



The Association of Geological Surveys of the European Union
(EuroGeoSurveys)
in their position as
custodians to their national natural resources
and
guardians of their terrestrial environment
present their contribution

The unknown space of European cities

Richard Annells
Secretary general
EuroGeoSurveys
3, Rue du Luxembourg
1000 Brussels
Tel +32 2 282 95 14
info@eurogeosurveys.org
www.eurogeosurveys.org

26 November 1998
(Revised 4 April 2000)

THE EUROPEAN URBAN ENVIRONMENT

(based on a presentation to Workshop 3A "Managing the Urban Environment: EC Urban Forum, Vienna, 26 November 1998)

by **Richard Annells, Secretary General, EuroGeoSurveys**

Introduction

EuroGeoSurveys is a non-profit association which combines the national (public sector) geological survey organisations of the 15 EU countries plus Iceland and Norway. These organisations are the principal centres of knowledge and advice on Earth matters for their own governments.

The public sector base of EuroGeoSurveys equips it to provide objective advice and information to the EU institutions and it is particularly interested in helping to develop Actions 19 and 20 of the COM98(605F) "Sustainable Urban Development in the European Union: A Framework for Action" on which the Vienna 'Urban Forum' of November 1998 was based.

The city above ground

Decision makers in Europe have good access to much environmental information on the space above cities - up to altitudes of at least 10,000 metres! The nature of the ground surface is shown on maps of detailed scales and other information is available on:

- atmosphere
- weather
- distribution of water in rivers and lakes
- topography and life forms of the land surface
- land use (settlements, industries and power plants, farming, transport corridors and terminals, etc)

However the surface distribution of contaminated land is not so well known.

The city below ground

The state of public knowledge for the underground space of most cities extends only to 50-100 metres depth and is very incomplete. Most city decision makers have very little information on critical Earth structures or natural hazards beneath cities. However the impact of human interactions with the Earth is very intense in this space, which is known only through incomplete information from scattered boreholes, sewer tunnels and old mine locations: perhaps more is known about the Moon! The same applies to knowledge of the hinterland underground space.

Planners need the following information:

Distribution and state of purity of water below ground

Rock structures and associated hazards

- will they subside or slip?
- are they fractured and likely to shift?
- do they contain caves or voids likely to collapse?
- can they bear a load?
- will they become water-logged through flooding or leaking drains?
- will they contain waste or sewers without seepage into water supplies?
- will they leak unhealthy gases like methane or radon to the surface?
- are they likely to be of economic value to the city - as construction or other industrial materials?

The hinterland

- is it a zone of earthquakes or volcanic eruptions likely to affect the city?
- will it release mud flows, landslides or floods towards the city?
- will greenbelt wastes (e.g. from agriculture, golf courses) infiltrate the city water supply?

Few EU cities would score well if examined in terms of the above criteria. Cities are heavy load structures: they can exacerbate natural hazard situations which develop over time scales that need regular monitoring. In many cases the time scales are so long that a geological as well as an engineering approach is required; these time scales are longer than the terms of office of city governments and managers! The natural hazards involved can have large or small-scale effects - while earthquakes and volcanic eruptions may be exceptional, the cumulative annual effect of widespread minor natural hazards such as subsidence or swelling/shrinking foundations costs billions of ECU to repair each year in Europe and is likely to increase. EuroGeoSurveys has compiled a matrix showing an indicative rating of risk for the cities of each EU country (see EuroGeoSurveys, 1997, published by the European Environment Agency, 1999). The risks vary between countries and regions because the Earth's natural subsurface structure changes from place to place.

The present situation

Most city managements can not answer essential questions for the ground over which their cities are built. In the geospatial dimension, European city planning has not evolved much since the first Minoan cities were built nearly 5000 years ago; most of them have since been ruined by natural hazards.

The solution

At the start of the 6th millenium of European cities it is time to give their decision takers an improved, holistic mode of urban environmental planning by organising knowledge of the substructure with appropriate, easy to visualise 3D and 4D GIS technology. This is not an activity that demands further research. The information needed already exists in city records and national Geological Survey organisations, which can process it into the required databases and formats for about 250 000 to 300 000 EUR for a large city. Thereafter the GIS systems are relatively inexpensive to maintain and the benefit is healthy, cost-effective decision making in a realistic, holistic and sustainable environmental context.

Essential actions

EuroGeoSurveys would therefore like to see the EU support two main actions:

- 1) establishment of best practice guidelines at EU level for the use of Earth science GIS in integrated planning and land use of cities and their hinterlands.
- 2) direct support to help individual cities establish detailed technical databases for their built-up and hinterland areas which can eventually be linked electronically to compare practice with other cities at the EU level.

References

EuroGeoSurveys, 1997. The importance of the geosciences in holistic urban environmental planning. EuroGeoSurveys position paper (Opinion 4) and project suggestion. 8 pages.

European Environment Agency, 1999. Environment in the European Union at the turn of the century. Environmental Assessment Report No. 2.