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Mapping the geochemical environment of urban areas

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More than fifty percent of the world's population now lives in urban areas. The lure of the city is the potential for a better standard of living, though the urban human-made environment can contain many health related hazards that in reality can reduce the quality of life of the population. The geochemical environment is primarily controlled by the underlying rocks and parent material upon which a city has been built. For many of the well-established industrialised cities, particularly in Europe, the bedrock and soil cover provided the materials required by industries in the form of clay, coal, and minerals, such as iron ore. Resources that drove the industrial revolution and attracted the dense concentrations of population needed to support industrialisation.

In many urban areas, there is a legacy of industrial contamination, further exacerbated by population pressures on the local environment, such as waste disposal and transportation (notably the internal combustion engine). The result is the contamination of urban soil and dust, and the exposure of the population to many toxins, often as a result of new development disturbing historical industrial sites or catastrophic climatic events, such as flooding. Applied geochemists have an important role in mapping the chemical environment of urban areas and distinguishing between the natural and urban (anthropogenically modified) geochemical baseline. Furthermore, legislatively driven demand for geochemical data from the urban environment is now an important requirement in the challenge to produce healthier and cleaner towns and cities.

The EuroGeoSurveys' Geochemistry Expert Group has in recent years focussed some initiatives to establish the geochemical baseline of urban areas, including a textbook project on mapping the chemical environment of urban areas [1], and an **UR**ban **GE**ochemistry project (URGE) to sample some cities across Europe by standardised methodologies of sampling, sample preparation, chemical analysis and quality control [2, 3]. This account draws on the experience of these projects to highlight some of the current issues and future developments in urban geochemical mapping.

Different strategies for tackling the mapping of the chemical environment of cities are discussed, depending on the challenges that are the drivers for the work. The use of hitherto different sampling media, sampling densities, and methods of data interpretation and presentation are considered. The mapping of organic and bioaccesible fractions of the introduced contaminating chemicals to the urban environment is regarded to be an important development, as is the need to communicate the geochemical results to non-scientists.

References:

[1] Johnson, C.C., Demetriades, A., Locutura, J. and Ottesen, R.T. (Editors), 2011. Mapping the chemical environment of urban areas. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, U.K., 616 pp., http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470747242.html.
[2] Demetriades, A. and Birke, M., 2015. Urban Topsoil Geochemical Mapping Manual (URGE II). EuroGeoSurveys, Brussels, 52 pp., http://www.eurogeosurveys.org/wp-content/uploads/2015/06/EGS_Urban_Topsoil_Geochemical_Mapping_Manual_URGE_II_HR_version.pdf.
[3] Demetriades, A. and Birke, M., 2015. Urban Geochemical Mapping Manual: Sampling, Sample preparation, Laboratory analysis, Quality control check, Statistical processing and Map plotting. EuroGeoSurveys, Brussels, 162 pp., http://www.eurogeosurveys.org/wp-content/uploads/2015/10/Urban_Geochemical_Mapping_Manual.pdf.