Onderzoeksvragen Smart Emission

1. Kunnen goedkope sensoren informatieve meerwaarde toevoegen aan het fijnmazige beeld van luchtkwaliteitsindicatoren in de stad?

2. Werkt het concept van het burger-sensor-netwerk? – Test proof of concept

3. Werkt het idee van gezamenlijke sense-making met burgers en experts?

4. Opent dit idee mogelijkheden voor milieu-geïnformeerd stadsbeleid?

5. Reflectief: Is er een verandering merkbaar inzake bewustwording en gedrag; treedt er een verschuiving op in de houding en relatie tussen (a) overheid en burgers, en (b) burgers onderling, in relatie tot specifieke casuïstiek?

Process of **Sense-making**
in participatory monitoring

Participatory setup:

- Issues/goals
- Monitor/ observe
  - Measure [unit of analysis]
  - Classification system
- Viewing and Interpreting

$\Rightarrow$ *apply **informed consent***

$\Rightarrow$ *Sensor-holders consent in participation*

Small Feedback loops, sense-making:

- **Meaning** contextualizing
- **Trust** in data
  - Calibration
  - Validation
  - Use of data for applications
- Experimenting and learning, build data infrastructure

$\Rightarrow$ *apply **sense-making** with participants*
$\Rightarrow$ ***Urban 'noise/air footprint'** as dynamic urban rhythmic patterns (weekdays, festivals)*

Long feedback loops and reflection of relations:

- **Social learning** across organizations:
  - Relation to existing models, norms and institutions
  - Sustainability of the network itself, identity building
  - Legitimation of rules of work, resources for maintenance, organization

=> **Roles between citizens and government:**
  - Self-organizing or co-creation between civil society and (city-) government?
  - Using new data infrastructure (and big data) for new apps

=> towards planning: **study 'local use cases'**

Conclusions (English)

Idea of fine-grained urban citizen-sensor-network:

- **Proof of concept:** the citizen sensor network can be used to see and signal variations and increases of emissions and noise in the city, with dynamics in space-time.

    - Sensors implemented in field, new data infrastructure works. Ongoing, **24/7,** with breaks
    - Data can be viewed and analyzed by experts as well as citizens, available as **Open Data** and data interoperability standards.

- Active citizen-sensor holders join in the collaborative learning and **sense-making process**
    - **"Collective sense-making"** implemented in practice, making 'intangble' environmental urban qualities visible
    - **Identity building:** a citizen scientist working group is forming, continuing in 2017 (after pilot project has finished)
    - **Roles and attitudes:** There seems to be more trust than in the beginning among critical citizens (final survey)

Technologic infrastructure:

- **1st generation sensor works**

- **Calibration:** Ozon (O3) well, CO2 has offset (can be solved), NO2 not so good. (other NO2-device in sensor station?)

- **Data**: De Open Data approach and standardised Sensor Data Infrastructuur invites more options in data presentatie.

    See http://data.smartemission.nl/

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Summarizing results (English)
January 2017

Proof of concept is positive: The citizen sensor network can be used to <u>signal space-time increases of emissions or noise</u>.

- **The basic concept is applied in and has showed to be working in practice, as envisaged in theory.**

  - Further study is considered, both in improving the application, organizing the maintenance, and create technical improvement as well as calibration improvement and measurement continuation (some sensors have downtimes, 'the data timeseries show holes in the data').

  - And further study is considered in the social and governance dimension of the project, with applying citizen science and experimenting with Use Cases, developing a new participatory relation between private and public institutions. (PPP/ cooperative network organization)

- **Sensor network:** As this is a first-design sensor, a second-design version could be further optimized. Further study seems promising; For example on the dimension of government-citizens cooperation, accuracy and calibration process, sensor data visualization, use practices and applications

- **Citizen Participation results;** active citizens have asked for these Evening Lectures to learn about Noise and Emissions in the City, and how to measure and interpret collectively with citizens and experts, applying **<u>collective sense-making</u>** in practice on these intangible qualities of the urban environment

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Sense-making, informed consent and roles in citizen participation process

- **Clarifying difference between policy objective and research objective**
  - this context is a research project – data-inquiry technically, then interpretation-meaning construction with citizens, contextualization
  - Informed consent obtained in participatory process: social contract

- **Monitoring with citizen science, experts and government:**
  - Added value, practices by using a Citizen Sensor Network
  - Data useful in hand of a diversity of users, with conflicting beliefs and worldviews

- **Thoughts on collaborative sense-making, citizen science, social-technical validity**
  - Open Data approach: Openness, Transparency, Trustworthiness
  - a subjective approach to sense-making, should involve evaluating questions of trust, legitimacy, accountability?
    - *Accountability:* Not only city government can be held accountable, also neighbour citizens.
    - *Trust:* Trust in data and in each other, building a relationship of understanding, professional-citizen and citizen-government.
    - *Legitimacy:* can models of governance gain legitimacy in view of citizens (broader citizen participation)