**Air quality assessment of smart-sustainable cities and innovative sensors system**

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**Highlights**

* Novelty in environmental monitoring sensors.
* Bio- and chemo-sensoristic contribution to smart environment.
* Assessing smart-sustainable project of pollution reduction.
* Integration between Air Quality Monitoring (AQM) stations and crowdsourcing.

**1. Introduction**

Many studies describe different types of sensors and methods used for air quality monitoring, impact and exposure of an individual to air pollution, interpolation, and calibration techniques on collected data [1]. Pollution monitoring is of huge importance to environmental protection and in health effects estimates. The Air Quality Monitoring (AQM) stations network has limited ability to account for spatial variability of pollution levels in heterogeneous regions such as urban areas, which in return, renders exposure assessment a very difﬁcult task [2]. The interest in widespread environmental monitoring is limited in the implementation of smart and sustainable city projects despite the great importance given to climate change. While monitoring technology is proliferating, thanks to the decrease in sensor costs and the diffusion of different types of technological devices, research to inform the translation of air sensor data into information that might guide an individual's decisions about daily activities remains limited [3]. At the same time, the demand for rapid detecting biosensor will increase in the near future [4].

Starting from the recent literature on bio-sensoristic and chemo-sensoristic devices for detection of environmental contaminants, the paper tries to highlight how without a quality monitoring and diagnostic system identifying chemical and biochemical substances in the environmental matrix the goal of a smart city will be missed. With this purpose, we examine a series of smart city projects focusing on the theme of environmental pollution and applied sensor technologies.

**2. Methods**

After selecting ten case studies in the Italian context, following the criteria of demographic dimension of the city and the presence in the first positions of the international rankings related to smart cities, we assess the smart environment (based on the Giffinger components of Smart City [5]). The assessment focuses on sensors technology and its applications in the case studies, and on the ability to make the city evolve towards greater environmental sustainability and quality of life of its inhabitants. The assessment approach is based on the multi-criteria decision aid theory, specifically using the Multi-Criteria Decision Aid Constructive Approach (MCDA-C).

**3. Results and discussion**

According to the literature, application of low cost sensors/monitors have already changed the paradigm of air pollution monitoring, and application of these technologies is set to grow. In real case study, the full potential of existing projects is not achieved. However, only by analysing what has been done and its impacts is it possible to identify existing problems and ensure that the integration of intelligent innovation helps users and service providers to make better decisions and take decision in real time. In this sense, the integration between monitoring networks and data collected by citizens is still in an ancillary phase, also due to the need for an expert intelligence that re-elaborates and provides suitable indicators to influence individual behaviour without creating alarmism.

**4. Conclusions**

The paper described an analysis of smart city projects for the sole component of environmental pollution and focused on the use of innovative sensors and sensor networks in Italy and on a sample of 10 cities selected according to the size demographic criterion and presence in national and international rankings on smart cities. The assessment of the projects was based on adherence to the achievement of sustainability and the quality of life of citizens. We have applied Multi-Criteria Decision Aid Constructive Approach (MCDA-C). The results showed a fair distance between the capacity of existing technologies and described in literature and reality.

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