

# Evaluation and management of arsenic contamination in agricultural soil and water

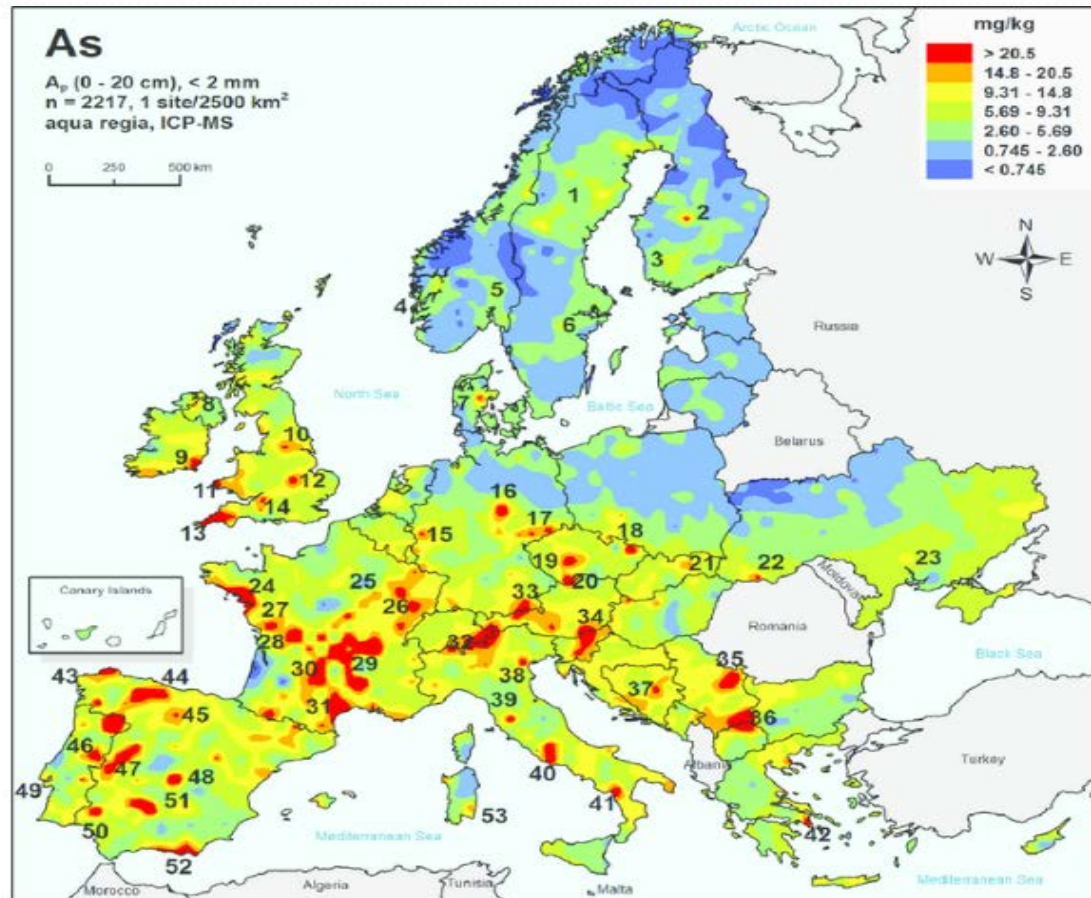


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Water JPI  
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# MOTIVATION

**Arsenic in European soil, both anthropogenic and natural**





# MAIN OBJECTIVES

- To summarize arsenic concentrations in **national and European databases** for agricultural soils and water,
- To apply biological tools to assess environmental quality and to manage **ecological, environmental and human risks**,
- To demonstrate **As removal technology** at target sites and to assess its technological and economic feasibility, and
- To develop **recommendations/guidelines** for sustainable management of As risk.

# CONSORTIUM

1. Geological Survey of Finland – GTK, Finland
2. University of Oulu, Finland
3. G.E.O.S. Ingenieurgesellschaft mbH, Germany
4. Bureau de Recherches Géologiques et Minières – BRGM, France
5. LEB Aquitaine Transfert, France
6. Kungliga Tekniska Högskolan, Sweden

## PRINCIPAL INVESTIGATORS:

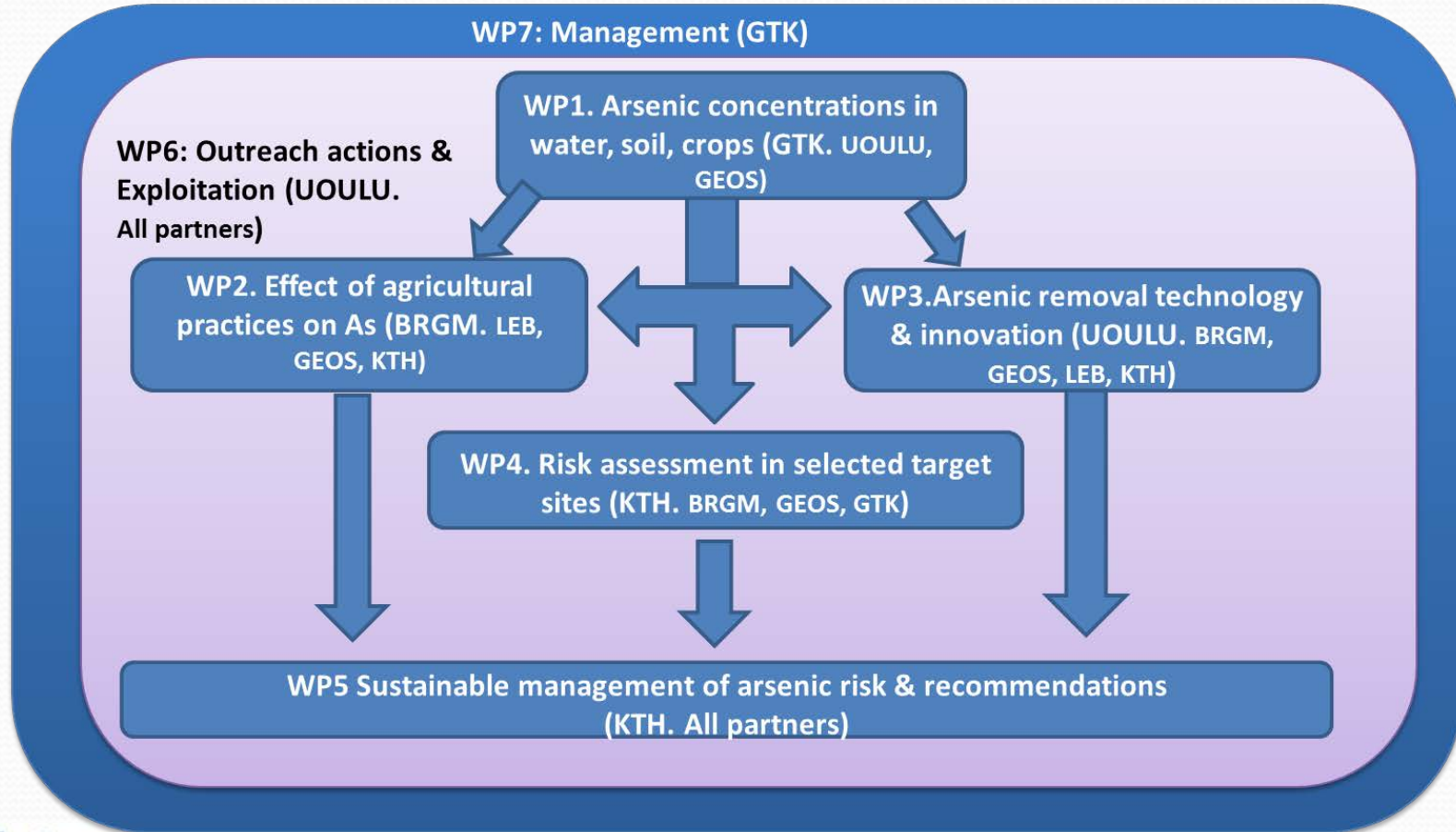




# Advisory Board

1. Professor Jose Solis Veliz, National University of Engineering, Lima, **Peru.**
2. Professor Jose Miguel Nieto, Universidad de Huelva, **Spain.**
3. Professor Sirpa Kurppa. Natural Resources Institute, **Finland.**
4. Dr. Ingo Müller, Desk officer, Saxon State Office for Environment, Freiberg, **Germany.**
5. Dr. Teodóra Szócs, MFGI, **Hungary.**
6. Dr. Grzegorz Siebielec, Institute of Soil Science and Plant Cultivation of **Poland.**

# Work Packages





# WPI.

## Arsenic concentrations in water, soil and crops



- **Literature review** and **existing data analysis** of environments contaminated either naturally or anthropogenically by As.
- **Scientific knowledge**
- **Practical experience** in remediation technologies
- **Overview of global markets** of different technologies.

## WP2.

# Effect of agricultural practices on As concentration, bioavailability and toxicity in water and soil



- The objective is to
  - quantify **the effect of chemical or organic fertilizers and liming** on the behavior of As,
  - transfer towards **crop plants, groundwater or surface water**
- Tasks: characterization, speciation, microcosms, modelling, mass balance



## Lorraine, France

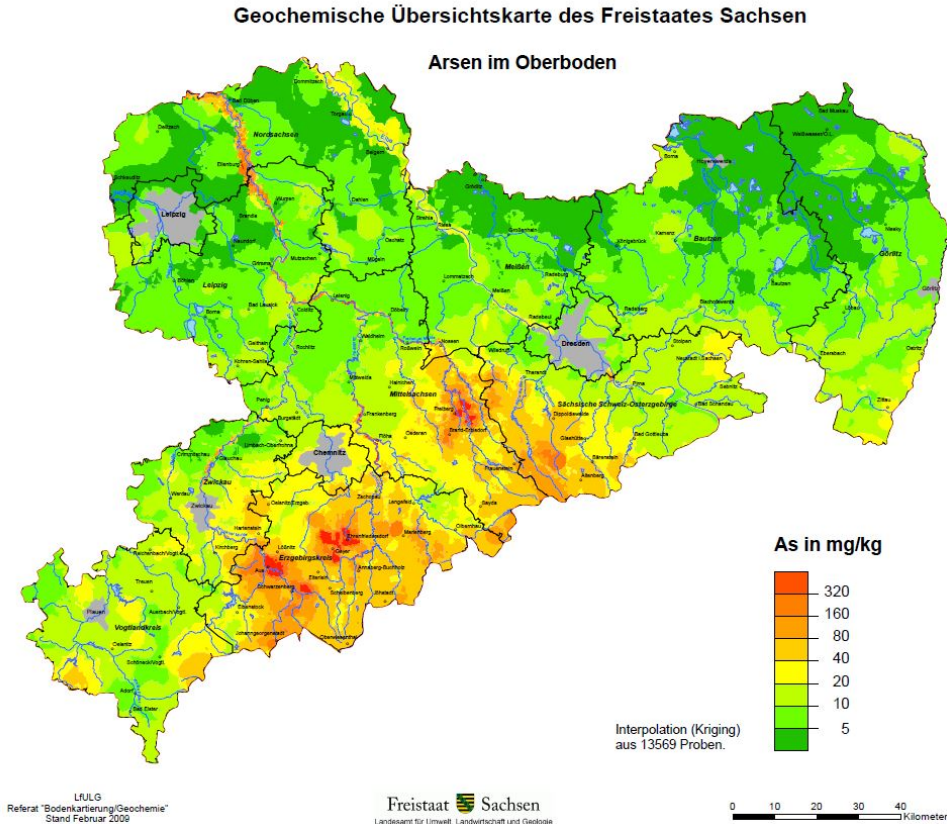
- A chemical ammunition breaking-down facility of the interwar period converted into agricultural land near **Verdun, France**
- One of the most important historical areas of chemical ammunition destruction of WW I, containing **arsenical chemical warfare** agents, located in a sensitive zone for agriculture and groundwater.



An historical view of the ammunition destruction facility near Verdun, 1921. Preparation of an open-burning operation of shells (source Private archives, D. Hube, BRGM)

# Saxony, Germany

- 800 years of mining for Ag, Pb, and Zn.
- Contaminants like As in ground water, surface water and soils.
- Intensive agricultural use: winter wheat



Arsenic concentrations in topsoil, Saxony (red=high). Saxon State Office for Environment, Geology and Agriculture, Geochemical Survey, Dresden 2010.



## WP3.

# Arsenic removal technology & innovation

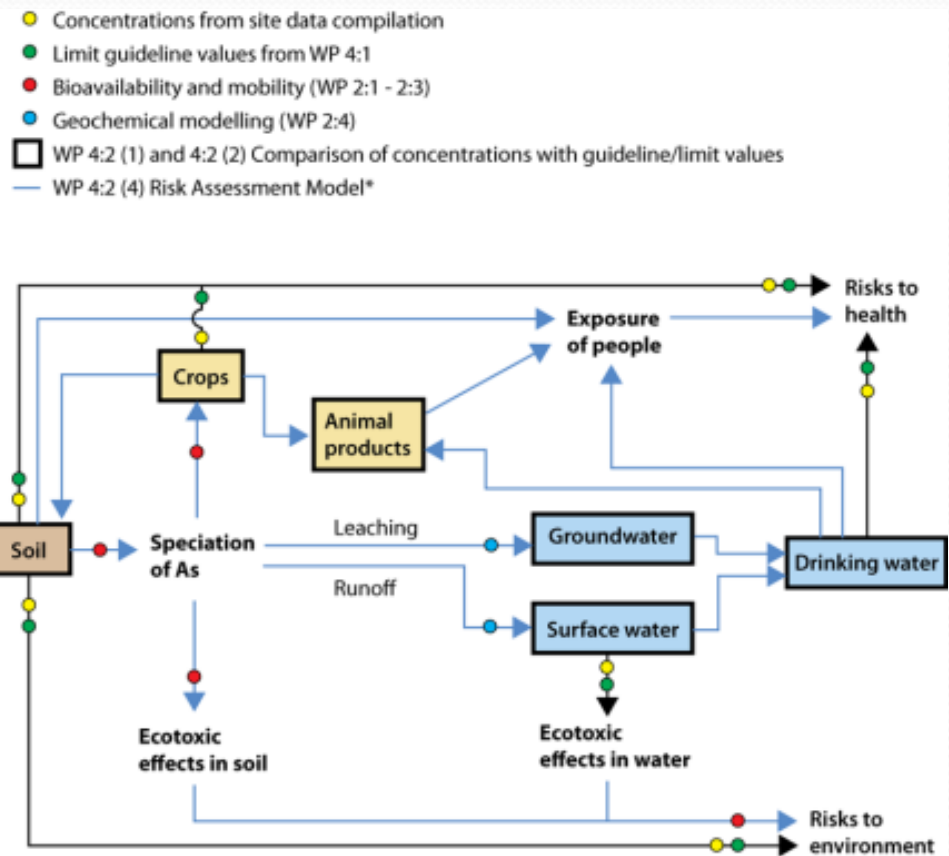
- Methods for **water purification and soil remediation**
- The goal is to develop **hybrid water treatment systems** including advanced oxidation-coagulation-filtration technique and reverse osmosis combined with adsorption/photocatalysis to separate As.
- Soil remediation will be based on **addition of iron-based components with CaO or MgO to As-contaminated soil.** As transfer will be evaluated by applying bio-indicators.



# WP4.

## Risk assessment in selected target sites

- Assessment of risks to health and environment at test sites
- Evaluation of results of ecotoxicological tests and measurements of biomarkers
- Calculation of actual As-exposure of people by identified exposure pathways and evaluation of resulting health risks.
- Assessment of risk reduction
  - Risk – present day conditions
  - Risk – after amelioration/mitigation and climate/ other environmental changes

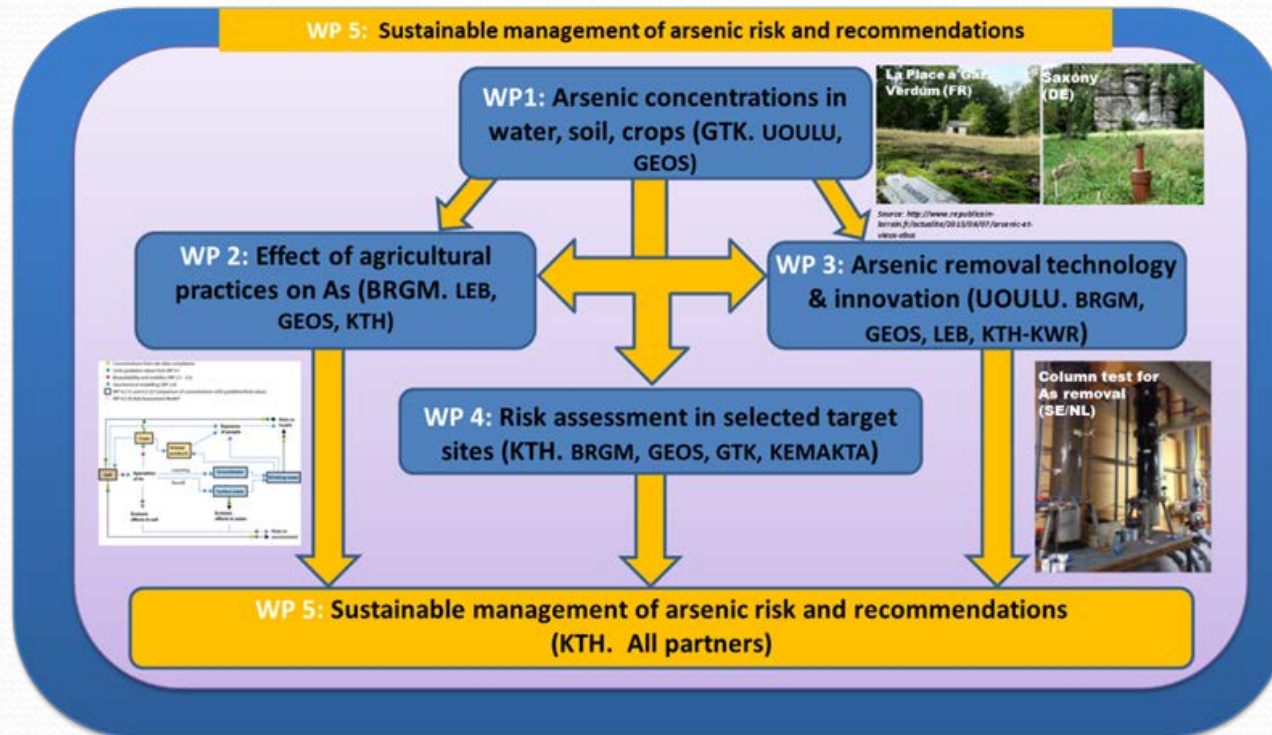




# WP5.

## Sustainable management of As risk & recommendations

- Baseline assessment, compilation and evaluation of data (VVPI-4).
- Preparation of the framework for management for compliance to the guidelines.
- Harmonized set of recommendations for sustainable management of the risks.



# WP6. Outreach & Exploitation

- **AgriAs** will create
  - synergies between researchers, industry, end-users, and regulatory entities and
  - space for new partnerships and communities of practice such as discussion groups and expert meetings.
- Dissemination activities include, e.g., roadshows in participating countries, info material, visits to the demo sites, learning cafés.



## Expected Impacts of AgriAs

- **Commercial exploitation and new job creation** especially in water and soil treatment business.
- The results and the new knowledge can be utilized also by the **SMEs**, especially in the generation of bio-indicators, new fertilizers and soil-conditioners.
- **Evaluation and management of European risks of As exposure through agriculture.** Risk monitoring.
- **Demonstration and dissemination** in close interaction with stakeholders, end-users and policy-makers.