Soil Inventory and Assessment Project: The EEA experience towards an Europe-wide assessment of areas under risk for soil contamination

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NATO CCMS Pilot Study
Prevention and Remediation In Selected Industrial Sectors: Small Sites in Urban Areas
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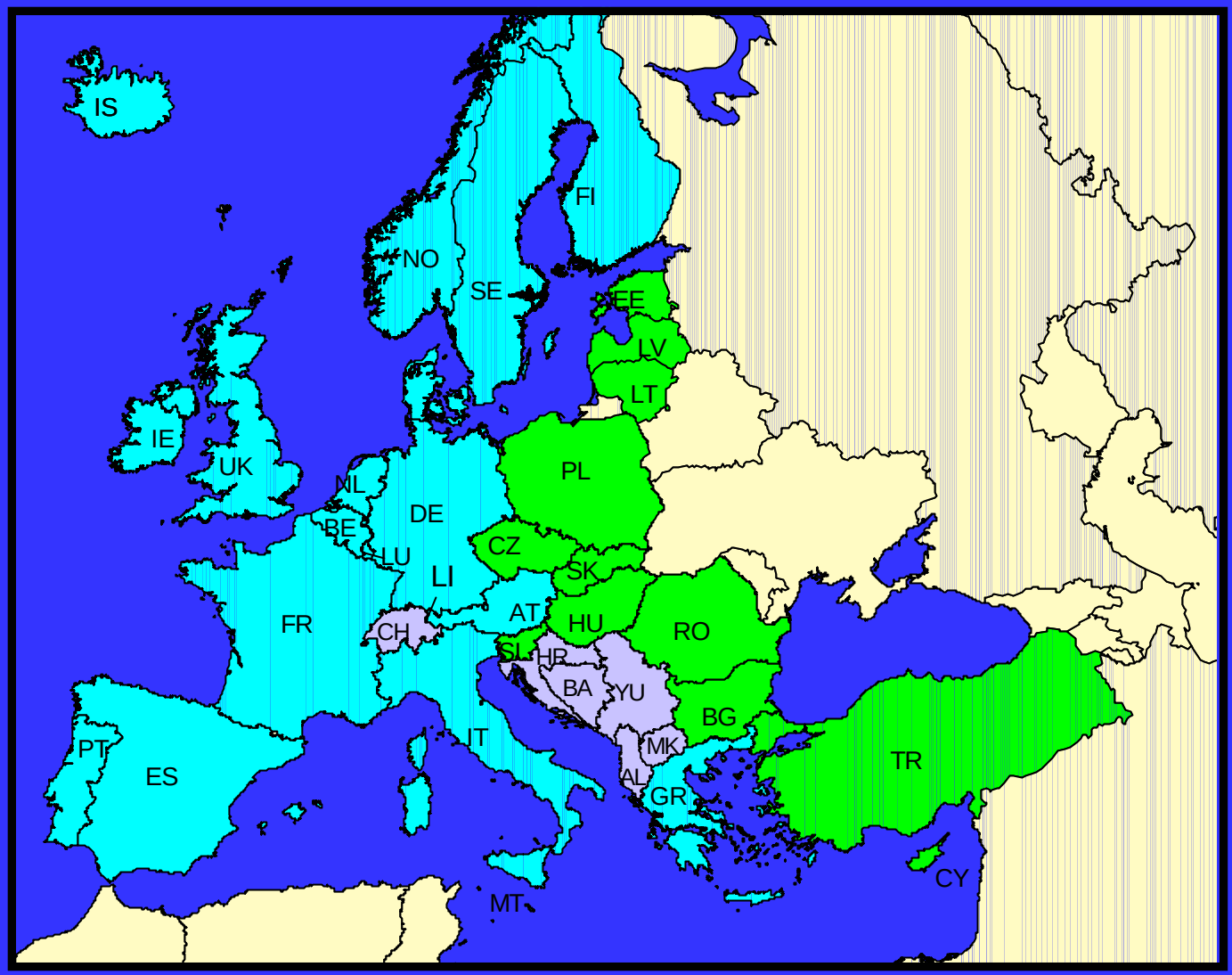
EEA members and participating countries



Old members

New members

Cooperating countries

EEA main tasks

- Making **environmental information** accessible
- **Networking** – Implement and coordinate the EIONET (European Environmental Observation and Information Network)
- **Reporting** – Prepare regular reports on the state and trends of the environment

- Annual budget of approx. 30 Meuro, about 150 staff, 5 topic centres

EIONET

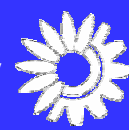
More than 300 national institutions in 31 countries:

- National Focal Points
- European Topic Centres
- National Reference Centres
- Main component elements

- National members are nominated by countries

- Covers a broad range of environmental issues

- Aims at:
  - improving capacity building in Member states
  - streamlining data flows originated from reporting obligations (also “moral” obligations)



Information on contaminated sites (1)

Sources of contamination

- Municipal and industrial waste disposals; losses during industrial activities; accidents
- CEE: mining sites; former military sites; pesticide stocks
- Industry: metal working , chemical, oil and wood industries; storage of hazardous substances

Major pollutants

- Heavy metals (31%), mineral oil (20), PAH (16), CHC (13), BTEX (13)

Information on contaminated sites (2)

Extent of the problem

- Partial estimates account for about 2 million sites in 25 countries of which about 100000 need remediation
- On average 5 sites per 1,000 habitants
- On average 2.2 % of artificial surface identified as contaminated

Progress in the management

- First management steps are far advanced, however detailed steps (investigation, remediation) are progressing slowly

Expenditures

- Average annual expenditures are app. 2.5 % of expected total costs

Aim of the PRA.MS Project

The main aim of the project is:

to develop an effective tool to identify, assess and map the areas under risk or potential problem areas for soil contamination of EU concern in order to provide inputs to EEA assessment activities and support policy development.

The expected outcomes are:

- a EEA proposed method for identification and preliminary assessment
- a map and related assessment focussing on potential problem areas for soil contamination

Problem Areas definition

- The following definition has been adopted:

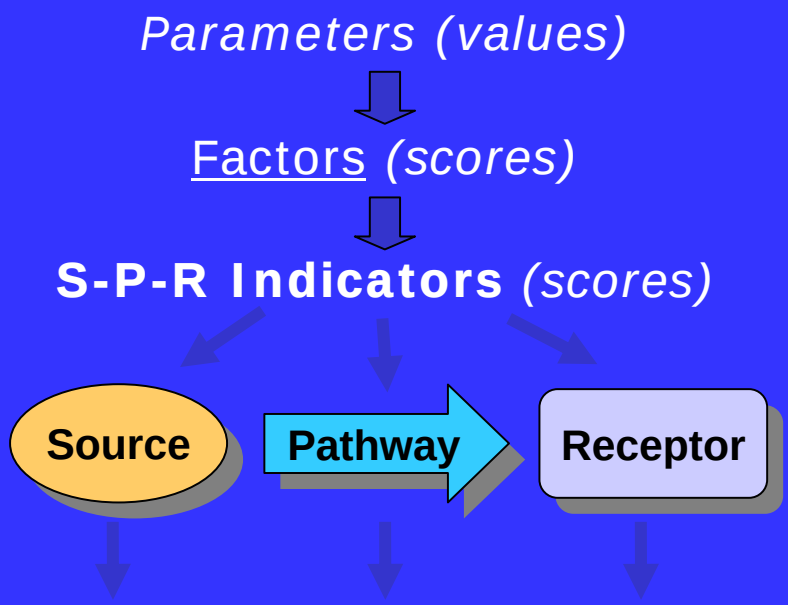
"Areas where soil contamination is considered to pose significant risks to human health and/or ecosystems with impacts beyond the local environment and where the assessment and reporting of pressures, state, impacts and remediation activities has a relevance at the European level."

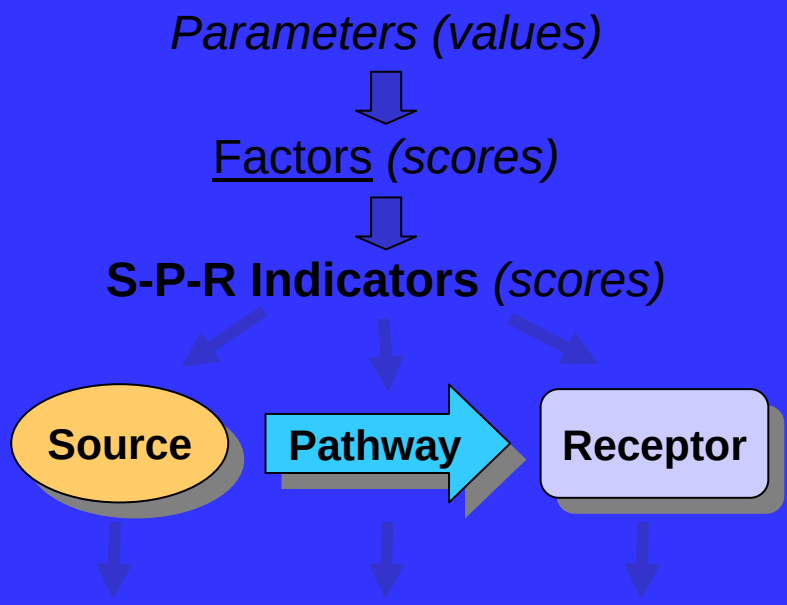
2004: PRA.MS I methodology

PRA.MS I (*Preliminary Risk Assessment Model for the identification of problem areas for Soil contamination in Europe*) methodology: a risk scoring system for the classification and assessment of individual sites. The system includes 3 Tiers to be applied to data of different detail.

- Objectives:
  - Identify, classify and assess problem areas of EU concern
- Background:
  - "Review and analysis of existing methodologies for preliminary risk assessment" and harmonization of input parameters.
  - data available at the EU level, such as:
    - the BRGM/DECHMINUE and EPER databases
    - Geo-referenced environmental data

PRA.MS I risk scoring system





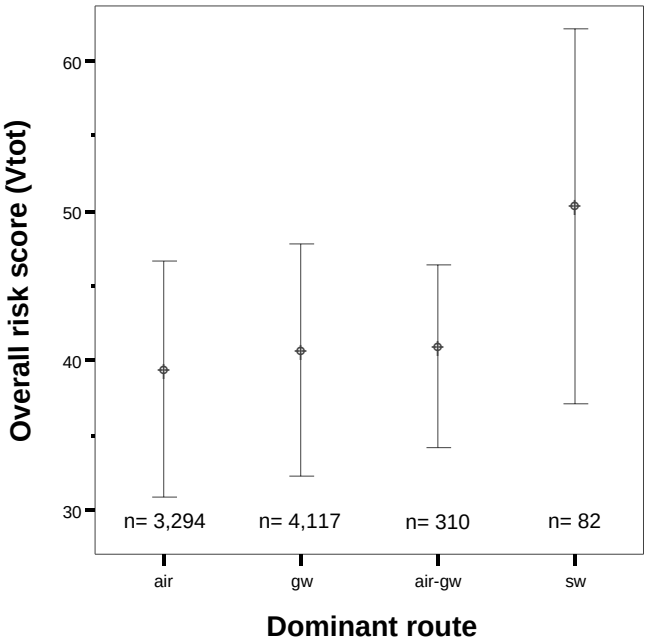
- "PRA.MS I scoring model and algorithm" **(EEA Technical Report, Volume 3)**

2004: Results of PRA.MS I applications

The PRA.MS I model was applied to selected industrial and mining sites.

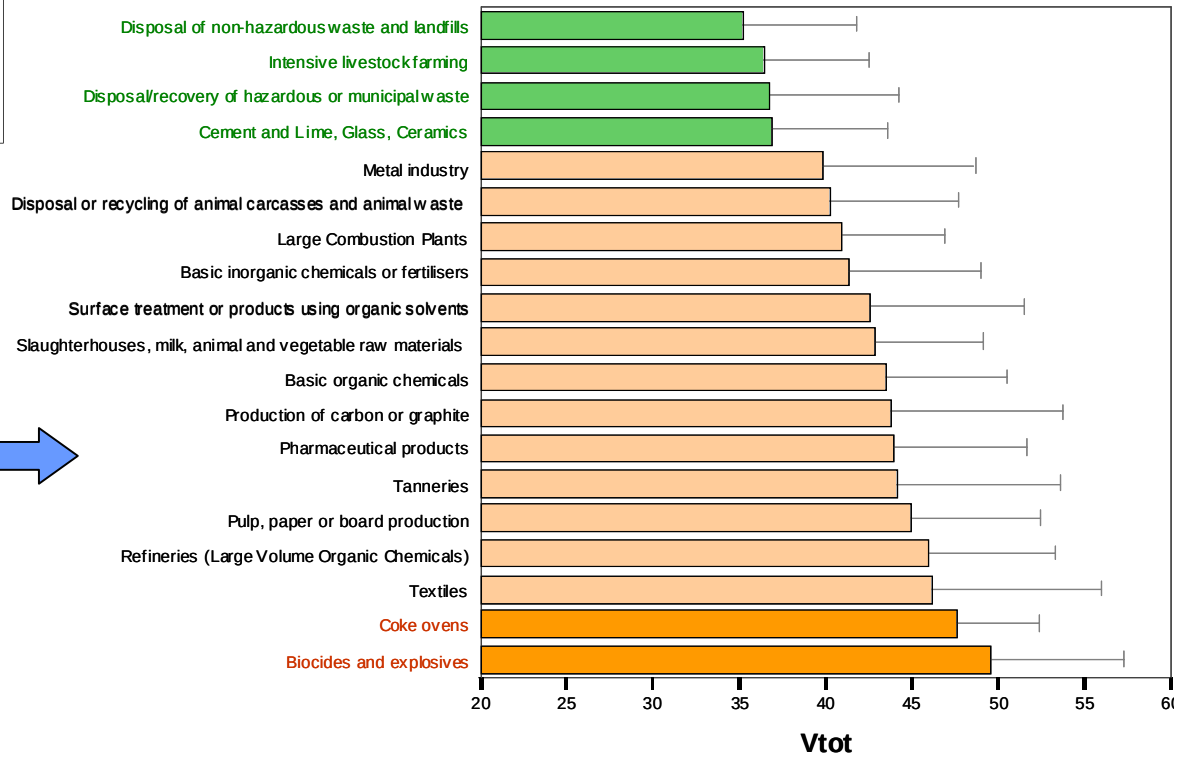
- Tier 0 assessment: pre- selection of relevant industrial and mining sites from available db (BRGM/DECHMINUE and EPER)
  - BRGM/DECHMINUE: selection of sites with chemical characterization of stored wastes (236 sites over 9 European countries)
  - EPER: selection of sites on the basis of source data availability (7881 sites)
- Tier 1 assessment (industrial sites)
  - Assessment of human health risks and evaluation of dominant exposure routes
  - Correlation between human health risks and IPPC classes
- Tier 2 assessment (mining sites)
  - Assessment of human health risks
  - Assessment of uncertainties
  - Mapping of results

Application of Tier 1 to EPER sites

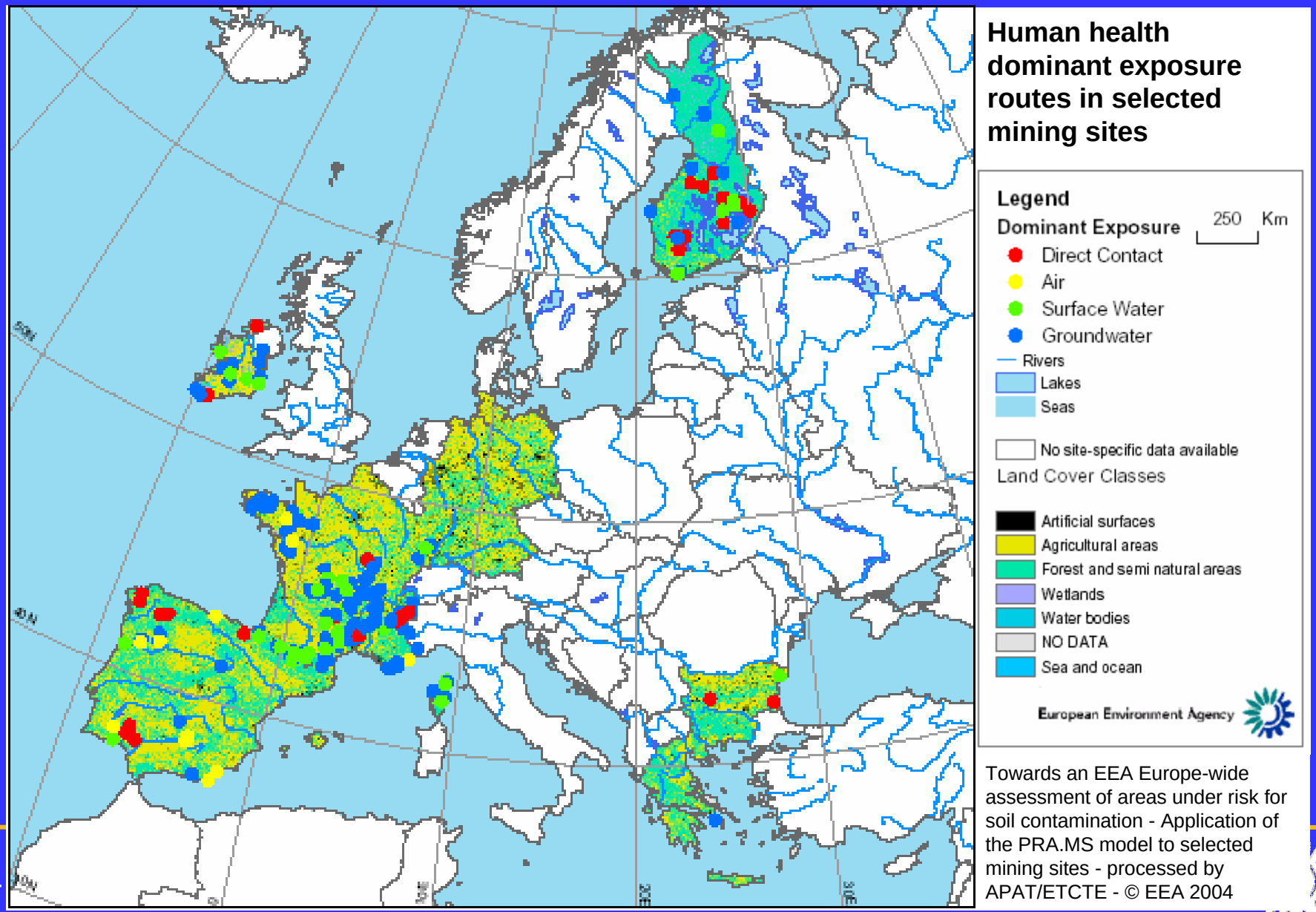


Overall risk score of industrial sites grouped according to its dominant exposure route

Overall risk scores of industrial sites grouped according to IPPC classes



Application of Tier 2 to DECHMINUE sites



Towards an EEA Europe-wide assessment of areas under risk for soil contamination - Application of the PRA.MS model to selected mining sites - processed by APAT/ETCTE - © EEA 2004

2004 Project outcomes

- ACCESS © database of existing methodologies for preliminary risk assessment
- ACCESS © based PRA.MS I model
- Technical reports:
  - **Background and outcomes of the project**
  - **Review and analysis of existing methodologies for preliminary risk assessment**
  - **PRA.MS scoring model and algorithm**
  - **Application of PRA.MS to selected industrial and mining sites**

2005: Inputs from peer review

Inputs from experts on methodology and data collection:

- Organize a streamlined country data collection: problem areas to be selected on the basis of agreed pre-screening criteria;
- Include assessment of multiple risks and multiple sources;
- Focus on site classification rather than on risk prioritisation;
- Add GIS and spatial assessment capabilities;
- Automate the methodology where feasible and relevant and integrate the procedures in an information system.

2005:PRA.MS II Pilot study

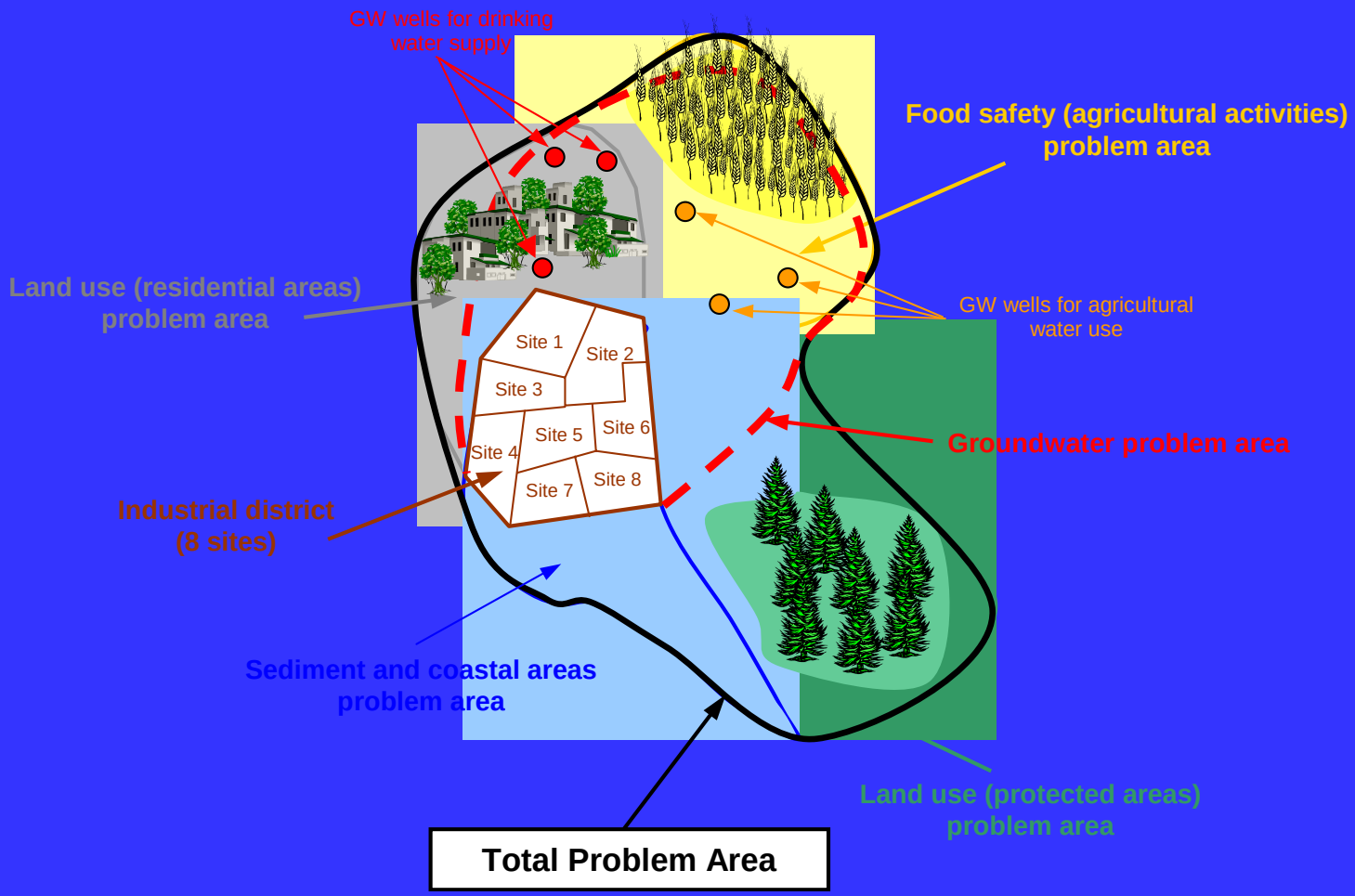
- Pre-screening of problem areas:

  Two sets of criteria to be used to select areas where:
  - knowledge on extent of impacts is available
  - knowledge on impacts is not sufficient and “surrogate” information may support the selection

- On-line questionnaire for the collection of data on areas passing the pre-screening

- Analysis and assessment of data collected

Schematic representation of a Problem Area



2005: Results from pilot study

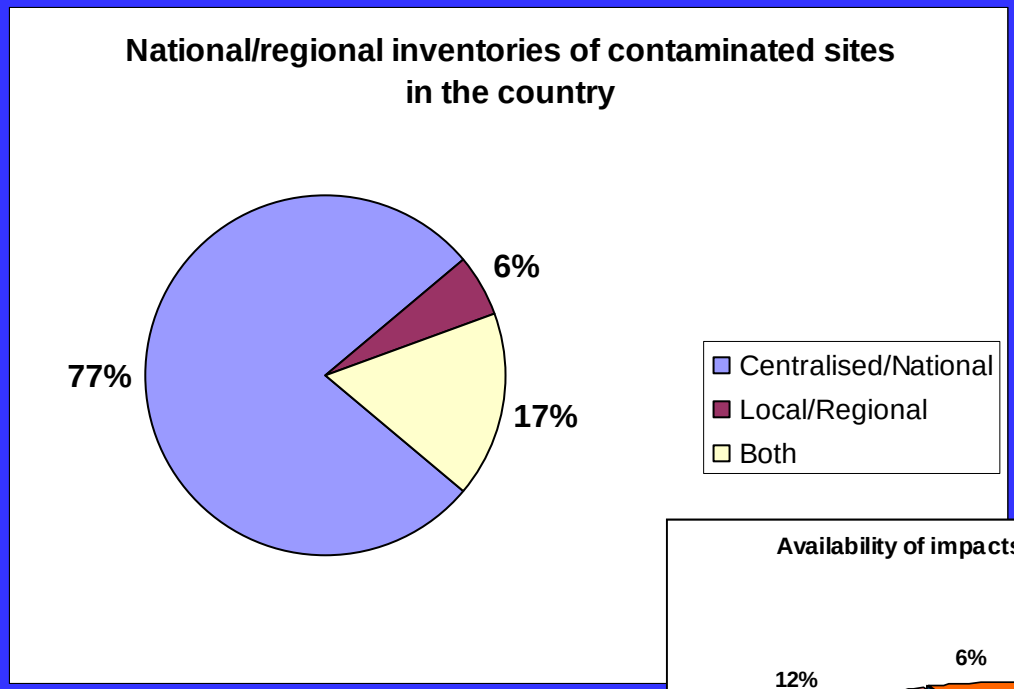
Pilot Country	Problem Areas where pre-screening applied	Problem Areas passing pre-screening	Problem Areas loaded in the online questionnaire
Italy	50	26	1
Finland	6	1	1
Austria	11	1	1
Sweden	10	1	1
Belgium-Flanders	2	2	1
Russian Federation			1
Total	**79**	**31**	**6**

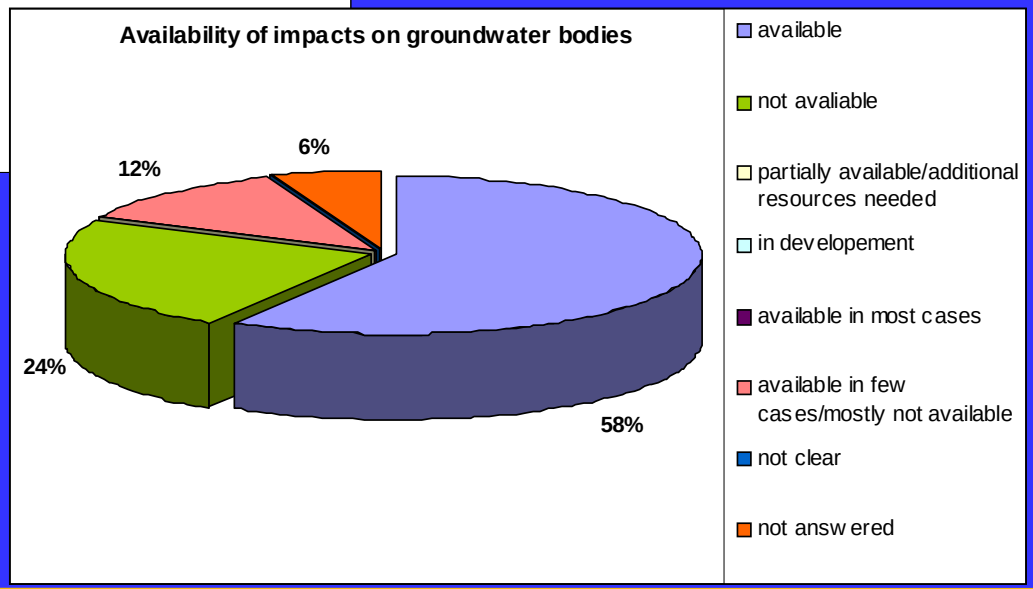
2005: EIONET consultation

EIONET members were consulted on a number of questions:

- General data availability and accessibility (local vs. central inventories);
- Application of proposed pre-screening criteria;
- Relevance and availability of proposed parameters for the classification and characterisation of Problem Areas.

EIONET consultation - 18 countries





2006: Conclusions and next steps 1

- The EIONET consultation confirmed the feasibility of continuing the project on an operational basis. However:
  - Some elements (i.e. pre-screening criteria) need further clarification and simplification
  - Data collection and reporting is an effort that requires dedicated resources at the national level
  - Information on impacts on receptors is not always readily available

- The implementation of the forthcoming Soil Framework Directive would result in data more readily available and comparable

2006: Conclusions and next steps 2

1. Extend data collection to all Member countries
2. Data collected will be used to classify Problem Areas in relation to:
   - Source complexity (number of sites/ownerships, categories of activities/contaminants);
   - Size (source size, Problem Area size);
   - Receptor complexity (number/types of receptors impacted/threatened within the Problem Area);
   - Progress in management
- Case studies
1. Results will be used in EEA reports

Case study 1: ACNA, Italy

Aereal photo of the source area

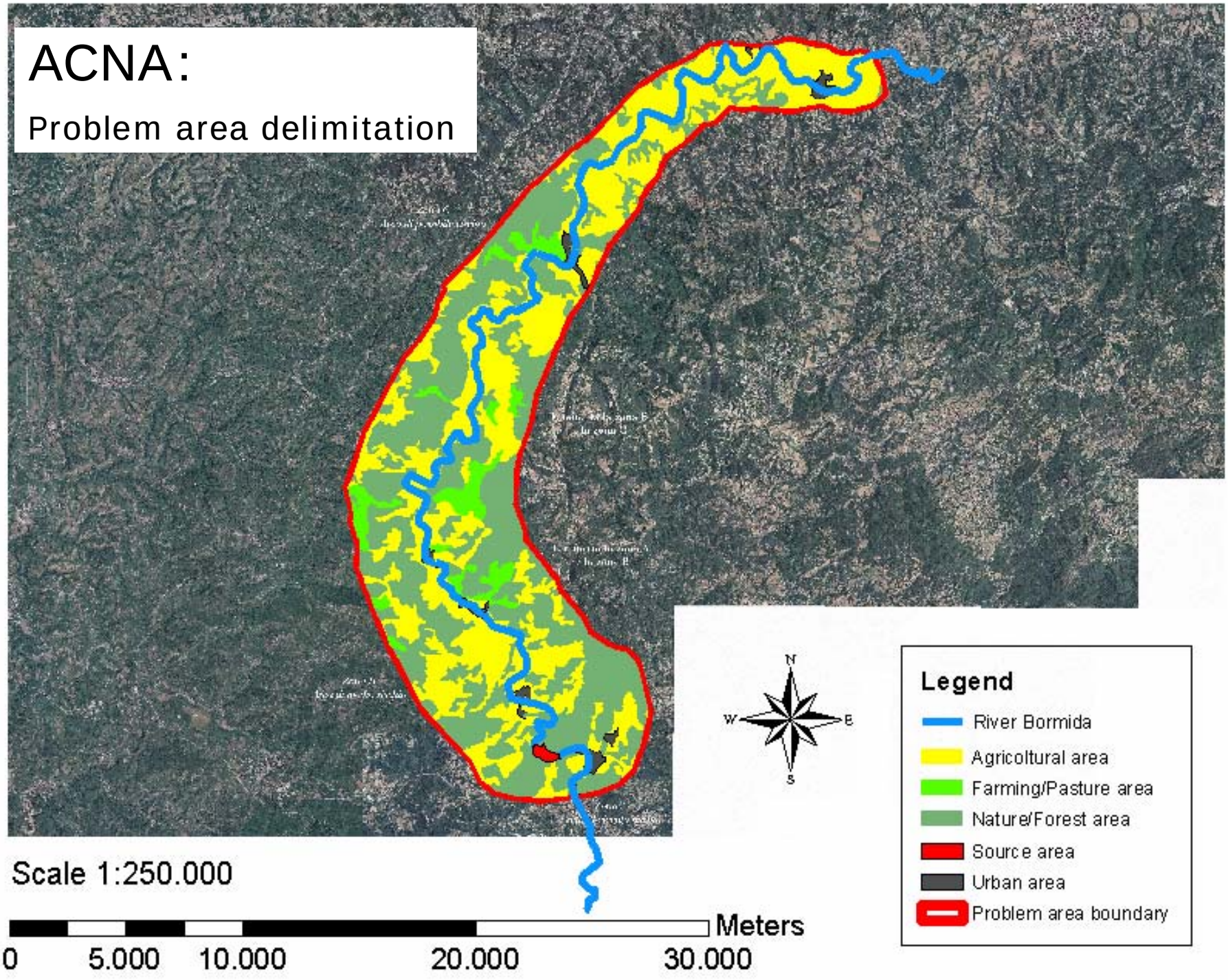
Lagoons on site used
to dispose sodic salts

ACNA History

1882	Activity started with the manufacturing of explosives
1909	Several drinking-water wells (up to 16 Km. from the site) of the Bormida River Valley were polluted.
1912	Production of pharmaceuticals and dyes started
1925	Production of sulphuric acid, nitric acid and phenol started
1938	Bormida river's water were no longer used for irrigation.
1962	No living organism up to 20 km downstream and fishes captured 70 km downstream smelled like benzo-phenol
'80	ACNA dismissed dyes production but manufacture of pigments continued
1986	Wastewater with high sulfate concentration were dumped in lagoons.
1988	A cloud of sulphur dioxide was released. ACNA was closed for 45 days.
1998	ACNA was declared as "Contaminated Site of National Interest"
1999	In January 1999, ACNA was closed and a Government Commissary was nominated

ACNA:

Problem area delimitation



ACNA Management

Delimitation of the problem area (22,200 ha)

- It was divided into 3 zones: zone A, high risk, including the chemical plant, a landfill; zone B, medium risk, including the river and flooding areas; zone C, low risk.

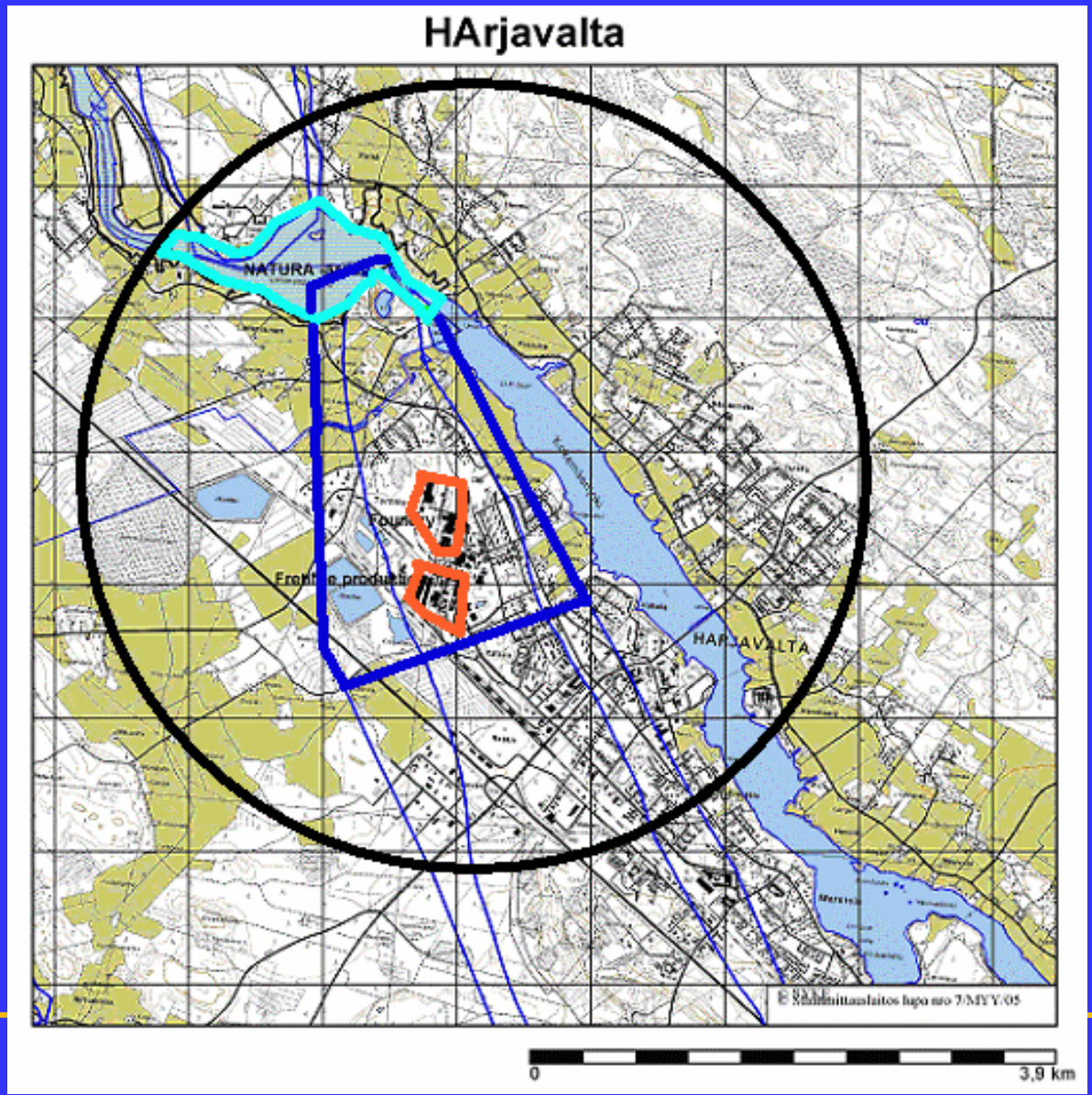
Characterization

- Soil and groundwater on site are polluted with **214** different compounds. Soil off site is contaminated to a depth of 2-3 meters.

Risk reduction measures

- An area will be entombed because it is not possible to remove the source (**2 M m3** of waste and cont'd soil).
- **140,000 tons** of lagooned sodic salts are being dewatered, packed and transported to Germany.
- A leachate and drainage waters collection system has been completed.
- Estimated costs for remediation and safety measures are 190 M euro which include government funds

Case study 2: Harjavalta, Finland



Legend

- Problem area boundaries
- Sources
- Cont'd groundwater
- Nature 2000 site

Harjavalta History

1944	Smelter activity and fertilizer production started.
‘80	Risk management actions started. As example, liming and fertilization was used to improve the condition of forest in the problem area. Emissions from plants reduced.
2000	Soil contamination thoroughly studied: affected forest growth, quality of agricultural and garden products, quality of groundwater and landscape.

Harjavalta Management

Delimitation of the problem area

- The location of Harjavalta town is by the river Kokemäenjoki. Foundry (metals) and fertilizer production are located near the center of the town. Natura2000 site is located in the left upper corner, downstream from the Harjavalta site. The problem area includes an important groundwater reservoir called Järilänvuori groundwater area. The quality of the groundwater is good except in the area between the smelter and the river.

Characterization

- Heavy metals (Cu, Ni, Zn, Pb, As, Cd)
- Sulphur dioxide
- NH4+

Risk reduction measures

- Limitation on Groundwater use
- Limitation on Agricoltural production
- Liming and fertilization of forest

PRAMS II Questionnaire

Parameters	***ACNA***	***HARJAVALTA***
Problem area characterisation		
Climate	9-12 °C -1000 mm/yr	4 °C – 600 mm/yr
Extension	22,000 ha	10,000 ha
Management progress	100% characterized 20% of site remediated	100% characterized
Source		
Categories of activity	former chemical plant	smelting, fertilizers production
Site ownerships	1	2
Categories of contaminants	heavy metals, PCB, PAH, etc.	heavy metals, SO2, NH4+
Quantity	0.5 M m^3 waste 1.5 M m^3 cont'd soil 140.000 tons salts	4.8 M m^3 waste
Receptor specific data		
Groundwater	impacted, drinking use limitations	locally impacted, drinking use limitations
Surface water	impacted	
Land use		nature and agricultural area impacted
Food safety		limitation of agricultural production
Sediments and coastal areas	river sediments impacted	

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Thank you !

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