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An innovative approach to urban water management based on taste sensors

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The application of an innovative technological platform, based on "taste sensors" for the quality assessment of groundwater, is described here. This work focuses on the aspects related to the impact of human activities on ground and surface water quality, and how new monitoring devices can unleash new possibilities for the management strategies.

The approach is based on a continuous monitoring methodology that has been developed in the recent years [A. Scozzari, N. Acito, G. Corsini, "Signal analysis of voltammetric data series for water quality tests and classification", IEEE Instrumentation & Measurement Technology Conference, Ottawa (Canada), 2005], which has experimentally shown a very promising performance for applications such as groundwater quality monitoring in an urban/industrial environment, or where agricultural practices may affect the quality of water. The huge variability of the nature of potential pollutants affecting natural water catched for drinkable use implies high costs and a substantially poor efficiency in the control of its quality with traditional monitoring methods. This is mainly due to the large number of chemical species to be detected and the complex chemical pattern to be analysed. The new concept that characterises these water quality sensors, lies in the fact that they provide a very informative aggregate chemical information, while the information coming from the traditional field instrumentation (providing the main physical/chemical parameters) is poor to fully assess the quality of drinkable water, and a complete laboratory analytical measurement is expensive and does not provide a continuous control over the resource. The proposed approach relies on a new monitoring method based on distributed low cost water quality sensors, based on the technology of the taste sensors developed at research level in recent years, and which now represent a mature enough, inexpensive

and very attractive technology in the framework of innovative solutions for obtaining overall quality indicators of a natural resource. In this context, new methodologies for a spatially distributed and continuous monitoring activity would imply an optimisation of the management of the resource, with a lower stress for the highest quality portion of groundwater and surface water, and a general environmental benefit, with positive socio-economic implications. In addition, innovative techniques for the continuous monitoring of supply water in different locations of the water cycle scheme such as filtering plants, pumping stations and distribution networks down to the final user, enhance the health safety protection for the citizens of the areas covered by the service. This work will go through the description of: a) the fundamental aspects of the proposed technology, b) the results of two different application experiments, selected according to the environmental issue that they imply.

The two experiments regard two different water supply locations prone to problems connected with human activities. In the first one, water samples are taken from the inlet and the outlet of an activated carbon filter, in a supply well affected by a slight pollution from halogenated hydrocarbons due to an old industrial activity which had been located in that area. In the second one, water from another location affected by a sporadic pollution from agrarian chemicals has been tested, with different levels of pollution simulated in the laboratory. In both cases, the discrimination and change detection capabilities of the proposed technology are shown, in order to discuss its applicability as a support to an optimised urban water management concept.