

# GEOCHEMICAL MAPPING OF AGRICULTURAL AND GRAZING LAND SOIL (GEMAS)

## EuroGeoSurveys Contribution to the International Year of Soils 2015



2015  
International  
Year of Soils



The main objective of the GEMAS project, involving 33 European countries, is the development of a comprehensive database about the chemical composition and quality parameters of European agricultural and grazing land soil for multipurpose use. The resulting harmonised data can be used to answer such frequently asked questions as:

### IS EUROPEAN AGRICULTURAL SOIL OF GOOD CHEMICAL QUALITY?

With respect to inorganic chemical elements, carbon and other physical and chemical properties, determined by the GEMAS project, we can say, yes, in general our soil is of surprisingly good chemical quality. The GEMAS project results demonstrate that at the European scale only a very low proportion of the collected soil samples (usually less than 2%) are at risk due to high metal concentrations. However, this does not exclude problems with toxic element concentrations related to human activities at the local scale.

### ARE THERE DIFFERENCES BETWEEN EUROPEAN COUNTRIES AND, IF SO, WHAT IS THE EXPLANATION?

Large differences are observed in the concentrations of chemical elements in soil samples from the different European countries, and these differences are mainly due to geology and climate. A large difference is also observed in the concentration of many chemical elements between the soil of northern and southern Europe. The young soil from northern Europe shows that the concentrations for many elements are 2-3 times lower than in the older and more weathered southern European soil. This regionality is an important factor to consider in soil legislation, which sets out to determine threshold or action levels for chemical elements in soil.

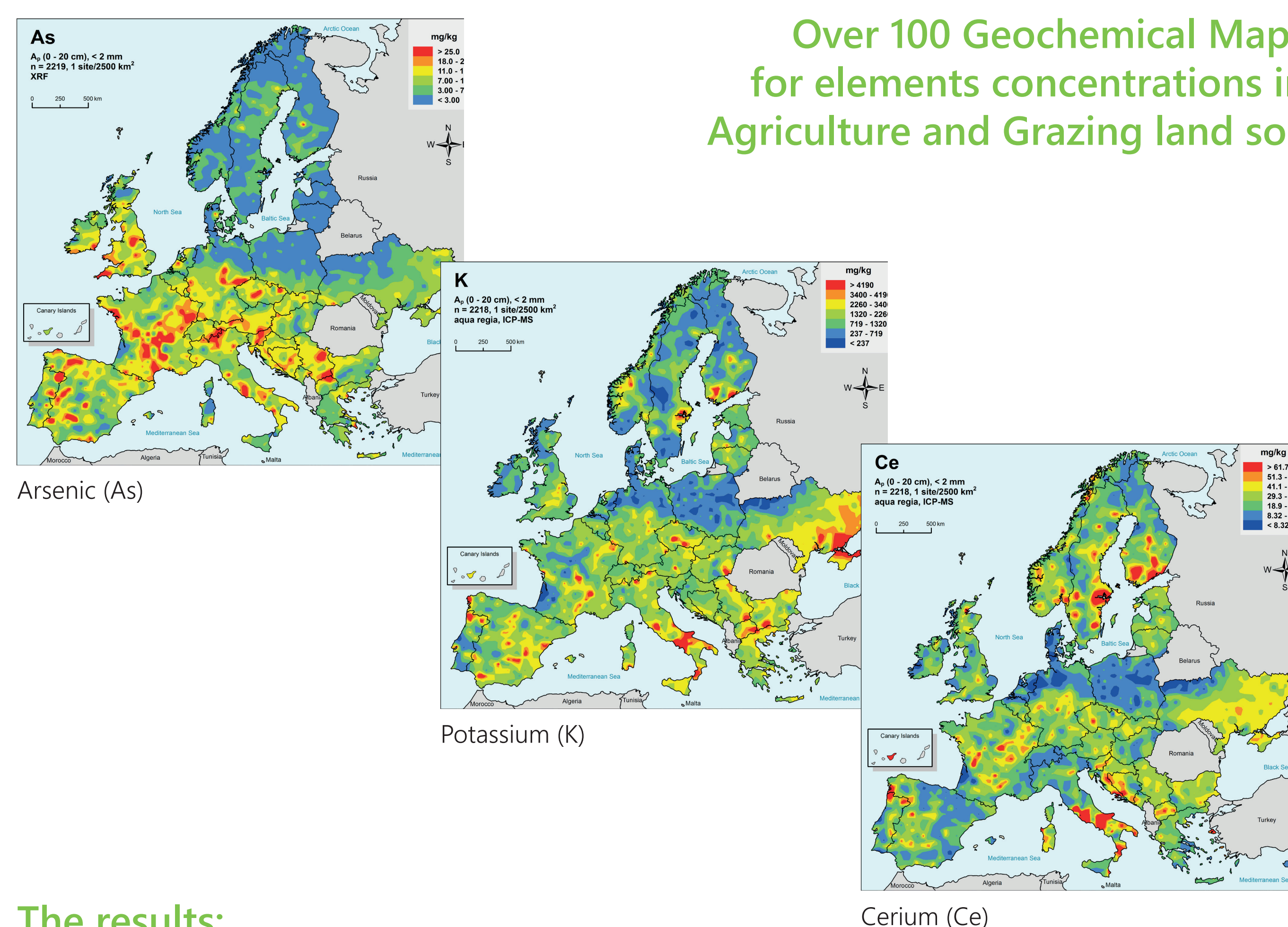
### WHICH ARE THE BENEFITS OF THE GEMAS RESULTS FOR SOCIETY?

For the first time, the GEMAS project provides fully harmonised data for chemical element concentrations and soil properties known to influence their bioavailability and toxicity at the continental (European) scale. Society has, therefore, a valuable reference data set, a 2008 time line, to monitor future changes caused by both human or natural causes, and a set of reference soil samples for future research. Such an archive is invaluable for land use planning, industrial development, environmental protection, risk assessment, forensic science, agriculture and food tracing.

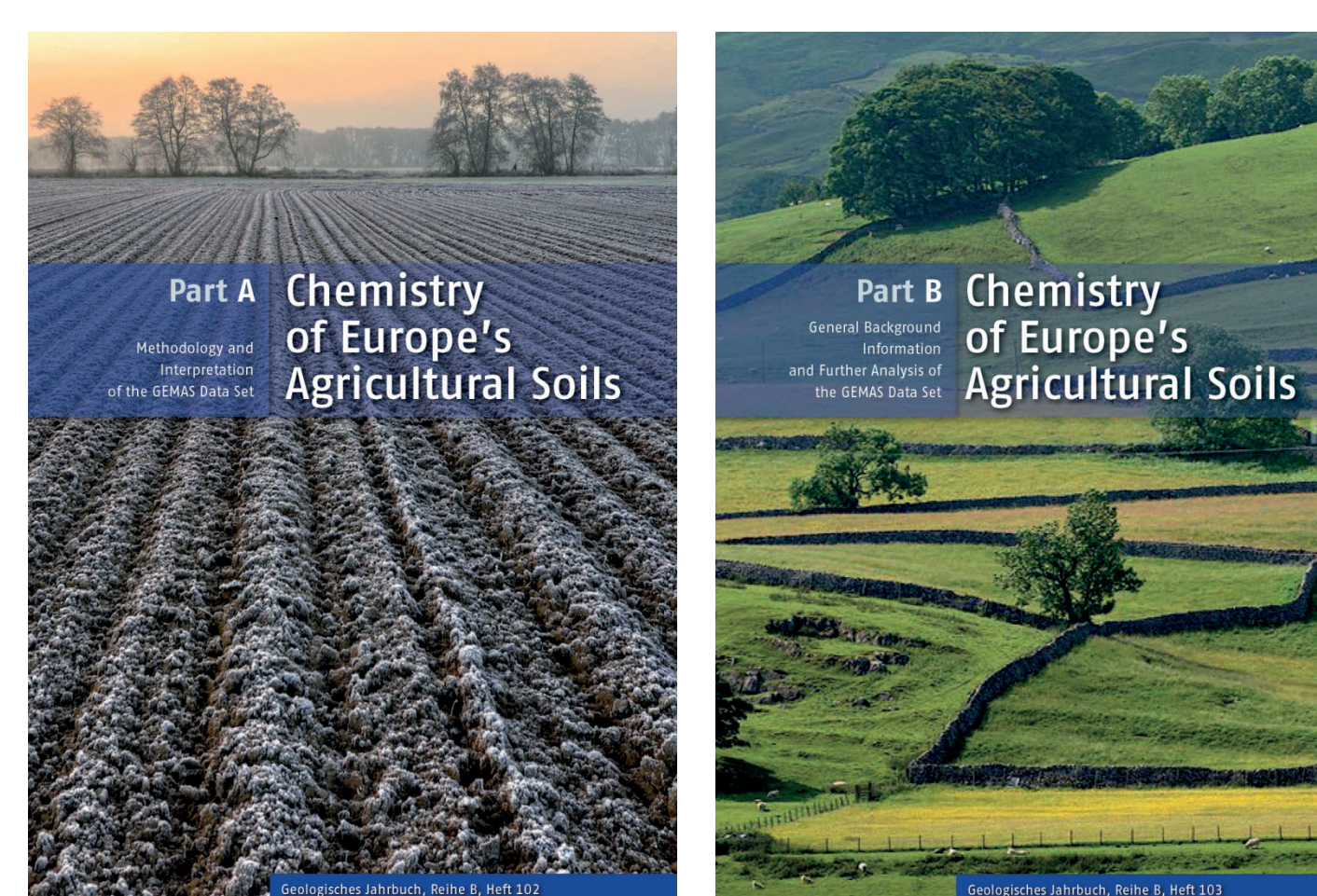
### WHO WILL USE THE RESULTS OF THE GEMAS PROJECT?

The GEMAS project database is in full compliance with the requirements of the European REACH Regulation (Registration, Evaluation, Authorisation and Restriction of Chemicals), and it has been used by industry in the preparation of the required dossiers submitted to the European Chemicals Agency (ECHA). It also provides valuable information for other European pieces of legislation related to metals in soil. The GEMAS results will find applications in forensic science (interest has already been shown by Scotland Yard and the Royal Canadian Mounted Police), medical geology, mineral exploration, and in further wide-ranging academic research. They can also be used as a data set for ground-truthing of remotely-sensed satellite observations that relate to soil composition.

Over 100 Geochemical Maps  
for elements concentrations in  
Agriculture and Grazing land soil



### The results: A two volume geochemical atlas



Reimann, C., Birke, M., Demetriades, A., Filzmoser, P. & O'Connor, P. (Editors), 2014. Chemistry of Europe's agricultural soils – **Part A**: Methodology and interpretation of the GEMAS data set. Geologisches Jahrbuch (Reihe B 102), Schweizerbart, Hannover, 528 pp., <http://www.schweizerbart.de/publications/detail/isbn/9783510968466>

Reimann, C., Birke, M., Demetriades, A., Filzmoser, P. & O'Connor, P. (Editors), 2014. Chemistry of Europe's agricultural soils – **Part B**: General background information and further analysis of the GEMAS data set. Geologisches Jahrbuch (Reihe B 103), Schweizerbart, Hannover, 352 pp., [http://www.schweizerbart.de/publications/detail/isbn/9783510968473/Geologisches\\_Jahrbuch\\_Reihe\\_B\\_Heft\\_B103\\_Chemistry](http://www.schweizerbart.de/publications/detail/isbn/9783510968473/Geologisches_Jahrbuch_Reihe_B_Heft_B103_Chemistry)

Soil, a finite limited  
natural resource, essential for  
food security and  
for vital ecosystem  
functions.