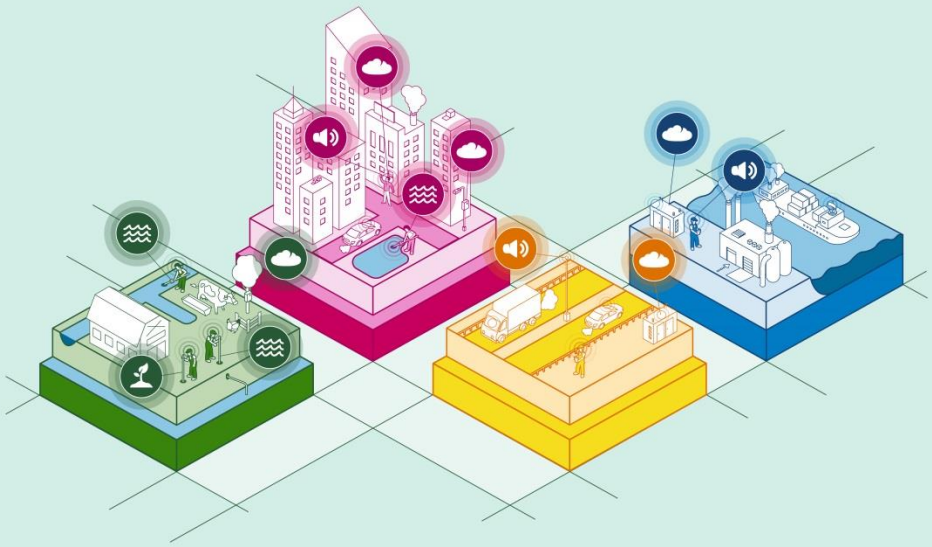

Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport

Citizen science and regulatory monitoring: bridging the gap?

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Outline

- RIVM and Citizen Science
- Examples and lessons learned
- Potential benefits and challenges
- Roadmap

RIVM and Citizen Science

RIVM

- 'Dutch' Environmental Protection Agency
- Responsible for the National Air Quality Monitoring Network: 67 stations measuring air quality in cities, rural areas and near industry
- Dedicated research for the national and local government

NO2 map

2016: start program '*Innovation of Monitoring*'

Why Sensors and Citizen Science?

➔ advances in sensor technology

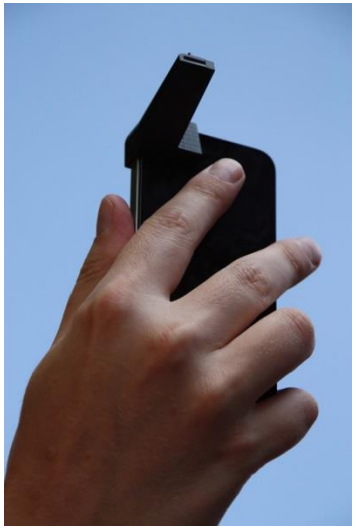
➔ prospect of higher spatial and temporal data resolution

➔ new ways to communicate with citizens needed

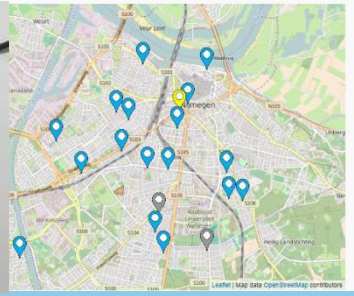
Participating in various projects

man.rivm.nl

www.waag.org/en



ispex.nl



smartemission.ruhosting.nl

Friends of the Earth

Example 1: Simple sensors in an ammonia network

The Ammonia Measurement Network in Nature Reserves measures ammonia concentrations at 82 locations on a monthly basis

➔ more than 250 tubes in total

passive diffusion tube

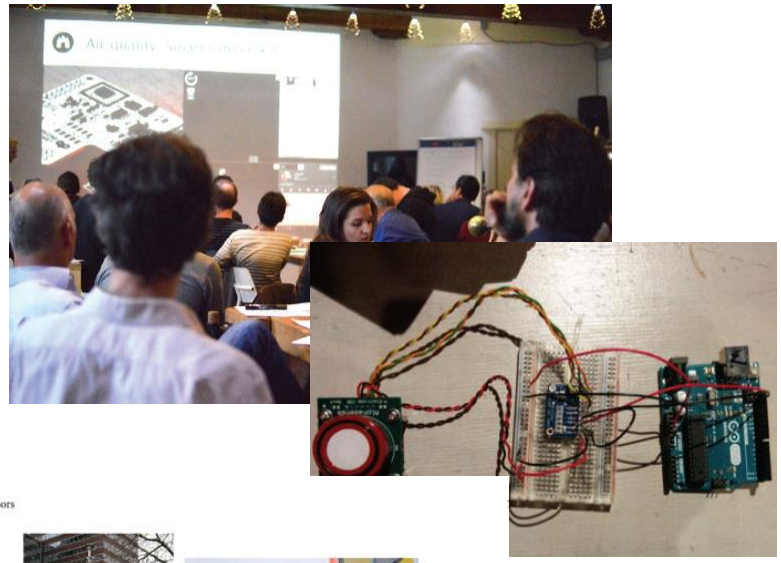
Example 1: Simple sensors in an ammonia network

Lesson learned

Trusting measurement devices to nonexperts is a cost- efficient way to build a monitoring network on a scale that would otherwise not be feasible.

Example 2: Amsterdam Smart Citizens Lab

Bottom up approach – De Waag Society



ournal of Sensors

FIGURE 8: An informal measurement point is close to an official station (Amsterdam-Stadhouderskade) for data comparison.

Aim

- Citizens develop simple tools to measure and understand their living environment

- Citizens involved in all steps of the project:
  - ➔issue mapping
  - ➔*sensor making*
  - ➔*sensing*
  - ➔*understanding*
  - ➔*comparison with official data*
  - ➔decision making
  - ➔acting …

Example 2: Amsterdam Smart Citizens Lab

Air Quality (NO2) mapping using sensor kits built by citizens

Lessons learned:

- *Citizens want support and information from experts*
- *Chance for success increases if experts participate*
- *Timing is crucial: people need enough information at an early stage*
- *Citizens may have different goals*

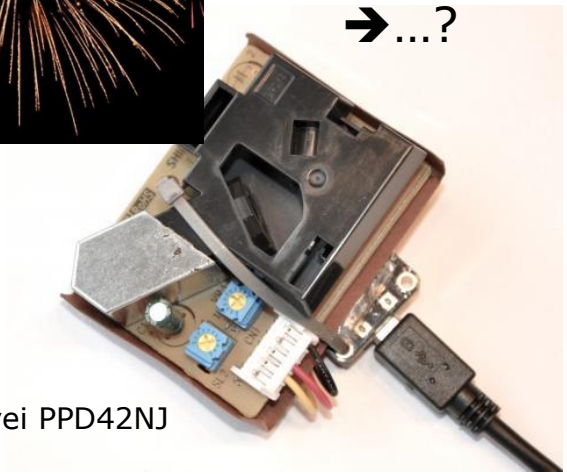
Example 3 Firework experiment 2017/2018

Kits provided by RIVM

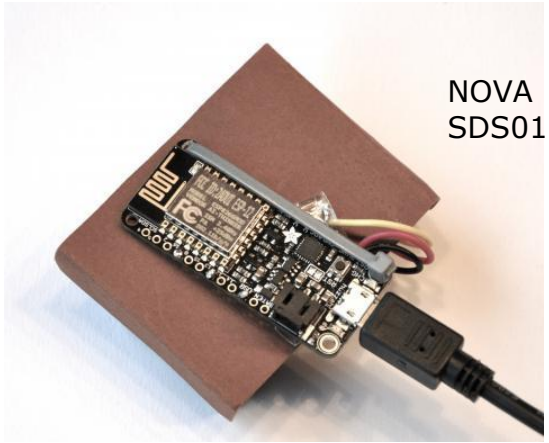
Contribution of other initiatives

Data portal was constructed

➔…?



Shinyei PPD42NJ



NOVA SDS011

DIY sensor housings



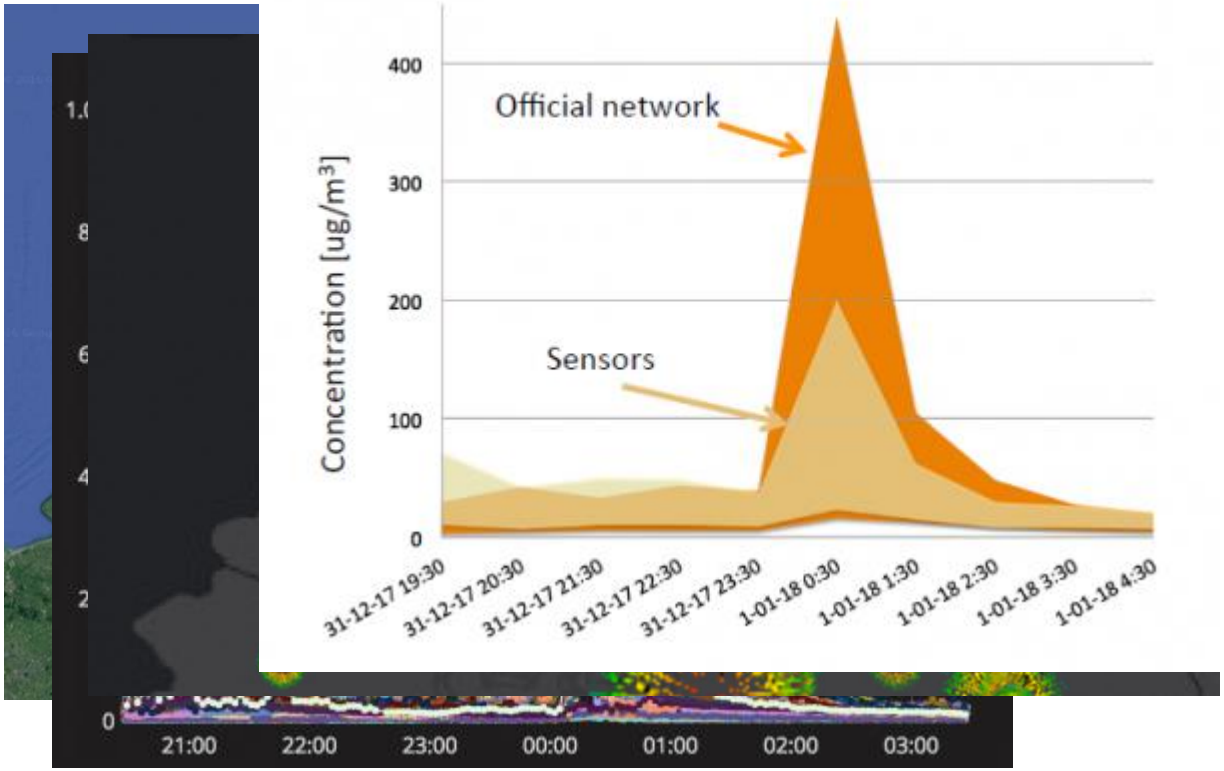






Example 3 Firework experiment 2017/2018

=>
More
than
130
sensors
online



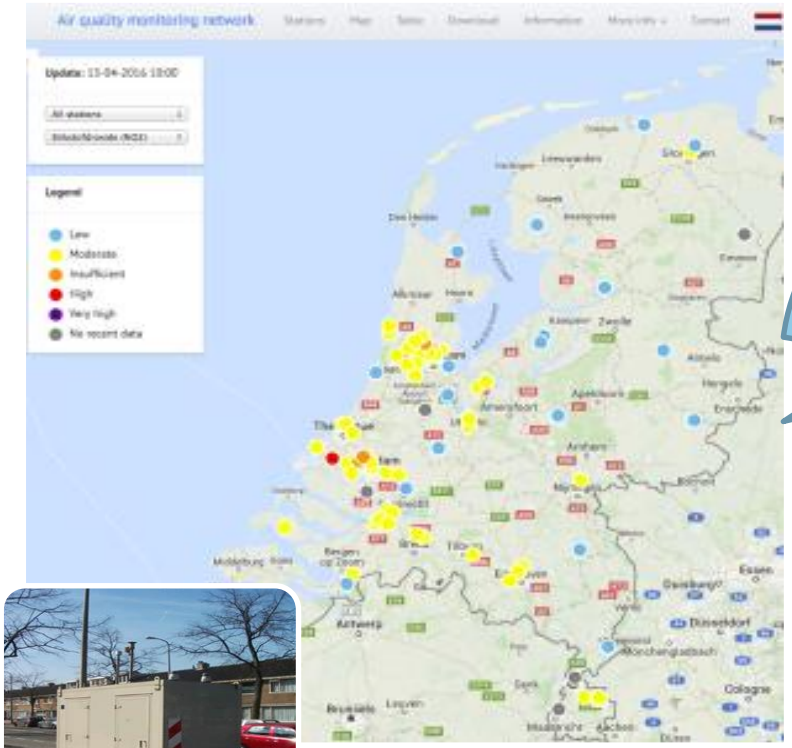
What people do with it …

Recurring themes

- Citizens are motivated to contribute to air quality measurements
- They want to compare with official data
- CS offers a platform for a better communication between ‘official’ science (monitoring) and citizens
- Motivation is stronger when participants "invest" ...
- Accessible expert information is needed to support citizens, e.g. by an interactive knowledge- and dataportal
- Increasing awareness of air quality as an environmental problem

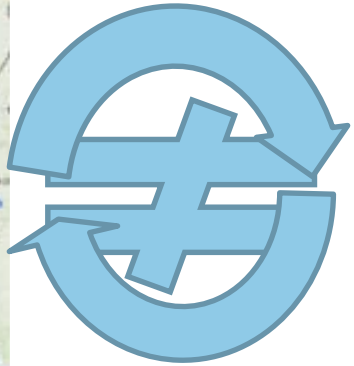
➔ *Research institutes can make CS more successful but ‘management of expectations’ is needed*

RIVM and citizen science –
From contradiction to synergie?

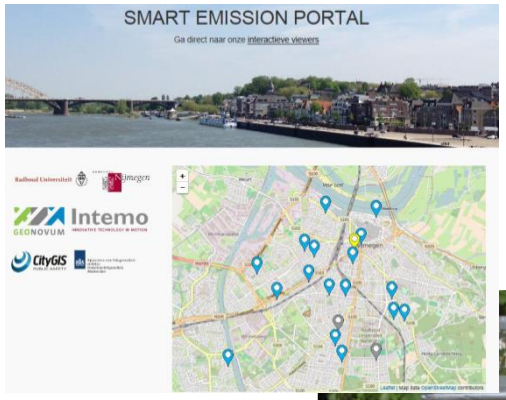


National monitoring

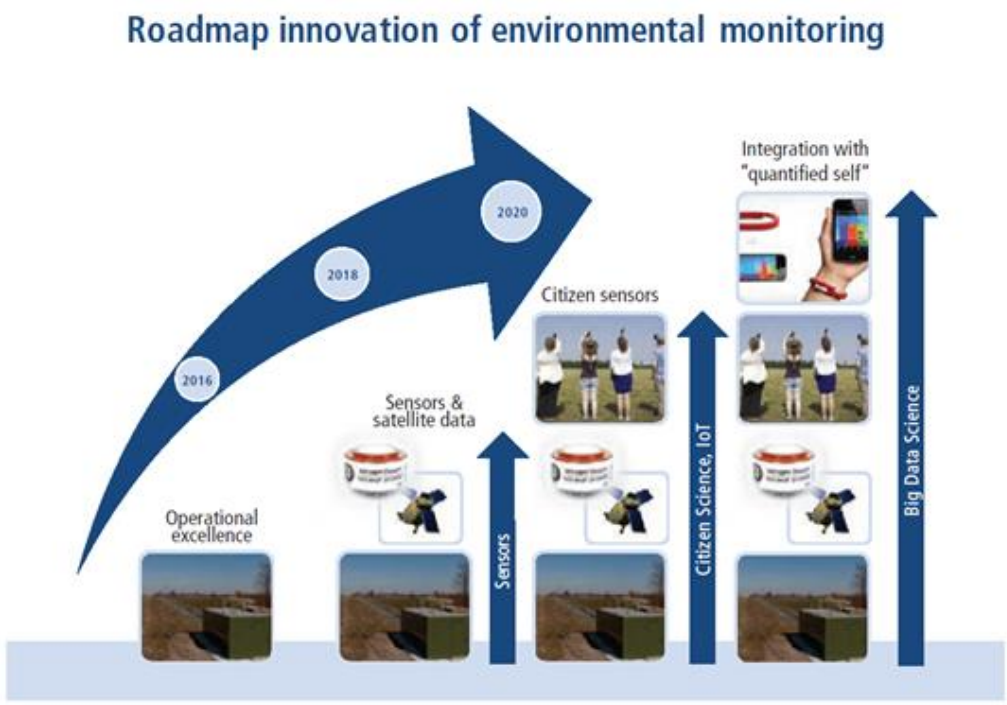
Calibration



Higher resolution



Citizen science



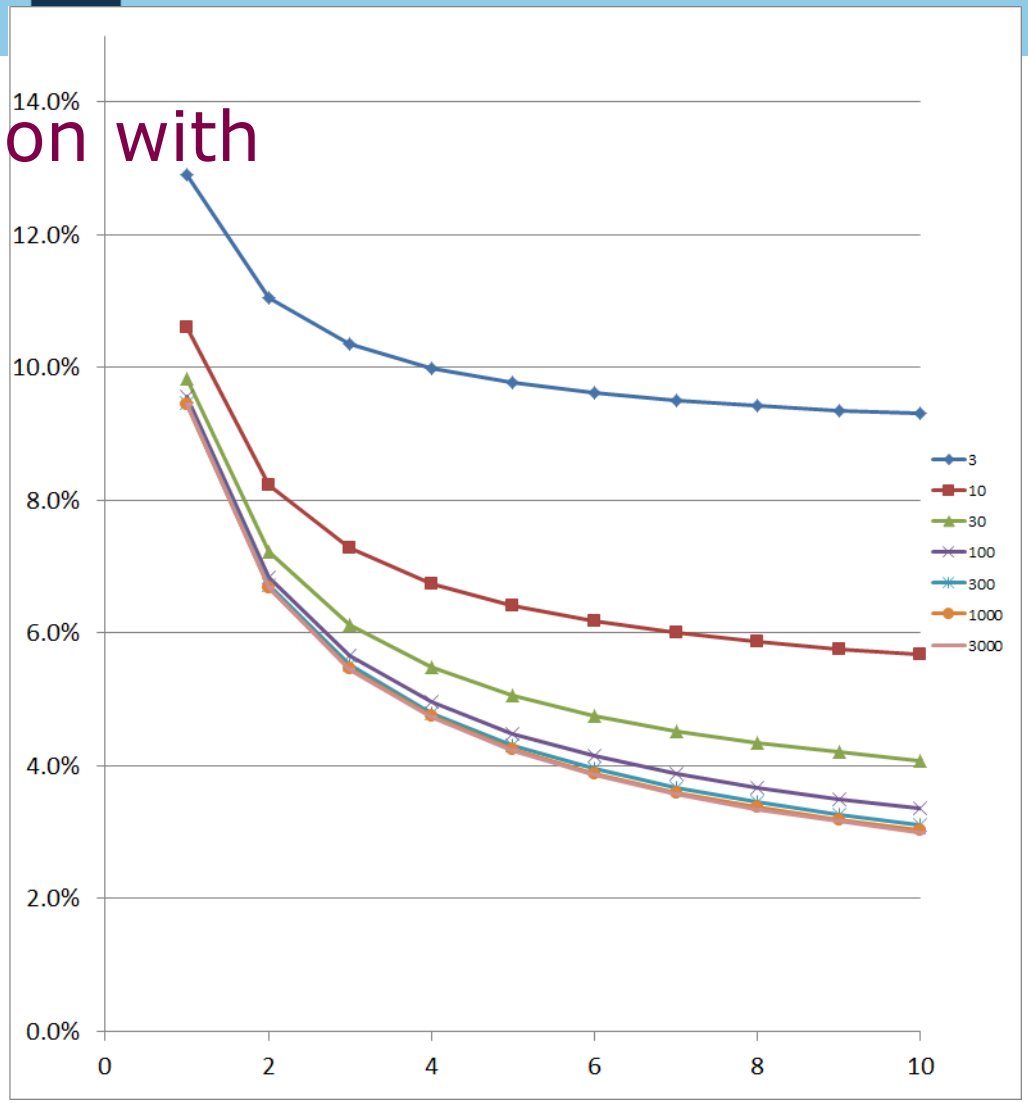
Innovating a traditional measurement network towards a hybrid platform

Example: Modelcalibration with sensor data

Example of Palmes diffusion

Annual average NO2

Reference	s=5%	BI =10 %
Sensor	s=8%	BI =16 %
Model	s=13%	BI =26 %



What's next?

- but what about the other way round:
- can science benefit fro CsS?
- Environment protection agencies can benefit(?) from citizen science using small sensor networks

- lowcost sensors (low quality data) need to be improved, and applications calibrated and validated (by reference data)

- Data needs to be assimilated, for example, in models.