



Soil contamination and the ESBN - Past activities & new challenges

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ESBN Plenary Meeting

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- Definitions
- Past and ongoing activities in Europe
- Requirements by EU Soil Thematic Strategy
- Research recommendations by
TWG Contamination and TWG Research
- Proposal for ESNB on soil contamination issues

Diffuse soil contamination

Diffuse soil contamination is the **presence of a substance** or agent in the soil as a result of human activity emitted from moving sources, from sources with a large area, or from many sources (adapted from ISO 11074).

It is caused by **dispersed sources**, and occurs where emission, transformation and dilution of contaminants in other media has occurred prior to their transfer to soil.

As a result, the **relationship** between the contaminant source and the level and spatial extent of soil contamination **is indistinct**.

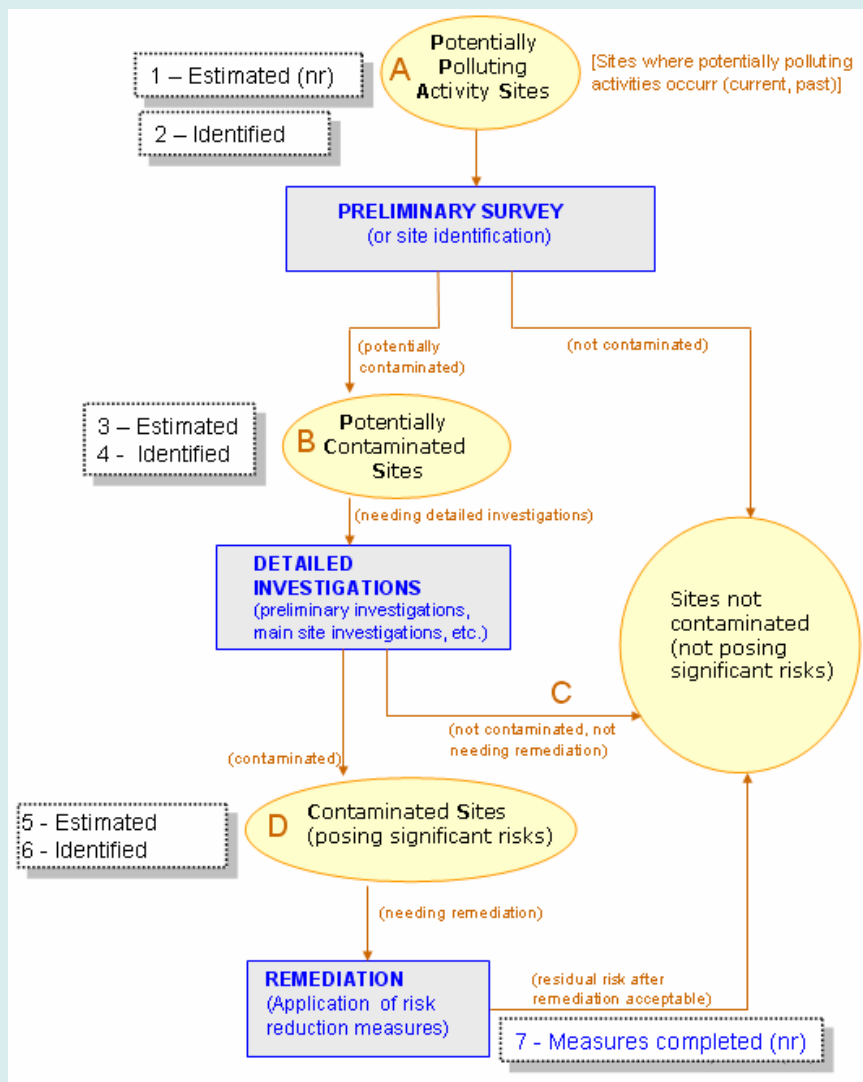
Local soil contamination

Local soil contamination occurs where **intensive industrial activities**, inadequate waste disposal, mining, military activities or accidents pose a **special threat to soil**.

If the natural soil functions of buffering, filtering and transforming are overexploited, a **variety of negative environmental impacts arise**, the most problematic of which are pollution of water, supplies, direct contact by humans with polluted soil, uptake of contaminants by plants and explosion of landfill gases (EEA, 1999).



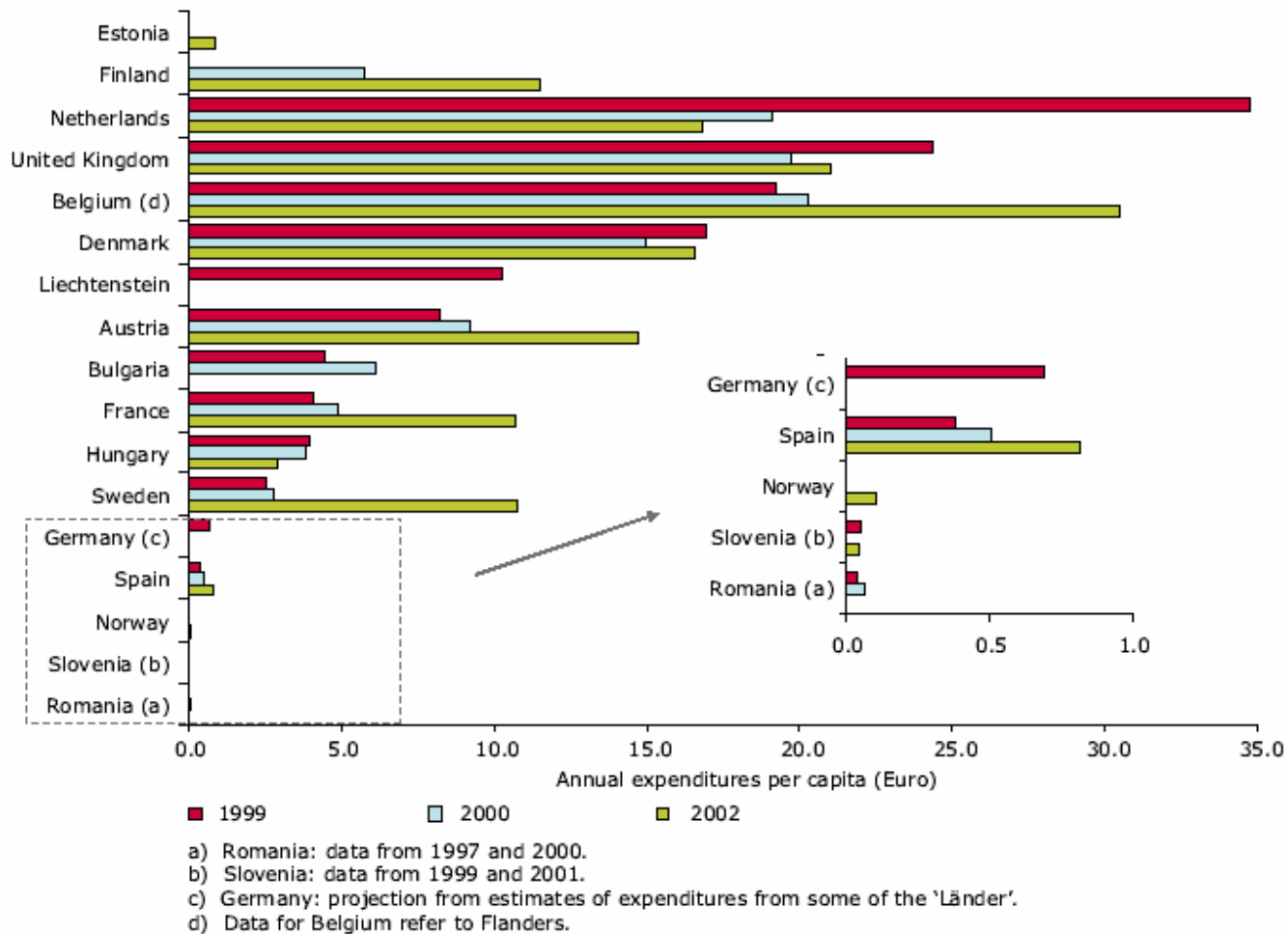
Management of contaminated sites



Source: EEA, 2007



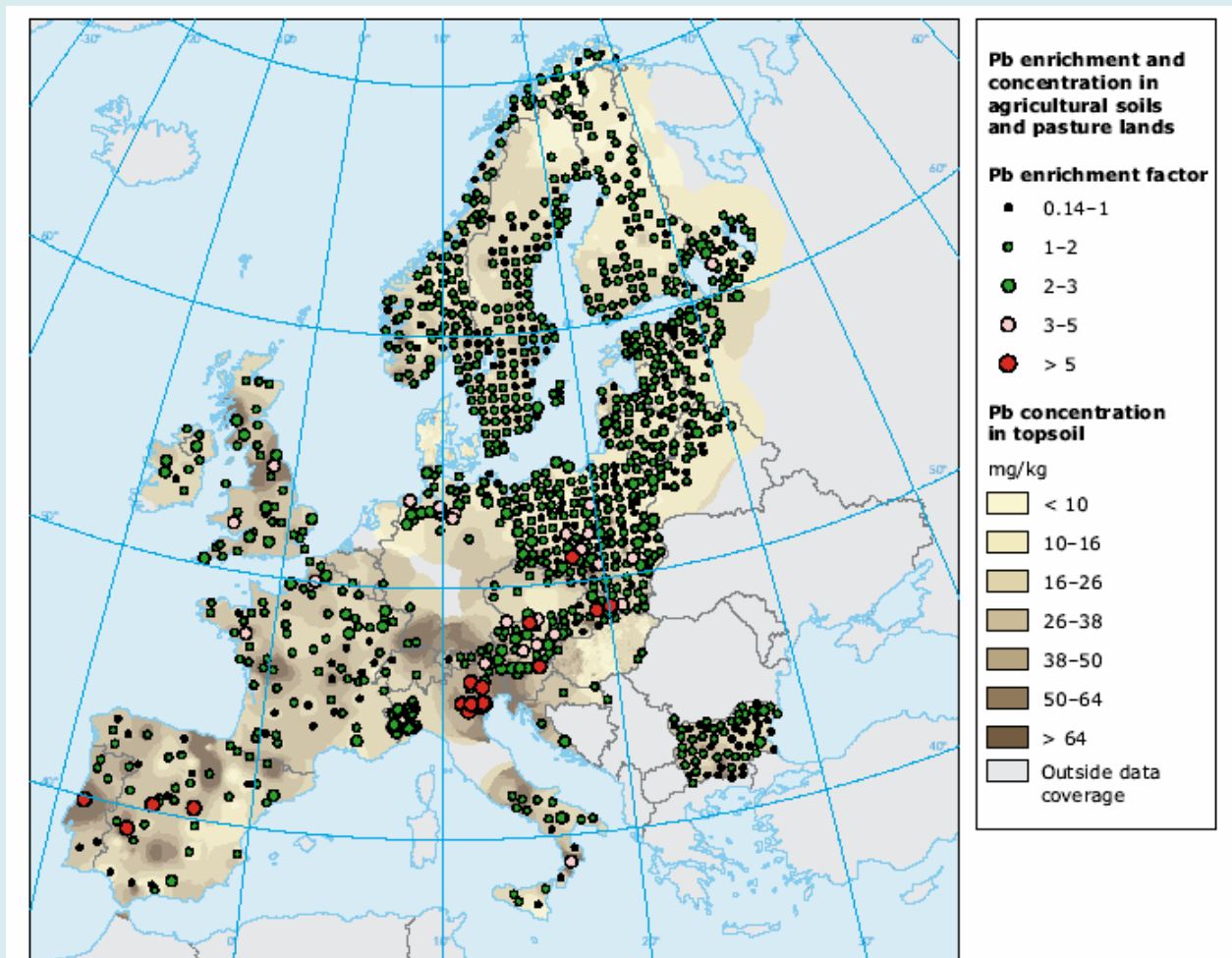
EEA, EIONET & ETC-TE Expenditure for CLM



Source: EEA, 2005.



EEA, EIONET & ETC-TE Heavy metal accumulation



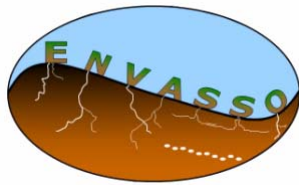
Note: Only randomly selected enrichment value dots shown for Austria, Bulgaria and Slovakia.

Source: Baltic Soil Survey (BSS), the Foregs Geochemical Baseline Mapping Programme and Eionet,2003.

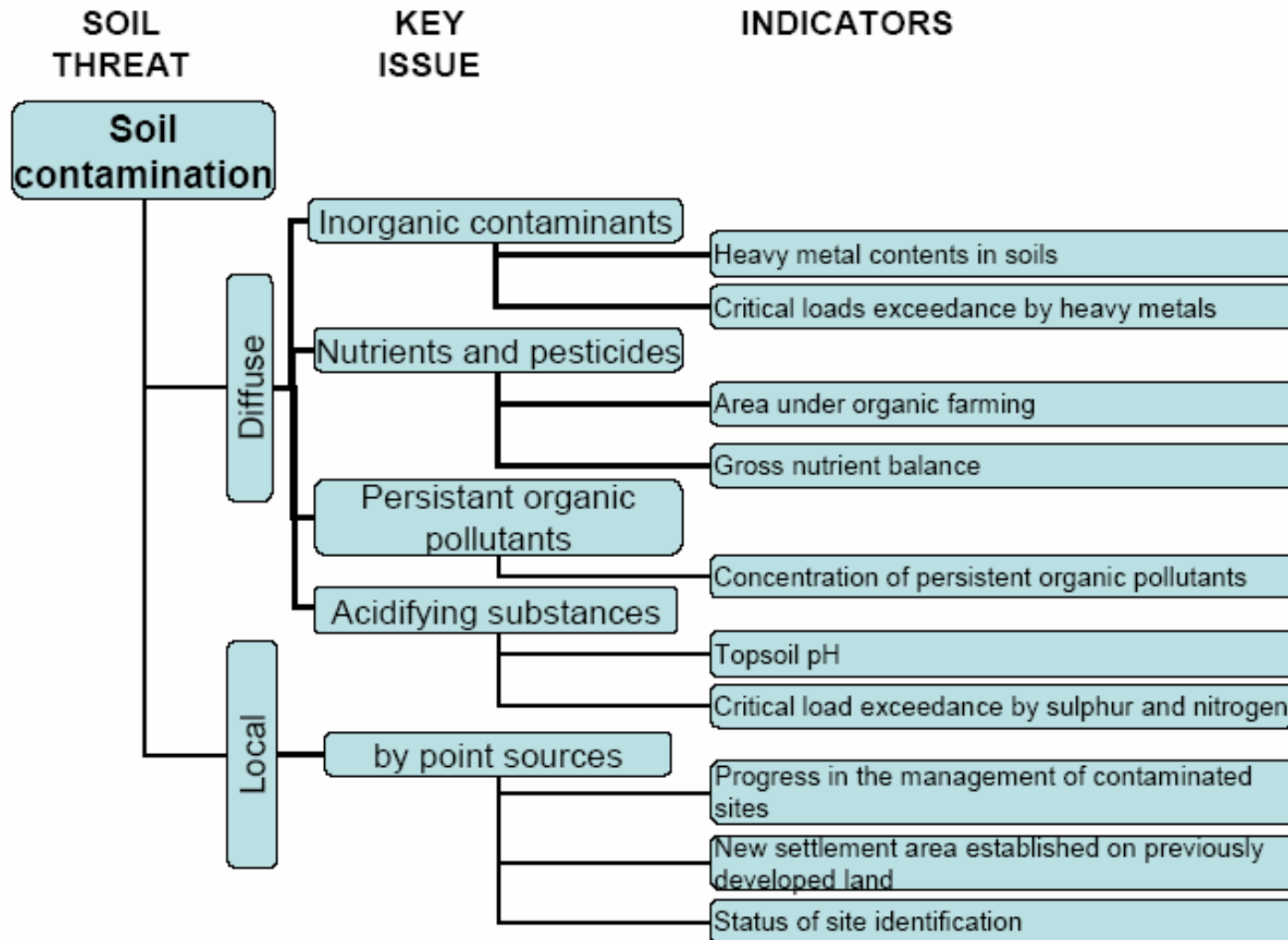
Source: EEA, 2005

ESBN WG on Heavy metals and SOM

- **'Short term study'** on heavy metal and organic matter content in European topsoils
- **Stratification** according to soil parent material & land use, pH and soil structure
- The **available data of the countries vary**, both in quality and quantity
- The **database is far from complete**, little steps forward to data harmonisation have been achieved
- **Need for 'long term action'** was identified towards reduction of data gaps and further standardisation



Selected key issues and indicators





TOP3 indicators contamination

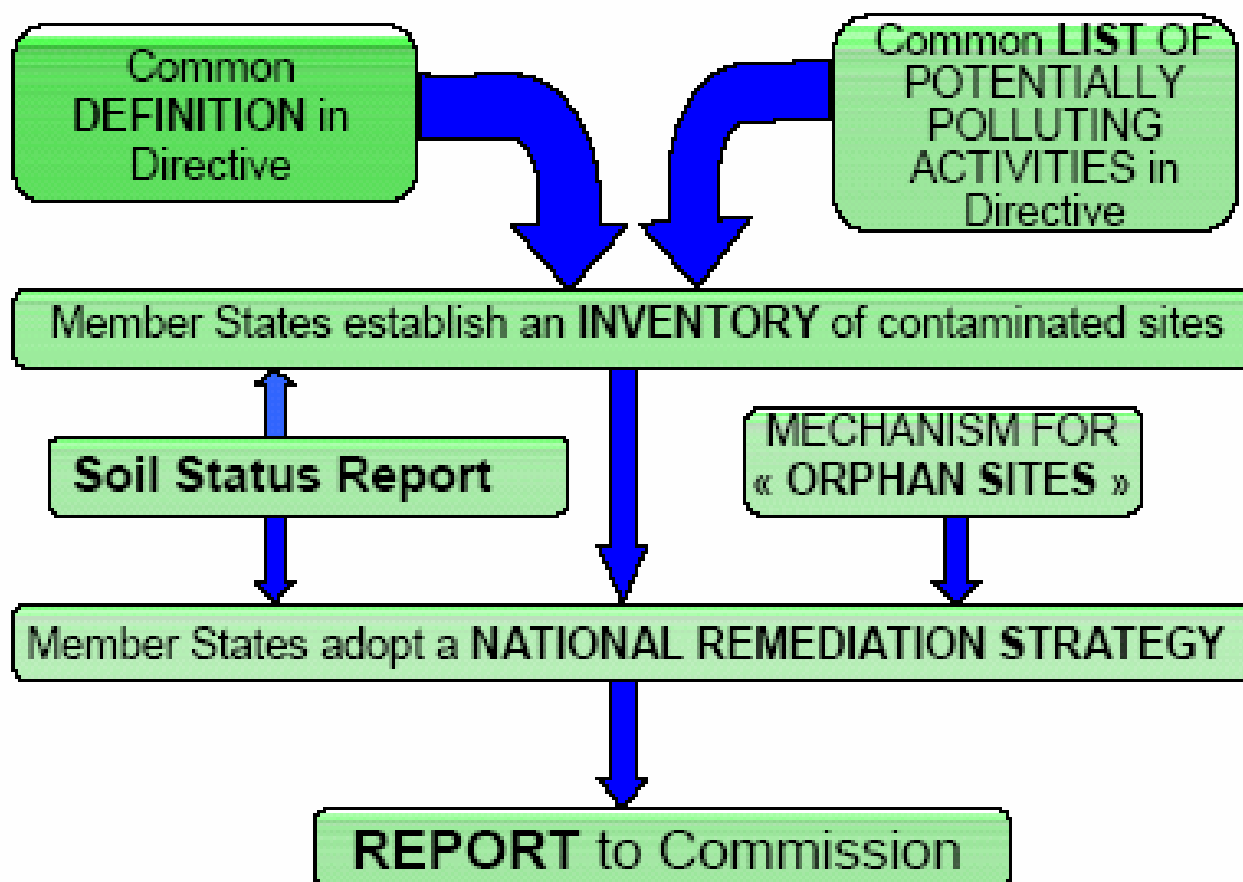
Key issue	Key question	Candidate indicator	Unit	ID
Diffuse soil contamination by heavy metals and other inorganic contaminants	Which areas show heavy metal contents in soils exceeding national thresholds?	Heavy metal contents in soils	% of area or plots exceeded	CO01
Diffuse soil contamination by acidifying substances	Are we protecting the environment effectively against acidification?	Critical load exceedance by sulphur and nitrogen	% of area exceeded	CO07
Local soil contamination	Is the management of contaminated sites progressing?	Progress in the management of contaminated sites	% of all sites	CO08

EU Soil Thematic Strategy / Framework Directive (1)

Article 9 - Prevention of soil contamination

For the purposes of **preserving the soil functions** referred to in Article 1(1), Member States shall take appropriate and proportionate measures to **limit the** intentional or unintentional **introduction of dangerous substances** on or in the soil, excluding those due to air deposition and those due to a natural phenomenon of exceptional, inevitable and irresistible character, in order to **avoid accumulation** that would hamper soil functions or give rise to significant risks to human health or the environment.

EU Soil Thematic Strategy / Framework Directive (2)



TWG Contamination – Local contamination

- **System-oriented approach** is required in contrast to approaches focusing on individual substances
- Need for **harmonised** analysis and sampling procedures
- Focus research on giving **better estimations of transfer of contaminants** to possible receptors via the different transfer routes
- **Sustainability** of remediation concepts
- **Easy-entry** decision support tools for BAT

TWG Contamination – Diffuse contamination

- **Tools to assess availability of substances** (to plants, animals and soil micro-organisms) that reach the soil from either atmospheric deposition or agricultural activities
- Investigate feasibility of development of **true farm and field gate balances**
- Knowledge on **long-term changes** in soil in relation to changes in land use
- An overview of effects of available and new management strategies on **environmental impact**

- **Identify and quantify contamination sources** (both geogenic and anthropogenic), especially diffuse, the route of entry and fate of contaminants into/in the soil and assess the spatial and temporal variations
- Understand the capacity **controlling factors** in soil influencing long-term behaviour of contaminants in soil
- Understand the **impact of contamination** on the soil/water/sediment system (the sub-surface)



TWG Research Research needs – Cluster 2

- **Produce, validate, optimize, and harmonize** in view of normalization, exhaustive, reliable, and economical **measurement methods** for all steps of the characterization of soil contamination (sampling, analysis, background levels, etc), specifically addressing:
 - Sampling procedures
 - Early warning systems
 - Speciation of fate of pollutants
 - Indicators for soil quality
 - Behaviour of substances



TWG Research Research needs – Cluster 3

- Define criteria and harmonize methodologies to allow the **identification of chemicals** which may pose potential danger in the future
- **Identify the socio-economic driving forces** and influencing management actions influencing soil pollution and quantify their effects on soil pollution
- **Identify the measures** for the control of non-point pollution from diffuse sources

TWG Research Research needs – Cluster 4

- To improve and harmonize the conceptualization and the modelling of the **transfers of contaminants** from and within the soil and of the subsequent risks
- To **improve risk assessment** methodologies for remediation activities
- To construct a "**fit-for-use**" **tool box** for risk modelling for use in (parts of) Europe
- To develop a conceptual basis for combining different sources of **spatiotemporal variability** for complex soil and ground water systems



TWG Research Research needs – Cluster 5

- Identification of **natural attenuation capacities** of soil and its preservation (link with cluster 1)
- Improve the quantification, and the consistency with impact assessment, of **natural soil rehabilitation processes**
- To develop a method for the **comparison of alternative management options** (evaluation of risk based approaches in decision support systems)

Proposal for ESBN

- **Produce, validate, optimize, and harmonize** in view of normalization, exhaustive, reliable, and economical **measurement methods** for all steps of the characterization of soil contamination
- Start with '**Long term action**' on heavy metals
- Provide evaluation methods and procedures for **combination of soil contamination data** from various sources (site and spatial data)
- Define criteria and harmonize methodologies to allow the **identification of chemicals** which may pose potential danger in the future