the efficiency of pollution load reductions substantially. And it must not always be a hot spot since the sum of small municipalities equally contributes to the pollution of the Baltic Sea. Projects like the EBRD initiative for the Small Municipalities Project in Estonia and a similar project in Latvia are also instrumental for pollution load reductions. The composition of HELCOM PITF helps for easy exchange of information and makes it a forum to mobilize assistance.

Of major support for mobilizing resources to promote the JCP is the continued participation of the international financial institutions within HELCOM PITF, the continuously intensive bi-lateral assistance rendered particularly from HELCOM PITF countries as well as of HELCOM observer organizations. Fortunately, assistance for implementing the JCP has been also rendered by a variety of other countries and organizations.

Regarding major waste water treatment plants co-financing has become instrumental to get these projects under way. Good examples are the projects in Vilnius, Klaipeda, Kaunas, Liepaja, Tallinn and Haapsalu/Matsalu. Here are, besides requisite national resources, the World Bank, NEFCO, EBRD, Denmark, Finland, Sweden, the EU-LIFE and PHARE Programmes, EUCC and WWF engaged as co-financiers. The IFIs with their development aid mandate are mainly managers regarding project preparation, wrapping up of financing

from various sources and control its implementation. This holds true particularly for the World Bank which is engaged in four of the examples given above.

Lack of finances cannot be noted as a constraint. The IFIs claim that the money is there, so do the other banks. Reason for the reluctance to invest in countries in economic transition is predominantly the mostly still very unstable legal and institutional framework. This causes particularly major problems of implementation regarding polluting industries. Their legal status is mostly unclear. Many are awaiting privatization while it is not forthcoming. Environmental liabilities are not exactly defined. For these reasons the important thrust of private investments is missing. In the municipal waste water treatment and clean water supply area tariffs may be set yet remain largely unpaid. The security of refinancing investments is, therefore, undercut. Thus, there is at the moment only one municipal hot spot, namely the Hanseatic city of Rostock (No. 121) which can point at an entirely private solution for its management and construction. Looking at the behaviour of donor countries and partly of IFIs the flow of information is still rather poor. This causes duplication and hinders optimal use of existing resources. Sensible coordination of information at all levels could promote the process of implementation substantially.

MAST REGIONAL SEAS - THE BALTIC SEA

Pentti Mälkki
Director General, Finnish Marine Research Institute

MAST III 1994-1998

AREA A: MARINE SCIENCE

1. Marine Systems Research

2. Extreme marine environments

3. Regional Seas Research

AREA B: STRATEGIC MARINE RESEARCH

1. Coastal and Shelf Sea Research

2. Coastal Engineering

AREA C: MARINE TECHNOLOGY

1. Generic Technologies

2. Advanced systems

AREA D: SUPPORTING INITIATIVES

MAST III 1994 - 1998

AREA A: MARINE SCIENCE

(1) Marine Systems Research

1. Circulation and exchange of water masses

2. Practical and theoretical integrated studies to model and define the resilience of pelagic and benthic ecosystems of marginal seas and ocean basins

3. Studies of marine biodiversity as a basis for understanding ecosystem structure, dynamics and resilience

4. Processes and fluxes across the air/sea interface in order to understand biogeochemical cycles

5. Flux of heat and organic and inorganic matter across the water/sediment interface

6. Sedimentary processes in the deep sea, on the continental slope and at the shelf edge

(2) Extreme marine environments

1. The deep sea floor in the North Atlantic and the Mediterranean

2. The ice-covered seas in the northern hemisphere

3. The surf and swash zone of European coasts

(3) Regional Seas Research

1. The Mediterranean Sea

2. The Baltic Sea

3. The Canary-Azores region and the Alboran Sea (Strait of Gibraltar)

4. The Northeastern Atlantic continental margin

AREA B: STRATEGIC MARINE RESEARCH

(1) Coastal and Shelf Seas Research

1. Coastal processes and morphodynamics

2. Structure and dynamics of shelf ecosystems

3. Methods of monitoring, forecasting and management of shelf seas and coastal zones

(2) Coastal Engineering and Natural Defenses

1. Coastal structures

2. Spaceborne techniques

AREA C: MARINE TECHNOLOGY

(1) Generic Technologies

1. Non-disturbing techniques

2. Underwater communication and orientation

3. Underwater viewing

4. Exploitation of marine biological resources other than fisheries and aquaculture

5. Submarine geotechnics

(2) Advanced systems

1. Unmanned platforms and autonomous systems

2. Oceanographic measurement and sampling equipment

3. Biosensors

AREA D: SUPPORTING INITIATIVES

1. Advanced training (fellowship, courses)

2. Standards for training and work

3. Modelling, ocean data management and quality control for research and operational applications

4. Heavy experimental equipment, research vessels and their modular equipment, large computing facilities and other technical resources in the EEA

5. Design of components and systems for heavy, advanced equipment

6. Calibration techniques and standards for marine instrumentation and observational equipment

REGIONAL SEAS RESEARCH

Objective

To combine comprehensive, interdisciplinary large-scale process studies under a common objective in order to understand the functioning of entire inland seas or specific sub-areas of the eastern North-Atlantic. If there is a need for more scientific understanding, other regional seas than the ones listed may be considered.

THE BALTIC SEA

Quantification of contemporary fluxes of matter and energy including exchange with the North Sea, for a better understanding of the susceptibility of the Baltic Sea to global changes; assessment of evidence for past and present, natural and anthropogenic, changes of the Baltic in order to develop adequate models to explain biotic and abiotic processes which control the system. Objectives should be to achieve a balance between exploitation of resources and sustainability and conservation of the entire system; development of general strategies and tools for integrated (i.e. scientific, technical and socio-economic) coastal zone management. These research tasks will be carried out in close cooperation with the Environment and Climate programme.

THE BALTIC SEA

Quantification of past and present matter and energy fluxes between the different compartments of the Baltic Sea, i.e., between land and sea, between atmosphere, water and sediment, between living and non-living compartments, within food webs:

- Biological productivity and sediment formation in near- and off-shore areas; sediment transport and diagenetic processes;

- Hydro- and thermodynamics of water masses on different time and space scales including exchange with the North Sea;

- Relation between the physical dynamics of water masses and biological, geological and chemical processes; exchange of matter and energy between basins and cross pycnoclines;

- Stability of living communities during short- to medium-term disturbance events in relation to typical diversity patterns in the Baltic Sea; investigation of ecosystem dynamics in hypoxic and anoxic habitats;

- Past and present changes in the structure and productivity of the Baltic Sea ecosystems in relation to external forcing;

- Integrated modelling of all relevant processes and of their interactions in the Baltic Sea.

PROGRAMME ON COOPERATION WITH THIRD COUNTRIES AND INTERNATIONAL ORGANIZATIONS (INCO)

Mirja Arajärvi
Ministry of Education, Finland

I N C O

RTD Cooperation with Third Countries and International Organisations 1994 - 1998

Second activity of the fourth framework programme of the EC for research and technological development

Total budget 540 MECU
+ 7 % increase ?

Aims and principles:
* to add value to EC RTD via targeted cooperation
* synergy with other external EC activities
* dialogue with all parties concerned
* mutual benefit in order to establish long-lasting relations

AREAS OF THE INCO PROGRAMME

A. Scientific and Technological Cooperation in Europe

A.1 Cooperation with other Fora for European Scientific and Technological Cooperation (COST, EUREKA, ESF, CERN, EMBL, ESA, ESRF etc.)

A.2 Cooperation with the Countries of Central and Eastern Europe and with the New Independent States of the the Former Soviet Union

B. Cooperation with Non-European Industrialised Third Countries

C. Scientific and Technological Cooperation with the Developing Countries

INDICATIVE BUDGET OF INCO

A.1	40 MECU
A.2	210 "
B	26 "
C	210 "
Admin.	54 "

A.2 COOPERATION WITH THE COUNTRIES OF CENTRAL AND EASTERN EUROPE AND WITH THE NEW INDEPENDENT STATES OF THE FORMER SOVIET UNION

Main goals:

* to help to safeguard the RTD potential

* to help to solve important social, economic and ecological problems

* to intensify cooperation in RTD fields where these countries are in the forefront on a world level

MEANS OF IMPLEMENTATION

1 Research actions

- joint research projects
(3 - 6 partners, at least 2 of them from different EC countries)

- concerted actions (networks)

2 Supporting measures

- dissemination and optimization of the RTD (establishment of relay centres, facilitation of access to data banks etc.
- taking part in conferences
- coordination meetings
- study and analysis of the scientific potential
- training in projects
- European chairs

3. Synergies and coordination

- concertation with CEEC and NIS in order to define research priorities

- close cooperation with PHARE and TACIS programmes (technical assistance for CEEC and NIS; infrastructure, environment, energy etc.)

- close coordination and cooperation with other EU initiatives in the countries concerned

- exchange of information with the member states

- relations with international organizations for promotion of scientific research and technology

CALLS FOR PROPOSALS

1. September 15, 1995

   deadline December 1995

2. March 15, 1997

   deadline June 1997

Funding for participation in other specific programmes (e.g. ENV 2) is to be applied for according to the rules and time schedules of the specific programme concerned.

OBJECTIVES AND INDICATIVE BUDGET:

	MECU
Stabilization of the RTD potential - joint research projects, networks, stimulation of mobility etc.	50
Environment and health - ecosystems in danger - rational use of energy resources - threats against the environment and public health in particular as a result of major accidents - occupational and work-related health research - research in health care systems - focused biomedical research	80
RTD directed towards industry - advanced communications and telematics - information technologies - materials and industrial technologies - biotechnology - transport	80

THE FINNISH RESEARCH PROGRAMME ON CLIMATE CHANGE

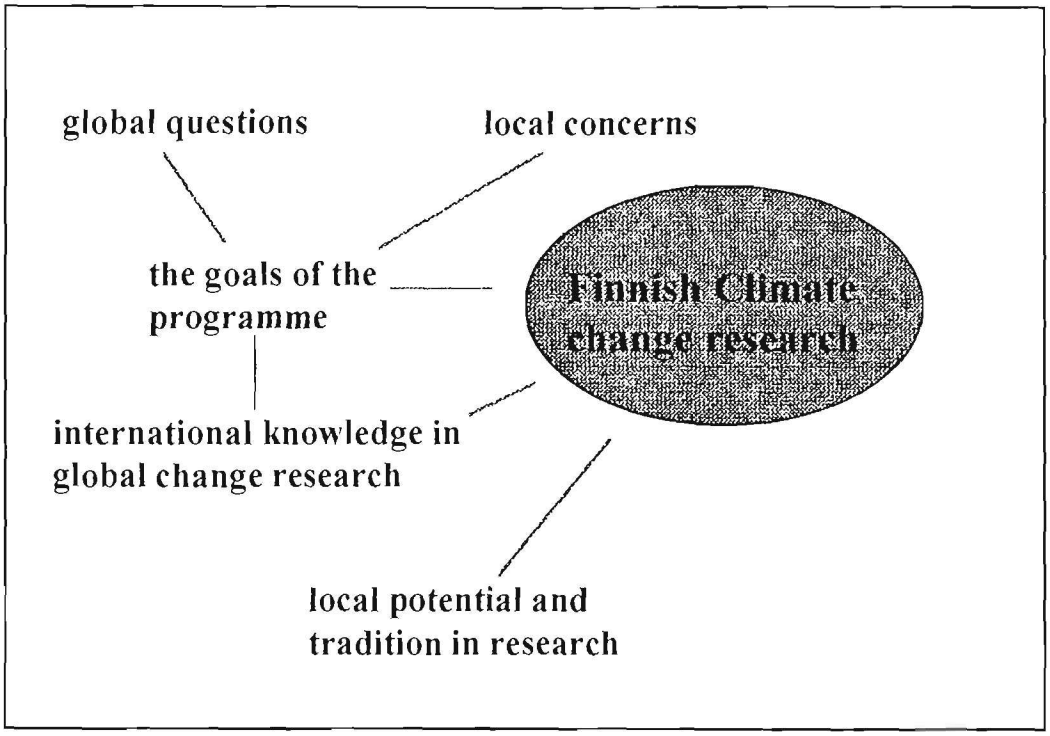
Pirkko Heikinheimo
The Academy of Finland

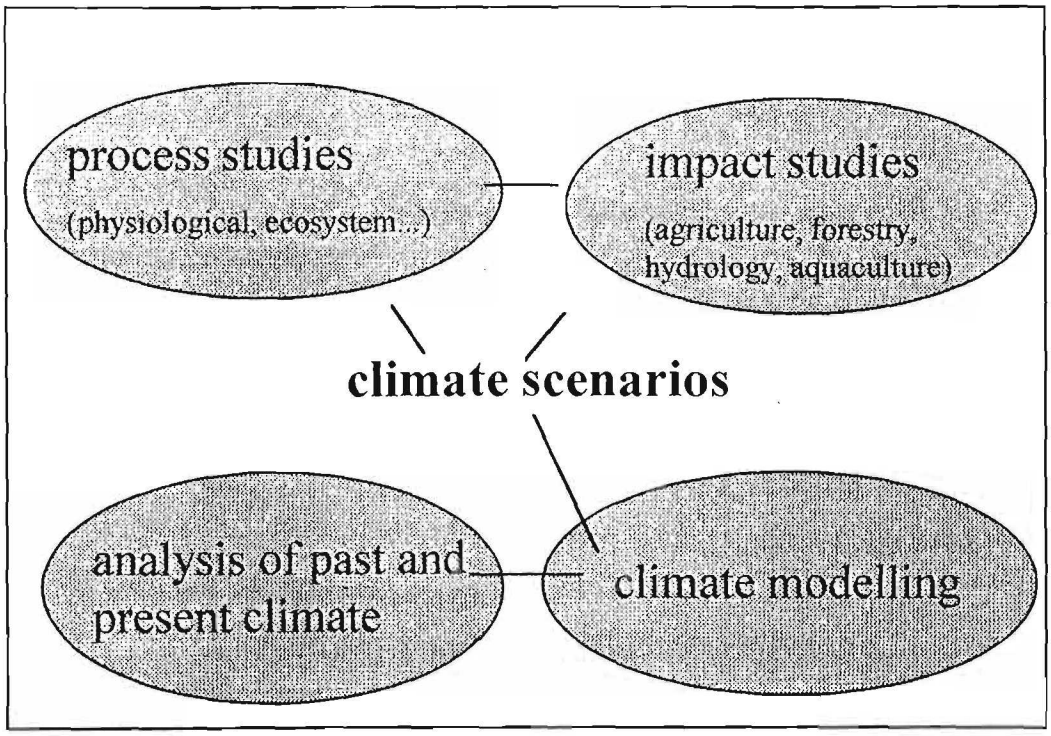
The Finnish Research Programme on Climate Change SILMU

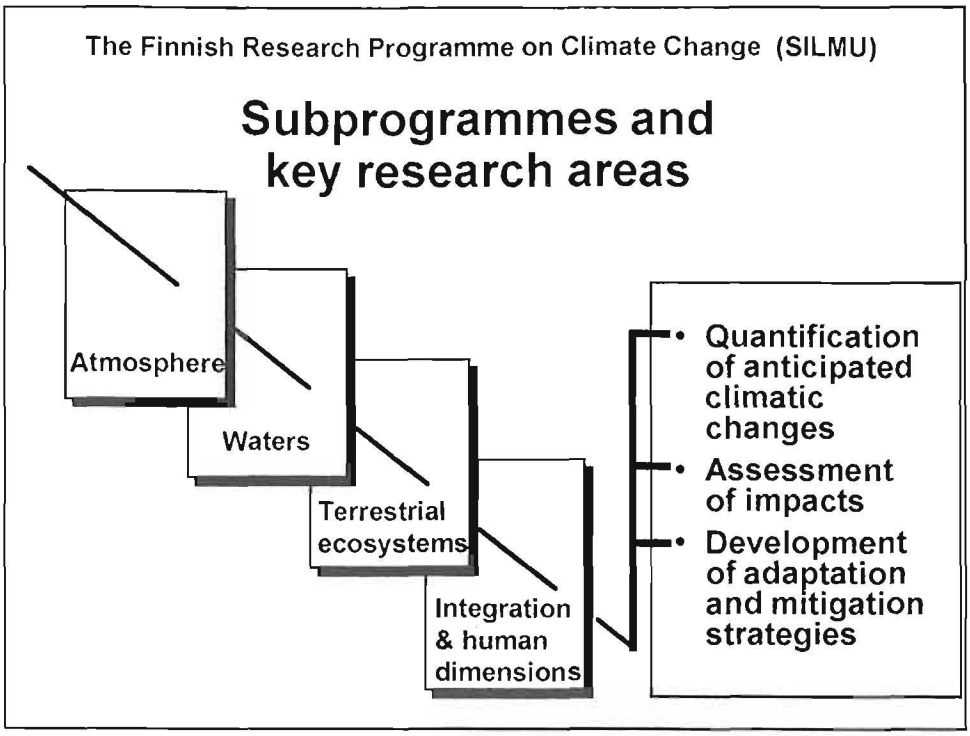
Pirkko Heikinheimo
project secretary /SILMU
Academy of Finland
P O Box 57, FIN-00551 Helsinki

The goals of SILMU

- To increase our knowledge of climate change, its causes, mechanisms and consequences
- To strenghten the research on climate change in Finland
- To increase the participation of Finnish researchers in international research programmes
- To preparate and disseminate information for policy makers for adaptation and mitigation


global questions
local concerns
the goals of the programme
Finnish Climate change research
international knowledge in global change research
local potential and tradition in research


process studies
(physiological, ecosystem...)
impact studies
(agriculture, forestry, hydrology, aquaculture)
climate scenarios
analysis of past and present climate
climate modelling



SILMU in a nutshell

- Six year research programme 1990-95
- Total funding 75 mill. FIM channelled to the Academy of Finland
- Total number of projects 74
- Almost 200 researchers
- Research is carried out in 8 universites and 11 research institutions

Atmospheric studies

- **past climatic changes**
- **long-term observations**
- **climate modelling**
- **scenarios development**
- **aerosol studies**
- **UV / ozone research**

Water studies

- **hydrological cycle**
- **ecology of freshwater lakes**
- **watersheds and catchments**
- **soil-vegetation-atmosphere -models**
- **nutrient cycling and balance**
- **Baltic Sea**

Forests and forestry

- **Production scenarios**
- **Impacts for forest management**
- **Forests as carbon sink**

Peatlands

- **Carbon storage**

Forest ecosystems - simulations

	Increase in temp	Increase in temp and CO2
net photosynthesis	+ 8-10%	+ 10-12%
respiration loss	+ 10-12%	+ 12-14%
transpiration	+ 5%	+5% +

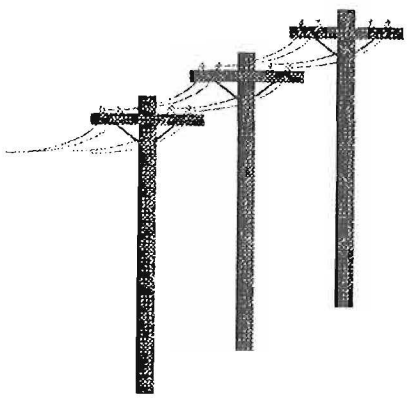
stemwood production + 5-6%

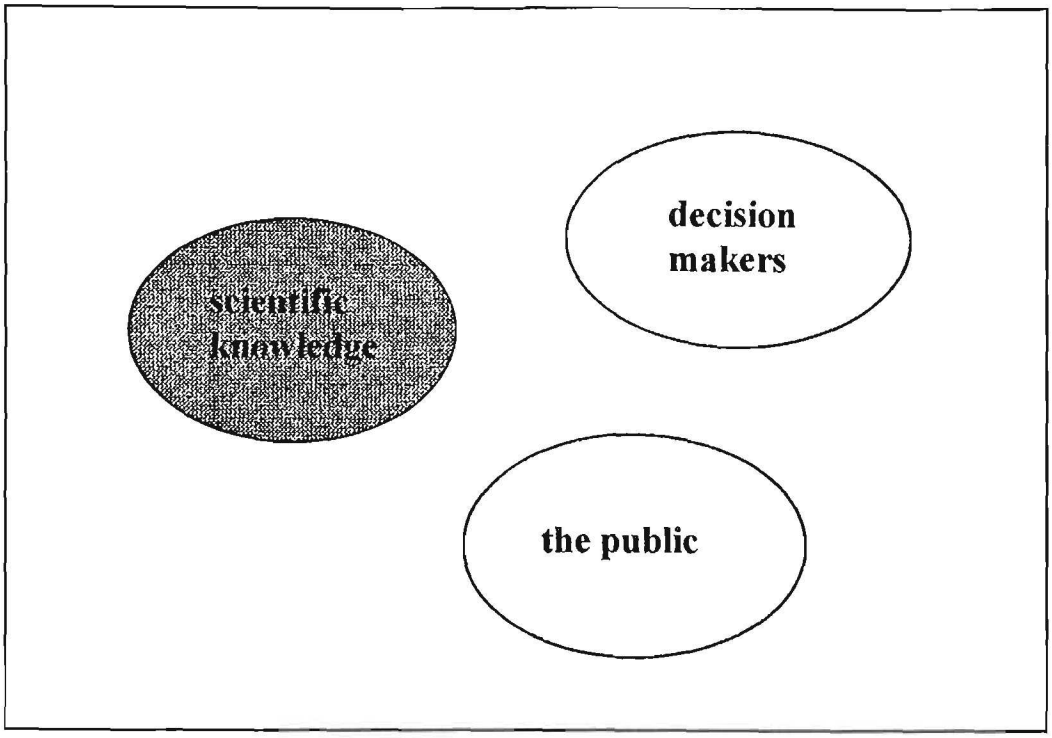
Climate change impacts in agriculture

- increased growth and yield
- use of higher yielding cultivars
- zones of suitability will move northwards
- the overwintering risk of crops will diminish
- the risk of nutrient leaching will increase
- good soil structure may weaken
- pest and disease problems may increase
- plant protection problems

Energy sector

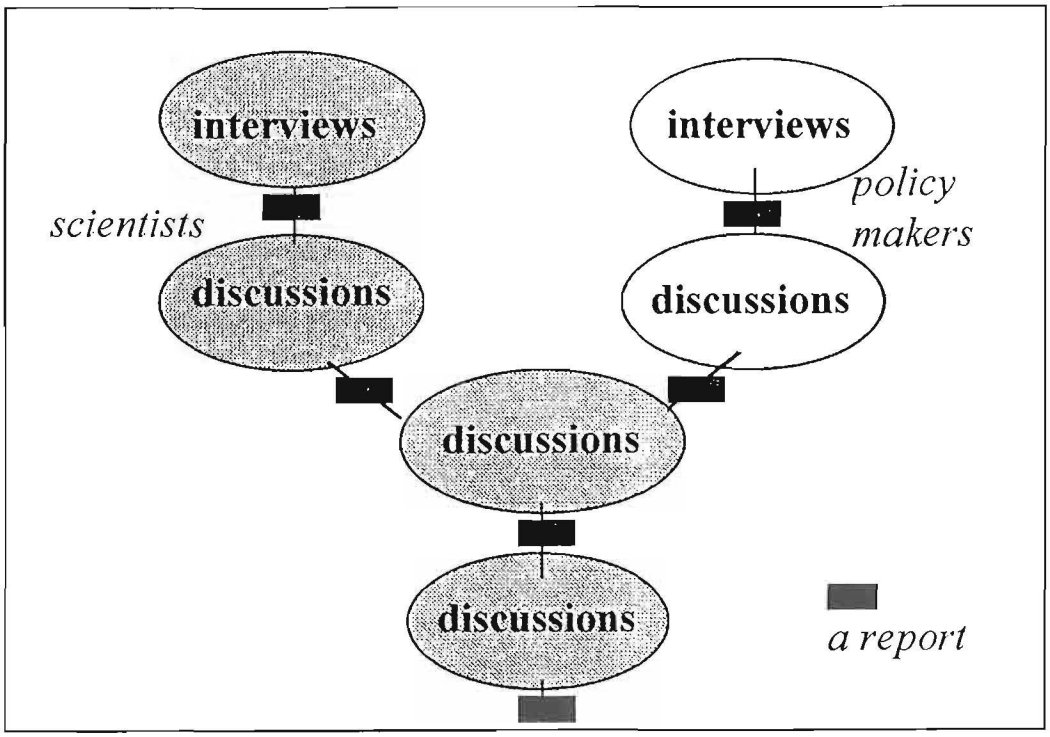
- aim: reduction of CO2 emissions
- CO2 taxation
- forests as CO2 sinks
- bioenergy (+25 %)
- energy saving (-10-15%)
- new decisions with a new government





Interaction project: objectives

- to enhance communication between the scientists, decision makers and societal organizations
- to develop ways for interaction
- to gather insight for the final reporting of SILMU
- to contribute to the development of Finnish climate policies



SILMU scientists' view on the importance of their studies to the decision makers

- **development of climate scenarios: more reliable estimates**
- **methods for the estimation of health risks**
- **analyses of impacts (forestry, agric.)**
- **optimization of climate policies**
- **more effecient use of energy**

Central questions for Finnish decision makers re climate change

- will the climate change and how
- what are the impacts (forestry, peat production etc.)
- what are the ways to reduce emissions
- energy questions
- how to include climate change questions into strategic palanning

Programme integration 1993-1995

- **10 % of the total budget to integration**
- **seven new projects started**
- **five international climate change conferences**
- **integrated planning of final reporting**

WATER PROGRAMMES OF UNESCO AND WMO

Risto Lemmelä
Finnish IHP Committee

INTERNATIONAL HYDROLOGICAL PROGRAMME

Phase IV

(1990-1995)

Hydrology and water resources
for sustainable development
in a changing environment

THE MAIN OBJECTIVE OF IHP IS TO DEVELOP A SCIENTIFIC AND TECHNOLOGICAL BASIS FOR THE RATIONAL MANAGEMENT OF WATER RESOURCES, BOTH AS REGARDS QUANTITY AND QUALITY.

PLANNED IHP-V PROJECTS (Annex 1) 1996 – 2001

THEME 1:	**Global hydrological and geochemical processes**
Project 1.1:	Application of methods of hydrological analysis using regional data sets (Flow Regimes from International Experimental and Network Data Sets/ FRIENDS)
Project 1.2:	Development and calibration of coupled hydroecological/atmospheric models
Project 1.3:	Hydrological interpretation of global change predictions
Project 1.4:	Strategies for water resource assessment and management under conditions of anthropogenic global climate change
THEME 2:	**Ecohydrological processes in the surficial environment**
Project 2.1:	Vegetation, land use and erosion processes
Project 2.2:	Sedimentation processes in reservoirs and deltas
Project 2.3:	Interactions between river systems, flood plains and wetlands
Project 2.4:	Comprehensive assessment of the surficial eco-hydrological processes
THEME 3:	**Groundwater resources at risk**
Project 3.1:	Groundwater contamination inventory
Project 3.2:	Monitoring strategies for detecting groundwater quality problems
Project 3.3:	Role of unsaturated zone processes in groundwater supply quality
Project 3.4:	Groundwater contamination due to urban development
Project 3.5:	Agricultural threats to groundwater resources
THEME 4:	**Strategies for water resources management in emergency and conflicting situations**
Project 4.1:	International water systems - (a) Conflict analysis and resolution; *(b) Development of integrated hydrological information and decision systems for international river basins; (c) Large-scale diversions; systems control, emergency procedures and extreme hydrological conditions*
Project 4.2:	Comprehensive environmental risk and impact assessment
Project 4.3:	Non-structural measures for water management problems

THE MAJOR SCIENTIFIC AND TECHNICAL PROGRAMMES OF THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

THE WORLD WEATHER WATCH PROGRAMME
* Data program centre
* Observation systems
* Telecommunication facilities

THE WORLD CLIMATE PROGRAMME
* Understanding of climate processes
* Assistance in economic and social planning

ATMOSPHERIC RESEARCH AND ENVIRONMENTAL PROGRAMME
* Hazards, global ozone, background air pollution, monitoring networks, physics and chemistry of clouds

APPLICATIONS OF METEOROLOGY PROGRAMME
* Agricultural, aeronautical, marine

HYDROLOGY AND WATER RESOURCES PROGRAMME
* Operational hydrology programme
* HOMS
* UNESCO IHP

EDUCATION AND TRAINING PROGRAMME
* All the programmes
* All levels

TECHNICAL AND COOPERATION PROGRAMME
* UNDP
* VCP
* Trust funds

WMO HYDROLOGY AND WATER RESOURCES PROGRAMME

The programme is concerned with the assessment of the quantity and quality of water resources in order to meet the needs of society, to permit migitation of water-related hazards, and to maintain or enhance the conditions of the global environment.

It includes standardization of all aspects of hydrological observations and the organized transfer of hydrological techniques and methods.

The programme is closely coordinated with UNESCO's International Hydrological Programme.

Operational hydrology programme is framework for all scientific and technical aspects in the field of hydrology and water resources.

The aim of **HOMS (Hydrological Operational Multipurpose System)** is to meet the needs of members for technology transfer in the field of operational hydrology (instruments, technical manuals, computer programmes).

NORDIC HYDROLOGICAL PROGRAMME 1995-1996

1. The use of satellites in hydrological mapping and models (CHIN)

2. Cost-benefit analysis of hydrological data (CHIN)

3. NOPEX (a northern hemisphere climate processes land-surface experiment) (IHP)

4. FRIEND (Flow remiges from international experimental and network data), UNESCO-IHP-IV, project H-5-5 (Plan. IHP-V, proj. 1.1)

5. Analysis and control of precipitation data (KOHYNO).

6. Climate change and energy production (CHIN)

7. Northern Research Basins (IHP)

8. Future groundwater resources at risk (IHP)

9. GIS (CHIN)

10. Spatial and temporal variability and independencies among hydrological processes (KOHYNO)

11. Nordic working group "Hydrology 2010" (KOHYNO)

12. Ecohydrodynamics of shallow eutrophic lakes (KOHYNO)

13. Nordic network on reference watersheds (KOHYNO)

14. An advanced course on "Snow in North European Environment" (KOHYNO)

15. Baltex (Baltic Sea Experiment)(WCRP and GEWEX)

16. Cooperation with the British Hydrological Society (NHF)

DEVELOPMENT OF RTD COOPERATION IN THE BALTIC SEA REGION WITHIN A EUROPEAN FRAMEWORK

Round-table discussion

EURO-WORKSHOP, HELSINKI, 19-20 JUNE 1995
SUMMARY OF THE ROUND-TABLE DISCUSSION

The theme of the round-table discussion was "Development of RTD cooperation in the Baltic Sea region within a European framework". The panel was chaired by **Dr. Lea Kauppi**, Research Director of the Finnish Environment Agency. The members were
- **Professor Andre Van der Beken**, TECHWARE,
- **Professor Ain Lääne**, Tallinn Technical University,
- **Dr. Matti Melanen**, Finnish Environment Agency, and
- **Dr. Niels-J. Seeberg-Elverfeldt**, Helsinki Commission.

Dr. Seeberg-Elverfeldt pointed out that the EU is a member of the Helsinki Commission (HELCOM). PHARE and LIFE programmes can be used to fill in gaps of financing. In this respect, the role of regional coordinators is important. The political and economic change in the Baltic states has brought new aspects to the work of HELCOM. Dr. Seeberg-Elverfeldt also pointed out that it would be very important to get permanent contact persons among EC officers who have both regional and professional knowledge.

Prof. Lääne said that from the point of view of the Baltic states, it would be important to adopt a legislation which is closer to the present European legal structure. This would make international cooperation easier than it is today. Another important goal is to develop an environmental monitoring system that would be more compatible with the current international practice. Prof. Lääne was worried about the fact that the threshold to the EU seems to be very high for the Baltic states. HELCOM is an important organization for the Baltic states, and the role of Germany as a whole is central.

Dr. Melanen stressed the importance of the Environment and Climate Programme. There are several other EU programmes which can be used in financing environmental projects in the Baltic Sea region: MAST, SMT, INCO and the programme on Training and Mobility. The roles of EEA, HELCOM, UNESCO and WMO are also important. As a whole, the programmes form a rather complex system which is not easy to utilize. Today, the states of the Baltic Sea region should influence the 5th FP of the EU. Dr. Melanen defined three levels for studying problems of the Baltic Sea region: (1) local studies (e.g. the Gulf of Finland) which can be financed on a bilateral basis or e.g. through HELCOM (2) the whole Baltic Sea scale and (3) the global change (climate change, biodiversity) level.

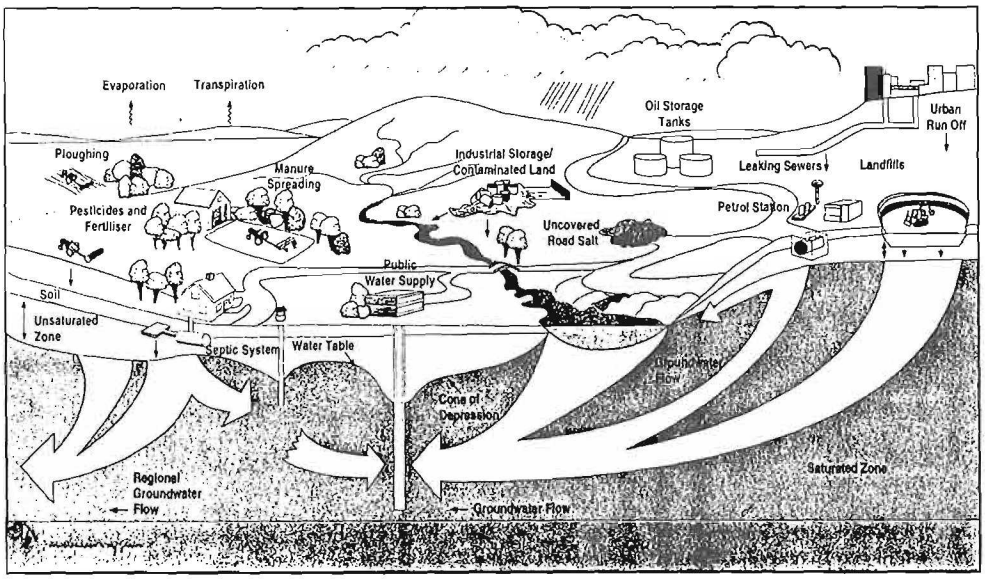
Prof. Van der Beken stated that the 4th FP is unfortunately still bureaucratic in many ways. The programme is targeted to support some of the EU's objectives. In this respect, the research programmes of UNESCO could offer examples of a new approach. The activity area 4 of the FP, training and mobility of researchers, is an important element of flexibility. Prof. Van der Beken pointed out that in addition to the "European dimension", represented by EU projects, bilateral programmes will be needed also in the future to stress local and regional aspects. This is one way of practising the principle of subsidiarity.

Discussions raised the question of linking programmes, which is extremely difficult at the moment. It would be very important to control and manage large and logical entities, but at present strictly defined scopes of various programmes lead to split activities. One problem in the Baltic Sea region is the different status of countries. Much more attention should be directed to the early phase of the projects, i.e. linking of the programmes, networking of research groups, as well as to the implementation of the project products.

MP/30.11.95

SUMMARIZING CONCLUSIONS OF THE EURO-WORKSHOPS

Andre Van der Beken
TECHWARE



"Water is a main component of the earth's surface. Control of the negative effects of water (hazard control) and the use of water for socio-economic activities and sustainable development (water management) is therefore of prime importance for mankind"

Recommendations from **EURO-WORKSHOPS** on Water Policy and RTD Issues

FOURTH FRAMEWORK PROGRAMME OF THE EUROPEAN COMMUNITY

Research, Technological Development and Demonstration programmes (RTD&D) in the water sector will map on to several of the themes of the first Activity in the Fourth Framework Programme.

Cooperation with Third Countries and international organisations will ensure effective use of resources in coordination with RTD supported under the Fourth Framework and national programmes

Dissemination and technology transfer from RTD outputs will facilitate sustainable Integrated Water Management both regionally and for international river basins.

Mobility and training of researchers will occur from using thematic networks of excellence to integrate international, multi-disciplinary teams to drive forward RTD in the water sector.

RTD in the water sector should have objectives which are closely aligned with:

- the 5th Community Programme of Policy and Actions for the Environment and Sustainable Development; and
- Structural Funds to strengthen cohesion with the lagging regions, especially for post-investment and capacity building.

Recommendations of the TECHWARE -EUROWORKSHOPS

The following recommendations are presented in a concise way in parallel with excerpts from the Commission's preparatory documents entitled "Proposal for Council Decisions concerning the Fourth Framework of Community Activities in the field of Research and Technological Development (1994-1998)". These recommendations are presented as information on behalf of TECHWARE and do not commit in anyway the Commission of the European Communities.

Proposals of the 4th Framework Programme

Recommendations

"The overall objective is to contribute to the healthy growth of information infrastructure... to help enhance the quality of life."
"Infrastructure... with telematics for... environmental protection,"
"The work of the programme is directed at ... selected topics which integrate technologies into the systems."

Models of physical and environmental processes need to be integrated with data acquisition, communication and management, GIS operating at an appropriate scale, multimedia and knowledge-based systems to produce hydroinformatics systems. This will consolidate ICT into working systems for understanding and managing the water cycle, a strategic resource which is critical to quality of life.

"... development and application of new design, engineering and production methods..."

New processes need to be developed for treating drinking water to appropriate EC standards as well as improved materials and technology for water distribution systems.

"... integration of new technologies in production workshops..."

New methods for conserving water should be developed for industrial processes and domestic appliances.

"...to contribute to the development of technologies for industrial waste and products"
".. scientific support for the definition of effective standards... for the quality of ... water..."

The development of new technologies and strategies for minimising the levels of wastewater produced from industrial processes should be supported.
Research is needed on the links between water quality and the health of man and of aquatic flora and fauna, to ensure that standards and objectives which are set for drinking, surface and ground water have a firm scientific foundation.

"... protection of ecosystems taking into account the criteria of ecosystem functioning..."

Information is required on how to establish and manage sustainable ecosystem habitats, on the role of sediments in pollutant transport and on both inter- and intra-fish species interactions.
Research should be commissioned on how to evaluate the needs of ecosystems and their dependence on river corridors and flood plains.

"... incorporation of new scientific knowledge into the implementation of Community environmental policy..."

Research is necessary to define frameworks for the efficient implementation of water policy and on the socio-economic dimensions of integrated water management.

"... application of life sciences and technology to agriculture ... and rural development"

Reduction of pollution should be encouraged by developing farming methods which are more environmentally acceptable, by applying treatment technology to farms and by using river-side buffer zones.

"Significant contributions will be made by innovations from generic technology programmes such as ... environment."

"New boat designs should be promoted which minimise river-bank erosion from wash.
RTD should be supported for more efficient engines and diesel-electric propulsion systems.

"Research for a European transport policy..."
"...the integration of each transport mode (...inland waterways) into a coherent multi-modal trans-European network.

The sustainable development of navigation on rivers and inland waterways requires research on fluvial morphology, sediment movement, dredging techniques and the impacts on pollution.

"...to determine the natural state of the ecosystems in relation to physical chemical sedimentological factors etc and to evaluate their sensitivity and resilience vis-à-vis anthropic influences"
"It is appropriate to take into account... waste disposal, urbanisation, abuse of water resources, land use and management and agricultural and forestry practice"

Methods and technologies need to be developed which enable the sustainable management and use of surface and ground waters on a catchment-wide basis through developing integrated catchment management plans, consistent with The Hague Ministerial statement on groundwater (November, 1991).
These plans need to identify and quantify with the aid of macro-scale and meso-scale models: water uses; habitats present; process interactions between physical, chemical and biological parameters; the effects of climate change; land use; and the rehabilitation of contaminated land and groundwater.

It is necessary to... study , understand and monitor ... the environment. This entails developing appropriate diagnostic means and observation, monitoring and modelling..."

Effective flood warning and management requires RTD in the areas of real time control of flood conveyance systems, urban hydrology, soft engineering techniques for environmentally acceptable flood defences and risk based probabillistic design.

"The objective is to contribute... to the development of methodologies and technologies for surveillance, forewarning and for management of natural risks including...floods..."

Development is needed on the methods of environmental surveillance, in particular for field observation to collect data over large areas and for appropriate instrumentation, sensors, collection networks and interpretation techniques for key parameters of ecological and statutory significance.
There is a need to develop systematic methods for validating and benchmarking computational modelling software for surface and groundwaters.

"The consequences on natural resources will be evaluated... concentrating particulary on water resources agricultural production and forestry as well as on fisheries"

Further research is needed into groundwater quality, water re-use, demand forecasting and drought alleviation.
Biomarkers should be developed to characterise the ecotoxicological status of water bodies. Areas of particular concern include sustained periods of low flows, complex discharges and the sensitivity of fisheries to the condition of the water bodies.

"... exchanges between different compartiments of the continental system (terrestrial system, aquatic systems, wetlands and coastal areas) will be taken into account..."

The scientifically appropriate unit for the flows of substances, water and energy is the entire water-basin and aquifer. A systematic approach for understating these transfers needs to be developed further, particularly at the land-water interface, and between surface and subsurface flows.

"... develop the methodological approaches which would make it possible to incorporate the environmental and quality of life parameters into economic performance indicators"

Environmental-economic methods are required for quantifying the ecological value of habitats to ensure that environmental issues are considered alongside engineering and economic factors in water management.

"... scenarios aimed at evaluating the socio-economic implications of strategies of adaption to change... alternative strategies will be considered..."

In assessing the sustainable management and use of water, risk management, institutional and non-structural measures must be evaluated.

"Technology assessment research at Community level... analysis of RTD in Europe in the World context... following... sectoral approaches."

Water being a vector like energy in all socio-economic activities and a main component of the environment, a sectoral approach for the assessment of water RTD should be initiated.

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