



URBAN HYDROGEOLOGY

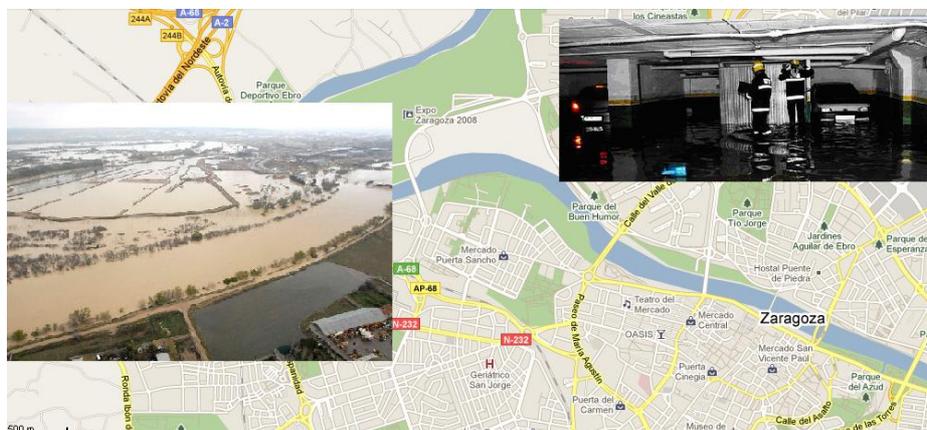
Urban hydrogeology special.

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The relationship between the city and underground water has frequently been an important factor of progress, even a reason for the first settlement of the current urban population centres. In Spain there are many cities that have developed on important aquifers or at their expense.

Currently, half of the world population lives in big cities and in two decades' time urban population will reach almost 60%. The boom of urban growth makes cities unsustainable places unless they ensure reliable access to drinking water and appropriate sanitation. Sustainable, efficient and fair water management has never been as important as it is in the current world scenario. (UN-Water)

The relationship between the city and underground water has frequently been an important factor of progress, even a reason for the first settlement of the current urban population centres. In Spain there are many cities that have developed on important aquifers or at their expense. The most important ones include: Zaragoza, León, Burgos, Palencia, Sevilla, Barcelona and Madrid. Zaragoza lies between two important aquifers: the Ebro River alluvial aquifer and the Gállego River alluvial aquifer.



Cities are three-dimensional spaces with an air, a surface and an underground component. Urban development involves an intense intervention in the underground component, the subsoil, both physical (infrastructure burial, basements, garages, tunnels, underground metropolitan transport) and in physicochemical and biological aspects (pollution, soil degradation, salt dissolution and precipitation and loss of biodiversity). All this involves a structural modification affecting its properties as a physical support, as a source of edaphic resources of water and geothermal energy, and as an ecosystem.

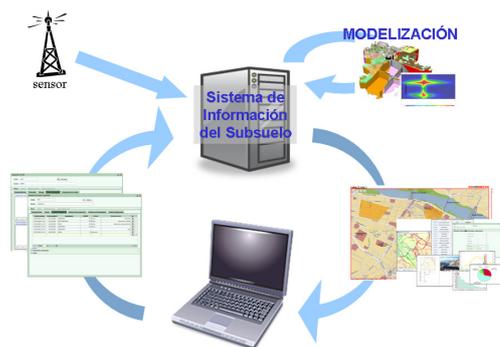


One of the characteristics of aquifers derives from their spatial distribution, which enables easy vertical access to their resources in the whole city. Once it is rationally managed, this availability makes it possible to face new challenges and opportunities in a sustainable way. For example, historically Zaragoza has utilized the alluvial aquifer for agricultural and industrial uses and even for water supply. Currently, the physicochemical deterioration of its water makes it unsuitable for many uses, which is the reason why its exploitation has been remarkably reduced over the last few decades. The increased implementation of cooling systems, which take advantage of the thermal inertia of underground water, has meant a new type of underground water demand where certain problems associated to the lack of an appropriate management can be observed, as well as considerable losses of energy efficiency.

Another adverse effect derived from the growth of the city “downwards” is the interaction between the water table and the surrounding infrastructures and buildings, especially in basements, cellars and buried tanks that require waterproofing measures. These measures have not always been well implemented and are too often giving problems of leaks or even periodic floods coinciding with the floods of the Ebro River.

In the way towards urban sustainability the development of the current urban subsoil uses, as well as other potential uses, requires an urban subsoil management plan and especially a plan concerning hydrogeological and geothermal resources. This plan should not only include the current uses, but also develop new exploitation plans characterizing and remedying the problems to which it is subjected.

In Zaragoza, as in the rest of the Spanish and European cities, a good part or almost all the information concerning subsoil is scattered and appears in very different formats nowadays, which makes harnessing it more difficult. In addition, it has to be taken into account that obtaining certain types of data on subsoil is expensive (drillings, hydrodynamic tests, etc.).



Therefore, integrating all underground information in an advanced spatial information platform would increase its value and enable to exploit it when it comes to making appropriate decisions and managing subsoil and hydrogeology in the metropolitan

environment intelligently. Instances of the advantages of this type of management include a considerable decrease in the drilling costs (probing, test drilling, etc.), a reduction of the errors derived from the lack of accurate information on the pipeline layout and the design of underground infrastructures, accident avoidance, minimization of environmental impacts, optimization of the exploitation of underground resources, increase of the value of the environmental resources as well as the cultural and historical heritage, and many other similar advantages.