

European perspective

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With contributions from:

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- ETC/ACM team, <https://acm.eionet.europa.eu/>
- CITI-SENSE team, <http://co.citi-sense.eu>

The Lancet Commission on pollution and health

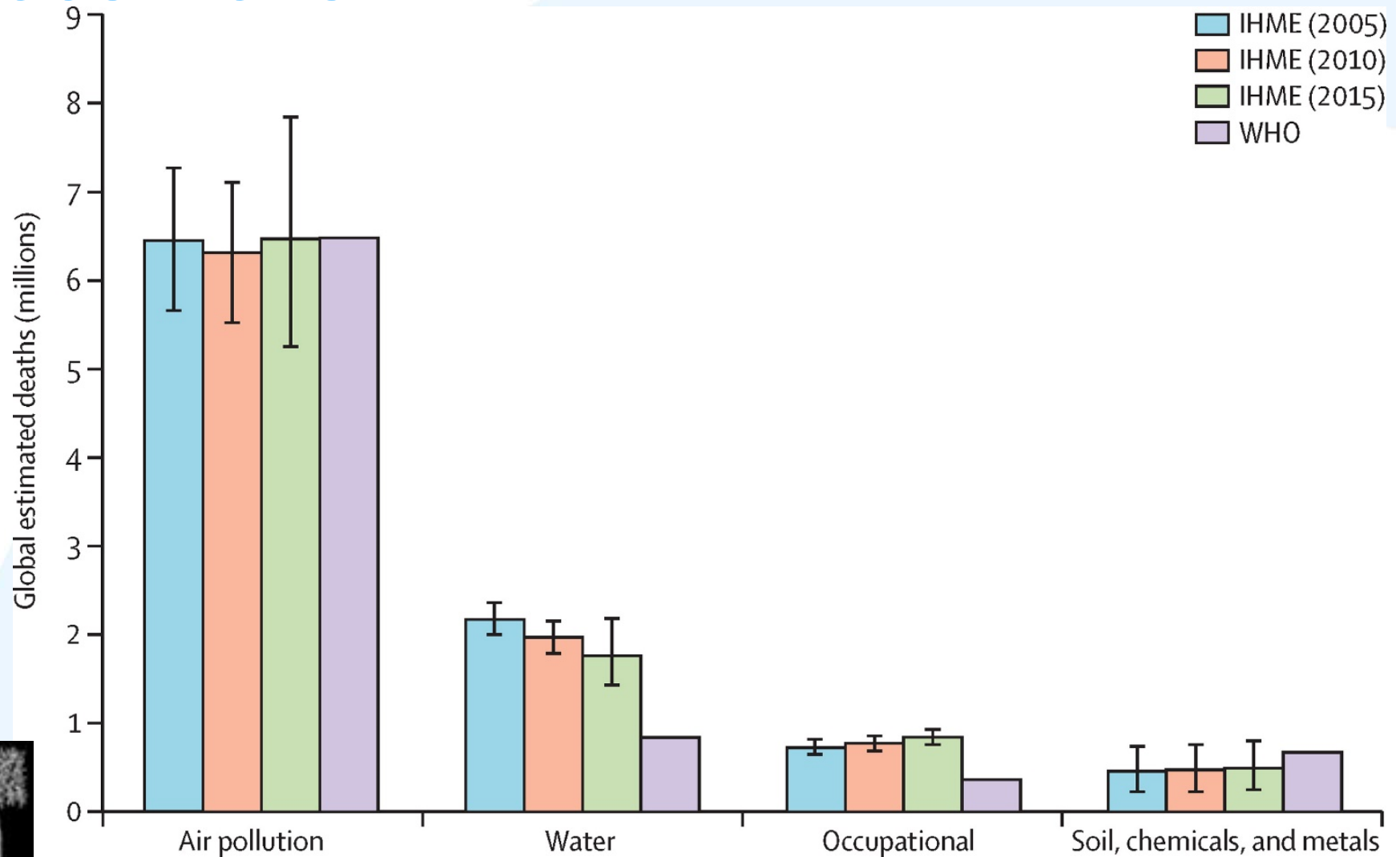
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The Lancet

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Global estimated deaths (million), 2005-2015



Air pollution in Europe: EEA (2017)

<https://www.eea.europa.eu/highlights/improving-air-quality-in-european>

	EU limit/target values	WHO guidelines
PM _{2.5}	7-8 % 	82-85 % 
PM ₁₀	16-20 % 	50-62 % 
O ₃	7-30 % 	95-98 % 
NO ₂	7-9 % 	7-9 % 
BaP	20-25 % 	85-91 % 
SO ₂	<1 % 	20-38 % 

Legislative efforts - air pollution

EU

(Council) Directives:

80/779/EEC AQ limits SO₂

...

96/62/EC, 2008/50/EC

on ambient air quality.

Sources regulations:

- National emission ceiling directive
- Traffic emissions (EURO standard)
- Fuel quality directive
- Waste incineration directive
-

UN ECE CLRTAP

1979 [Convention on Long-range Transboundary Air Pollution](#)

Protocols:

1999/2012 Acidification, Eutrophication and Ground-level Ozone

1998/2009 Persistent Organic Pollutants

1998/2012 Heavy Metals

1994 Sulphur emissions

1991 Volatile Organic Compounds

1998 Nitrogen Oxides transboundary fluxes

1985 Sulphur emissions reduction

Selected AAQD objectives

1. Defining common methods to monitor and assess air quality
2. Assessing ambient air quality in order to monitor trends.
3. Establishing standards of air quality to achieve across the EU.
4. Ensuring that information on air quality is made public.
5. Maintaining good air quality, improving it where it is not good.

Implementation: Subsidiarity - governance

The resulting AQ monitoring

Based on scientific consensus achieved through a broad stakeholder involvement (research, policy, corporate/collective stakeholders)

Standardization



Comparability

Information systems



Info systems: Source contribution

SOURCE SELECTION:

Traffic Ship **Wood heating** Industry Background Others

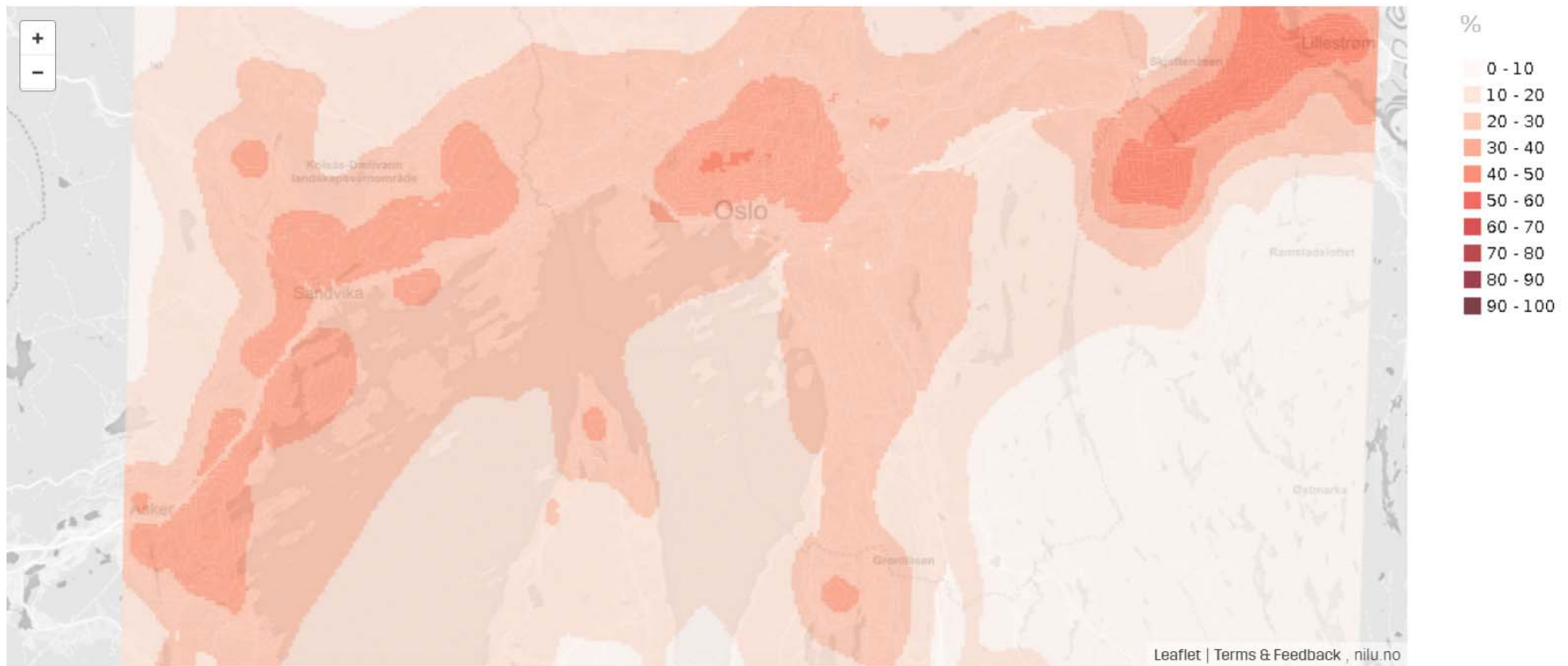
CHOOSE COMPONENT:

PM_{2.5} PM₁₀ NO_x

SELECT YEAR:

2015 v0 **2015 v1**

Contribution to PM_{2.5} concentration (in%) from Wood heating



Explanation +

Download shape ↓



HelseDirektoratet



Folkehelseinstituttet



Why monitor

Monitoring/measurement technology and QA/QC reflect the purpose of assessment:

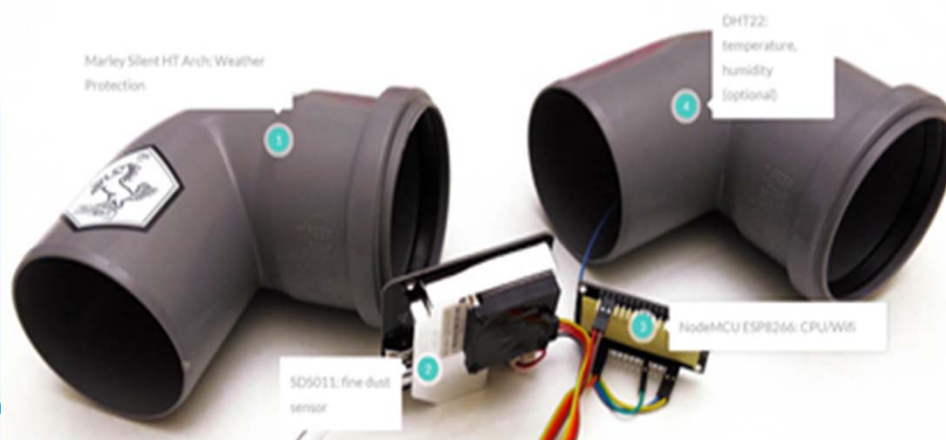
- Compliance with legislation (comparability of data across a region)
- Scientific research
- Other purpose (information needs, citizen science)

Priority of the citizens: what is the air quality here and now? Is it “good enough”?

Low cost sensors: opportunities

The monitoring unit is «low cost» compared to reference instruments → potential for large deployment

For publikum: «plug and play», «do it yourself» kits



Low cost sensors: challenges

Quality of output and data interpretation

Connectivity and upscaling

Calibration/correction/QA/QC of low cost sensor systems

Who	What
Sensor provider	<ul style="list-style-type: none">• Quality control of sensor before shipping;• Algorithms to convert signal to concentration
Sensor system manufacturer	<ul style="list-style-type: none">• Algorithms to convert signal to concentration;• Some manufacturers: Quality control before shipping – calibration curve
Sensor system lay user	<ul style="list-style-type: none">• Access to own instrument data• <i>Support from public systems?</i>
Sensor systems network - professional user	<ul style="list-style-type: none">• Some providers: access to signal (raw data);• Different levels of calibration or corrections<ul style="list-style-type: none">• Lab and field calibration (nb no agreed protocols)• Additional correction procedures

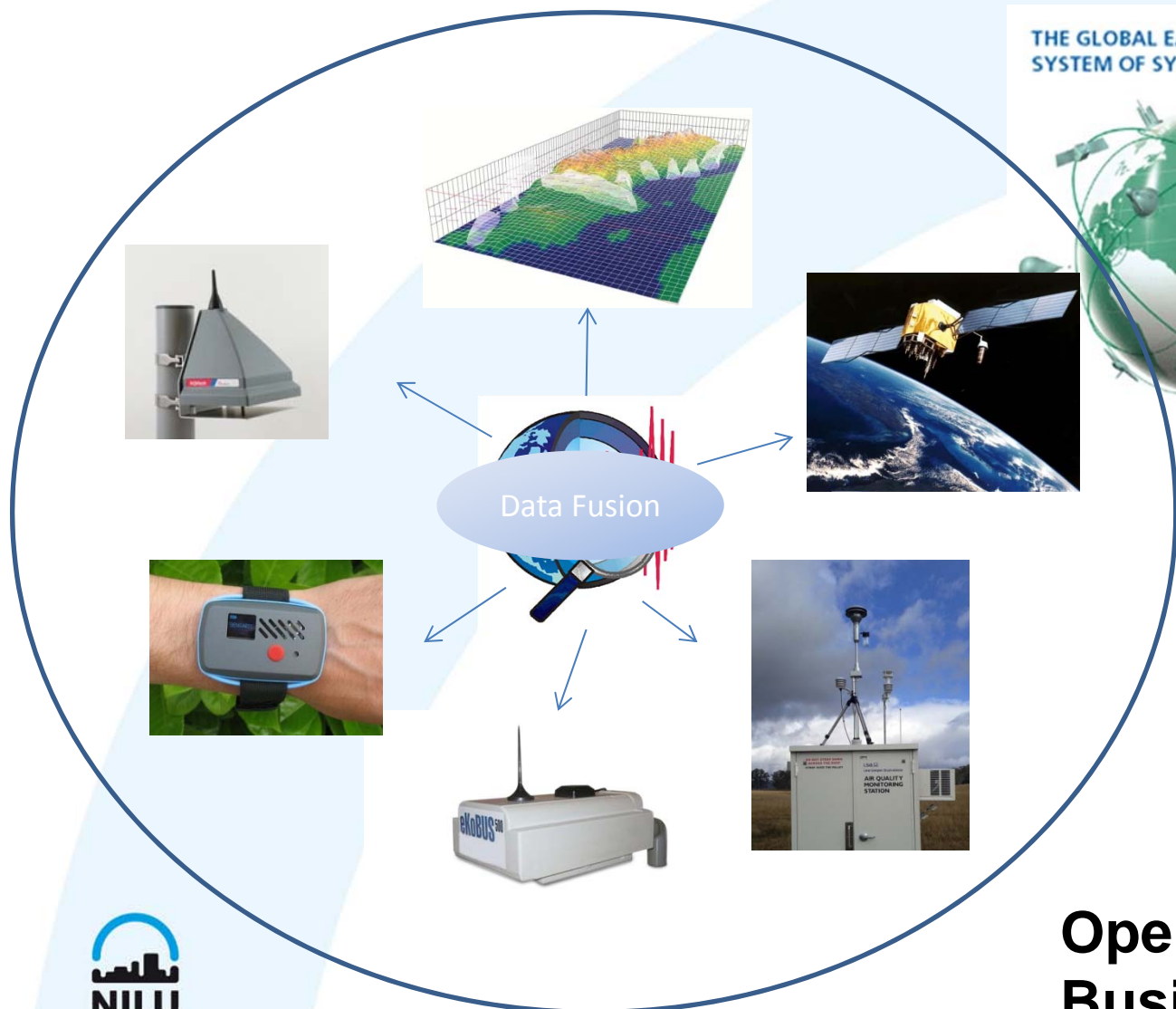


Open systems? Traceability? Transparency?

Innovative technology to continuously sense, measure and communicate environmental data

Dynamic city infrastructure for real-time city management and sustainable progress

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



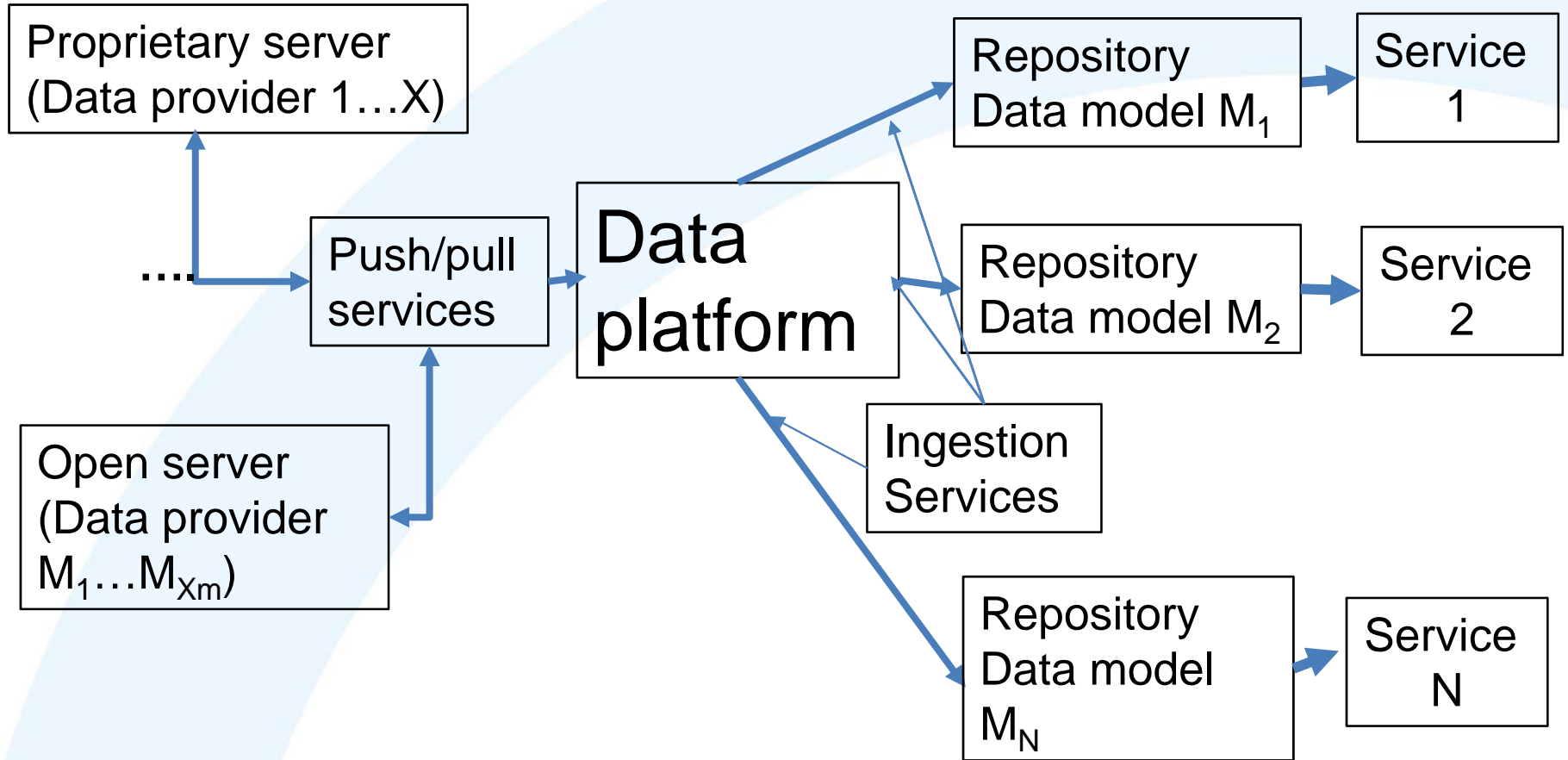
Open data
Business opportunities



Primary data

Pre-processed data

Data directly used for a service



Need to keep track of the processing

Complementary in-situ monitoring

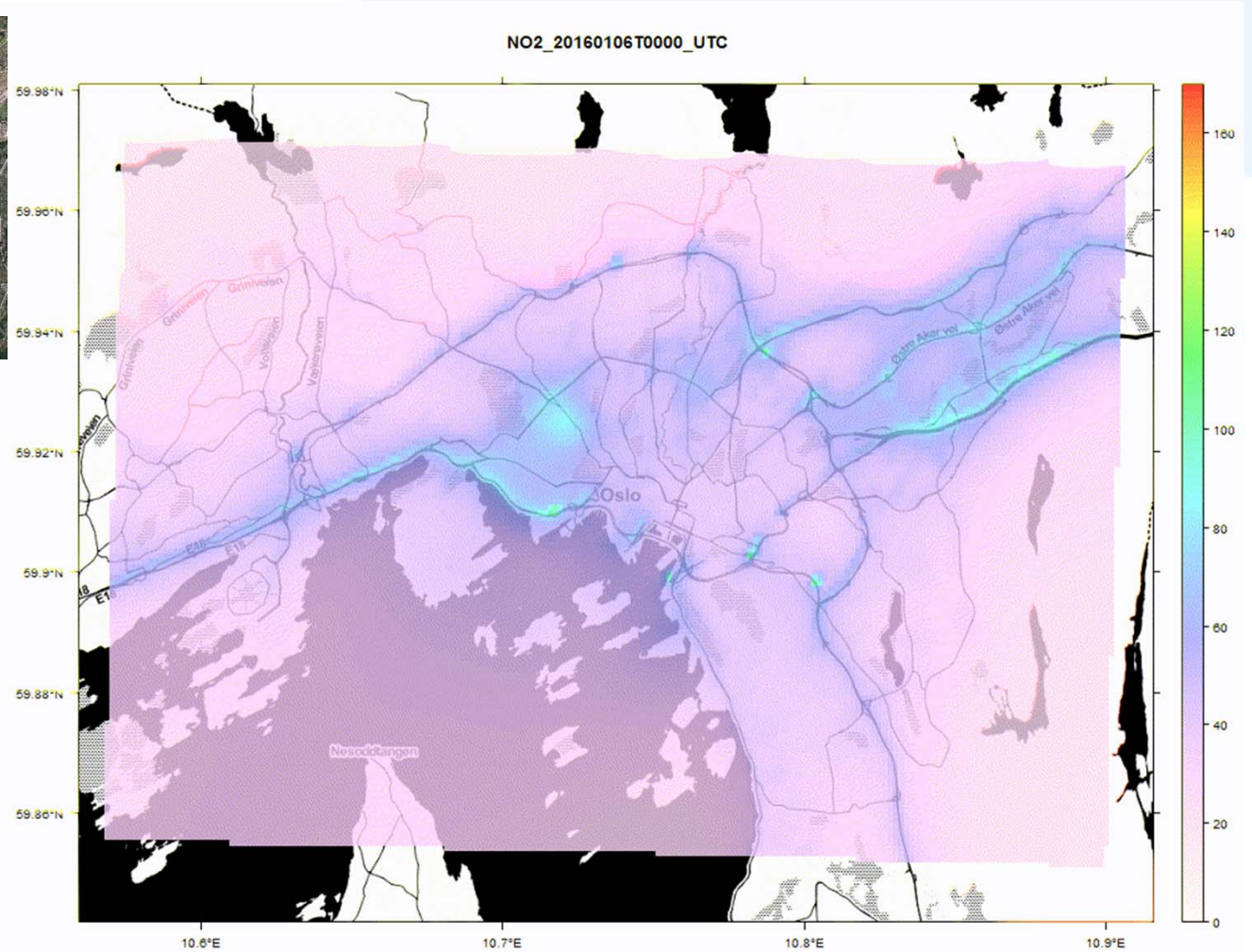
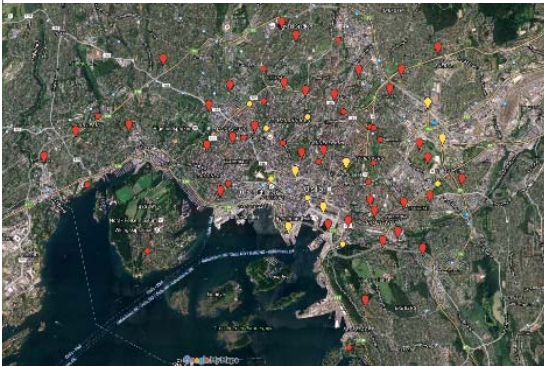
Public monitoring networks:

- High investment cost
- Rigorous QA/QC
- (High) operating costs
- Benefit: comparability in time and space

Sensor systems:

- Low investment costs for monitoring technology
- Unclear QA/QC
- High operating costs for sustained operation
- Benefit: local and spatial resolution high

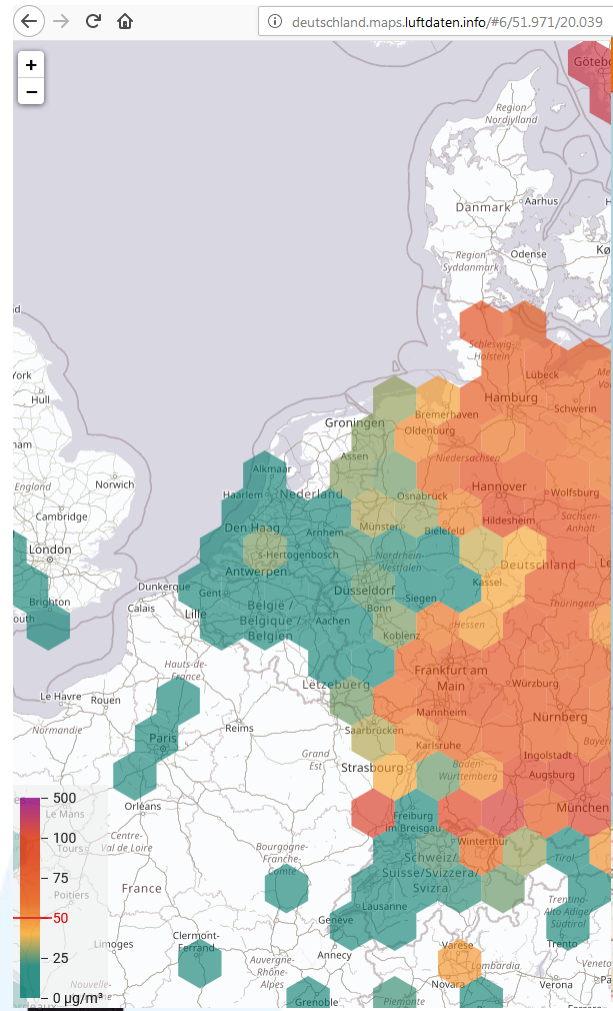
Real time air quality map



Source: Schneider, P., Castell, N., Vogt, M., Dauge, F. R., Lahoz, W. A., & Bartonova, A. (2017). Mapping urban air quality in near real-time using observations from low-cost sensors and model information. *Environment International*, 106, 234-247. doi:10.1016/j.envint.2017.05.005

Support to networks

<http://deutschland.maps.luftdaten.info>



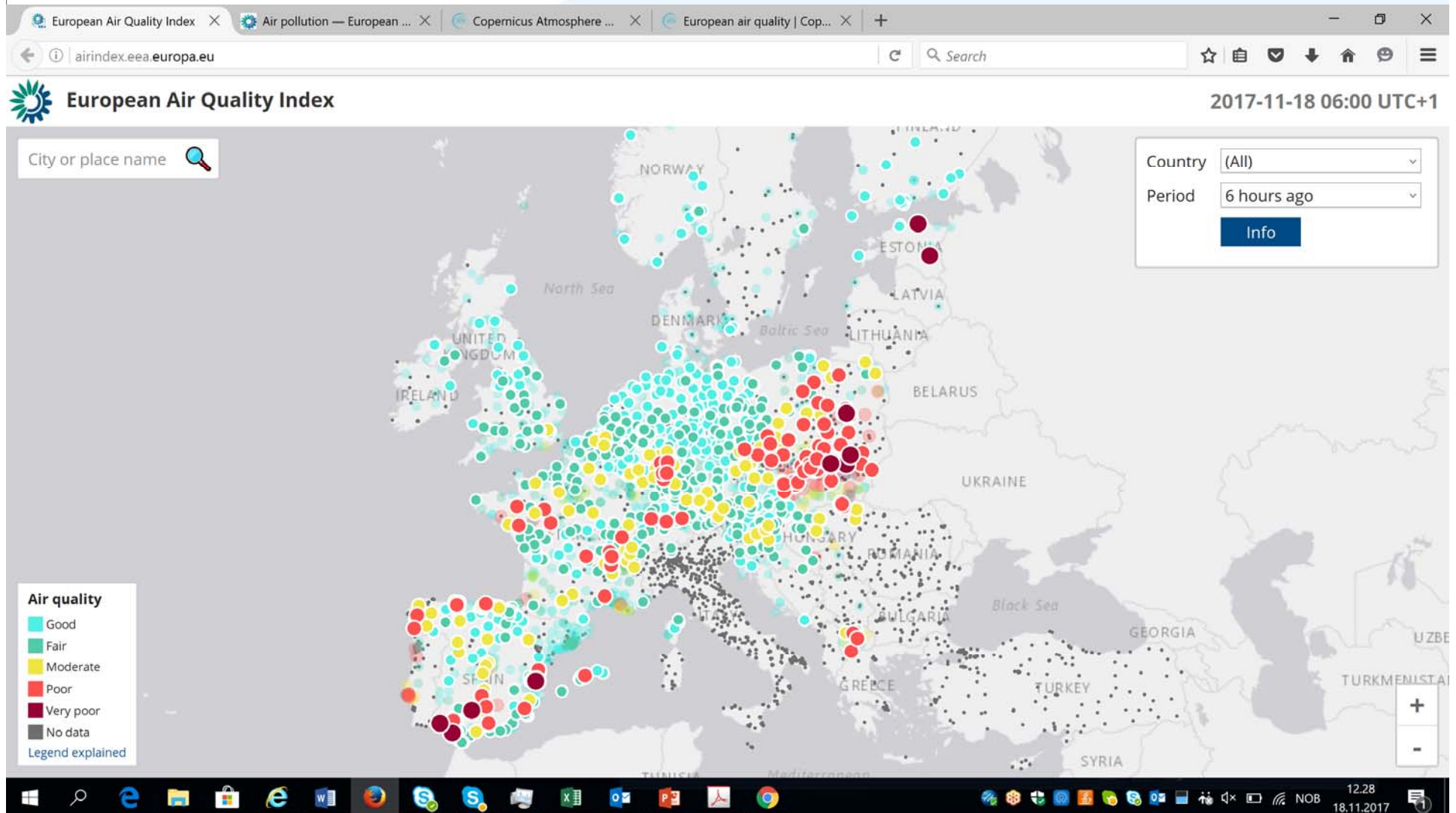
<http://samenmeten.rivm.nl>



airindex.eea.europa.eu

<http://www.eea.europa.eu/themes/air/air-quality-index/index>

regulatory monitoring combined with Copernicus observing system



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