New Citizen Science Tools for Urban Sensor Data Visualization, Project Smart Emission 2

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SUMMARY

Air quality is one of the major determining factors for the quality of living environment in cities.

According to a quantifying study of the health impacts of ambient air pollution, there were more than 500.000 premature deaths attributable to air pollution in the EU in 2013. Citizens become more aware about air pollution and its possible health consequences. Providing information in the form of annual average air quality maps based on air quality model values, turns out not to be sufficiently reassuring. Moreover, the models are nowadays less trusted by the larger public. These are reasons why citizens start initiating their own sensing projects. Environmental Protection Agencies see this trend, and the Dutch RIVM and Norwegian NILU experiment with engaging citizens and schools in monitoring air quality in new and innovative ways.

In the project Smart Emission (1), executed between 2015 and 2017, an innovative citizen-sensor-network has been developed in the city of Nijmegen. This first "Smart Emission" project revolved around monitoring environmental indicators in the city, together with actively participating citizens and low-cost sensors. This Small Innovation Project was part of the research program 'Maps 4 Society'. Citizens joint in analyzing air quality, noise and meteorological data. It appears that dynamic sensor data offer added value on a fine-grained scale level, at a very localized level of detail, in time and space. The dynamic sensor data, processed into time-series and visualizations on Apps and Map viewers, provide a dynamic, "live" measured image of the city. In some instances, a significant pattern of periods with increased air quality levels or noise levels could be identified, with value for interpreting a number of concrete urban 'use cases,' although more research into calibration and validation is desired (and currently underway). The project delivered a prototype sensor Spatial Data Infrastructure based on Open Source code and standards. A follow-up project has been initiated, 'Smart Emission 2'. This follow-up project focuses on data

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visualization, sensor data use by citizen scientists, data quality, and communication. The project has four objectives:

1. Developing a multi-sensor-approach for low-cost citizen sensing, and improve a shared Sensor Spatial Data Infrastructure (sensor SDI) by connecting and re-using data portals, API's, and sensor types.

2. Development and participatory assessment of a toolkit for flexible Sensor Data Visualization

3. Experiment with the data quality of the sensor data, assessing fit-for-purpose accuracy

4. Communicating with a Linked-Data Concept Map, citizens can learn and educate others on the key concepts and metadata provided with data processing chain. Representatives of citizen initiatives are included in this study, following principles of citizen science.

At the FIG conference, we aim to present the first findings with the toolkit for flexible Sensor Data Visualization. This toolkit will be developed by the University of Applied Sciences in Den Bosch, with students in 'Geomedia and Design'. At FIG, we aim to present this ongoing research 'fresh from the lab'. An aim is to apply the new toolkit with citizen volunteers on Clean Air Day in June 2020.