2011 ANNUAL REPORT FOR THE INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)/ INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY (IAGC) TASK GROUP ON GLOBAL GEOCHEMICAL BASELINES

URL: http://www.globalgeochemicalbaselines.eu/

1. TITLE OF CONSTITUENT BODY

IUGS/IAGC Task Group on Global Geochemical Baselines.

2. OVERALL OBJECTIVES

The mission of the IUGS/IAGC Task Group on Global Geochemical Baselines is (i) to prepare a global geochemical database, and its representation in map form, and (ii) to document the concentration and distribution of chemical elements and species in the Earth's near-surface environment. This database is urgently needed by environmental and resource managers throughout the world. To reach this goal, the Task Group promotes and facilitates the implementation of harmonised sampling, sample preparation, quality control, and analytical protocols in geochemical mapping programmes. Task Group activities include the following:

- Developing partnerships with countries conducting broad-scale geochemical mapping studies;
- Providing consultation and training in the form of workshops and short courses;
- Organising periodic international symposia and conferences to foster communication among the geochemical mapping community;
- Developing criteria for certifying those projects that are acceptable for inclusion in a global database;
- Acting as a repository for data collected by projects meeting the standards of harmonisation;
- Preparing complete metadata for the various certified projects; and ultimately
- Preparing a global geochemical database and atlas.

3. FIT WITHIN IUGS SCIENCE POLICY

Current IUGS scientific policy objectives relate to global earth science issues, such as identification of mineral resources, global change, geological hazards, environmental geology and sustainable development. The work of the Global Geochemical Baselines Task Group relates directly to all of these objectives through the establishment of a land-surface global geochemical reference network, providing multi-media, multi-element baseline data for a wide variety of environmental and resource applications. The project is also consistent with the strategic plan published by the IUGS Strategic Planning Committee (2000), and the International Year of Planet Earth (2005-2009) of 'Earth Sciences for Society'.

4. ORGANISATION

The project is led by a Steering Committee, which co-ordinates the activities of five Technical Committees and contributions made by regional representatives.

Steering Committee

Co-Leaders	Dr David Smith	US Geological Survey
	Dr Xueqiu Wang	IGGE, China
Scientific Secretary	Mr Shaun Reeder	British Geological Survey
Treasurer	Mr Alecos Demetriades	IGME, Greece

Analytical Committee

Chair Ms Gwendy Hall Geological Survey of Canada

Co-ordinates the work plan for the analysis of GRN samples, the activities of the laboratories, and the supervision of analytical quality control data.

Sampling Committee

Chair Prof Reijo Salminen Geological Survey of Finland

Supervises development and co-ordination of sampling protocols in the various climatic and geomorphic provinces throughout the world.

Data Management Committee

Chair Dr Timo Tarvainen Geological Survey of Finland

Supervises sampling strategy, co-ordinates the sampling progress of the participating countries, manages the database of sample information and analytical results.

Regional Co-ordination

Chair Prof Reijo Salminen Geological Survey of Finland

Co-ordinates project activities of groups of neighbouring countries.

Regional Representatives

South America:
Gloria Prieto; INGEOMINAS, Bogota, Colombia
Carlos Alberto Lins; CPRM - Geological Survey of Brazil; Recife - PE, Brazil

Africa
Theo Davies; University of Venda; Limpopo Province, South Africa
Marthinus Cloete; Council for Geoscience; Pretoria, South Africa
Keith Sheppard, World Agroforestry Centre (ICRAF), Nairobi, Kenya

South-east Asia:
Pradip Govil; National Geophysical Research Institute; Hyderabad, India
Mathew Joseph, Geological Survey of India; Kerala, India
Ashvin Wickramasooriya; South Eastern University of Sri Lanka; Sammanthurai, Sri Lanka

China:
Xueqiu Wang, Institute of Geophysical and Geochemical Exploration, Langfang, China

Australia:
Patrice de Caritat, Geoscience Australia, Canberra

Europe:
Clemens Reimann, Geological Survey of Norway, Trondheim, Norway

North America:
David Smith, United States Geological Survey, Denver, USA
Francisco Moreira Rivera, Servicio Geológico Mexicano, San Luis Potosí, SLP, Mexico

Public Relations and Finance Committee

Chair Mr Alecos Demetriades IGME, Greece

Advertises and promotes the aims, objectives and achievements of the project world-wide, including by use of the World Wide Web, and takes responsibility for trying to secure funding for the project.

5. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS and IAGC

The project does not have any other source of direct funding. However, within Europe, National Geological Surveys, and associated institutes and universities, have provided staff time and support to the project to complete the preparation and updating of the European GRN as part of the FOREGS/EGS programme as an input to the IUGS/IAGC Global Geochemical Baselines project [http://www.gtk.fi/publ/foregsatlas]. A very conservative estimate of the cost for the production of the *Geochemical Atlas of Europe* is on the order of 5 million Euro (approx. 7.1 million USD). Other countries, including China, Russia, Colombia, India, Brazil, Canada, Mexico, Nigeria and the United States have provided funds through their National Geological Surveys or related institutes for pilot studies on establishing the GRN or for national- to continental-scale geochemical mapping projects. The Cyprus Geological Survey Department recently carried out a fairly detailed soil geochemical project according to the specifications of the Global project. The cost of this project was in the order of 780,000 Euro (approx. 1,044,000 USD). A recent training course on Geochemical Mapping and Environmental Geochemical Survey for African Countries that took place in Beijing between October 24 and November 18, 2011 cost approximately 450,000 Chinese Yuan (approx. 70,000 USD). The course was sponsored by the Ministry of Commerce of the People's Republic of China. From 2007–2011, the USGS has provided funding of approximately 6,000,000 USD for sampling, chemical/mineralogical analyses, and staff salaries for the soil geochemical survey of the conterminous United States.

6. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

This project is closely associated with the work of the EuroGeoSurveys Geochemistry Expert Group (previously the Forum of European Geological Surveys, FOREGS Geochemistry Working Group). The project also has links with the International Atomic Energy Agency (IAEA) and potential links with GTOS, the Global Terrestrial Observing System. The EGS Geochemistry Expert Group has also established closer links with the European Soil Bureau over the past few years, and was actively involved in the European Commission's 'Soil Thematic Strategy Group' for the preparation of the EU's Soil Protection Document, and the final draft of the pending Soil Protection Directive. The EuroGeoSurveys Secretary General has established links to other European Commission projects, such as the GMES Forum (Global Monitoring of Environment and Security), and INSPIRE (Infrastructure for Spatial Information in Europe), since the Geochemical Atlas of Europe has been produced in a harmonised manner, according to IGCP 259 specifications (Darnley *et al.*, 1995) and, therefore, according to INSPIRE specifications. He is also still attempting to link the project with GEOSS (Global Earth Observation system of Systems). In North America, the project has established links with the North American Soil Geochemical Landscapes Project involving the Geological Survey of Canada (GSC), the United States Geological Survey (USGS), and the Servicio Geologico Mexicano (SGM). The Task Group also interfaces with the National Geochemical Survey of Australia.

7. CHIEF ACCOMPLISHMENTS IN 2011

Scientific Accomplishments:

There has been continued and significant progress in a number of areas during 2011, including:

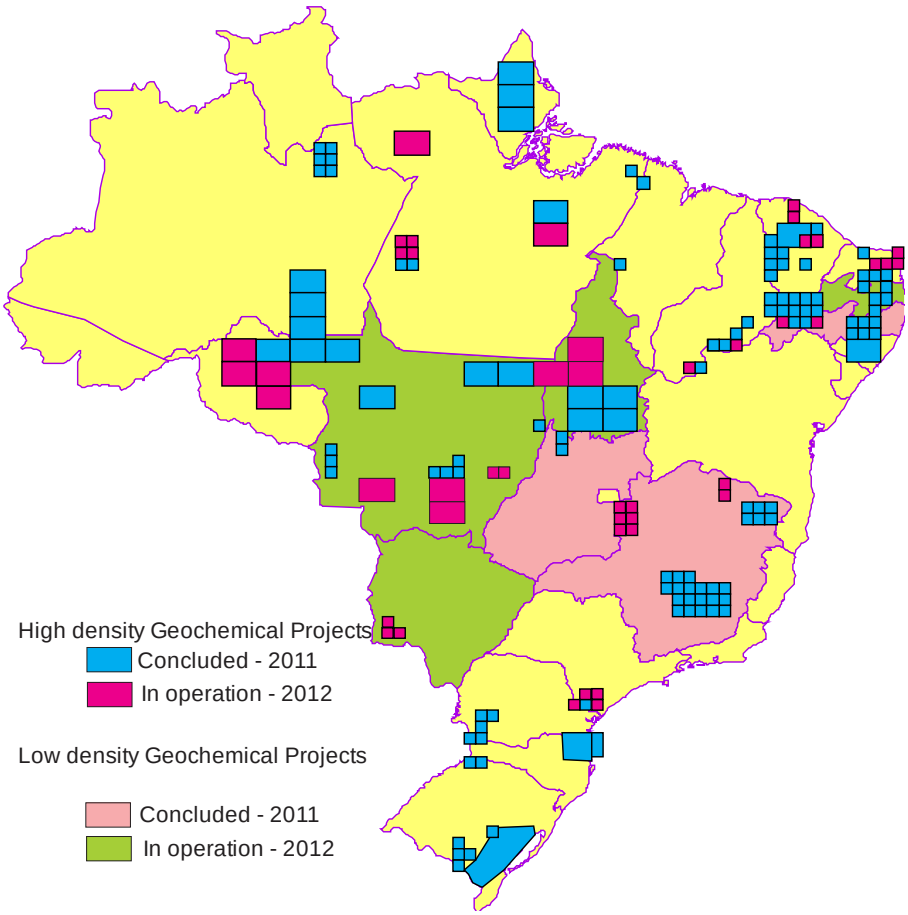
North America: (David B Smith, USGS; Francisco Moreira Rivera, SGM)

The collaboration between the U.S. Geological Survey (USGS) and the Servicio Geológico Mexicano (SGM) to establish a soil geochemical database for the US and Mexico continues to show progress. In 2011, funding was obtained to analyse all the remaining US samples. Geochemical analyses should be completed in early 2012, with the mineralogical analyses following in the summer of 2012. When complete, the US data set will consist of approximately 4,800 sites representing about 14,400 samples. In Mexico, an additional 264 cells were sampled in 2011

representing 749 samples. A total of 1,028 cells have now been sampled (77% of the total 1,327 cells) representing 2,982 samples. Chemical and mineralogical analyses were begun in 2011 in the SGM laboratories.

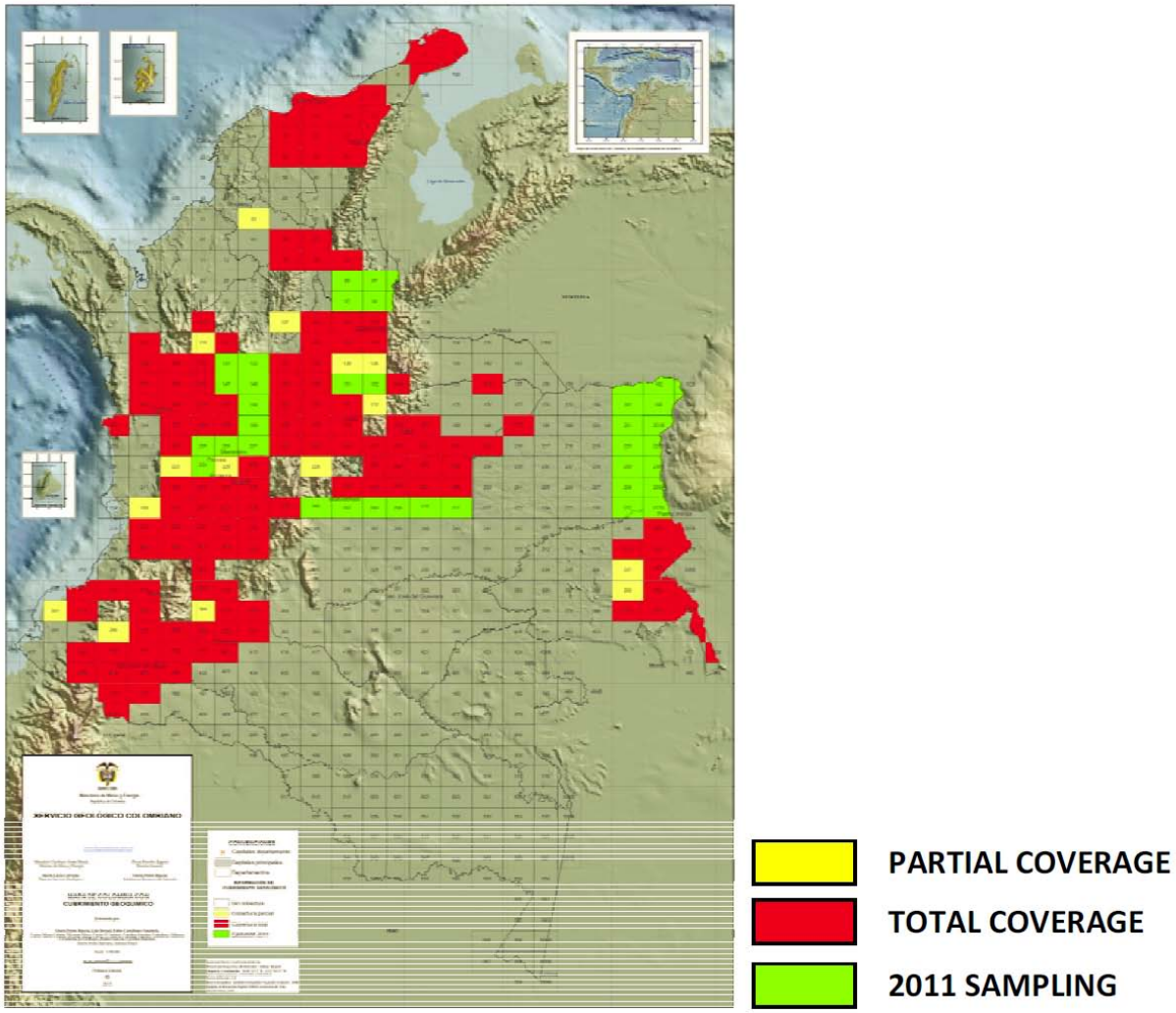
Brazil (Carlos Alberto Lins, Geological Survey of Brazil, Recife)

The geochemical mapping of Brazil is being conducted by the Geological Survey of Brazil (CPRM, www.cprm.gov.br). High Density Geochemical Mapping is being carried out via a National Geological Mapping Programme (scales 1:250.000 and 1:100.000). Low Density Geochemical Mapping, covering all Brazilian territory, is being executed in hydrographic basins in Brazilian States. The figure below shows progress to date. In addition, a research project is being developed at USP (Universidade de São Paulo), by Alethéa Ernandes Martins Sallun, "BACKGEO -Establishment of natural geochemical background at the State of Sao Paulo", http://www.igeologico.sp.gov.br/ler_noticia.asp?id=420 .



Columbia (Gloria Prieto, INGEOMINAS, Bogotá)

During 2011, the Geological Survey of Colombia (INGEOMINAS) began new geochemical mapping in areas using low and medium density sampling. In eastern Colombia, in a region of geological homogeneity ("Llanos Orientales"), 4200 km^2 were covered by stream sediment at density of 1 sample per 25 km^2. In addition, a sampling programme was conducted in Central Colombia covering 2400 km^2 by stream sediment at a density of 1 sample per 4–9 km^2. A new geochemical sampling programme that will be completed in 2012 was initiated for 71,400 km^2 using stream sediment at a density of 1 per 4–9 km^2.



Systematic geochemical sampling programme in Colombia (1:100.000 sheets).

<u>China and other Asian countries</u> (Xueqiu Wang, IGGE, China)

China Geochemical Baselines: Preliminary Results

The China Geochemical Baselines Project (CGB) is a contribution to the IUGS/IAGC Task Group on Global Geochemical Baselines. Its purpose is to document China's nationwide geochemical baselines, spatial distribution and evolution of all elements. Each Global Reference Network (GRN) cell is divided into 4 CGB cells. Approximately 1,500 CGB cells cover the whole of China (9.6 millions km^2). Soil samples for pedosphere and rock samples for lithosphere geochemical baselines will be collected in each cell. Two sampling sites are designed to collect homogeneous samples of soils/overbank/floodplain sediments from each CGB cell. At each site, two samples are taken: 0-25 cm depth and >100 cm depth. Typical rock samples, representing different geological times, are simultaneously collected in each CGB cell to interpret the geogenic sources of secondary geochemical patterns and to explore the evolution of elements with geological time from Archaeozoic to Quaternary. A 1000 g sample is ground to <200 mesh in an agate or pure-aluminium-porcelain mill. A 500 g sample is sent to the lab for analysis. The remaining sample is bottled and archived. Seventy-six elements are determined by ICP-MS/AES following 4-acid digestion and by XRF following fusion as the backbone methods combined with another 10 methods. Analytical quality is under strict control by using standard reference samples.

Internet-based software named Digital Chemical Earth, similar to Google Earth, is being developed, which can manage the geochemical database and allow people to access vast amounts of geochemical data and maps through the Internet.

A 5-year term, from 2008 to 2012, is planned for covering the whole of China's mainland. A one-year pilot study was conducted in 2008 to test and refine the recommended protocols and to optimise field logistics for the geochemical sampling. After completion of the pilot studies, approximately 1,700 soil sites (3,400 samples) and 10,000 rock samples have been collected in eastern China from 2009 to 2011. Sampling is expected to be completed in 2012 with the data and atlas published in 2013.Preliminary results show that (i) lithosphere geochemical baselines provide geochemical responses for geological boundary or geological events (e.g. Ir background values in Cretaceous and Tertiary rocks are 0.02 ppb, Ir anomalies in Cretaceous and Tertiary (K-T) boundary range from 0.2-0.8 ppb; (ii) many of the toxic elements such as Hg, As, Cd, Pb and halogen elements such as F, Cl, Br and I tend to concentrate in top soils and are influenced by human activities; (iii) major elements such as Ca and Al show the influence of climate and geography; (iv) metallic elements such as Au, Ag, W, Sn, Cu, and U are related to metallogenic provinces and geology. These results were presented at the International Applied Geochemistry Symposium in Finland in August, 2011.

Geochemical Mapping across the Boundary Regions of China and Mongolia

China is cooperating with Mongolia in geochemical mapping at a scale of 1:1,000,000 covering an area of approximately one million km^2 across the two countries. The project was launched in 2008 under an agreement issued by the China Geological Survey and the Mineral Resources and Petroleum Authority of Mongolia. The Institute of Geophysical and Geochemical Exploration is helping with training in sample-collection protocols and is providing free chemical analysis. An area of 1,000,000 km^2 has been covered at a density of one sample per 100 km^2 up to October 2011. Sixty-nine elements have been determined on each sample. The results showed that (i) regional geochemical patterns were identified for the first time across the world's largest REE ore deposit in Inner Mongolia; (ii) regional geochemical patterns of Ag-Pb-Zn have good correlation with the polymetallic province along the east part of the boundary region; (iii) regional geochemical patterns of Cu-Au-Mo have good correlation with the porphyry mettallogenic province along the middle part of the boundary region.

CCOP Geochemical Baseline Programme

As detailed in the 2010 Annual Report, the China Geological Survey has approved a proposal to provide financial and technical support for a Geochemical Baseline Programme within the member countries (China, Japan, Vietnam, Indonesia, Singapore, Cambodia, Thailand, Malaysia, Papua New Guinea, Philippines and Korea) of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP). A field sampling instruction for desert terrains was prepared. A coordinating meeting and a training course, which was scheduled in 2011, has been postponed until March 2012 because the field sampling instruction for tropical forestry terrains was not finished because of the south-eastern Asia flood.

Publications of Multi-purpose Regional Environmental Geochemical Atlases

As detailed in the 2010 Annual Report, the China Geological Survey and provincial governments have jointly implemented multi-purpose environmental geochemical survey projects at a scale of 1:250,000 since 2002. The projects provide geochemical data for environmental assessment, land use planning, and agricultural production increase in the agriculturally and industrially developed regions of eastern China. Soils from two depths (0-20 cm and 150-200 cm) are taken as the general sampling media. The sampling density for the surface samples is 1 sample/km^2 and for the deep samples is 1 sample/4 km^2. Four samples are composited into one analytical sample, i.e. one analytical top soil sample per 4 km^2 and one deep soil sample per 16 km^2. Samples are ground to <200 mesh for analysis of 52 elements (Ag, Al, As, Au, B, Ba, Be, Bi, Br, C, Ca, Cd, Ce, Cl, Co, Cr, Cu, F, Fe, Ga, Ge, Hg, I, K, La, Li, Mg, Mn, Mo, N, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Si, Sn, Sr, Th, Ti, Tl, U, V, W, Y, Zn and Zr) plus organic carbon and pH. An area of approximately 1.5

million km^2 has been covered up to 2011. Since the 2010 Annual Report, three geochemical atlases have been published (see Publications section of this Annual Report).

Training Course on Geochemical Mapping and Environmental Geochemical Survey for African Countries

A training course on Geochemical Mapping and Environmental Geochemical Survey for African Countries took place in Beijing between October 24 and November 18, 2011. The training course was sponsored by the Ministry of Commerce of the People's Republic of China and organised by the Academy for International Business Officials (AIBO) of the Ministry of Commerce and China Geological Survey (CGS). Twenty three geoscientists from 12 African countries (Eritrea, Ethiopia, Guinea, Liberia, Malawi, Nigeria, Sierra Leone, South Sudanese, Sudan, Tanzania, Uganda and Zimbabwe) participated in the course.

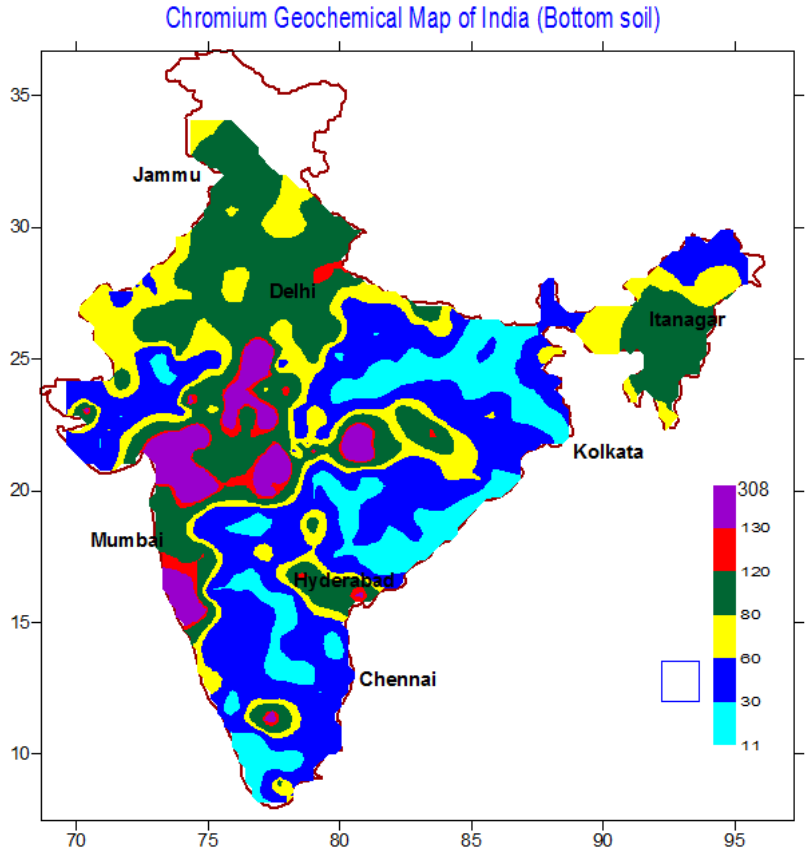
The training course comprised three aspects: lectures, field sampling training and laboratory demonstrations. Lectures covered the following topics: (i) basic principles related to geochemical mapping; (ii) geochemical mapping procedures - design and planning, field sampling, chemical analysis, data processing and map generation; (iii) global-scale geochemical baselines mapping; (iv) regional/national-scale geochemical mapping; (v) application of geochemical mapping data for mineral resources; (vi) environmental geochemical survey and its applications; (vii) laboratory analysis for 76 elements used in geochemical mapping; and (viii) geochemical data management and map generation. Implementation proposals for national/regional-scale geochemical mapping and global-scale geochemical baselines mapping in African countries were discussed in the training course. Professor Wang Xueqiu, Dr. Zhou Guohua and Mr. Zhang Qin from the Institute of Geophysical and Geochemical Exploration (IGGE), Dr. Liu Dawen and Dr. Xiang Yunchuan from the China Geological Survey gave the above-mentioned lectures.

Field training focused on stream sediments and overbank sediments sampling in mountainous terrains, and soil sampling in plain terrains. The participants visited the National Geological Archives of China, Fangshan National Geopark, Jixian National Geopark and the Great Wall. Laboratory demonstrations focused on sample management, sample grinding, sample dissolution, instrumental determination (XRF, ICP-MS, ICP-AES, AAS, AFS), data quality control and data processing.

This is the second training course on geochemical mapping for Africa given by China, after the first course in 2004.

<u>India</u> (Pradip K Govil, National Geophysical Research Institute, Hyderabad)

As a part of the Global Geochemical Baselines project in India, samples from the remaining GRN cells in the western parts of India and parts of Jammu and Kashmir were collected in 2011 and analysed at the National Geophysical Research Institute, Hyderabad. Maps for bottom soils have been prepared for the whole country based on data generated by X-ray fluorescence spectrometry and interpreted with reference to geology (see figure below). Maps for both top and bottom soils showing the distribution of different toxic metals have been prepared for 23 elements along with their maximum and minimum concentrations. Based on these maps, a report (Emeritus Scientist Scheme Technical Report) has been submitted to the Council of Scientific and Industrial Research, New Delhi. An abstract has been submitted to the 34th International Geological Congress, Australia for presentation of global baselines studies in India.

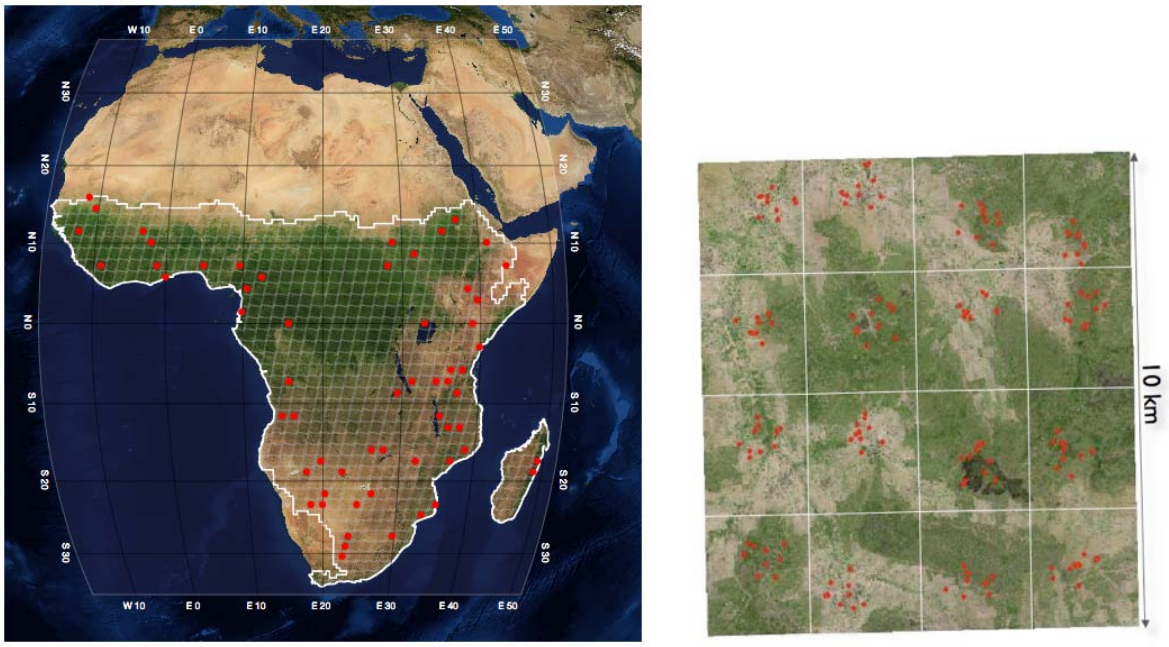


<u>Africa</u> (Keith Sheppard, World Agroforestry Centre (ICRAF), Nairobi)

The Africa Soil Information Service (AfSIS) is developing a practical, timely, and cost-effective soil health surveillance service to map soil conditions, set a baseline for monitoring changes and provide options for improved soil and land management. Because knowledge about the condition and trend of African soils is highly fragmented and dated, there is an urgent need for accurate, up-to-date, and spatially referenced soil information to support agriculture and environmental management in Africa. The system will facilitate the identification of areas at risk of soil degradation and corresponding preventive and rehabilitative soil management interventions.

AfSIS builds on recent advances in digital soil mapping, soil infrared spectroscopy, remote sensing, multilevel statistics, and automated scientific work flows. These novel approaches provide assessments of soil condition, enable mapping of soil functional properties and monitoring change, while significantly reducing costs.

AfSIS is targeting 17.5 million km^2 of continental sub-Saharan Africa and 591,740 km^2 of Madagascar giving a total of ~ 18.1 million km^2 covering 42 countries. A probability sample of 60 sentinel sites is being characterised stratified (in proportion to size) based on the distribution of the major Köppen-Geiger climate zones. The actual randomised sites (see figure below) cover 21 African countries. Each sentinel site is 10 x 10 km^2 within which 160 plots of 1000 m^2 plots are sampled. Soil samples are taken at 0 – 20 cm and 20 – 50 cm from all plots, and to 100 cm on every third plot.



Geographic coverage of the Africa Soil Information Service (left). The grey grid represents (663) potential sentinel site locations in the Landsat World Reference System (WRS2). Red dots represent the centroid locations of 60 proposed sentinel sites. The right hand figure shows a sentinel site with spatially-stratified randomised clusters of 1000 m^2 sampled plots (red dots).

All samples are being characterised using near and mid infrared diffuse reflectance spectroscopy in the World Agroforestry Centre's Soil-Plant Spectral Diagnostics Laboratory (http://africasoils.net/methods/specdiagn). A 10% subset of samples will be subjected to a wide range of tests, including extractable nutrients, soil carbon using thermal combustion, total element analysis using total X-ray fluorescence spectroscopy, mineralogy using X-ray diffraction spectroscopy, particle size analysis and soil stability using laser diffraction spectroscopy, water holding capacity, and engineering properties.

A key area of research is the use of spectral information (visible-near-mid infrared diffuse reflectance, attenuated total reflectance, X-ray fluorescence and diffraction) to predict soil functional properties such as nutrient supply and retention capacity, water infiltration and retention capacity, resistance to water and wind erosion, and engineering properties.

Soil mineralogy and geochemistry is a key determinant of all soil functional properties. AfSIS is keen on exploring collaborative opportunities with the IUGS/IAGC Task Group on Global Geochemical Baselines to further knowledge on soil geochemistry in Africa.

Africa (Theo Davies, University of Venda for Science and Technology, Thohoyandou, South Africa

The systematic national geochemical mapping of Nigeria, conducted under the terms of a World Bank funded project (NGMTAP), was concluded for two master cells (the 'Minna Cell' and the 'South-western Cell') in 2011, with the submission of an overview report to the Nigerian Government. The two completed cells cover a combined area of 52,000 km^2. The project was undertaken by the Nigerian Geological Survey Agency (NGSA) with the support of the British Geological Survey (BGS) and the Geological Survey of Finland (GTK). The project consisted of three major components:

(i) Production of baseline geochemical maps of Nigeria based on a sampling density of 1 sample per 100 km^2 for 25 complete global geochemical reference network (GRN) cells and 19 incomplete cells;

(ii) Collection of samples (sediment, water, soil, etc) from 5-8 sampling sites per cell (i.e. 200 - 300 sampling sites across Nigeria);

(iii) Production of baseline geochemical maps of cells considered to be the most prospective for specific minerals, based on higher density sampling of 1 sample per 20 km^2.

Also for Nigeria, Abimbola *et al.* (2011) report the results of urban geochemical mapping of southern Nigeria.

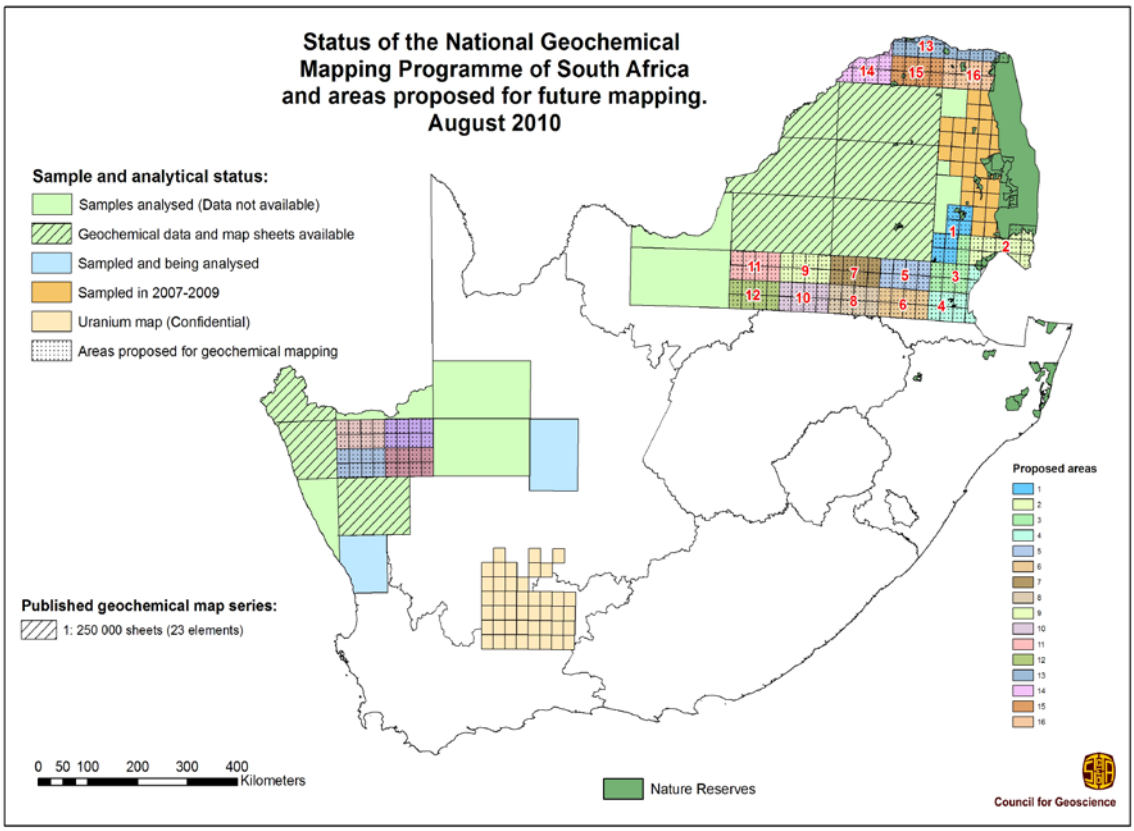
Sierra Leone has been making some efforts in conducting geochemical studies, but these have been confined to stream sediment sampling and analysis to serve in mineral exploration research programmes. In April, 2010, the Government of Sierra Leone invited consultants to undertake geochemical mapping of the country for mineral exploration purposes under the 'Mining Technical Assistance Project' (MTAP) funded by the World Bank. The main objective of the assignment is to provide ecoscientific/geochemical information (maps at a scale of 1:10,000) for 9 areas (sheets), incorporating the distribution patterns of important metallic elements. Information on the progress of this project was not available at the time of writing.

Korkiakoski (2008) has compiled existing regional geochemical survey data of Mozambique into a digital format as part of the Geochemical and Industrial Mineral Surveys Project (GIM). Most of the surveys were carried out in the 1980s using different analytical methods and sampling techniques. In total, regional geochemical sampling covers approximately 30 percent of Mozambique.

South Africa (Marthinus Cloete, Council for Geoscience, Pretoria)

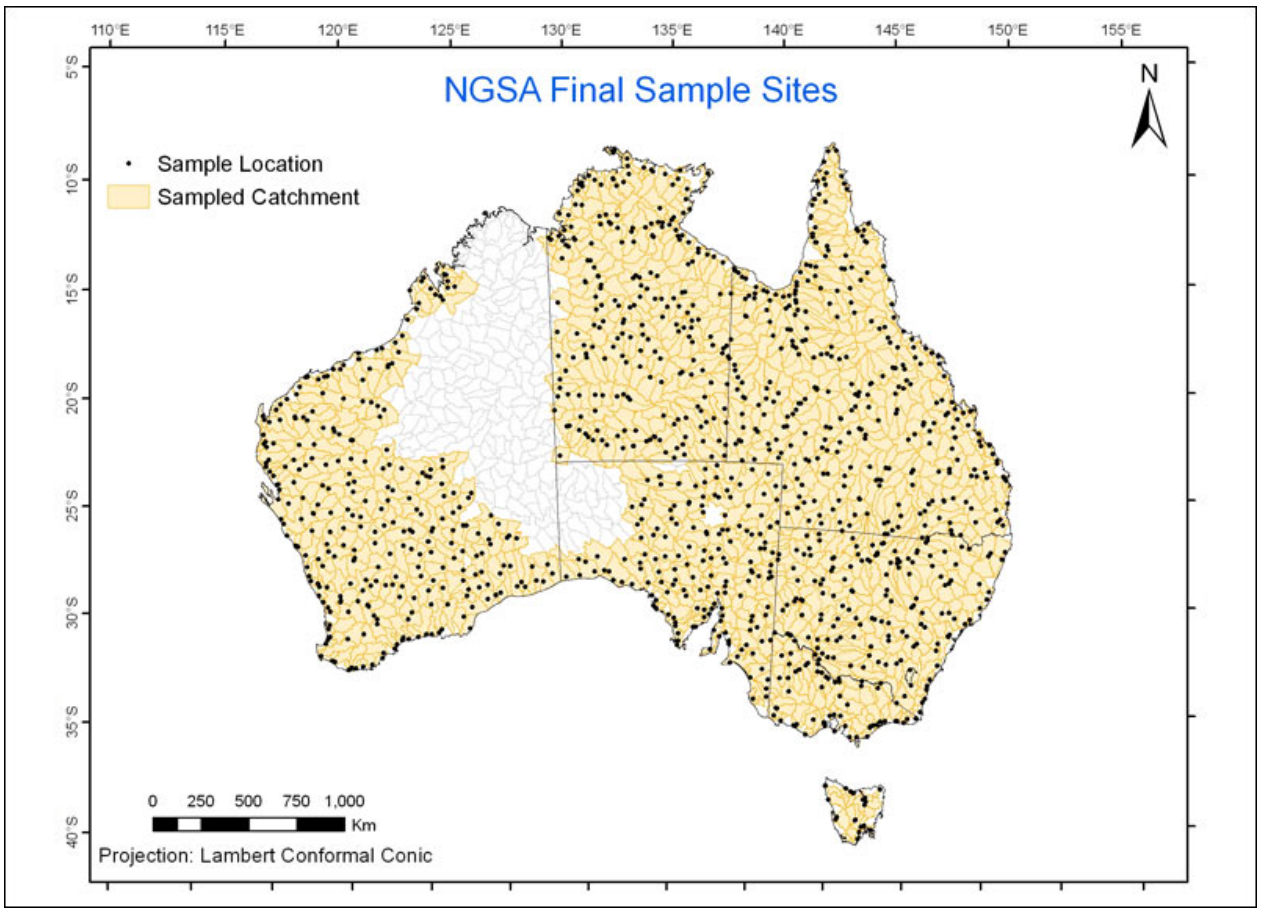
The Council for Geoscience routinely conducts baseline geochemical mapping of the land surface of South Africa and has opted to do so by means of an ongoing, high-density regional geochemical survey using a sampling density of one sample per square kilometre. First order stream sediments and soil samples have been collected for two separate regions, respectively, each about 200,000 km^2 in extent (see following status map). The national regional geochemical mapping programme has been ongoing for about 30 years and has seen major improvements over time, especially with regard to sample collection, sample preparation, range of elements analysed and data applications. The key aspects of sample density, total analysis and archiving of samples, however, have not changed.

Due to the global financial crisis, routine geochemical mapping was not undertaken during the 2010–11 financial year. Instead of going to the field, it was decided that the mapping team would undertake a data mining exercise in which the soil geochemistry database of the entire Bushveld Complex (~100,000 km^2) would be geochemically evaluated and baseline values produced down to formation/lithological unit level. It is well recognised, however, that the sampling density of the South African National geochemical mapping programme is orders of magnitude higher than that required for global baseline mapping. The Council for Geoscience is nevertheless keen to get involved with global baseline mapping as envisaged by the Task Group, but will in the short to medium term need to adhere to the current high density sampling of select areas (when funds become available again). The current high-density coverage will provide an excellent opportunity to ground-truth the low density method as high-density baseline maps of a couple of world class and other well-known metallogenic provinces occur in the catchments of the previously identified 'large African rivers'.



<u>Australia</u> (Patrice de Caritat, Geoscience Australia, Canberra)

The National Geochemical Survey of Australia (NGSA) was completed on 30 June 2011 with the delivery of a geochemical atlas, a data set and a series of reports (<u>www.ga.gov.au/ngsa</u>). The NGSA collected catchment outlet sediment samples (similar in most cases to floodplain sediments) near the lowest points of 1186 catchments distributed nationally (covering ~6.2 million km^2 or 81% of Australia; see map below). Within each catchment, at least one site was sampled near the surface (0-10 cm) as well as at depth (~60-80 cm on average). Both samples were subsequently sieved to a coarse fraction (<2 mm) and a fine fraction (<75 um), which were subjected to a comprehensive analytical programme including total, aqua regia and mobile metal ion extractions. Some bulk properties (dry and moist colour, field and lab pH, electrical conductivity, laser grain size, Vis-NIR spectroscopy) were also recorded. A data quality assessment report was produced to assist potential users to determine if the data is suitable for their purposes. Also, a preliminary interpretation report for energy and mineral exploration, as well as one comparing the geochemical results to airborne radiometric data for K, U and Th, were released.



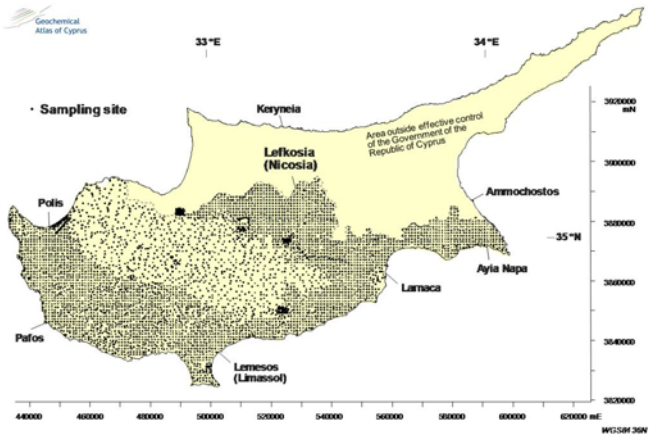
<u>Europe</u> (Clemens Reimann, NGU, Trondheim, Norway)

The two volumes of the FOREGS-EuroGeoSurveys Geochemical Atlas of Europe (Salminen *et al.*, 2005; De Vos *et al.* 2006) are still proving to be very popular. Both volumes are available for free download from http://www.gsf.fi/publ/foregsatlas/. The complete European database of all field and geochemical data collected as part of this project and the related digital photo archive are also freely available at this website.

The EuroGeoSurveys Geochemistry Expert Group, under the chairmanship of Clemens Reimann of the Geological Survey of Norway, continues to be active in developing new scientific initiatives throughout the European geochemical community. A three-day business meeting of the Expert Group was held in Espoo, Finland, from the 5 to 7 October 2011. The focus of the meeting was on the GEMAS project, which is partly funded by the European Association of Metals (Eurometaux - http://www.eurometaux.org/) for the provision of data for compliance with the European Commission's REACH Directive (Registration, Evaluation and Authorisation of Chemicals – http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm/). Also, short sessions were held on (i) the status of the Urban Geochemistry project of major European cities using a common approach; all samples, following preparation, are being analysed at the same commercial laboratory that was used for the analysis of the GEMAS samples; (ii) the publication of the urban geochemistry book '*Mapping the Chemical Environment of Urban Areas*', which was released in April 2011 by Wiley-Blackwell (http://www.wiley.com/buy/978-0-470-74724-7), and the Special Session on '*Mapping the Geochemical Environment of Urban Areas*' at the International Conference on Environment & Health (SEGH 2011) held at Edge Hill University, UK (http://www.edgehill.ac.uk/segh2011/specialistsessions/mapping); and (iii) the status of publications on new data arising from the FOREGS/EuroGeoSurveys Geochemical Atlas of Europe and European Groundwater Geochemistry Atlas project.

Danube River catchment basin countries: The EuroGeoSurveys Geochemistry Expert Group has supported the initiative of the Danube River catchment basin countries to use the FOREGS/EuroGeoSurveys data from the European Geochemical Atlas. The International Commission for the Protection of the Danube River programme (ICPDR) is the largest river basin programme of the UN worldwide. The main activity of ICPDR is to assist member states in the implementation of the Water Framework Directive (WFD) and other EU legislation. Although the programme's Website was launched (http://hantken.mafi.hu/icpdr/) in autumn 2009, the geochemical data have not yet been uploaded. There are, however, descriptions of the national data sets. The main purpose of this site is to make use of European Geological Surveys' geochemical maps, especially those of the Geochemical Atlas of Europe. The website will support environmental assessment, and it is intended for use by decision makers, planners, researchers and the public in general. Another aim of the website is to increase interested parties' awareness for geochemical maps and data. The site has been developed and it is maintained by the Geological Institute of Hungary (MAFI).

Cyprus (Geological Survey Department): The Cyprus Soil Geochemical Atlas project began in April 2006, following an international tender that was won by the School of Biological, Earth and Environmental Sciences (Faculty of Science) of the University of New South Wales, Australia, and the Cypriot partner ADCS International Ltd. The soil sampling was completed in December 2009, and the project ended in July 2011 with the publication of the Geochemical Atlas of Cyprus. In total, 5377 sites were sampled (topsoil 0-25 cm and subsoil 50-75 cm) and over 11,000 samples were collected, including field duplicates (see figure below). The sample density was 1 sample/km^2 and covered the part of Cyprus controlled by the Republic of Cyprus. Unfortunately, it was not possible to sample the northern part of Cyprus, which is under Turkish occupation since the summer of 1974. Project results are included in a four volume technical report, and a concise summary has been published in a 144 page atlas. The results were presented by project scientists and invited speakers during a three day event from the 5 to 7 September 2011 in Nikosia, Cyprus, which was organised by the Geological Survey Department and attended by more than 120 people. (http://www.moa.gov.cy/moa/gsd/gacsymposium2011.nsf/index_en/index_en?OpenDocument)



Systematic soil geochemical sampling in Cyprus.

The top and bottom floodplain sediment samples, collected from 89 drainage basins during 2005 with financial support by GeoInvest Ltd. (http://www.geoinvest-cy.org/), were analysed by aqua regia and ICP-AES techniques. As this part of the project is under the auspices of the IUGS/IAGC Task Group on “Global Geochemical Baselines”, arrangements have been made for the whole suite of samples to be analysed on a free basis by X-Ray Fluorescence by the Federal Institute of Geosciences (BGR) in Germany, according to the specifications of the EuroGeoSurveys/ FOREGS Geochemical Atlas of Europe. The samples will be analysed during 2012, and results released either by the end of 2012 or during 2013.

Public Relations Accomplishments:

The main priority of the Public Relations and Finance committee is to promote the project for the purpose of attracting sponsors that may be interested to finance the Global Geochemical Baselines project in different parts of the World.

One of the main priorities is the reorganisation and update of the Task Group's website material, including preparation of templates and uploading material to the server of the new website provider (http://www.globalgeochemicalbaselines.eu/). Unfortunately, due to technical problems, it was not possible to update the website during 2011. These problems have apparently been solved and regular updating is planned during 2012. The website hosting the Geochemical Atlas of Europe (http://www.gtk.fi/publ/foregsatlas/) is still very important for the promotion of the Global Geochemical Baselines project. Hotlinks have been established to the Atlas site from the sites of EuroGeoSurveys, many European Geological Surveys, and also professional organisations, e.g. the Association of Applied Geochemists, International Medical Geology Association, and the Society of Environmental Geochemistry and Health.

In 2010, the EuroGeoSurveys Geochemistry Expert Group decided to produce a GEMAS calendar for 2011, 2012 and 2013, for the promotion of the project. The first calendar for 2011 was produced in pdf format by Peter Hayoz and his team from Switzerland. The 2012 calendar has been produced in electronic and print versions. The cost of the printed version was paid by the royalties received from the sales of the book '*Geochemistry of European Bottled Water*' (http://www.schweizerbart.de/publications/detail/artno/001201002). Each calendar has 12 photographs from different countries, which display European agricultural and grazing land landscapes.

The CD of the FOREGS/EuroGeoSurveys Geochemical Atlas of Europe, which includes the two volumes of the Atlas, the analytical data, the field manual, the IGCP 259 Report "A *global geochemical database for environmental and resources management"* (Darnley *et al.*, 1995), and other useful information, is still being distributed at international conferences, congresses and meetings. More than 2300 copies have been distributed to date (1300 copies by EuroGeoSurveys office and over 1000 copies by the Public Relations and Finance Committee).

Another significant promotional activity has been the distribution of the memorial issue DVD to honour Arthur G. Darnley (1930-2006). The DVD includes all the material from the Geochemical Atlas of Europe CD, all publications from 1988 to 2008 of the two IGCP programmes 259 'International Geochemical Mapping' and 360 'Global Geochemical Baselines', and copies of all papers from the *Arthur Darnley Symposium - Geochemical Mapping from the Global to the Local Scale* - held at the 32nd IGC, Oslo, Norway. About 1500 copies of the DVD were made, and up to the end 2011, more than 1000 copies have been distributed at workshops, conferences, congresses and meetings.

8. CHIEF PROBLEMS ENCOUNTERED IN 2011

The main problem still facing the project is the lack of funding that is required to achieve the aims and objectives of the project at the global scale. The geochemical baseline project in Europe was completed with funding by the participating European Geological Surveys. Ongoing work in North America, Australia, India, China and Cyprus, for example, are similarly funded by national geological surveys or other national scientific institutions. Some proposed activities, such as the international geochemical mapping project by the member countries of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP), have been delayed because of a lack of available funding by the individual countries. Funds are required for training, transportation, additional analytical services and quality control. In addition, the Task Group is almost entirely dependent on funds from participating agencies for marketing activities, such as website development and workshops.

9. CHIEF PRODUCTS IN 2011

Articles, Papers, Atlases and Books

Caritat de P, Cooper M, Jaireth S and Bastrakov E. 2011. National Geochemical Survey of Australia: Preliminary Implications for Energy and Mineral Exploration. Geoscience Australia Record, 2011/29, 78 pp.

Caritat de P and Cooper M. 2011. National Geochemical Survey of Australia: Data Quality Assessment. Geoscience Australia Record, 2011/21 (2 Volumes), 478 pp.

Caritat de P and Cooper M. 2011. National Geochemical Survey of Australia: The Geochemical Atlas of Australia. Geoscience Australia Record, 2011/20 (2 Volumes), 557 pp.

Caritat de P, Cooper M and Wilford J. 2011. The pH of Australian soils: field results from a national survey. *Soil Research*, **49**,173-182.

Cohen DR, Morisseau E, Rutherford N and Zissimos AM. 2011. *Geochemical atlas of Cyprus*. University of New South Wales Press, 144 pp.

Govil PK. 2011. Geochemical baseline studies for environmental management in India. Technical Report of Emeritus Scientist Scheme, Council of Scientific and Industrial Research, India.

Institute of Geophysical and Geochemical Exploration. 2011. Multi-purpose Regional Geochemical Atlas of the Reaches of Yangtze and Huai River, Anhui Province. Geological Publishing House, Beijing.

Institute of Geophysical and Geochemical Exploration. 2011. Multi-purpose Regional Geochemical Atlas of Hainan Island, Hainan Province, 2011, Geological Publishing House, Beijing.

Johnson CC, Demetriades A, Locutura J and Ottesen RT (Editors). 2011. *Mapping the Chemical Environment of Urban Areas*. Wiley-Blackwell, Chichester, 516 pp.

Reimann C, Smith DB, Woodruff LG and Flem, B. 2011. Pb concentrations and Pb-isotope ratios in soils collected along an east-west transect across the United States. *Applied Geochemistry*, **26**, 1623–1631.

Salpeteur I and Maldan F. 2011. Valeurs de reference pour les teneurs en éléments traces dans les sols et les limons d'inondation obtenues dans le cadre du nouvel Atlas géochimique européen (II) [French geochemical baseline data for trace elements in top- and bottom-soils and overbanks of the shield areas and sediment covers: A low density survey in the FOREGS Geochemical Atlas of Europe (II)]. *Environnement, Risques and Santé*, **10(4)**, 299-315.

Smith DB, Cannon WF and Woodruff LG. 2011. A national-scale geochemical and mineralogical survey of soils of the conterminous United States. *Applied Geochemistry*, **26**, S250–S255.

Viscarra Rossel RA, Chappell A, Caritat de P and McKenzie NJ. 2011. On the soil information content of visible--near infrared reflectance spectra. *European Journal of Soil Science*, **62**, 442-453.

Wang Xueqiu, Xie Xuejing, Zhang Benren, Zhang Qin, Chi Qinghua, Hou Qingye, Xu Shanfa and Zhang Bimin. 2011. China Geochemical Probe: making “Geochemical Earth”. *Acta Geologica Sinica* (English edition), **84**(6), 854-864.

Wilford J, Caritat de P, Minty B and Cooper M. 2011. National Geochemical Survey of Australia. Comparison of Geochemical and Airborne Data. Geoscience Australia Record, 2011/39, 35 pp.

Xie Xuejing and Yao Wensheng, 2011. Outlines of New Global Geochemical Mapping Program. *Acta Geologica Sinica* (English edition), **84**(3), 441-453.

Xie Xuejing, Wang Xueqiu, Cheng Hangxin, Cheng Zhizhong and Yao Wenshen. 2011. Digital Element Earth. *Acta Geologica Sinica* (English edition), **85**(1), 1-16.

Xie Xuejing, Lu Yinxiu, Yao Wensheng and Bai Jingfeng. 2011. Further study on deep penetrating geochemistry over the Spence porphyry copper deposit, Chile. *Geoscience Frontiers*, **2**(3), 303-311.

Yao Wensheng, Xie Xuejing and Wang Xueqiu. 2011. Comparison of Results Analysed by China and European Laboratories for the FOREGS Geochemical Baselines Mapping Samples. *Geoscience Frontiers*, **2**(2), 247-259.

PRESENTATIONS

Cannon WF, Woodruff LG and Smith DB. 2011. Progress toward a U.S. national map of mercury in soils. The 10th International Conference on Mercury as a Global Pollutant, July 24–29, 2011, Halifax, Nova Scotia.

Caritat de P, Cooper M, Mann A and Prince P. 2011. Lithological signatures and exploration implications from overbank sediment sampling and MMI Analysis: Preliminary findings from the National Geochemical Survey of Australia. 25th International Applied Geochemistry Symposium (Rovaniemi, Finland, 22-26 August 2011), Programme & Abstracts: 159.

Caritat de P and Cooper M. 2011. The National Geochemical Survey of Australia: A new, quasi-continental geochemical atlas and dataset to support mineral exploration and environmental applications. 25th International Applied Geochemistry Symposium (Rovaniemi, Finland, 22-26 August 2011), Programme & Abstracts: 101.

Caritat de P, Cooper M, Wilford J, Bastrakov E and Jaireth S. 2011. The geochemical atlas of Australia: A new, quasi-continental dataset to aid exploration. Association of Mining and Exploration Companies (AMEC) Convention 2011 (Perth, WA, 28-30 June 2011).

Caritat de P and Cooper M. 2011. The distribution of uranium, thorium and potassium in floodplain sediments in Australia: preliminary results of the National Geochemical Survey Of Australia. AusIMM International Uranium Conference 2011 (Perth, WA, 8-9 June 2011), The Minerals Institute, Program/Abstracts Volume: 13-14.

Cohen D, Rutherford N, Morisseau E and Zissimos A. 2011. How Much Influence do Humans Exert on Regional Geochemical Patterns? – The Cyprus Case. In: Sarala P, Ojala VJ and Porsanger M-J (Eds) Programme and abstracts. The 25th International Applied Geochemistry Symposium, 2011. Vuorimiesyhdistys, Finnish Association of Mining and Metallurgical Engineers, Series B 92-1, 104-105. 25th International Applied Geochemistry Symposium, 22-26 August 2011, Rovaniemi, Finland.

Demetriades A. 2011. Geochemistry and quality of European surface and ground water. ENSAA: Young Europeans Discuss Sustainable Development, 9-14 May 2011, Athens, Hellas.

Demetriades A, Reimann C and Birke M. 2011. European groundwater geochemistry using bottled water as a sampling medium. NATO Advanced Research Workshop (The NATO Science and Peace and Security Programme): Drinking water protection by integrated management of contaminated land, 21-23 March 2011, Belgrade, Serbia.

Ďuriš M, Poňavič M, Reimann C, Demetriades A, Birke M. and the EuroGeoSurveys Geochemistry Expert Group. 2011. Soil sampling procedure of the EuroGeoSurveys project 'Geochemical Mapping of agricultural and grazing land soil of Europe'. In: Jakšík O, Klement A and Borůvka L. (Eds), Book of abstracts: Pedometrics 2011 – Innovations in Pedometrics. Pedometrics

Commission of the IUSS, Czech University of Life Sciences and Czech Society of Soil Science, Prague, Czech Republic, 31 August – 3 September, 2011.

Griffioen J, Vermooten S, van der Grift B. 2011. The geogenic impact on groundwater composition in the Netherlands. Goldschmidt conference, 14-19 August 2011, Prague, Czech Republic. http://goldschmidt2011.org/

Griffioen J, Roskam G. 2011. Geo-availability of metals in anaerobic soils. What's different? What difficult? National Soil Conference, The Netherlands.

Hoogewerff J, Reimann C, Posey R and Frew R. 2011. Baseline studies for a probabilistic approach to geographical origin intelligence. Nanoelectronic Devices for Defense and Security Conference, 29 August to 1 September 2011, New York University, Brooklyn, N.Y.

Jaireth S, Caritat de P, Cooper M and Wygralak A. 2011. Preliminary results of the National Geochemical Survey of Australia in the Pine Creek region, Northern Territory: implications for the prospectivity of uranium mineral systems. AusIMM International Uranium Conference 2011 (Perth, WA, 8-9 June 2011), The Minerals Institute, Program/Abstracts Volume: 33-34.

Janik L, Forrester S, Kirby JK, McLaughlin MJ and Reimann C. 2011. Predicting metal and metalloid partitioning in soils using infrared spectroscopic analysis. 11th International Conference on the Biogeochemistry of Trace Elements, 3-7 July, 2011, Florence, Italy.

Mann, A, Caritat de P and Prince P. 2011. Inferring bio-availability of nutrients from overbank sediment sampling and MMI analysis: Preliminary findings from the National Geochemical Survey of Australia. 25th International Applied Geochemistry Symposium (Rovaniemi, Finland, 22-26 August 2011), Programme & Abstracts: 99-100.

Morman SA and Smith DB. 2011. Bioaccessibility studies using *in vitro* extraction methods on soils of North America. Environmental Measurement Symposium, A Combined Meeting of The National Environmental Monitoring Conference and The Forum on Laboratory Accreditation, Bellevue, Washington, August 15–19, 2011.

Oorts K, Delbeke K, Reimann C and Schoeters I. 2011. Monitoring data for trace elements in soil and their use in risk assessment: the GEMAS project. SETAC Europe 21st Annual Meeting: Ecosystem Protection in a Sustainable World: a Challenge for Science and Regulation. 15-19 May 2011, Milan, Italy.

Oorts K, Reimann C, Schoeters I, Delbeke K and Verougstraete V. 2011. Monitoring data for trace elements in soil and their use in risk assessment: the GEMAS project. 11th International Conference on the Biogeochemistry of Trace Elements, 3-7 July, 2011, Florence, Italy.

Petrović T, Zlokolica MM, Veljković N, Papić P and Stojković J. 2011. Geochemistry of Bottled Waters of Serbia. NATO Advanced Research Workshop (The NATO Science and Peace and Security Programme): Drinking water protection by integrated management of contaminated land, 21-23 March 2011, Belgrade, Serbia.

Reimann C. Smith DB, Woodruff LG and Flem B. 2011. Variations in Pb concentrations and Pb-isotope ratios in soils collected along an east-west transect across the United States [abs.], *in* Otero N, Soler A and Audi C (Eds), 9th International Symposium on Applied Isotope Geochemistry, September 19–23, 2011, Tarragona, Spain, Book of Abstracts, p. 113.

Reimann C, Birke M, Demetriades A, Bush A, Verougstraete V and Schoeters I. 2011. GEMAS: Mapping soil properties and metal concentrations in agricultural and grazing land soil at the European scale. 11th International Conference on the Biogeochemistry of Trace Elements, 3-7 July, 2011, Florence, Italy.

Reimann C, Négrel P, Belinda Flem B, Fabian K, Birke M, Ladenberger A and Hoogewerff J. 2011. A new view of the lead isotopic soil landscape at the European continental scale. AGU Fall Meeting, 5-9 December 2011, San Francisco, California, US.

Scheib AJ and Flight DMA. 2011. Distribution and mobility of Niobium in European soils. In: Sarala P, Ojala VJ and Porsanger M-J (Eds) Programme and abstracts. The 25th International Applied Geochemistry Symposium, 2011. Vuorimiesyhdistys, Finnish Association of Mining and Metallurgical Engineers, Series B 92-1, 103-104. 25th International Applied Geochemistry Symposium, 22-26 August 2011, Rovaniemi, Finland.

Smith DB. 2011. Report from the IAGC Working Group on Global Geochemical Baselines. Newsletter of the International Association of GeoChemistry, No. 54, May 2011, p. 12–15.

Smith DB, Woodruff LG and Cannon WF. 2011. The North American Soil Geochemical Landscapes Project: History, objectives, accomplishments. Environmental Measurement Symposium, A Combined Meeting of The National Environmental Monitoring Conference and The Forum on Laboratory Accreditation, Bellevue, Wash., August 15–19, 2011.

Wang Xueqiu, Zhang Qin, Chi Qinghua, Xu Shanfa, Nie Lanshi, Zhang Bimin, Zhou Jian and Zhao Shanding. 2011. China Geochemical Baselines: Preliminary Results. 25th International Applied Geochemistry Symposium, 22-26 August 2011, Rovaniemi, Finland.

Webber E, Pappas W, Thun C, Caritat De P and Cooper M. 2011. Analysing Australia: Analytical methodology used for the National Geochemical Survey of Australia. Australian X-ray Analytical Association (AXAA) 2011 Workshop, Conference and Exhibition (Sydney, NSW, 6-11 February 2011), Program & Abstract Book.

Woodruff LG and Smith DB. 2011. Preliminary continental-scale soil geochemistry from the North American Soil Geochemical Landscapes Project. Environmental Measurement Symposium, A Combined Meeting of The National Environmental Monitoring Conference and The Forum on Laboratory Accreditation, Bellevue, Washington, August 15–19, 2011.

Woodruff LG, Smith DB and Cannon WF. 2011. Element distributions in 0 to 5 cm depth soils: preliminary results from the North American Soil Geochemical Landscapes Project. Environmental Measurement Symposium, A Combined Meeting of The National Environmental Monitoring Conference and The Forum on Laboratory Accreditation, Bellevue, Washington, August 15–19, 2011.

Woodruff LG, Cannon WF and Smith DB. 2011. Distribution of trace and potentially toxic elements in soils at the national scale—the USGS Geochemical Landscapes Project. Geological Society of America Abstracts with Programs, Vol. 43, No. 5, p. 121.

Woodruff LG, Cannon WF and Smith DB. 2011. Mercury in soils along two continental-scale transects, Canada and the United States. The 10th International Conference on Mercury as a Global Pollutant, July 24–29, 2011, Halifax, Nova Scotia.

Zissimos A, Christoforou I, Morisseau E and Cohen D. 2011. An Ion Chromatography Method for the Determination of Soluble Salts in Soil Samples from Cyprus. In: Sarala P, Ojala VJ and Porsanger M-J (Eds) Programme and abstracts. The 25th International Applied Geochemistry Symposium, 2011. Vuorimiesyhdistys, Finnish Association of Mining and Metallurgical Engineers, Series B 92-1, 124-125. 25th International Applied Geochemistry Symposium, 22-26 August 2011, Rovaniemi, Finland.

Other Presentations, Posters, Abstracts and Dissemination of Promotional Material

Symposium on the release of the Geochemical Atlas of Cyprus, Hilton Park Hotel, Lefkosia, Cyprus, 5-7 September 2011, Geological Survey Department of Cyprus, Hilton Park Hotel, Lefkosia, Cyprus): Oral presentations:

- Constantinou G. 2011. The geology of Cyprus – A historical perspective.
- Cohen D, Rutherford N, Morisseau E and Zissimos A. 2011. The geochemical atlas of Cyprus: Project Overview.
- Cohen D, Rutherford N, Morisseau E and Zissimos A. 2011. Geochemical characteristics and processes in the regolith of Cyprus.

- Laffan S. 2011. Spatial analysis of geochemical data.
- Zissimos A. 2011. The geochemical atlas of Cyprus and the Geological Survey Department.
- Christoforou I. 2011. Determination of soluble salts in soil samples from Cyprus.
- Rutherford N. 2011. Geochemistry in the natural and un-natural environment.
- Reimann C. 2011. Geochemical mapping – The importance of scale.
- Caritat de P. 2011. The national geochemical survey of Australia.
- Zomeni Z. 2011. Geological aspects of pedology and landscape development on Cyprus.
- Reimann C, Birke M, Banks D, Demetriades A and the EuroGeoSurveys EGG project Group. 2011. EGG: European Groundwater Geochemistry: bottled water.
- Demetriades A. 2011. Urban and suburban geochemical studies for assessing the quality of the living and working environment.
- Darmendrail D. 2011. Regulatory framework for soil protection in Europe and future developments.
- Christophi C. 2011. Hydrogeological-hydrochemical conditions in Cyprus.
- Naden J add Grebby S. 2011. Digital geological mapping and GIS-based mineral exploration in the Northern Troodos, Cyprus.
- Dalrymple I. 2011. Geochemical mapping – The analytical perspective.
- Hudson-Edwards K. 2011. The Geochemical atlas: A foundation for environment Geoscience Research.

Symposium on the release of the Geochemical Atlas of Cyprus, Hilton Park Hotel, Lefkosia, Cyprus, 5-7 September 2011, Geological Survey Department of Cyprus, Hilton Park Hotel, Lefkosia, Cyprus): Poster presentations:

- The FOREGS Project Team and the EuroGeoSurveys Geochemistry Expert Group. 2011. The Geochemical Atlas of Europe.
- The EGG Project Team, EuroGeoSurveys Geochemistry Expert Group. 2011. EGG – The European Atlas of Ground Water Geochemistry: Bottled water.
- The GEMAS Project Team, EuroGeoSurveys Geochemistry Expert Group. 2011. GEMAS – Geochemical Mapping of Agricultural and Grazing Land Soil.
- The Urban Geochemistry Book Project Team, EuroGeoSurveys Geochemistry Expert Group. 2011. Mapping the Geochemical Environment of Urban Areas.

EuroGeoSurveys Geochemistry Expert Group Meeting – Geological Survey of Finland, Espoo, Finland, 5-7 October , 2011. Oral presentations:

- Albanese S, Cosenza A, De Vivo B and Lima A. 2011. The geochemical atlas of the Acerra-Marigliano suburban area (Napoli) in the framework of the URGE project.
- Bel-lan A, Locutura J and Batista MJ. 2011. Results of GEMAS in Iberian peninsula.
- Birke M and Rauch U. 2011. URGE Project: Urban geochemical mapping of Aschersleben.
- Birke M, Reimann C, Rauch U and The Eurogeosurveys GEMAS Project Team. 2011. Geochemical mapping of agricultural and grazing land soils (GEMAS-project): Selected results at German and European scales.
- Cicchella D, Birke M, Albanese S, Lima A, Dinelli E and De Vivo B. 2011. U-Th-K concentrations in European soils from the GEMAS database.
- Cicchella D, Giaccio L, Lima A, Albanese S, Dinelli E, Valera P and De Vivo B. 2011. Geochemical atlas of Italy from the GEMAS database.
- Demetriades A and Kaminari M. 2011. Hellenic GEMAS atlas results and supporting maps.
- Dinelli E, Lancianese V, De Vivo B, Albanese S, Lima A, Hayoz P, Salpeteur I, Gosar M, Haslinger E and Reitner H. 2011. Geochemical Atlas of the Alps from the GEMAS database.
- Dinelli E et al. 2011. A comparison between XRF and Aqua Regia data from the GEMAS database.
- Flight D and Scheib A. 2011. A geochemical transect through Greater London: Precious metals and URGE.

- Glennon M, Scanlon R, O'Connor P, Finne TE, Andersson M, Eggen O, Jensen HKB and Ottesen RT. 2011. Dublin SURGE Project: Baseline survey of heavy metals and organic contaminants in topsoil in the greater Dublin area.
- Gosar M and Špela B. 2011. Introduction to URGE project in Idrija.
- Gosar M. 2011. GEMAS results from Slovenia.
- Guerra M, Calace N, Falconi M, Ponavic M, Birke M, De Vos W, Gosar M, Reinmann C, Demetriades A, Zomeni Z and Zizzimos A. 2011. Chromium in European Agricultural and Grazing land soil.
- Kriete C. 2011. GEMAS Project Proficiency Test - Laboratory Assessment.
- Johnson CC, Demetriades A, Ottesen RT and Locutura J. 2011. Mapping the chemical environment of urban areas: Status report.
- Lučivjanský P. 2011. Preparation of two GEMAS project reference materials.
- Mackových D. 2011. Preparation of GEMAS project samples.
- Oorts K, Reimann C, Schoeters I, Delbeke K and Verougstraete V. 2011. Use of GEMAS data for regional risk assessment of metals in soil.
- Oorts K, Schoeters I, Reimann C and Dohrmann R. 2011. Experiences with the grain size analyses of the GEMAS samples: How to measure the clay content?
- Ottesen R.T. 2011. Urban geochemistry in Europe: Norwegian contribution - City of Kristiansand.
- Ottesen RT. 2011. Plans for the final URGE report.
- Ottesen RT. 2011. Mercury in agricultural- and grazing land soils.
- Reimann C. Fabian K, Flem B, Birke M, Ladenberger A, Negrel P, Hoogewerff J and the EuroGeoSurveys Geochemistry Expert Group. 2011. GEMAS –lead and lead isotopes in agricultural soils of Europe.
- Salminen R. 2011. Geochemistry of boron, chlorine and fluorine.
- Salpeteur I and Maldan F. 2011. Grazing and agricultural soil background values (GEMAS EuroGeosurveys programme) over the French Hercynian shield and younger sedimentary basins: contrasted heritage.
- Scheib A, Flight D, Birke M, Tarvainen T et al. 2011. The geochemistry of Niobium and its distribution and relative mobility in agricultural soils of Europe.
- Tarvainen T. 2011. The Finnish URGE town Hämeenlinna

Others:

The Arthur G. Darnley memorial DVD was distributed to participants at (a) Workshop for postgraduate students of the Faculty of Geology and Geo-Environment (National and Kapodistrian University of Athens), Athens, Hellas, 27 January 2011, (b) NATO Advanced Research Workshop (The NATO Science and Peace and Security Programme): Drinking water protection by integrated management of contaminated land, Belgrade, Serbia, 21-23 March 2011 and (c) International Conference on Environment & Health (SEGH 2011) held at Edge Hill University, U.K., 11-14 April 2011.

10. SUMMARY OF EXPENDITURES IN 2011

The Task Group has received 5000 USD from IUGS in 2011. This amount is very small for the planned promotional activities, and even for assistance to developing country participants. It was decided, therefore, to keep it for future small promotional activities, and in the hope that IUGS will approve the requested amount.

The cost of the EuroGeoSurveys programme over the past year is estimated to be in excess of US $50,000. The overall cost of the FOREGS/EGS activities over the past decade or so is difficult to estimate as the work has been funded independently from each of the participating countries, but is thought to be in excess of US $11M. These funds were provided from the Geological Surveys of the participating countries within Europe. The cost of the soil geochemical mapping project in the

conterminous United States during 2011 was approximately US $1M , and the Cyprus Soil Geochemical Atlas about US $1M. There has also been considerable expenditure within a range of countries worldwide, as indicated in Section 7.

11. WORK PLAN FOR NEXT YEAR

The next business meeting of the Task Group will take place in 2012. It will either be timed to coincide with the annual business meeting of the EuroGeoSurveys Geochemistry Expert Group, scheduled for autumn of 2012 in Lisbon (Portugal) or at the 34th International Geological Congress in Brisbane, Australia, where the 2nd Arthur Darnley Symposium on "Global Geochemical Mapping: Understanding Chemical Earth" will be held.

The revision of the FOREGS Geochemical Mapping Field Manual (Salminen *et al.*, 1998) is progressing, and will be completed in 2011, and will most likely be published by the Geological Survey of Finland in 2012. It will include new details on sampling in (a) Karstic terrains, prepared by A Demetriades, S Pirc, M Bidovec and F Sustersic, (b) Desert terrains by Xueqiu Wang (first draft completed in 2010), (c) Arctic terrains by Rolf Tore Ottesen, and (d) Tropical terrains by Chris Johnson, Reijo Salminen and others.

12. COMMUNICATION AND DISSEMINATION PLANS

The IUGS/IAGC Task Group and all the national- and international-scale geochemical mapping projects being carried out in many countries plan to continue active participation in national and international symposia, conferences and workshops for the promotion of the global-scale project. Communication will also be achieved through continued output of peer-reviewed scientific papers, oral presentations, posters and promotional materials.

In addition, the Task Group's website will be a key forum for communication and dissemination of information.

13. SUMMARY BUDGET FOR NEXT YEAR AND POTENTIAL FUNDING SOURCES OUTSIDE IUGS

The success of the IUGS/IAGC Task Group on Global Geochemical Baselines has been, to date, almost entirely dependent on funding from sources outside IUGS and IAGC. This funding has come primarily from national geological surveys and other scientific institutions in participating countries. We conservatively estimate that over the past ten years, US $32 M has been spent on broad-scale geochemical surveys conducted according to recommendations from the IUGS/IAGC Task Group and its predecessors.

Funding from IUGS has consisted of US$ 1500 per year for 2003 and 2004-2008, US$ 4000 for 2009 and 2010, and US$ 5000 for 2011. This funding has been used for promotional purposes such as the DVDs distributed at the 33rd IGC, hosting of the Task Group's website, and organisation of the 2009 Data Management Committee's Workshop in Athens, Greece. IAGC has provided sporadic funding of US$2000 on three occasions (2000, 2003, and 2004) over the past ten years to assist with travel expenses of Task Group members from developing countries to attend our business meetings. While this funding is greatly appreciated, it is barely enough for the Task Group to function as a viable entity within IUGS and IAGC. The IUGS *ad-hoc* review committee, led by Prof. Ryo Matsumoto of the University of Tokyo, recommended in their 2008 report that funding from IUGS to the Task Group be increased to US$5000 per year for routine operations of the Task Group, such as maintenance of the Website and preparation of educational materials. This review committee also recommended that IUGS provide occasionally an influx of about US$25,000 to the Task Group for the purpose of holding workshops in African and Asian countries to promote the establishment of international-scale geochemical mapping projects, similar to that conducted from 1995 and 2005 by the Forum of European Geological Surveys.

The Task Group appreciates the recognition by the review committee for the need of this additional funding and we have plans to use this increased amount to hold training workshops in south-east Asia, India, or Africa in 2012 or 2013. With this report, we formally ask the IUGS Executive Committee to consider the committee's recommendation for this increased funding and officially request US$30,000 in 2012. A similar request was turned down in previous years. We ask for reconsideration in 2012. Our Public Relations and Finance Committee will continue to seek funding from other sources, but this has proven to be most difficult.

14. CHIEF ACCOMPLISHMENTS 1998-2011

1998 Publication of Salminen R, *et al.* (1998) *FOREGS Geochemical Mapping Field Manual.* Geological Survey of Finland Guide Number 47.
1998 Release of the UGS/IAGC Global Geochemical Baselines website, hosted by the British Geological Survey at www.bgs.ac.uk/IUGS.
1998 European GRN sampling programme commenced.
1999 Completion of pilot study for geochemical mapping carried out in Colombia.
2000 The Committee for Coastal and Offshore Geoscience Programmes (CCOP) agreed to act as a Regional Co-ordinator for their member countries (China, Japan, Vietnam, Indonesia, Cambodia, Thailand, Malasia, Papua New Guinea, Philippines, and Korea) in SE Asia.
2000 Symposium on geochemical baseline activities organised as part of the 31st International Geological Congress in Rio de Janeiro.
2001 Sampling and the majority of analysis completed in FOREGS countries. Preliminary maps of geochemical data for Europe prepared and preliminary interpretation begun.
2001 Meeting held with CCOP member countries during the Seminar on Regional Geochemical Exploration, Beijing, China to discuss their participation in the global project.
2002 Sampling and analysis completed in Southern India. Pilot studies partially completed within Colombia and Brazil.
2003 FOREGS poster, as the European contribution to IUGS/IAGC Working Group on Global Geochemical Baselines, and a two-page flyer prepared for promotional purposes.
2003 Launch of North American Soil Geochemical Landscapes Project.
2003 Launch of geochemical baseline mapping programme in India.
2004 Production of Part 1 of the FOREGS Geochemical Atlas of Europe, including background and introductory texts and geochemical maps for a wide range of sample media and chemical elements.
2005 Production of Part 2 of the EuroGeoSurveys/FOREGS Geochemical Atlas of Europe, including interpretation, papers on specialised data treatment, and supplementary tables, and figures and maps.
2006 Launch presentation of the Geochemical Atlas of Europe to the European Commission in Brussels on 21 September 2006.
2006 Completion of pilot studies for the North American Soil Geochemical Landscapes Project.
2006 Launch of the Geochemical Mapping Project across China and Mongolia.
2007 Launch of the Geochemical Atlas of Europe in Athena, Hellas, on the 23rd April 2007
2007 Initiation of soil sampling for the soil geochemical survey of North America, under the north American Soil Geochemical Landscapes Project.
2007 Completion of provisional soil geochemical mapping in India.
2007 National Geochemical Survey of Australia approved for funding by the Australian Government's "Onshore Energy Security Initiative".
2007 Publication of Geochemical Atlas of 76 Elements in south-western China.
2008 Compilation of the Arthur G. Darnley memorial DVD with published material of the "Global Geochemical Baselines" project, and distribution of more than 500 copies.
2008 Publication of a special issue of the journal *Geochemistry: Exploration, Environment, Analysis* [Vol. 8, 3/4] with the title *"Thematic set in honour of Arthur G. Darnley (1930-2006)"*.

2008 Organisation of the Arthur Darnley Symposium entitled *"Geochemical Mapping from the Global to the Local Scale"* at the 32nd IGC, Oslo, 9 August 2008.

2008 Organisation of session entitled *"Soil Geochemistry: Databases and Applications at Regional to Continental Scales"* for the joint meeting of the Geological Society of America, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, and Gulf Coast Association of Geological Societies, 5-9 October 2008, Houston, Texas (USA).

2008 Launch of the China Geochemical Probe Project (China All-Elements Scope Project).

2009 Publication of the Geochemical Atlas of Italy using the FOREGS/EGS data.

2009 Launch of Task Group's new website at http://www.globalgeochemicalbaselines.eu/.

2009 Launch of the International Commission for the Danube River's (ICPDR) website at http://hantken .mafi.hu/icpdr/. 2009 Organisation of the *"Global Geochemical Mapping symposium"* in Langfang (China), 10-12 October 2009.

2010 Completion of soil sampling at approximately 4800 sites in the conterminous United States as part of the North American Soil Geochemical Landscapes Project.

2011 Completion of the Cyprus Soil Geochemical Atlas project, and publication in July 2011 of the "Cyprus Geochemical Atlas" and four technical reports.

2011 Publication of the EuroGeoSurveys Urban Geochemistry Book project "Mapping the Chemical Environment of Urban Areas" (April 2011).

2011 Publication of Multi-purpose Regional Geochemical Atlas of the Reaches of Yangtze and Huai River, Anhui Province, 2011, Geological Publishing House, Beijing.

2011 Publication of Multi-purpose Regional Geochemical Atlas of Hainan Island, Hainan Province, 2011, Geological Publishing House, Beijing.

15. REFERENCES

Abimbola AF and Olatunji AS. 2011. Urban geochemical mapping in Nigeria with some examples from Southern Nigeria. In: CC Johnson, A Demetriades, J Locutura and RT Ottesen (Eds), Mapping the Chemical Environment of Urban Areas, Wiley-Blackwell, Chichester, UK, Chapter 32, 570-580.

Darnley AG, *et al.* 1995. *A Global Geochemical Database for Environmental and Resource Management: Recommendations for International Geochemical Mapping.* Final Report of IGCP Project 259. Earth Sciences 19, UNESCO, Paris, 122p.

International Union of Geological Sciences Strategic Planning Committee. 2000. *International Earth Science in the 21st Century. Science and Organisational Strategy for the International Union of Geological Sciences.* Trondheim, Norway, International Union of Geological Sciences, 49p.

Korkiakoski E. 2008. Geochemical surveys in Mozambique: A data compilation project. GTK Consortium Geological Surveys in Mozambique 2002–2007; Geological Survey of Finland, Special Paper 48, 263-287.

Salminen R *et al.* 1998. FOREGS Geochemical Mapping. Field Manual. Geologian tutkimuskeskus - Geological Survey of Finland, Opas - Guide 47, 42p. Also available at http://www.gsf.fi/foregs/geochem/fieldman.pdf.

Salminen R, *et al.* 2005. FOREGS Geochemical Atlas of Europe: Part 1 - Background information, Methodology and Maps. Geological Survey of Finland, 525p. Also available at http://www.gsf.fi/publ/foregsatlas/.

De Vos W, *et al.* 2006. FOREGS Geochemical Atlas of Europe: Part 2 - Interpretation of Geochemical Maps, Additional Tables, Figures, Maps, and Related Publications. Geological Survey of Finland, 690p. Also available at http://www.gsf.fi/publ/foregsatlas/.

NAME: Mr Shaun Reeder
POSITION: Scientific Secretary
DATE: 21 December 2011
ADDRESS: British Geological Survey
Keyworth, Nottingham, United Kingdom, NG12 5GG +44
TELEPHONE: (0)115 936 3523 +44
FACSIMILE: (0)115 936 3261
E-MAIL: s.reeder@bgs.ac.uk