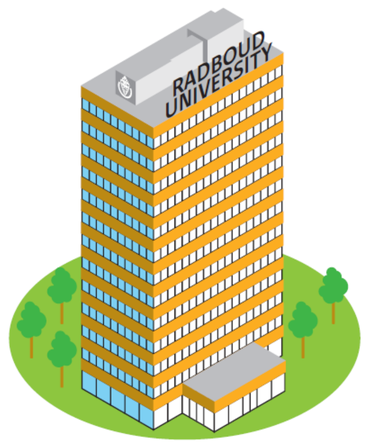
Smart Emission

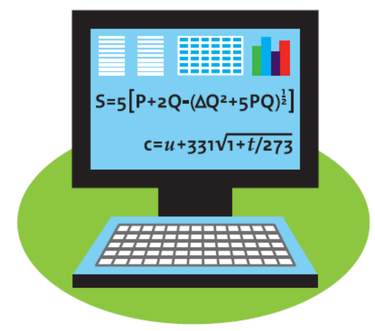
Smart Citizens: with help of experts from science and government, well-informed residents co-create solutions



By taking part in the research being conducted by Radboud University, residents in the city of Nijmegen can take measurements in their own neighbourhood over the next years and think of ways of improving the air quality.

Researchers approach the residents and ask if they want to measure the air quality.

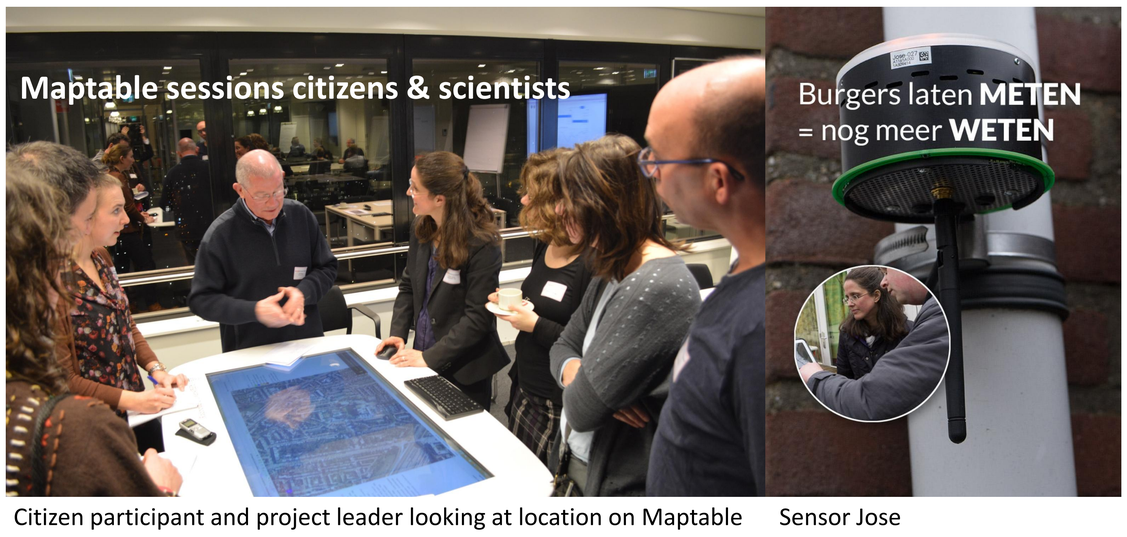
The residents then receive a simple sensor which they can put up near their home.



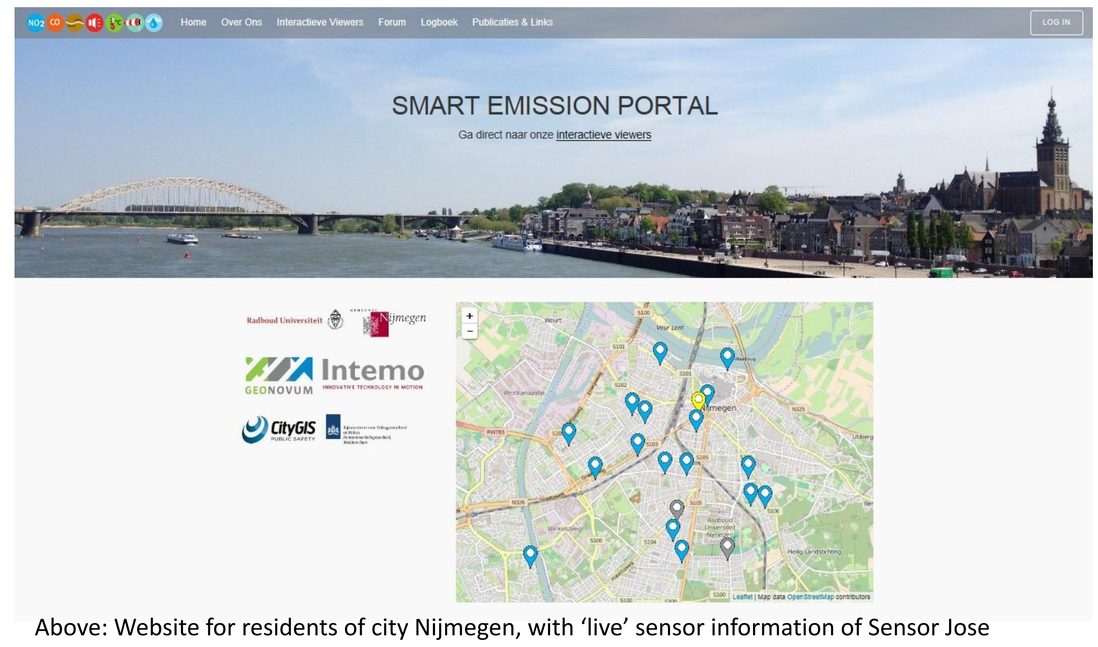
The university processes the measuring data from the sensors and then converts into a visual image.

Residents can then develop scenarios based on these images to improve the air quality even more and make their local environment and the city of Nijmegen healthier.

Please visit the 'live' citizen-sensor-network website: www.smartemission.ruhosting.nl



Citizen participant and project leader looking at location on Maptable Sensor Jose



Above: Website for residents of city Nijmegen, with 'live' sensor information of Sensor Jose

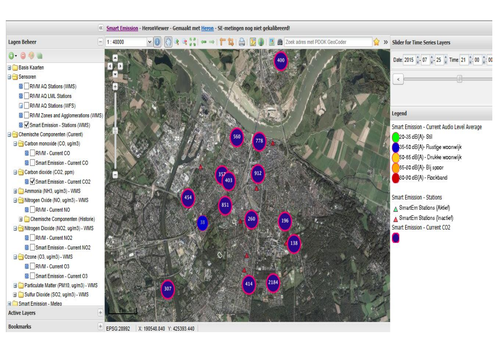
Smart Emission: A citizen-sensor network in the city of Nijmegen, connecting low-cost sensors, Open Data and citizen questions aimed at doing fine-grained, collective urban sense-making from the ground up.

Introduction:
This poster presents about the project Smart Emission, a current research project executed by a consortium of Dutch knowledge institutes, government, ICT- and sensor companies together with citizens in the city of Nijmegen. In this project, an innovative set of low-cost outdoor sensors and related Open Geo Data infrastructure is being developed.

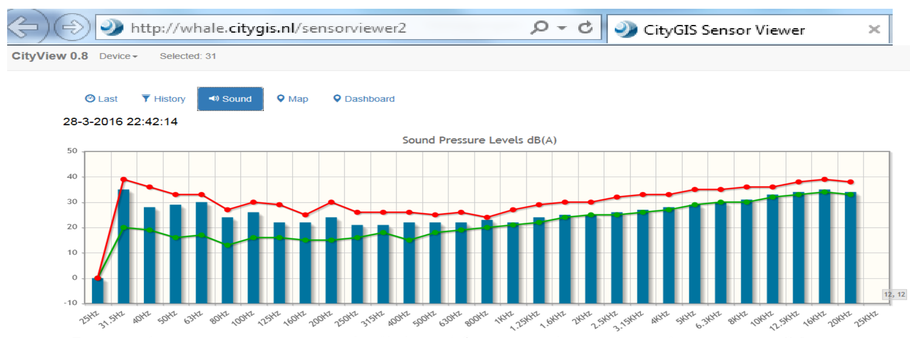
The objective is to monitor, visualize and communicate a real-time, fine-grained 'environmental footprint' of the city. Simultaneously, a participatory process is organized to collaborate with citizens and consortium professionals with the shared purpose of *'collective sense-making'*. The future vision is to combine *bottom-up* and *top-down* communication with citizens and government for the purpose of increasing *urban health*. The project consortium aims to do action research together with students and citizens. By creating an *urban laboratory* setting, its project members pioneer in practice, innovating and learning about low-cost sensing, shared citizen science in urban settings, Open Data apps, dataflows and sense-making.

Research questions:
1. Do low-cost sensors add to the fine-grained picture of air quality indicators?
2. Does the concept work?
3. Does sense-making with citizens work?
4. Does this open up opportunities for environmentally-informed city governance?
5. Reflective: (How) do roles of government and citizen change?

Intermediate Results:
Currently, 27 sensors have been installed at people's houses and gardens, and these citizens of Nijmegen monitor their environment by keeping track of various 'viewers,' showing indicators on air quality and noise: CO2, NO2, O3, CO, noise in dB(A) and individual noise frequencies, as well as weather indicators Air Temperature, Air Pressure and Moisture. Currently, the first data streams are being calibrated and analysed, by citizens and professional analysts, with live meetings and with an online platform: On 26 May 2016, the measurements and their processing procedures are discussed in a process of meaning-making with citizens, experts, and city-government, during the 3rd citizen science participation meeting of project smart emission.



Left: Monitoring with citizens where they live or work on a daily basis.
Above and below pictures: Various viewers visualize the Open Data in real-time.



Raw noise measurements, individual frequencies at location sensor 31.

Philosophy:
1. Inclusive Citizen Sensing:
- Transparency and democracy of pollution monitoring, 'making the externalities (noise, air pollution) visible';
- Citizen-sensor-networks for fine-grained measurements, with new low-cost sensing devices;
- Cost-effective environmental monitoring, Open Data;

2. Towards Sustainable Cities:
- Discuss the value of human health in the city, and its conditions;
- Awareness raising and 'actionable information' sharing by a process of collective sense-making;
- Assess fine-grained measurements & large-scale models in mutual relation;
- Thinking from the small and local, in designing plans and interventions: f.i. support change of daily behavior by city citizens in shifting car traffic to bicycle and electric transport;

3. Smart Governance:
- Tracing phenomenon of "pollution clouds": Visualize urban environmental footprint;
- Create information feedback cycles: Connect small cycles (data processing from citizens to citizens) and large cycles (info piping through expert models);
- Embrace bottom-up practice: combine knowledge and experience of citizens and fine-grained analysis of urban air/noise quality in informed, bottom-up planning processes, and relating this practice to existing aggregate modeling on city-level, in order to build a shared understanding and co-create an accepted diagnosis of city-health.

Publications: (partly in Dutch, and in English), including full paper about 'Empowering citizen-sensor-networks for participatory monitoring and planning for a responsible distribution of urban air quality': http://smartemission.ruhosting.nl/publicaties-links/

Consortium partners: Radboud University Nijmegen, Municipality Nijmegen, RIVM (National Institute for Public Health and the Environment), Geonovum, Intemo, and CityGIS.

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