

European-wide Data on Arsenic Concentrations in Agricultural Soils, Waters and Crops (AgriAs Project)

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Arsenic is a toxic and carcinogenic substance. According to WHO, the greatest threat to public health from As originates from contaminated groundwater. Food is another notable pathway for As exposure in humans. There are numerous As-related publications and reports, but many of them focus on As problems in South-East Asia or are limited to groundwater or contaminated soil. The AgriAs project (<http://projects.gtk.fi/AgriAs/index.html>; Water-JPI 2017) has focused on European data on agricultural soils and the quality of related surface water and groundwater.

The AgriAs project has summarised European-wide databases and publications on As concentrations in soil and water. This was followed by a literature review and a questionnaire on national-level data sources of As concentrations in agricultural soil and water. A web-based AgriAs questionnaire on national and large-scale regional data sources on As in soil, surface water, groundwater and crops in Europe was sent to 23 countries. The general findings, concerning As concentrations in crops, were summarised from the literature. Following the assessment of data availability, a list of major data gaps was reported.

Reimann *et al.* (2009) have provided a comprehensive summary of the European-wide availability of data on As concentrations in soil and water. More up-to-date information on national and regional data sources were identified from the AgriAs questionnaire. The questionnaire revealed that regional-scale data are available on As concentrations in soil and surface water. These data can provide a detailed insight into the European-wide anomalies found in the FOREGS (Salminen *et al.*, 2005), Baltic Soil Survey (Reimann *et al.*, 2003), GEMAS (Reimann *et al.*, 2014; Tarvainen *et al.*, 2013, 2014) and LUCAS surveys (Tóth *et al.*, 2016a, b).

There are quite extensive European-wide data sets on As concentrations in agricultural soil, but more detailed regional mapping at the national level is needed, especially in those areas where anomalously high As concentrations in topsoil have been discovered. According to the AgriAs questionnaire and literature study, European-wide data as well as nationwide data on As concentrations in crops are entirely lacking. There is no up-to-date map of As concentrations in European groundwater related to agricultural sites. European-wide or large-scale regional databases very seldom combine As concentrations in agricultural topsoil with concentrations in adjacent surface water or groundwater.

According to the European-wide soil geochemical data, two study sites of the AgriAs project in Verdun (France) and in Freiberg (Saxony, Germany) represent anomalous As areas (Fig. 1). Arsenic anomalies can be either geogenic or anthropogenic, or the anomalies can be a combination of naturally high As concentration and long history of mining and metallurgy like the study site in Freiberg. The study site near Verdun (France) represents anthropogenic anomaly: it is a chemical ammunition breaking-down facility of the interwar period converted into agricultural land. Thus, the two test sites can be used to develop and demonstrate the objectives of the AgriAs project: develop recommendations/guidelines for sustainable management of As risks together with stakeholders; to demonstrate As removal technologies in Verdun and Freiberg to assess their technological and economic feasibility; and apply biological tools to manage ecological, environmental and human risks.

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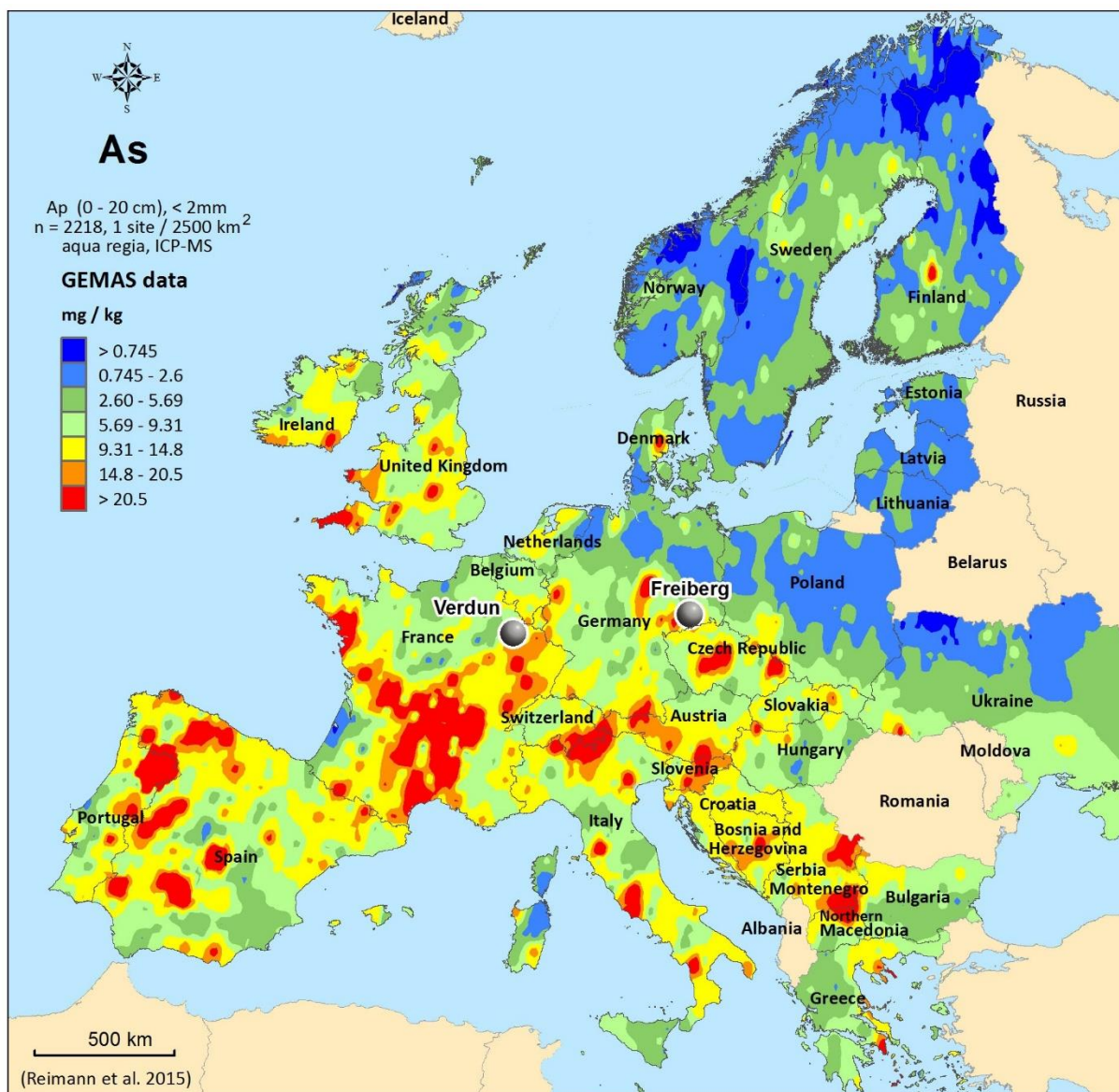


Figure 1. Geochemical map showing the distribution of As in GEMAS agricultural soil (hot *aqua regia* extraction) and the AgriAs project study sites in Verdun (France) and in Freiberg (Saxony, Germany).

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