ENVIRONMENTAL MONITORING PROGRAMMES IN FINLAND

Environment Data Centre
National Board of Waters and the Environment
Helsinki 1990
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INTRODUCTION

This report on the Environmental Monitoring Programmes in Finland has been compiled on the request of the Finnish Ministry of Environment to provide information on permanent data production within the concept of the planned Environment Information System of the European Environment Agency, EEA, as adopted in Article 4 of the EC Regulation no 1210/90.

As the core of the European System will be formed around the CORINE system of the European Community, the monitoring programmes presented in this report have been grouped according to the main topics of the EEA function and the CORINE.

The monitoring programmes presented represent on-going data collection on environmental issues with respect to national coverage. The programmes have been described with respect to their objectives, variables, spatial and timely coverage. Programmes on repeated control measures on environmental pollution have also been included although they do not represent monitoring programmes sensu stricto. However, mapping activities without intended repetition (e.g. national surveys on soil chemistry and soil types) or other environmental impact statistics (e.g. traffic, agricultural production) have been left out.

The responsible authority, collaborating authorities as well as the data banks on monitoring information are also given in order to facilitate information retrieval.

The information has been compiled to an Environment Report by the Environment Data Centre (EDC). The Centre expresses its cordiest thanks to all those project leaders and/or institutes which have provided information on the programmes.
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Name

Synoptic climate

Objectives

To detect climate change, to provide for weather forecasts, to serve meteorologic information for research and climate depending activities

Responsible authority

Finnish Meteorological Institute

Collaborating authorities

Variables

Air temperature, mean daily temperature, maximum and minimum daily temperatures, precipitation, snow depth, surface conditions, air pressure, relative humidity, wind speed and direction, cloudiness, visibility and weather phenomena

Links to international networks

29 stations in the WMO-synoptic network

Datastorage

Climate database/Finnish Meteorological Institute/VAX3400/Oracle 6.0
Geographical coverage and resolution

150 stations throughout the country

Timely coverage and resolution

Since 1938; daily observations

Map of stations in 1989
Name

Solar radiation

Objectives

To provide information on different radiation to surface and sunshine duration

Responsible authority

Finnish Meteorological Institute

Collaborating authorities

Variables

Global, diffuse and reflected solar radiation, radiation balance and sunshine duration

Links to international networks

Datastorage

Radiation database; Finnish Meteorological Institute/VAX 3400/Oracle 6.0
Geographical coverage and resolution

5 sites for solar radiation and 25 for sunshine duration

Timely coverage and resolution

Since 1950; continuous for every hour

Measuring stations in 1989 [A = radiation stations; B = sunshine duration stations]
**Objectives**

To follow the development of surface temperatures and the vegetation index (NDVI) over Finland from NOAA-AVHRR satellite images; to calibrate parameters of models for areal soil/vegetation/atmosphere interactions and microclimatic change.

**Responsible authority**

National Board of Waters and the Environment

**Collaborating authorities**

Finnish Meteorological Institute

**Variables**

Normalized difference vegetation index (NDVI), surface radiative temperature

**Links to international networks**

EDC Satellite Image Storage; National Board of Waters and the Environment/HP/APOLLO 9000 optical disks
Geographical coverage and resolution

Coverage of southern Finland, Gulf of Finland and northern Estonia (1990), whole country in 1991; resolution by pixel size 1.1 x 1.1 km.

Timely coverage and resolution

Since 1990; daily, when clear sky between 15 May - 30 September.
Name

Stratospheric ozone

Objectives

To study changes in the thickness of the stratospheric ozone layer over Finland

Responsible authority

Finnish Meteorological Institute

Collaborating authorities

Variables

Total ozone, ozone soundings, intensity of UVB-radiation

Links to international networks

Arctic and antartic ozone programme

Datastorage

Stratospheric ozone database; Finnish Meteorological Institute/VAX 3400/Oracle 6.0
Geographical coverage and resolution

1 site/Sodankylä

Timely coverage and resolution

Since 1988, daily recording of total ozone, soundings 1/week
Name
Stationary emissions

Objectives
To survey the regional and timely development of point source emissions to air and to follow up abatement strategies for emission control

Responsible authority
Ministry of the Environment

Collaborating authorities
12 Provincial Authorities

Variables
Particles, sulphur compounds, nitrogen compounds, carbon oxides, hydrocarbons and other volatile organic carbons, metals (altogether some 180 different compounds)

Links to international networks
UN ECE Environmental Monitoring and Evaluation Programme (EMEP)

Data storage
Environment Data System/Emission database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution
About 1300 individual stationary emission sources throughout the country

Timely coverage and resolution
Since 1986; annual sums per emitter

Number of point-sources per region in 1988
Name

Base-line air quality, national

Objectives

To detect changes in air quality of background stations as caused by air pollutants

Responsible authority

Finnish Meteorological Institute

Collaborating authorities

Variables

SO2, SO4, NO3, NH4, Cl, Na, K, Ca, Mg, pH, conductivity, suspended particles

Links to international networks

Datastorage

Finnish Meteorological Institute/PC/Paradox 3.0
Geographical coverage and resolution

5 stations

Timely coverage and resolution

All year round since 1972; sampling frequency 1 month

Sampling stations in 1990
Objectives

To produce information on the long-range transboundary air pollution for administrative and research purposes as well as to follow up the timely development of the background air quality.

Responsible authority

Finnish Meteorological Institute

Collaborating authorities

Variables

- pH, H, SO4, NO3, Cl, NH4, Na, K, Ca, Mg, conductivity of bulk deposition, SO4S of aerosols, SO2, NO2, NH3 + NH4 and O3 (EMEP-stations)
- pH, H, SO4, NO3, Cl, NH4, Na, K, Ca, Mg, conductivity of wet deposition and aerosols (BAPMoN-stations)
- NO3, SO4, NH4, Mg, Pb, Cd, Cu, Zn of bulk deposition (EGAP-stations)

Links to international networks

- UN ECE EMEP (European Monitoring and Evaluation Programme)
- WMO BAPMoN (Background Air Pollution Monitoring Network)
- HELCOM EGAP (Group of Experts on Airborne Pollution of the Baltic Sea)

Data storage

Air quality base-line registers; Finnish Meteorological Institute/PC/Paradox 3.0
Geographical coverage and resolution

8 stations

Timely coverage and resolution

EMEP-network since 1977, BAPMoN-network since 1973, EGAP-network since 1979; sampling frequencies vary between 1 hour and 1 month depending on the variable.

Background stations

▲ BAPMoN
◆ EGAP
○ EMEP
▼ Special program
Name

Municipal air quality

Objectives

To follow changes in air quality in municipalities in general, to assess and plan pollution abatement strategies

Responsible authority

Local air protection authorities

Collaborating authorities

Official (i.a. Finnish Meteorological Institute and State Technical Research Centre) and private consultants, local emitters

Variables

Depending on local requirements: most common SO2, NOX, CO; occasionally O3, odouring sulphuric compounds, organic compounds (i.a. PAH, PANI), heavy metals; wind speed and direction, local emissions, traffic vehicle numbers

Links to international networks


Datastorage

Local registers by municipal authorities; collated and aggregated data in Environment Data System/Municipal air quality database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

Almost 200 municipalities of which active monitoring in 50 - 100; 1-10 sampling points/municipality

Timely coverage and resolution

First started in 1960s; larger towns and important industrial places possess continuous recordings, elsewhere monitoring periods of a few months to a few years; most common resolutions 1 h and 1 day

Municipalities with air quality monitoring in 1987
**Name**

Bulk deposition

**Objectives**

To produce reliable information on the quality of deposition and to calculate air pollution load to water bodies, ground surface and drainage areas.

**Responsible authority**

National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**

Finnish Meteorological Institute, Forest Research Institute, Meteorological Institute of Stockholm University (Sweden)

**Variables**

Precipitation, conductivity, strong acids, pH, SO4, Ntot, NO3, NH4, Ptot, Cl, Na, K, Ca, Mg, TOC

**Links to international networks**

**Data storage**

Environment Data System/Deposition database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

39 stations throughout the country

Timely coverage and resolution

Since 1971; 12 monthly pooled samples/yr

Sampling stations in 1990
Heavy metal aerosol deposition

To repeatedly map the Nordic heavy metal deposition and its changes as reflected by moss samples

Ministry of the Environment

Finnish Forest Research Institute, Botanical Institute of Helsinki University, State Technical Research Centre

As, Cd, Cr, Cu, Fe, Pb, Ni, V, Zn analyzed from mosses (Hylocomium splendens/Pleurozium schreberi)

Nordic Council of Ministers/Nordic Environmental Monitoring Network

Sequential file on PC at University of Helsinki; from 1991 Environment Data System/Immision database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

More than 500 sampling grids throughout the country

Timely coverage and resolution

First mapping in summer 1985, second in summer 1990; repeated inventories with specific intervals

Sampling grid in Norden of 1985
Name
Regional precipitation

Objectives
To provide information on regional flux of water to drainages and consequent use of water resources; to detect climate change

Responsible authority
National Board of Waters and the Environment/Hydrological Office

Collaborating authorities
13 Water and Environment Districts of National Board of Waters and the Environment, Finnish Meteorological Institute

Variables
Precipitation

Links to international networks
The WMO precipitation network

Datastorage
Environment Data System/Hydrological database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

255,820 km², 76 per cent of the area of Finland, 9 stations on an area of 5000 km² on an average

Timely coverage and resolution

Since 1911; daily manual observations from which pentad and monthly values are calculated with the isohyet method for 90-215 regions
**Name**

Snow water equivalents

**Objectives**

To measure the thickness of the snowpack and to calculate its water equivalent for prediction of meltwater effects on water levels in different water bodies.

**Responsible authority**

National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**

Finnish Meteorological Institute

**Variables**

Snow pack depth and its water equivalent

**Links to international networks**

Surface and Atmospheric Airborne Microwave Experiment-project

**Datastorage**

Environment Data System/Hydrological database; National Board of Waters and the Environment/VAX 8.550/Ingres 6.2
**Geographical coverage and resolution**

160 snowlines and 43 snow pack depth stations by the the National Board of Waters and the Environment and 30 stations of the Finnish Meteorological Institute.

**Timely coverage and resolution**

Since 1911; gravimetric determinations 1-2 times/month, depth measurements 6 times/month; the records are calculated for 102-215 regions.
Name

Fresh water surface temperatures

Objectives

To provide information on periodic changes in water surface temperatures for hydrobiological analysis and swimming water conditions

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Variables

Water surface temperature at -10 cm

Links to international networks

Data storage

Environment Data System/Hydrological database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

58 sites throughout the country

Timely coverage and resolution

Since 1911; daily during the ice-free period

Measurement sites in 1989
Name

Pan evaporation

Objectives

To estimate the potential evapotranspiration and the temporal distribution of other evaporation variables.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Finnish Agricultural Research Institute

Variables

Water level in US Weather Bureau Class A pan, precipitation (land-based gauge), wind speed (at 7 stations), water temperature in pan (at 7 stations).

Links to international networks

Datastorage

Environment Data System/Hydrological database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2.
**Geographical coverage and resolution**

22 stations throughout the country

**Timely coverage and resolution**

Since 1957; 1-2 times daily during the frost-free season

Network of pan evaporation stations in 1989
Name

River discharge

Objectives

To provide flow values for mass balance calculations and hydrological resource calculations.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Variables

Flow, water level and discharge curves

Links to international networks

Datastorage

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
**Geographical coverage and resolution**

350 discharge stations of which 150 calibrated water power plants or dams; the rest represent natural river control cross sections.

**Timely coverage and resolution**

Since 1847; daily observations on water levels and discharge curves checked by 300 direct measurements/yr and from water power plant statistics; winter control measurements separately.

Measuring sites since 1982.
Name

Hydrology of small catchments

Objectives

To assess hydrological variables and processes, their changes and affecting factors in small catchments

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Water and Environment Districts

Variables

Runoff, precipitation, water equivalent of snow, ground frost, also air temperature, solar radiation and groundwater table in some catchments

Links to international networks

FRIEND (Flow Regimes from International Experimental and Network Data) - database

Datastorage

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

60 catchments

Timely coverage and resolution

Since 1958; continuous recording devices

Small catchments in 1989
Name
Real-time data collection system on water resources.

Objectives
To provide real-time data on water-level changes in basins and rivers sensitive to floods; for calibration of flood forecasting by modelling, for calibration of expert system for water body regulations.
To improve hydrological service.
To control water quality in rivers.

Responsible authority
National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities
Water power producers, Municipal water works

Variables
Water level, discharge, water temperature, pH, oxygen content, conductivity

Links to international networks

Datastorage
Environment Data System/Hydrological database; National Board of Waters and the Environment/VAX 8550/PROCOL
Geographical coverage and resolution

36 automated stations (1990)

Timely coverage and resolution

Since the middle of 1980s; continuous measuring, recording 1-4 times/hour
Manual water level observations

**Objectives**

To provide information on water level changes in drainage basins; for assessment of hydrology in water construction works, flood forecasting and calibration for water body regulations.

**Responsible authority**

National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**

1.3 Water and Environment Districts, National Board of Survey

**Variables**

Water level

**Links to international networks**

**Datastorage**

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

563 stations throughout the country of which 216 by other organizations than the National Board of Waters and the Environment

Timely coverage and resolution

Since 1847; 197 stations are read off daily, 150 limnigraphs provide for level curves of one two weeks, statistics from collaborating organizations

Network of manual water-level stations of the NBWE since 1983
Groundwater table

**Objectives**

To provide information on changes in the groundwater table of different aquifers and to relate observed changes in climatic fluxes; to evaluate and predict drought periods.

**Responsible authority**

National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**

1.3 Water and Environment Districts

**Variables**

Groundwater level

**Links to international networks**

The Nordic groundwater monitoring network

**Datastorage**

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

54 recording stations, 10 tubes each

Timely coverage and resolution

Since 1973; 2 times/month

Network of stations in 1989
**Name**
Soil frost depth

**Objectives**
To follow the development of soil frost for basic information in construction works, forestry, agriculture and domestic heating

**Responsible authority**
National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**
Upper and lower soil frost level, snow depth (open land, forest and bogs)

**Variables**
Soil frost depth, snow depth

**Links to international networks**

**Datastorage**
Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
**Geographical coverage and resolution**

40 stations equipped with 200 recording tubes

**Timely coverage and resolution**

Since 1968; 3 times/month during the frost season (normally October-May)

Network of soil frost stations in 1989
Name

Cryophenology

Objectives

To provide information on changes in ice formation and ice break-up with respect to climatic change; to accomplish for hydrometric corrections in water levels

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Variables

Dates of following events: ice on shore, ice cover in bays, ice within risable range (first time), final freeze-up (beginning of longest total ice cover period), open water on shore, open water offshore, ice in movement, total disappearance of ice

Links to international networks

Datastorage

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution
Ca 600 stations throughout the country associated with water-level recordings of large watercourses

Timely coverage and resolution
Since 1693; complete program since 1960, annual observations

Network in 1989
Name

Ice thickness of fresh water courses

Objectives

To provide for information on changes in ice conditions of fresh water courses

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Variables

Total ice thickness, snow ice thickness, snow thickness on ice, water thickness on ice

Links to international networks

Data storage

Environment Data System/Hydrological database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
**Geographical coverage and resolution**

76 stations in the biggest lakes (water courses) of Finland

**Timely coverage and resolution**

Since 1911; 1/10 days during the ice cover period

Network 1989
Name

Industrial wastewater pollution

Objectives

To assess effluent quality and quantity of wastewater; to supervise permit conditions; to assess treatment plant performance.

Responsible authority

National Board of Waters and the Environment

Collaborating authorities

13 Water and Environment Districts

Variables

Flow, COD, BOD, suspended solids, P, N, hydrocarbons, AOX, metals and some others depending on the branch.

Links to international networks


Datastorage

Environment Data System/Industrial sewage database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
<table>
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<th>Geographical coverage and resolution</th>
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<td>Some 350 industrial plants throughout the country with some 1500 control sites</td>
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<table>
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<th>Timely coverage and resolution</th>
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<td>Since 1988; continuous sampling at big plants, 2-6 times/yr at small plants</td>
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Fish farming sewage pollution

Objectives

To assess effluent quality and quantity of sewage.
To assess the effects of fish farm pollution load on the recipient.

Responsible authority

National Board of Waters and the Environment

Collaborating authorities

13 Water and Environment Districts

Variables

Varying by farm: most common are water visibility, temperature, O2, pH, conductivity, water colour, Ptot, PO4P, Ntot, NH4N, NO3N, turbidity, suspended load, fecal and coliform bacteria, fecal streptococci, Fe and a-chlorophyll; at some farms also experiments on sliming of rets, periphyton and benthic fauna monitoring and economic fish stock assessment

Links to international networks

Datastorage

Environment Data System/Fish hatchery sewage database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

Some 350 fish farms throughout the country

Timely coverage and resolution

Initially since the beginning of the 1960s, most hatcheries since the middle of the 1970s; all year round monitoring - but most intensively during the period May - September; pollution control normally 1-2/month during production season, recipient control normally 1-4 times during May-September and 1-2 times during October-April.

Fish farm distribution in 1987
Name
Municipal sewage pollution

Objectives
To assess affluent quality and quantity of municipal sewage, to supervise permit conditions, to assess treatment plant performance

Responsible authority
National Board of Waters and the Environment

Collaborating authorities
1.3 Water and Environment Districts, water protection associations and other consultants in the field of water pollution and protection.

Variables
Most important are BOD, P, N, NH₄

Links to international networks

Datastorage
Environment Data System/Municipal sewage database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
**Geographical coverage and resolution**

Some 580 municipal sewage treatment plants throughout the country.

**Timely coverage and resolution**

Since the beginning of the 1960s, control sampling varying between 1/month to a few times/yr depending on the size of the treatment plant.
Name

Water quality of lake deeps

Objectives

To study water quality profiles of the deepest parts of economically and naturally important lakes and to assess if possible changes are caused by pollution load.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

13 Water and Environment Districts

Variables

- pH
- Conductivity
- Alkalinity
- Colour number
- a-Chlorophyll
- Temperature
- O2, Oxygen saturation
- COD,MN, NO2, NO3, NH4, PO4
- Ntot, Ptot
- Cl, Fe, Mn, Sr, K, Mg, Na, SiO2, DOC, NO3N, NH4N, PO4P

Links to international networks

2 stations in the UNEP GEMS Water network, 1 station in the UN ECE ICP Assessment and Monitoring of acidification of rivers and lakes network

Data storage

Environment Data System/Water quality database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
**Geographical coverage and resolution**

176 sampling sites throughout the country

**Timely coverage and resolution**

Since 1962; sampling normally 2 times/yr, at GEMS stations 4 times/yr; at regional monitoring lakes (chosen by the districts) 1/month

Monitoring sites in 1989
Name

Water quality of streams

Objectives

To study the water quality of large streams for assessing if changes caused by pollution load occur.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

13 Water and Environment Districts

Variables

Hach-turbidity, conductivity, alkalinity, colour number, temperature, O2, oxygen saturation, pH, COD_MN, Ntot, Ptot, Cl, Fe, Mn, Stot, Se, K, Mg, Na, Ca, Al, SiO2, DOC, suspended load, coliform bacteria and fecal streptococci

Links to international networks

3 stations in the UNEP GEMS Water network

Datastorage

Environment Data System/Water quality database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

187 sampling sites throughout the country

Timely coverage and resolution

Since 1962, sampling 4/yr between March-October

Monitoring sites in 1989
**Objectives**

To assess changes in water quality of drainages common to SE-Finland and the Soviet Union, of the Tenojoki river between Finnish and Norwegian Lapland and the Tomionjoki river between Finnish and Swedish Lapland.
**Geographical coverage and resolution**

4 sites in SE-Finland, 1 site in Tenojoki and 3 sites in Tornionjoki

**Timely coverage and resolution**

Since 1966: sampling 4/yr (March, June, August, December; except for the Saimaa channel, where May, June, July, August)
Name

Acidification of small water-bodies

Objectives

To assess the impact of acidification on small water-bodies (natural lakes, brooklets, small drainages)

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Finnish Game and Fisheries Research Institute

Variables

Temperature, O2, conductivity, pH, Gran-alkalinity, alkalinity, colour number, COD_MN, TOC, Ntot, Ptot, Fe, Mn, Cl, SO4, NO3, NH4, F, Na, K, Ca, Mg, Al(by AAS), Al-fractions, SiO2

Links to international networks

4 stations in the UN ECE ICP Assessment and Monitoring of acidification of rivers and lakes - network

Datastorage

Environment Data System/Water quality database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution
Throughout the country; 28 lakes since 1979, 160 lakes since 1990; hydrobiological studies in ca 10 lakes; possibly (from 1991 onwards) some small drainages without lakes

Timely coverage and resolution
Sampling 1/yr during autumn turnover; 2-4/yr at ECE ICP-stations; diatom sampling 1/autumn, benthic fauna 2/yr (in spring and fall)
Name
Transport of suspended and soluble material from land areas

Objectives
To assess the mass fluxes and their changes from small drainage basins caused by agri- and silviculture and acidic deposition.

Responsible authority
National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities
1 3 Water and Environment Districts

Variables
In forest and agricultural areas: Hach-turbidity, alkalinity, temperature, pH, Ntot, NO\textsubscript{3}N, NH\textsubscript{4}N, Ptot, P\textsubscript{O4P}filtered, TOC, suspended solids; additionally in forested areas only: colour number, COD\textsubscript{an}, Fe, Mn, Grav-alkalinity, K, Cu, Mg, Na, SO\textsubscript{4}, Cl, Alfractions, F

Links to international networks

Datastorage
Environment Data System/Water quality database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
**Geographical coverage and resolution**

13 small watersheds

**Timely coverage and resolution**

Since 1962; sampling 1/week in spring, 2/month in autumn, in some basins automatic flow-weighted sampling.

*Monitoring sites in 1989*
Air quality, water quality, the state of the soil, land use and natural resources, waste management, noise emission, chemical substances, coastal protection

**Name**

Soil water quality

**Objectives**

To detect changes in soil water chemistry due to anthropogenic impact

**Responsible authority**

National Board of Waters and the Environment/Water and Environment Research Institute

**Collaborating authorities**

1.3 Water and Environment Districts

**Variables**

In lysimeters and percolation tubes: pH, conductivity, alkalinity, Ntot, NO3N, NH4N, Ptot, PO4P, Fe, Mn, Ca, Na, K, Mg, Cu, Ni, Pb, Cd, Al, SiO2, TOC; additionally Cl, F and Hg in lysimeters only

**Links to international networks**

**Datastorage**

Environment Data System/Groundwater database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

percolation tubes: 7 sampling sites
lysimeters: 31 sampling sites

Timely coverage and resolution

Since 1978-80

Monitoring sites in 1989
Name

Groundwater quality of soil aquifers

Objectives

To detect changes in groundwater chemistry and infiltration water due to anthropogenic impact

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

13 Water and Environment Districts

Variables

In groundwater and snow: pH, conductivity, alkalinity, Ntot, NO3N, NH4N, Ptot, PO4P, Fe, Cl, SO4, Mn, Na, K, Ca, Mg, Cu, Ni, Zn, Hg, Pb, Cd, Al, SiO2, F

Links to international networks

Datastorage

Environment Data System/Groundwater database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

47 sampling sites throughout the country

Timely coverage and resolution

Since 1975-78; sampling 2/yr
Name

Effect of soil excavations on groundwater quality

Objectives

To detect changes in groundwater chemistry as caused by excavation of soils

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

Geological Survey of Finland, The Finish National Road Administration

Variables

Temperature, O2, colour number, conductivity, CO2, alkalinity, pH, permanganate, NO3N, NH4N, PO4P, Cl, SO4, SiO2, Ca, Mg, total hardness, Na, K, Fe, Mn, Al, a-chlorophyll (of surface reaching groundwater pools)

Links to international networks

Datastorage

Environment Data System/Groundwater database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

25 groundwater sampling sites, 10 lysimeter sites and 4 groundwater pools throughout the country.

Timely coverage and resolution

Since 1984; sampling 2/yr
### Name

Groundwater level and quality of rock aquifers

### Objectives

To follow changes in water level and quality of rock aquifers under different geological regimes.

### Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

### Collaborating authorities

1.3 Water and Environment Districts, Geological Survey of Finland

### Variables

Groundwater level, pH, alkalinity, Ntot, NO₃N, NH₄N, Ptot, PO₄P, Fe, Cl, SO₄, Mn, Na, K, Mg, Cu, Ni, Zn, Hg, Pb, Cd, Al, SiO₂, DOC, F, As

### Links to international networks

The Nordic geohydrological network

### Data storage

Environment Data System/Groundwater database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

16 bedrock well sites

Timely coverage and resolution

Since 1989; level measurements 2/month; chemistry sampling 4/yr

Monitored wells in 1989
Water quality in water works

**Objectives**

To assess water quality, detect possible pollutants and supervise water resources of i.a consumption water

**Responsible authority**

National Board of Waters and the Environment, National Board of Health

**Collaborating authorities**

Municipal and private water works serving > 200 inhabitants

**Variables**

Biological: Coliform bacteria, Fecal coliform bacteria, (Fecal streptococci), Aerobic mesophilic bacteria  
Cations: As, Cd, Cr, Hg, Pb, Al, Fe, Mn, NH$_4$  
Anions: CN, F, Cl, NO$_2$, NO$_3$  
Others: pH, CO$_2$, colour, turbidity, COD$_{nr}$, Cl$_2$, odour, alkalinity, total hardness

**Links to international networks**

**Datastorage**

Environment Data System/Water works database; National Board of Waters and the Environment/VAX 8.550/Ingres 6.2
Geographical coverage and resolution

About 670 water works (90% of water works serving > 200 inhabitants) throughout the country.

Timely coverage and resolution

Since 1969; official sampling 4-50/yr (depending on size of water works).
Name

Effect of climate and air pollution on forests

Objectives

To determine the effect of climate change on forest ecosystems; to detect cause-relationships between air pollutants and forest changes; to plan abatement strategies for forest deterioration

Responsible authority

Finnish Forest Research Institute

Collaborating authorities

Finnish Meteorological Institute, Geological Survey of Finland, National Board of Waters and the Environment, several universities

Variables

State of forests, damage to forests, bioindicators i.a. epiphytic lichens (3009 sites); forest increment (50000 sites); N, S, P, K, Na, Mg, Cu, Mn, Zn, Pb, B, Ca of needles (150 sites); major ions in throughfall (30 sites); major ions in soil water (30 sites); major ions in groundwater (30 sites); soil chemistry (450 sites)

Links to international networks

ECE ICP Assessment and Monitoring of Air Pollution Effects on Forests

Datastorage

State of Forest Database/Forest Research Institute/VAX 6210/Ingres 6.2
**Geographical coverage and resolution**

Extensively and intensively throughout the country

---

**Timely coverage and resolution**

Since 1985; varying depending on subprogramme: every 5 years (lichens & soil chemistry); every year (state of forest ecosystems); monthly during growing season (litterfall); 14 days (throughfall)

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Different levels of used sampling networks (A = 50000 randomly chosen inventory plots, B = 3009 permanent sampling plots, C = 600 extensive sampling plots, D = 100 intensive sampling plots)
Objectives

To monitor the extent and pace of forest damage in Lapland along assumed pollution gradients from large emitters.

Responsible authority

Finnish Forest Research Institute

Collaborating authorities

The universities of Helsinki, Turku, Joensuu, Kuopio and Oulu, Finnish Meteorological Institute, Geological Survey of Finland, National Board of Waters and the Environment, Arctic Centre

Variables

Soil water chemistry, tree health and vitality, needle chemistry, roots and mycorrhiza lichen and bryophyte taxonomy and chemistry, tree and stand characteristics

Links to international networks


Datastorage

State of Forest Database; Forest Research Institute/VAX 6210/Ingres 6.2
**Geographical coverage and resolution**

Pollution source-centred gradient sampling lines including 430 plots in Finnish Lapland and 100 plots on the Kola peninsula.

**Timely coverage and resolution**

Since 1990; varying depending upon subprogramme, between 1 yr to 1 month.
Integrated effect of air pollutants on ecosystems

Objectives

To identify effects of air-borne pollutants on ecosystems, cross-media pathways and transport of pollutants; to evaluate changes in ecosystem stability and to predict critical loads and assess the effect of reduction of emissions.

Responsible authority

Ministry of the Environment

Collaborating authorities

National Board of Waters and the Environment, Finnish Meteorological Institute, Finnish Forest Research Institute, the Universities of Helsinki, Turku, Jyväskylä and Oulu, Geological Survey of Finland, Finnish Game and Fisheries Research Institute

Variables

Sulphur, nitrogen compounds, carbon, base cations, Cl: in air, precipitation, surface water, soil water, groundwater and soil; meteorological and hydrological variables; biological variables (i.e. species, coverages, fertility, vitality, population and pollution sensitivity indices) - optional for metals, persistent organic compounds and ozone

Links to international networks

UN ECE Pilot Programme on Integrated Monitoring

Data storage

Integrated Monitoring Data System (incl. the total international network); EDC National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

4 international areas in Finland, 32 in other countries

Timely coverage and resolution

Since 1987; varying depending on subprogramme from daily to intervals of 5 yrs

* sites nominated
- sites to be established
SU03, SU12, SU17 and CA01 are not shown in this map

IM-network of Europe in 1990
Objectives

To estimate the timely variation in population size and breeding success of raptors and owls.

Variables

Number of breeding pairs, population index, breeding success (fledlings/occupied territory, fledlings/active nest, fledlings/successful nest)

Links to international networks

International Bird Census Committee mapping-network

Data storage

Nest site database; University of Helsinki/VAX6420/sequential files
Geographical coverage and resolution

Ca 120 study areas (100 km² squares, National Grid) covering the whole country

Timely coverage and resolution

Since 1982; annual observations
Bird population

Objectives

To estimate the state of the bird fauna and its biotopes and to evaluate annual and long-term changes of these

Responsible authority

University of Helsinki/Finnish Museum of Natural History

Collaborating authorities

Finnish Game and Fisheries Research Institute

Variables

Population indices (species indices, biotope-oriented indices) of about 150 most frequent bird species

Links to international networks

International Bird Census Committee network

Datastorage

Bird census data register; University of Helsinki/VAX6420/own programme
Geographical coverage and resolution

Covering the whole country by UTM-squares of 50 x 50 km; indices representative only for larger regions.

Timely coverage and resolution

Breeding bird censuses at ca 150 sites in May-June since 1984-85; winter bird censuses at ca 500 sites 3/winter period since 1956-57; old inventories in the 1940s have been made on other sites.

Number of mid-winter census routes in grid squares (50 x 50 km) between 1956/57 and 1987/88.
**Name**

Herptile distribution and abundance mapping

**Objectives**

To analyse changes in species distribution of Finnish amphibians and reptiles (5+5 species)

**Responsible authority**

University of Helsinki/Finnish Museum of Natural History

**Collaborating authorities**

Finnish Game and Fisheries Institute, Finnish Nature Conservation Organization, Nature and Youth Organization

**Variables**

Observation coordinates, species, colour form, abundancy and observer

**Links to international networks**

Mapping Programme of Societas Herpetologica Europaea

**Data storage**

Data < 1979 on sequential mg-files, > 1980 as PC-storage/Database; University of Helsinki/Finnish Museum of Natural History
Geographical coverage and resolution

Grid /27 °E network (10 x 10 km squares) based on voluntary observations throughout Finland

Timely coverage and resolution

Since 1974; annual observations

Grid squares with positive observations in 1979
Name

Insect distribution mapping

Objectives

To analyse changes in the long-term species distribution of 21 easily identified insect species.

Responsible authority

University of Helsinki/Finnish Museum of Natural History

Collaborating authorities

Variables

Observation coordinates, species, first appearance, observer

Links to international networks

Datastorage

Insect mapping-81 register; Finnish Museum of Natural History; PC/Database
Geographical coverage and resolution

Grid network (10 x 10 km squares) based on voluntary observations throughout Finland

Timely coverage and resolution

Since 1981; annual observations

Observations of Rhino Beetle (8) and the Orange-tip butterfly (11) during the five-year period 1981-84
Phytoplankton in fresh water

Objectives

To evaluate the eutrophication levels and to forecast changes in the water quality based on species composition and mass of phytoplankton in freshwater environments.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

13 Water and Environment Districts

Variables

Species composition, phytoplankton mass; temperature (1 m and 2 m), α-chlorophyll, Ptot, PO4P, NO2N, NO3N, NH4N of water

Links to international networks

Data storage

Environment Data System/Hydrobiology database; National Board of Waters and Environment/VAX8550/Ingres 6.2
Geographical coverage and resolution

139 sampling sites throughout the country

Timely coverage and resolution

Since 1963; annual sampling at 24 sites, 1/4yr at 115 sites between June-August

Monitoring sites in 1989
Bioindicators of fresh waters

To evaluate fresh water ecosystem community changes due to eutrophication and/or nutrient imbalances

National Board of Waters and the Environment/Water and Environment Research Institute

13 Water and Environment Districts

Benthic species composition and mass; temperature, O2, colour number, COD_MN, Ptot, Ntot, pH, alkalinity, chlorophyll; growth of periphyton on artificial substrates, phytoplankton and benthic species, macrophytic species and mass

Environment Data System/Hydrobiology database; National Board of Waters and the Environment/VAX8550/Ingres 6.2
Geographical coverage and resolution

24 sites coinciding with annual phytoplankton sampling

Timely coverage and resolution

Since 1989; sampling 4/yr between June-October

Sampling network in 1989
Name

Endangered species

Objectives

To evaluate the populations of endangered species; to continuously survey their sites and to protect their habitats

Responsible authority

Ministry of the Environment

Collaborating authorities

National Board of Forests, National Board of Waters and the Environment, Biological institutes of universities and museums of natural history

Variables

Site, species, number, biotope, state of environment, hazards to habitat

Links to international networks

Datastorage

Environment Data System/Endangered species database; National Board of Waters and the Environment/VAX8550/Ingres 6.2
Geographical coverage and resolution
More than 10,000 sites throughout the country

Timely coverage and resolution
Since 1985; surveillance by frequent visits to observed sites

Number of endangered and vulnerable species by region in 1985
**Name**

Land use and forest stands

**Objectives**

To survey land use and forest stand changes with 5-10 years intervals

**Responsible authority**

National Board of Survey

**Collaborating authorities**

National Board of Waters and the Environment, Statistical Centre of Finland, Finnish Forest Research Institute, Post and Tele Company

**Variables**

50 different land use classes as interpreted from LANDSAT-images and ground-truth measurements

- Water
- Open fields
- Clear cut areas
  - new clear cuttings
  - old clear cuttings
- Bare ground
- Peat production areas
- Open bogs
  - oligotrophic
  - eutrophic
- Spruce swamps
- Hardwood swamps
- Pine swamps
- Firm forest land
  - pine dominated
  - spruce dominated
  - deciduous
  - mixed pine/spruce
  - mixed coniferous/deciduous
- Sapling stands
- Alpine birch forest
- Dwarf birch woods
- Coniferous forests near the tree line
- Bare mountain regions and tundra

**Links to international networks**

UNEP Global Resource Information Database (GRID)

**Data storage**

RSU Satellite Image Storage; National Board of Survey/APOLLO 3550, VAX 11/750 or PC/BINARY file or ASCII file or Disimp format or DRAGON format; EDC Satellite Image Storage; National Board of Waters and the Environment/APOLLO 5500/Disimp 5.0
**Geographical coverage and resolution**

The whole of Finland in 25 x 25 m pixel size

**Timely coverage and resolution**

Since 1988; repetitions every 5-10 yrs

1 In use
2 In use 1.5.1991
Forest resources

Objectives
To survey and forecast the development of Finnish forest resources

Responsible authority
Finnish Forest Research Institute

Collaborating authorities

Variables
Essential forest resource information: Soil class, forest- and bogtype, tax class, ditches, age and structure class, dominating tree species, damage types, performed or planned harvesting and plantation of forest stands; tree volume by species and size class, tree wood type distribution, tree increment at measuring plots

Links to international networks

Data storage
VMI-data storage; Finnish Forest Research Institute/VAX 11/785/Sequential files from 1964
Geographical coverage and resolution

Systematic sampling throughout the country; sampling plot areas in 8 x 8 km or 7 x 8 km squares.

Timely coverage and resolution

7 national surveys: the first in 1921-24, the last in 1977-84. The 8th survey was started in 1986 and is estimated to be finished in 1995. By integrating inventory data and satellite images from 1989 the resolution now covers municipalities. Sampling plot measurements are only from one year; from 1992 onwards sample plots will be partly permanent. Field survey from 1981-90 and new simulating programmes give possibilities to estimate forest resources annually (last estimation is for 1.1.1990).
Name

Stock assessment of mammals (excluding shrews and small rodents)

Objectives

To estimate the abundance of stocks, predator/prey relations and habitat requirements of different species

Responsible authority

Finnish Game and Fisheries Research Institute

Collaborating authorities

Local hunting organizations; National Board of Forestry

Variables

Species and abundance (by snowtracks)

Links to international networks

Datastorage

Disc storages on PC; Finnish Game and Fisheries Research Institute
**Geographical coverage and resolution**

1200 equiform triangle-shaped (4 km long sides) survey routes throughout the country.

**Timely coverage and resolution**

Since 1990; in winter after snowfall periods; early data since the 1960s are based on visual observations of animals; collected data are transferred to square grids of 50 x 50 km size.

(Triangle-Grid network in 1990 and frequency of some mammals (tracks/10 km/d))
Name

Stock assessment of grouse

Objectives

To estimate the abundance of grouse species for management purposes

Responsible authority

Finnish Game and Fisheries Research Institute

Collaborating authorities

Local hunting organizations; National Board of Forestry

Variables

Species, sex, age and number

Links to international networks

Data storage

Disc storages on PC; Finnish Game and Fisheries Research Institute
**Geographical coverage and resolution**

1200 equifotm triangle-shaped (4 km long sides) survey routes throughout the country.

**Timely coverage and resolution**

Since 1990; in August by counting pairs along the 60 m broad triangle-sides (total 1.2 km); collected data are transferred to square grids of .50 x .50 km size.

(Triangle) Grid network in 1990 and density of 4 birds (number/km²)
Name
Stock assessment of Baltic herring and sprat

Objectives
To estimate the state of the stock for management purposes

Responsible authority
Finnish Game and Fisheries Research Institute

Collaborating authorities

Variables
Species, gear, fish weight, length, age

Links to international networks
International Council for the Exploration of the Sea-network

Datastorage
Disc storages on PC; Finnish Game and Fisheries Research Institute
Geographical coverage and resolution

Northern Baltic Sea

Timely coverage and resolution

Since 1974, round the year ca 300 samples/yr (~ 15000 individuals)

Reporting grid
Name

Stock assessment of Baltic salmon

Objectives

To determine the status of ranched and enhanced salmon stocks

Responsible authority

Finnish Game and Fisheries Research Institute

Collaborating authorities

Variables

Smolt releases for ranching purposes, fish releases for enhancement, tag recaptures (%kg/1000 released), catch, parr density in nursery areas, smolt run

Links to international networks

Baltic Salmon and Trout Assessment Working Group/International Council for the Exploration of the Sea-network

Data storage

Disc storages on PC; Finnish Game and Fisheries Research Institute
Geographical coverage and resolution

ICES subdivision areas 24-32 and rivers flowing to these

Timely coverage and resolution

Tag recovery data since 1959; catch statistics since 1970; parr density since 1980
Name

Stock assessment of coastal whitefish and pike perch

Objectives

To estimate the state of the stock as affected by environmental changes and fish captures

Responsible authority

Finnish Game and Fisheries Research Institute

Collaborating authorities

National Board of Fisheries & Swedish Environment Protection Agency (Sweden), Läänemere KTUI (Estonia), Regional government of Alandia

Variables

Species, average weight and length, growth pace, species catch, relative abundance of age, class, subarea catch

Links to international networks

Datastorage

Disc storages on PC; Finnish Game and Fisheries Research Institute
Geographical coverage and resolution

Along the Finnish coasts and the Lohjanjärvi lake

Timely coverage and resolution

Monitored cost-area and the Lohjanjärvi lake
Assessment of changes of migratory fish stock in northern rivers

Objectives

To estimate the state of the migratory fish stock as affected by acidification of northern streams.
To follow the effects of fishing regulations in the river Teno and Näätämö.

Responsible authority

Finnish Game and Fisheries Research Institute, river laboratory Utsjoki

Collaborating authorities

PINRO (Murman), Academy of Sciences/ Carelian SSR (Petroskoi), Norwegian Institute for Nature Research (NINA), Finnmark regional authority (Norway), Lapland Water and Environment District (Finland)

Variables

pH change (as caused by snowmelt) in tributaries of the Utsjoki river, density of juvenile stages of salmonid fish (56 sites in the river Teno, 10 sites in the river Näätämö), growth of juvenile salmon (6 sites), stock size analyses of migratory trout in the river Lutto, scale analysis, stock of migratory juveniles in 6-8 tributaries to the Tenojoki river.

Links to international networks


Datastorage

Disc storages on PC; Finnish Game and Fisheries Research Institute
Geographical coverage and resolution

Drainages of Finland (except those of Paatsoki river) discharging into the Arctic Sea.

Timely coverage and resolution

Since 1979

Monitoring drainages discharging into the Arctic Sea
Name

Effects of acidification on fish stocks in small lakes

Objectives

To assess changes in acidification and fish stocks in small oligotrophic lakes and evaluate possible abatement strategies for rehabilitation

Responsible authority

Finnish Game and Fisheries Research Institute

Collaborating authorities

National Board of Waters and the Environment

Variables

Fish catch, species composition and abundance, average length and weight of fish, growth rate; pH, alkalinity, conductivity, colour number, Ca of water

Links to international networks

Datashare

Disc storages on PC; Finnish Game and Fisheries Research Institute
Geographical coverage and resolution

20 oligotrophic lakes and 10 lime-treated lakes in areas sensitive to acidification in southern Finland.

Timely coverage and resolution

Since 1985; fish stock assessment 1/3-4yr in untreated lakes, and 1/2yr in lime-treated lakes.

Monitored lakes for acidification effects on fish stocks.

- Oligotrophic lakes
- Lime-treated lakes
Name

Dump

Objectives

To control siting and environmental effects of official and industrial dumping grounds.

Responsible authority

National Board of Waters and the Environment

Collaborating authorities

11 Provincial Environmental Authorities, Environmental protection and technical boards of municipalities

Variables

Siting, annual amount of different waste, waste handling procedures, observations of harmful effects, infiltration of hazardous chemicals, economy

Links to international networks

Datastorage

Environment Data System/Dumping ground database; National Board of Waters and the Environment/VAX 8550/Ingres 6.2
Geographical coverage and resolution

Ca 1100 dump throughout the country

Timely coverage and resolution

Since 1983; waste amount and infiltration measurements annually, other information 1/5yr

Dump abundance of municipalities in 1983
Name

Accumulation of harmful substances in fresh water environments

Objectives

To evaluate the levels and changes in concentrations of harmful substances in biota, sediments and water in fresh water environments

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

13 Water and Environment Districts, University of Jyväskylä

Variables

Pb, Cd, Cu, Zn, Hg, chlorinated hydrocarbons, chlorophenols and some other organic pollutants in clam, whitefish, vendace, pike, roach, bottoms sediments and water

Links to international networks

5 stations in the UNEP GEMS Water Quality-network

Datastorage

Environment Data System/Immission database, National Board of Waters and Environment/VAX8550/Ingres 6.2
Geographical coverage and resolution

20 sites for chlorinated organic substances in clams; mercury content in pike in 48 areas, other substances at 18 sites

Timely coverage and resolution

Since 1978; 5 different species by rotation of 1/3 yr; sampling 4/yr in running waters, 2/yr in lakes

Sampling network in 1990
Name
Accumulation of harmful substances in coastal water environments

Objectives
To evaluate the levels and changes in concentrations of harmful substances in biota, sediments and water in coastal water environments

Responsible authority
National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities
7 coastal Water and Environment Districts, University of Jyväskylä

Variables
Pb, Cd, Cu, Zn, Hg, chlorinated hydrocarbons, chlorophenols, and some other organic pollutants in Macoma baltica, Mesidotea entomon Mytilus edulis, pike, Baltic herring and cod

Links to international networks
Nordic monitoring project "Chlorinated hydrocarbons in marine environments"

Datastorage
Environment Data System/Immission database; National Board of Waters and Environment/VAX8550/Ingres 6.2
Geographical coverage and resolution

8 sites along the Finnish coast; additionally Hg measurements in pike in 16 coastal areas.

Timely coverage and resolution

Since 1978; 5 different species by rotation of 1/3 yr

Sampling sites in 1990
Name
Accumulation of harmful substances in marine environments

Objectives
To evaluate the levels and changes in concentrations of harmful substances in biota, sediments and water in marine environments of the Baltic

Responsible authority
Finnish Institute of Marine Research

Collaborating authorities
Finnish Game and Fisheries Research Institute

Variables
Pb, Cd, Cu, Zn, Hg, DDT, PCB, HCB, HCH in cod (liver/muscle), herring (muscle), Mesidotea entomon and Mytilus edulis (soft parts)

Links to international networks
Helsinki Commission Baltic Monitoring Programme-network

Datastorage
Helsinki Commission Data Bank (incl. all international data); Finnish Institute of Marine Research/HP 1000/own programme
Geographical coverage and resolution

2 areas in the Gulf of Finland and 2 areas in the Gulf of Bothnia

Timely coverage and resolution

Since 1979; sampling 1/yr

Sampling network in 1990
Name

Airborne radioactivity

Objectives

To detect changes in concentrations of radioactive substances in air masses close to ground

Responsible authority

Finnish Centre for Radiation and Nuclear Safety

Collaborating authorities

Finnish Meteorological Institute, Research Centre of the Defense Forces

Variables

Artificial gamma-emitting nuclides, $^{90}$Sr, transuranic nuclides

Links to international networks

Datashare

Radioactivity Data System; Finnish Centre for Radiation and Nuclear Safety
**Geographical coverage and resolution**

22 sampling stations throughout the country

**Timely coverage and resolution**

Since 1968; sampling 2/week, analyses of $^{90}$Sr and transuranic nuclides from 3 months pooled samples only.
### Name
Deposition of radioactive substances

### Objectives
To detect changes in deposition of radioactive substances as transported by air masses

### Responsible authority
Finnish Centre for Radiation and Nuclear Safety

### Collaborating authorities
Finnish Meteorological Institute, Research Centre of the Defense Forces

### Variables
Gamma-emitting nuclides, $^{90}$Sr, $^{90}$Sr, $^3$H

### Links to international networks

### Datastorage
Radioactivity Data System; Finnish Centre for Radiation and Nuclear Safety/VAX 3600
**Geographical coverage and resolution**

18 sampling stations throughout the country.

**Timely coverage and resolution**

Since 1961; continuous sampling, analyses of monthly pooled samples.

Sampling stations in 1990
Name
Radioactivity of fresh waters and water sediments

Objectives
To detect changes in concentrations and flow of radioactive substances in fresh water environments

Responsible authority
Finnish Centre for Radiation and Nuclear Safety

Collaborating authorities
National Board of Waters and Environment

Variables
Artificial gammanuclides, $^{90}$Sr, $^{3}$H

Links to international networks

Datastorage
Radioactivity Data System; Finnish Centre for Radiation and Nuclear Safety/VAX 3600
Geographical coverage and resolution

5 sampling stations in river mouths flowing to the Baltic Sea, numerous stations in large water bodies, 8 lake sediment sampling stations

Timely coverage and resolution

Since 1970: sampling frequency 4/yr in river mouths, 3-4 annual surveys of lake bodies since the Chernobyl accident, 1/10 yrs of lake sediments

Sampling stations in 1990
Name

Radioactivity in sea water and marine sediments

Objectives

To detect changes in concentrations and flow of radioactive substances in marine environment

Responsible authority

Finnish Centre for Radiation and Nuclear Safety

Collaborating authorities

Finnish Institute of Marine Research

Variables

$^{137}$Cs, $^{134}$Cs and other gamma nuclides, $^{90}$Sr, $^{238}$Pu, $^{239,240}$Pu

Links to international networks

Helsinki Commission/MORS-network

Data storage

HELCOM/MORS Data Base; Finnish Institute of Marine Research
Geographical coverage and resolution

7 water and 2 sediment sampling stations in the Gulf of Bothnia, 6 water and 2 sediment sampling stations in the Gulf of Finland, 3 water and 2 sediment sampling stations in the Baltic Proper

Timely coverage and resolution

Since 1974; sampling frequency 1/yr
Radioactivity in the vicinity of nuclear power plants

Objectives

To follow the dispersion of radioactive releases from nuclear power plants to the environment and their transfer to foodchains and to ensure that discharges remain below the set limits.

Responsible authority

Finnish Centre for Radiation and Nuclear Safety

Collaborating authorities

Variables

<table>
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<th>Radioisotopes</th>
<th>Radioisotopes</th>
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<td>Air</td>
<td>137Cs, gamma,</td>
<td>89Sr, 90Sr</td>
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<td>137Cs</td>
<td>89Sr, 90Sr, 3H</td>
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<td>Drinking water</td>
<td>137Cs</td>
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<tr>
<td>Sediment</td>
<td>137Cs</td>
<td>89Sr, 90Sr, 238Pu, 239Pu, 240Pu</td>
</tr>
</tbody>
</table>

Links to international networks

Radioactivity Data System; Finnish Centre for Radiation and Nuclear Safety/VAX 3600 (+ data storages of the nuclear power plants)

Data storage

Radioactivity Data System; Finnish Centre for Radiation and Nuclear Safety/VAX 3600 (+ data storages of the nuclear power plants)
Geographical coverage and resolution

Sampling 2/month of air, 1/month - 1/3 months of deposition, 1/3 months of drinking water, 1-4/month of milk, 1-2/yr of meat, cereals, vegetables and fruits, 2/yr of grazing grass, 1/4 yrs of soil, 3-4/yr of sea water, 2/yr of fish, 1-3/yr of algae, 1/yr of benthic animals, 4/yr of sinking matter, 1/4 yrs of sediments

Timely coverage and resolution

Since 1975 at Loviisa, 1977 at Olkiluoto; in 1-40 km circumference of 2 nuclear power plants, 1-5 sampling sites of each media
Name

Substances transported by rivers

Objectives

To calculate the load from rivers to the Finnish coast and the Baltic Sea; to assess large-scale changes in the wash-out and load characteristics from different drainage basins.

Responsible authority

National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities

7 coastal Water and Environment Districts

Variables

Temperature, conductivity, O2, suspended load, alkalinity, pH, colour number, COD_{MN}, N{NO3}, NH_{4N}, Pot, PO_{4P}, Cl, SO_{4}, Fe, K, Ca, Mg, Na, TOC, SiO_{2}, As, Hg, Cd, Cr, Cu, Pb, Zn, Ni, AOX

Links to international networks

HELCOM Baltic Monitoring Programme-network

Data storage

Environment Data System/Water quality database; National Board of Waters and the Environment/DEC S810/Ingres 6.2
Geographical coverage and resolution

21 stations along the Finnish seacoast

Timely coverage and resolution

Since 1970 at least 12/yr

Location of recipient areas (black) and sampling stations (arrows) in 1989
Name
Quality of coastal waters

Objectives
To detect changes in time and space of coastal water chemistry and biology and assess the external cause for these

Responsible authority
National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities
7 coastal Water and Environment Districts, Finnish Institute of Marine Research Helsinki, Turku and Oulu universities.

Variables
Visibility, temperature, salinity, O2, turbidity, pH, colour number, Ntot, NO2N, NO3N, NH4N, Ptot, PO4P, Fe, SiO2, TOC, a chlorophyll, phytoplankton species composition, primary production capacity.

Links to international networks
HELCOM Baltic Monitoring Programme-network

Datastorage
Environment Data System/Water quality database; National Board of Waters and the Environment/DEC 5810/Ingres 6.2
Geographical coverage and resolution

106 stations along the Finnish coast

Timely coverage and resolution

Since 1965; 2/yr nowadays, 20/yr at 12 stations

Network of stations in 1989
Name
Coastal benthic ecosystem

Objectives
To detect changes in the composition and biomass of coastal benthos and assess the external cause for these.

Responsible authority
National Board of Waters and the Environment/Water and Environment Research Institute

Collaborating authorities
University of Helsinki, Finnish Institute of Marine Research

Variables
Species composition and number, biomass, length distribution of Macoma baltica and Pontoporeia affinis

Links to international networks
HELCOM Baltic Monitoring Programme-network

Datastorage
Benthos register; Finnish Institute of Marine Research/HP 1000/own programme
Geographical coverage and resolution

2 stations in one area of the SW-coast

Timely coverage and resolution

Since the 1920s; 2/yr (May, September)
Water quality of sea areas around Finland, national

**Objectives**

To detect changes in water quality in the Gulf of Finland, northern Baltic Proper and the Gulf of Bothnia

**Responsible authority**

Finnish Institute of Marine Research

**Collaborating authorities**

National Board of Waters and the Environment, Finnish Game and Fisheries Research Institute

**Variables**

Temperature, salinity, alkalinity, O₂, pH, NΚ, NO₂N, NO₃N, NH₄N, Ptot, PO₄P, SiO₂, H₂S, Cd, Pb, Hg, phytoplankton and zooplankton composition and biomass, biological primary production, a-chlorophyll

**Links to international networks**

Finnish-Swedish Committee on the Gulf of Bothnia, Finnish-Soviet Scientific-technological Commission/Committee on the Gulf of Finland

**Data storage**

Chemical-Hydrographic database; Finnish Institute of Marine Research/HP 1000/own programme
Geographical coverage and resolution

Ca. 50 stations in the sea areas around Finland

Timely coverage and resolution

Since 1962: 2-4 times/yr

Network of stations in 1989
Name

Quality of the Baltic Sea

Objectives

To detect changes in the water quality of the Baltic Sea, to follow up the measures taken by the Helsinki Commission

Responsible authority

Finnish Institute of Marine Research

Collaborating authorities

National Board of Waters and the Environment, Finnish Game and Fisheries Research Institute

Variables

Temperature, salinity, alkalinity, O2, pH, Ntot, NO2N, NO3N, NH4N, Ptot, PO4P, SiO2, H2S, Cd, Pb, Hg, phytoplankton and zooplankton composition and biomass, biological primary production, α-chlorophyll, microbiology

Links to international networks

HELCOM Baltic Monitoring Programme-network

Datastorage

Helsinki Commission Data Bank (incl. all international data); Finnish Institute of Marine Research/HfP 1000
Geographical coverage and resolution

4.5 stations in the Baltic Sea; Finland is (in collaboration with the Soviet Union) responsible for the Gulf of Finland, northern Baltic Proper and the Gulf of Bothnia (in collaboration with Sweden)

Timely coverage and resolution

Since 1979; each country is expected to visit its stations at least 2/yr (coordinated so that each station is sampled 4/yr)
Name

Macrozoobenthos of the Baltic Sea

Objectives

To assess the state of the Baltic Sea and to produce background information for international assessments

Responsible authority

Finnish Institute of Marine Research

Collaborating authorities

National Board of Waters and the Environment

Variables

Species composition, abundance, biomass (wet weight, dry weight and ash-free dry weight), size distribution of selected species

Links to international networks

Finnish-Swedish Committee on the Gulf of Bothnia, Finnish-Soviet Scientific-technological Commission/Committee on the Gulf of Finland, Helsinki Commission

Data storage

Benthos register; Finnish Institute of Marine Research/HP 1000/own programme
Geographical coverage and resolution

Ca 100 stations in the Baltic Sea

Timely coverage and resolution

Since 1962; sampling 1/yr for the HELCOM-stations and the main stations; 1/5 yr for the stations belonging to the enlarged programme
To detect chemical changes in the marine sediments in the Gulf of Finland, the northern Baltic Proper and the Gulf of Bothnia.

**Responsible authority**
Finnish Institute of Marine Research

**Collaborating authorities**

**Variables**
Zn, Cd, Pb, Cu, Hg, Cr, DDT, PCB, HCH, HCB, petroleum hydrocarbons

**Links to international networks**
HELCOM Baltic Monitoring Programme network

**Datastorage**
Marine sediment register; Finnish Institute of Marine Research/not computerized
Geographical coverage and resolution

Ca 5 stations in the sea areas around Finland (the exact number is decided by the Helsinki Commission) per year on the average.

Timely coverage and resolution

Since 1960; sampling 1/5yr
GENERAL CONCLUSIONS

Reflection of topics

The Finnish monitoring programmes do not reflect the main EEA topics very clearly. Many programmes could have been marked to several topic groups. Here they have been grouped according to their original objectives. With time many programmes have expanded to become more ecosystem-oriented and integrated in nature and are thus not more purely sectorial as the topics of the EEA.

Distribution of topics

About one third of the Finnish programmes deals with fresh waters. This is quite natural due to the numerous water courses and lakes of Finland. If programmes designed for the coastal and sea environments are taken into account, about half of all programmes have water as the monitoring environment. The second most important monitoring group in Finland deals with natural resources (stock of biota and forests). The vast forest coverage and traditional hunting have been the main reasons for the establishment of such programmes. On the other hand, there are very few programmes, if at all, on topics of noise and waste. One reason for this is the novelty of these environmental problems in Finland, another, the fact that Finland is sparsely populated and have few urban areas in relation to countries of the European Community.

International co-operation

About one third of the presented programmes has at least a partial link to international monitoring networks. Finland has furthermore the responsibility for two international programme centres which possess monitoring data from other countries as well.

Main component elements

Most of the responsible authorities for the monitoring programmes are research institutes. The bulk of the programmes are the responsibility of 6 institutes: the Water and Environment Research Institute, the Finnish Meteorological Institute, the Finnish Forest Research Institute, the Finnish Institute for Marine Research, the Finnish Game and Fisheries Research Institute and the Finnish Centre for Radiation and Nuclear Safety. The collaboration between these sectorial institutes as well as between central and regional authorities is rather high because of the limited amount of experts in different fields.

Data storages

The data from the monitoring programmes are almost without exception stored centrally. The four largest data storages are the Environment Data System, the Forest Data System, the Climate Data System and the Helsinki Commission Database on Baltic Monitoring. These data storages contain more than 80% of all monitoring data in Finland at present.

Coincidence of networks

Most networks have been designed from a sectorial point of view. Allocation of measuring or observation stations to mutual geographical units are very scarce. In terms of integration of information, this is unfortunate. The networks of several monitoring programmes are however presently under consideration in order to facilitate a more extensive use of the information collected.