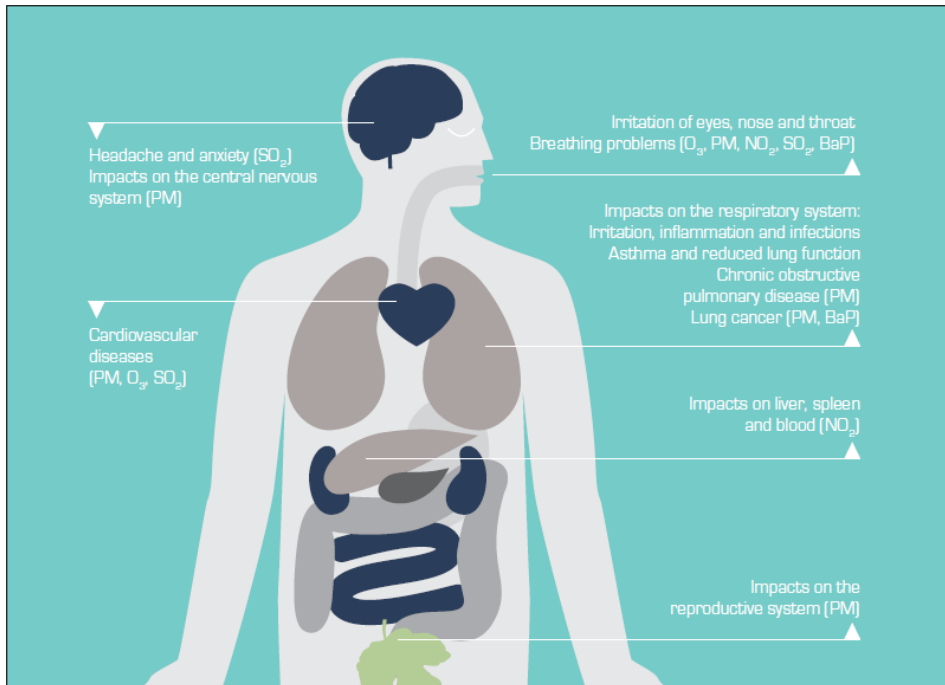# Air quality sensing in europe

**Round Table: New opportunities for air quality sensing –
lower cost sensors for public authorities and citizen science initiatives**
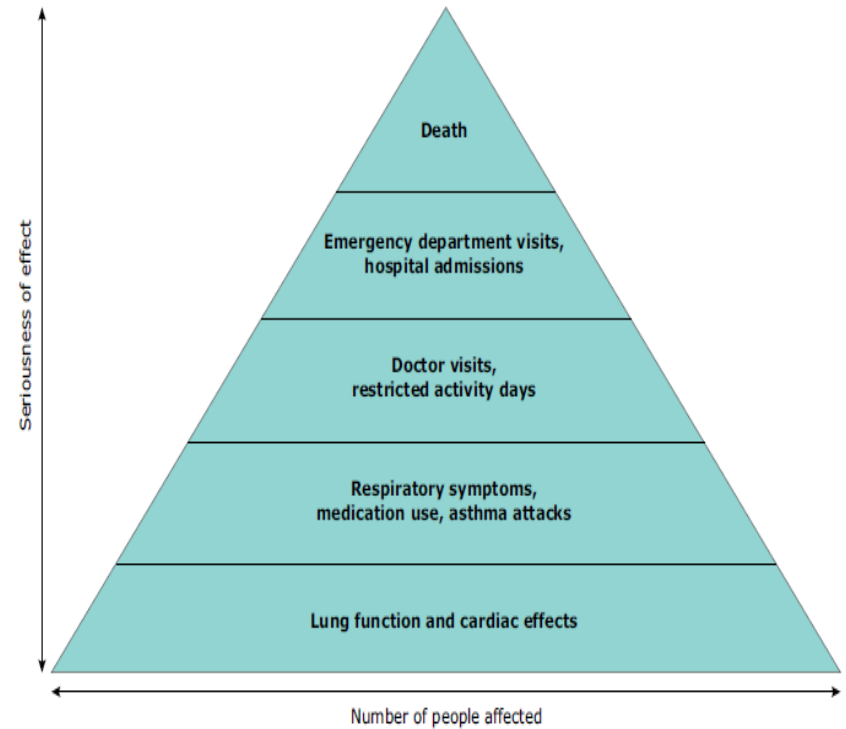
Frankfurt, 24 October 2018

European Commission
Clean Air

Air pollution is a threat to our health and well-being

Headache and anxiety (SO₂)
Impacts on the central nervous system (PM)

Irritation of eyes, nose and throat
Breathing problems (O₃, PM, NO₂, SO₂, BaP)

Impacts on the respiratory system:
Irritation, inflammation and infections
Asthma and reduced lung function
Chronic obstructive
pulmonary disease (PM)
Lung cancer (PM, BaP)

Cardiovascular
diseases
(PM, O₃, SO₂)

Impacts on liver, spleen
and blood (NO₂)

Impacts on the
reproductive system (PM)

Source: EEA, 2013f.

Seriousness of effect

Death

Emergency department visits,
hospital admissions

Doctor visits,
restricted activity days

Respiratory symptoms,
medication use, asthma attacks

Lung function and cardiac effects

Number of people affected

Source: Based on US EPA.

EU Clean Air Policy – The policy framework

CONCENTRATIONS

- -

EMISSIONS

Air Quality Directives

Maximum concentrations of
air polluting substances

National Emission Ceilings Directive

National emission totals
(SO_2, NO_x, VOC, PM $_{2.5}$, NH_3)

Source-specific emission standards

- IED Directive
- MCP Directive
- Eco-design Directive
- Energy efficiency
- Euro and fuel standards

Air pollution in Europe – Health dimension

	EU urban population exposed to air pollution **above EU standards**	EU urban population exposed to air pollution **above 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 %

Source(s): For 2013-2015; EEA Air Quality in Europe (2017)

Air pollution in Europe – A widespread issue

PM10 exceedances: often linked to fuel combustion (i.e. energy, heating)

NO2 exceedances: often linked to traffic, in more than 130 cities in EU.

Source(s): EEA Air Quality in Europe (2017)
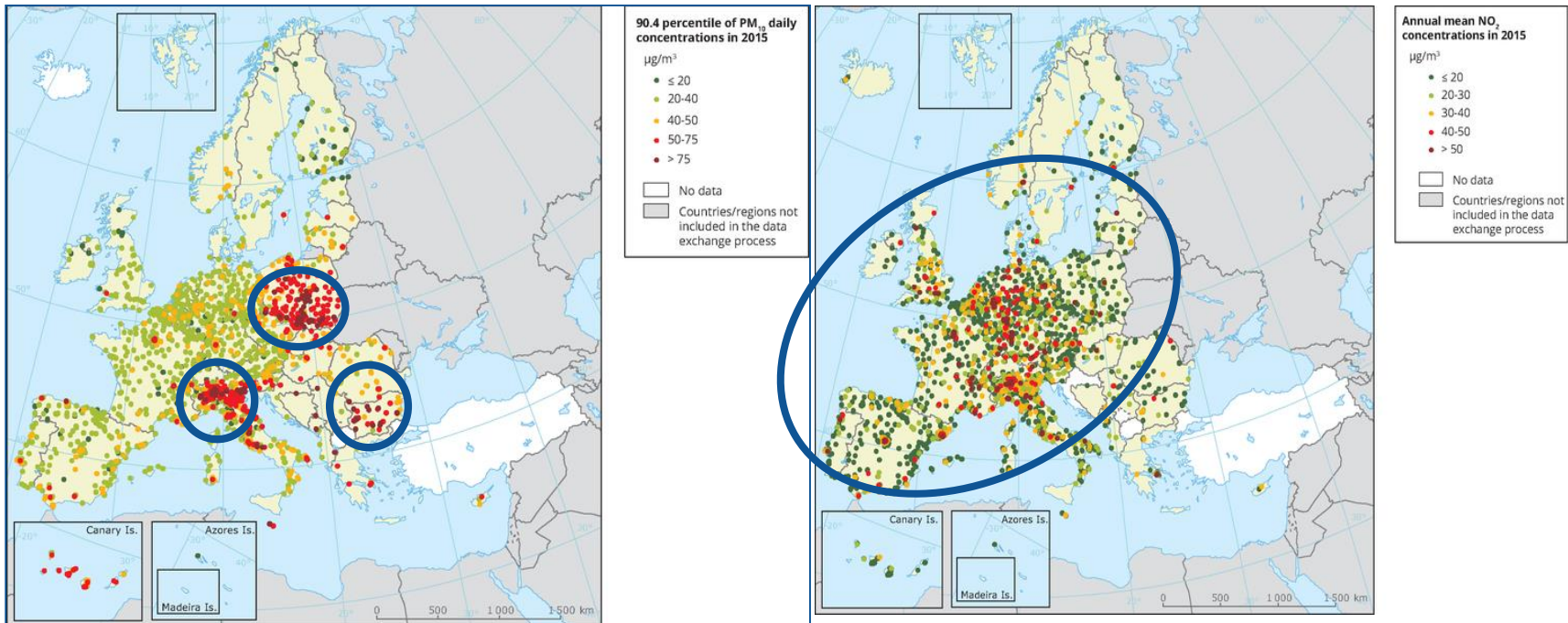
Improving Air Quality – Effective Measures

Examples for PM$_{10}$

Boosting **energy efficiency** by refurbishing buildings
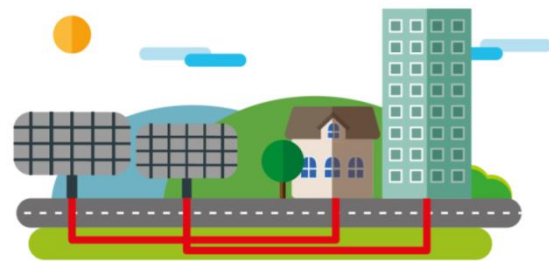
City or district heating, using heat from existing industry or renewable energy sources

Reliable, affordable and clean **public transport** such as electric buses and trams and new Euro VI

Implementing **cleaner industrial processes**
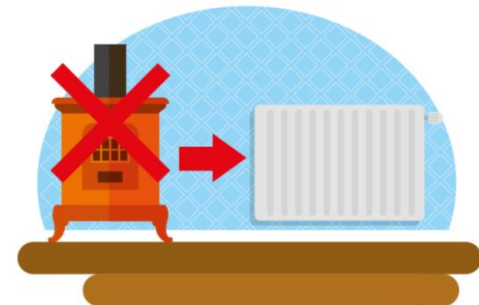
Promoting substitution of old, dirty **stoves and boilers** with clean models, and banning **dirty fuels for household heating/cooking**

Improving Air Quality – Effective Measures

Examples for
NO_2

Reliable, affordable and clean **public transport** such as electric buses and trams and new Euro VI

Extensive and safe **cycling networks**, abundant bike-parking facilities with easy access to public transport

Traffic restrictions such as low-emission zones, reduced speed limits and congestion charges

Implementing **cleaner industrial processes**

Cleaner transport such as electric cars or buses and **retrofitted dirty vehicles and ships**

Fitness Check of AAQDs – Focus

This fitness check will look at two complementary EU Ambient Air Quality Directives, i.e. Directives 2008/50/EC and 2004/107/EC – see Roadmap of August 2017.

Important: A fitness checks is a retrospective exercise – to assess what has happened and looks at what caused any change and how much might reasonably be credited to EU action. This particular fitness check will focus on the period 2008 to 2018.

Key question of this evidence-based critical analysis is whether EU actions are fit for purpose and delivering as expected – to identify learning points to guide future action.

Fitness Check – Five evaluation criteria

Relevance: e.g. to what extent do the Directives (still) set appropriate objectives, and set air quality standards to protect health in accordance with scientific understanding?

Coherence: e.g. to what extent are the Directives coherent internally, between each other, as well as with the overarching EU air quality policy approach?

Effectiveness: e.g. to what degree have the Directives acted as an incentive to implement effective and cost-effective measures to improve air quality?

Efficiency: e.g. to what degree do the benefits of improved air quality justify the costs, and have been significant differences in costs (or benefits) between actors?

EU value added: e.g. to which degree have common EU air quality standards and comparable monitoring, reporting and assessment regimes enabled better action?

Fitness Check – Our timeline

Roadmap

Clean Air Forum

TODAY'S EVENT

Green Week

Stakeholder Meeting

2017						2018					Public Consultation						
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

RSB Submission

Finalisation of European Commission Report / SWD

Clean Air Forum

Stakeholder Workshop

Draft Support Study Report

| 2019											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
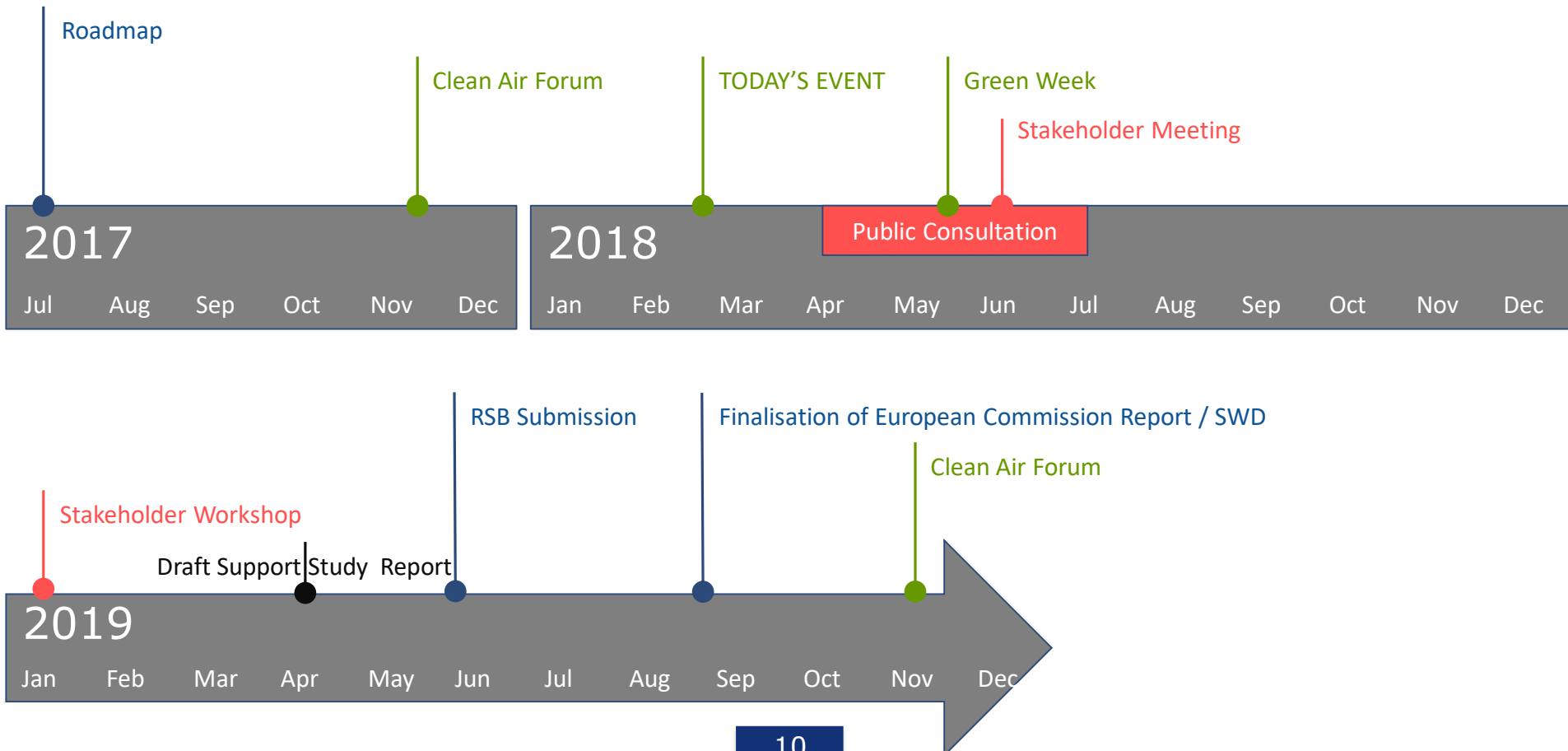
AQ sensors: a fast-moving field

Sensor values depend on technology and their implementation: a **huge variety** of sensor technologies and prices exist. No simple correction or fitting is possible

In certain situations **the measurement uncertainty may approach the AQ Directives' DQO of indicative methods**.

However, the main message is «validate low-cost sensors, both with field tests and laboratory tests under controlled conditions in order to understand the measurement uncertainties»
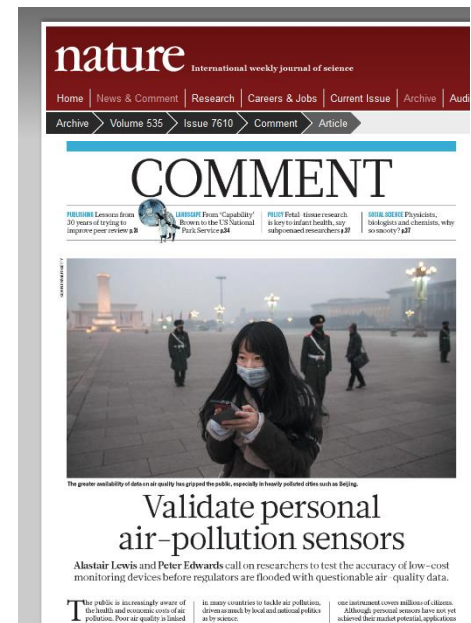
EP pilot project on AQ sensors

"Integrating smart sensors and modelling for air quality monitoring in cities"

- 1M EUR in funding from EP, 3-year duration

- JRC to perform research on low-cost AQ sensors

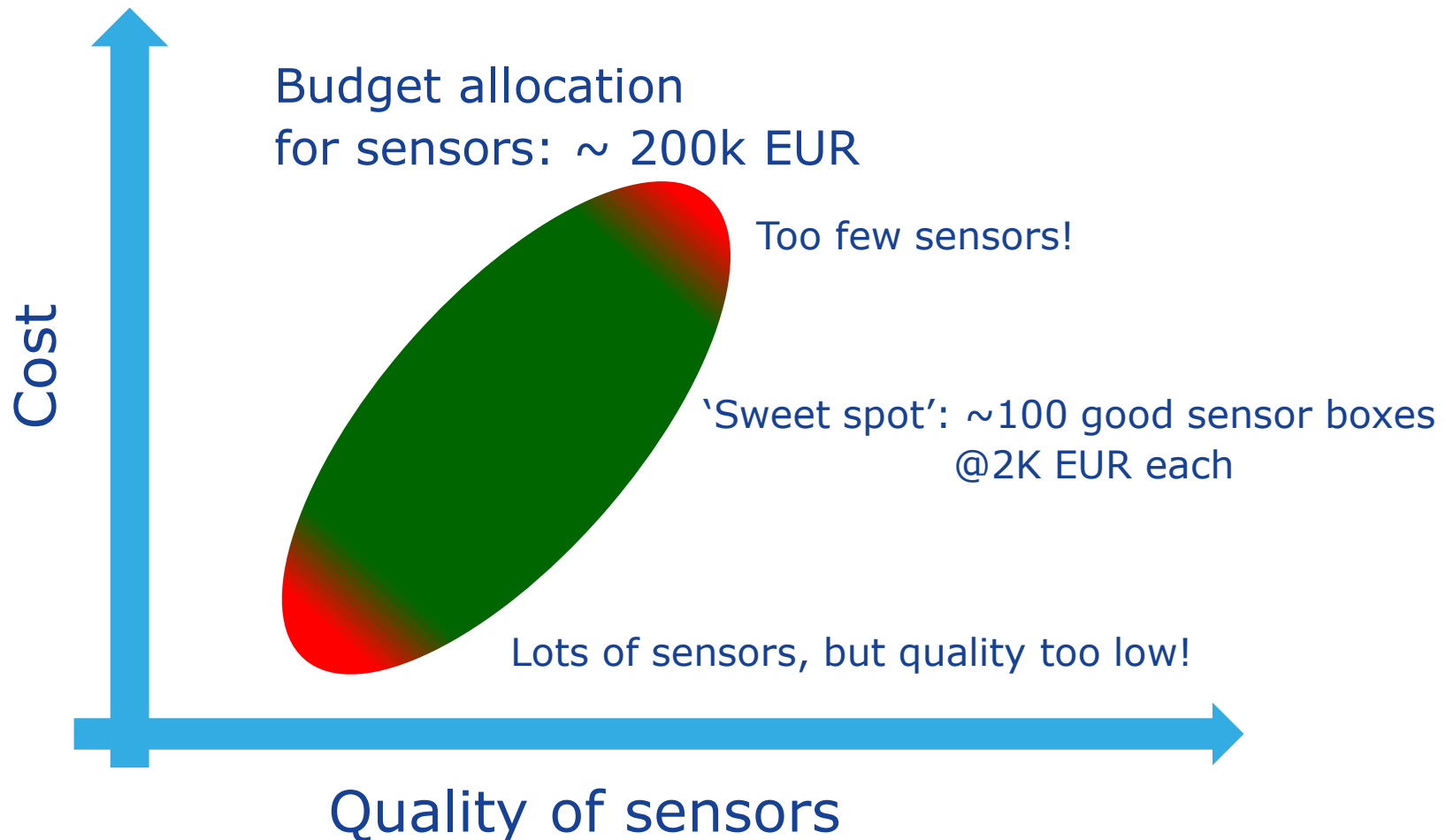- Field deployment of sensors in a small number of European cities

EP pilot project on AQ sensors

Project objectives

- Develop **deployment and calibration procedures** for air quality sensors

- Research ways of **integrating lower-cost sensors** with conventional air quality monitoring systems

- Develop general **guidance** on the use of lower-cost air quality sensors

EP pilot project on AQ sensors

Cost

Quality of sensors

Budget allocation
for sensors: ~ 200k EUR

Too few sensors!

'Sweet spot': ~100 good sensor boxes
@2K EUR each

Lots of sensors, but quality too low!

Some concluding reflections

Public (and political) awareness of **air quality challenge** has increased – but substantial implementation and compliance gaps remain across the EU.

Reducing air pollution effectively requires **close cooperation** between different societal actors and across governance levels (EU, national, local).

With the on-going Fitness Check we are seeking to understand what works well, and what could work better: **whether the Directives are fit for purpose**.

Air quality sensors are seeing fast technological development: **ongoing research will inform which role such complementary modelling can play**

More Information

http://ec.europa.eu/environment/air/

Feedback

ENV-AIR@ec.europa.eu

vicente.franco@ec.europa.eu

Thank you!

European Commission

Clean Air

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