

European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

COST Action TD1105

INTERNATIONAL WG1-WG4 MEETING on

New Sensing Technologies and Methods for Air-Pollution Monitoring

European Environment Agency - EEA

Copenhagen, Denmark, 3 - 4 October 2013

Action Start date: 01/07/2012 - Action End date: 30/06/2016 - Year 2: 2013-2014 (*Ongoing Action*)

Introduction of the CITI-SENSE project



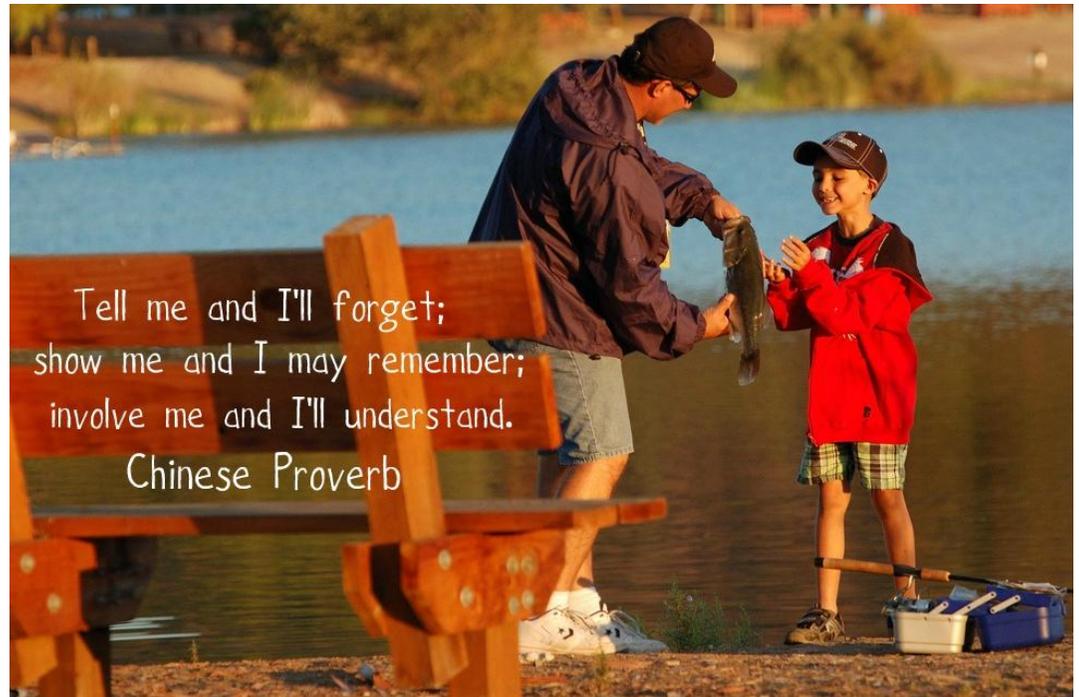
Hai-Ying Liu, Alena Bartonova

Function in the Action: (Invited Expert)

Norwegian Institute for Air Research/Norway

Scientific context and objectives

- **Citizens' Observatories for citizens to**
 - Contribute in environmental governance
 - Support community
 - Influence policy priorities
 - Contribute to Global Earth Observation System of Systems (GEOSS)



Scientific **context** and objectives

- **CITI-SENSE works within GEOSS framework**
 - Common methodologies & standards for
 - Scientific approach
 - Data management
- Section on collaboration with GEOSS & FP7-ENV-2012 cluster projects added to project description
- Data should be made available through the GEOSS without restrictions



Scientific **context** and objectives

- CITI-SENSE may join GNON** (Global Network of Networks by EEA and Global Monitoring for Environment and Security Initiative (GMES))



Scientific **context** and objectives

- **Linking to other FP7-ENV-2012 observatories**

<i>Name</i>	<i>Lead</i>	<i>Topic</i>
Citclops	Barcelona Digital Centre Tecnològic (Spain)	Coast and ocean optical monitoring
WeSenselt	University of Sheffield (UK)	Water Management
CITI-SENSE	Nilu (Norway)	Air quality
Omniscientis	Spacebel (Belgium)	Odour monitoring
COBWEB	UEDIN (UK)	Various

Current activities of the Partner

- 28 partners
- Partner organization research & Problem statements

Research topics (NILU, all):

ICO is needed as a support system for community-based environmental governance

What is ICO in environmental health fields?

What do citizens want and what can citizens offer to an ICO?

What products and services from an ICO is useful for citizens daily life?

How to recruit and retain citizens to participate in environmental governance?

Which tools can support citizens to report/upload their observations?

Which tools can facilitate citizens getting environmental information?

Current activities of the Partner

- Current research topics

- **Outdoor air quality (CREAL, all):** air pollution, noise, UV, pollen, PAHs
- **IAQ in school (NAAF, all) :** Indoor air pollution has become a main concern in western cities where people spend 90% of their time indoors.
- **Public spaces (Tecnalia, all):** 60% of population of the world is expected to live in cities by 2030, providing and maintaining urban public spaces environment conditions is concerned.



Current activities of the Partner

- **Brief list of ongoing research/measurement/service**

- **Empowerment initiative: OAQ in eight cities**

- Barcelona (CREAL)
- Belgrade (VINCA)
- Edinburgh (IOM)
- Haifa (Technion)
- Ljubljana (JSI)
- Oslo (NILU)
- Ostrava (CVUT)
- Vienna (Ubimet)

- **Empowerment initiative: IAQ in four schools**

- Oslo school (NAAF)
- Belgrade school (VINCA)
- Edinburgh school (IOM)
- Ljubljana school (VINCA)

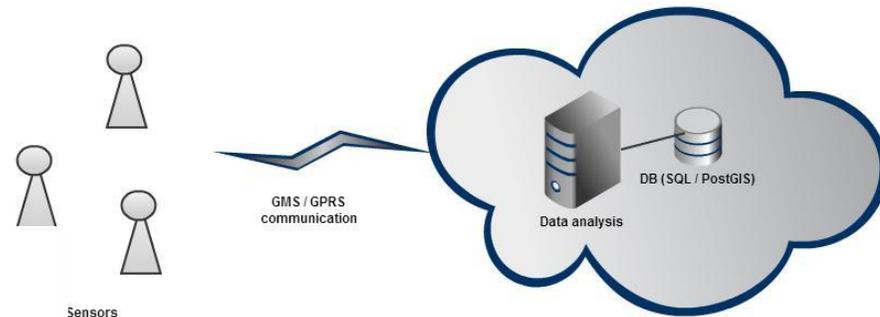
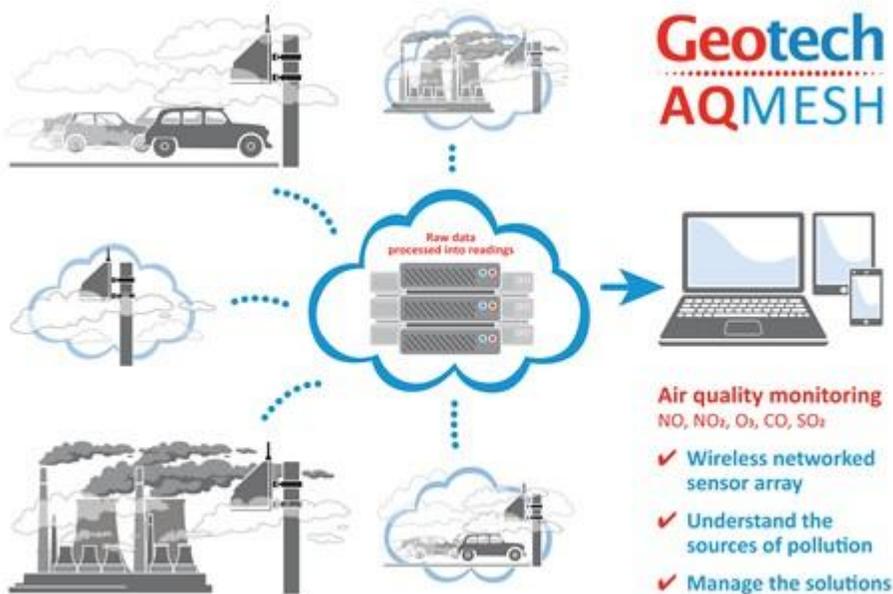
- **Empowerment initiative: public spaces**

- Public spaces in Vitoria (TECNALIA)

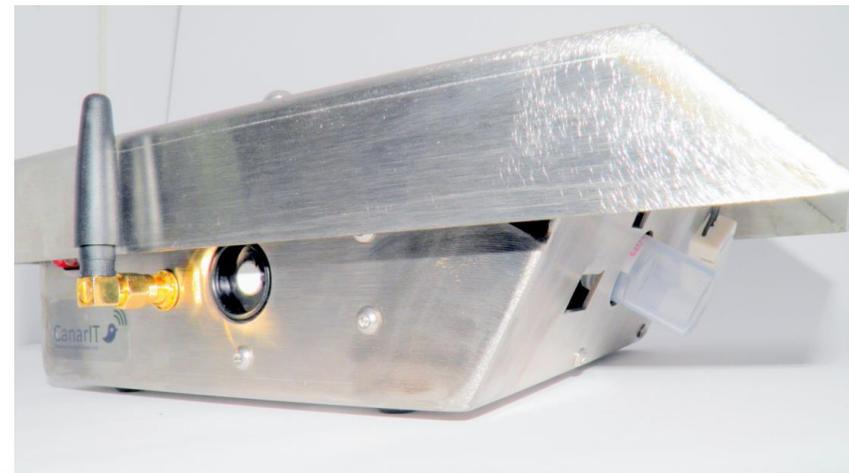
Facilities available for the Partner

- **Sensor and sensor platform**

- AIRBASE
- GEOTECH
- ATEKNEA
- JSI
- OBEO
- CVUT
- DNET



CanarIT™ Sensors, data collection and storage



Picture of the CanarIT™ sensor

Facilities available for the Partner

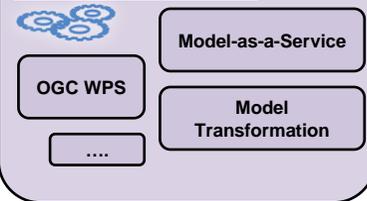
- Smart phone-based mobile sensor stations
- Data services
- Application services

Smart Phone-based Mobile Sensor Stations



- CivicFlow
- Crowdsense
- Web and App
- U-Hopper
- Bluetooth Gateway
- S&C
- SINTEF

Processing Services



Data Services

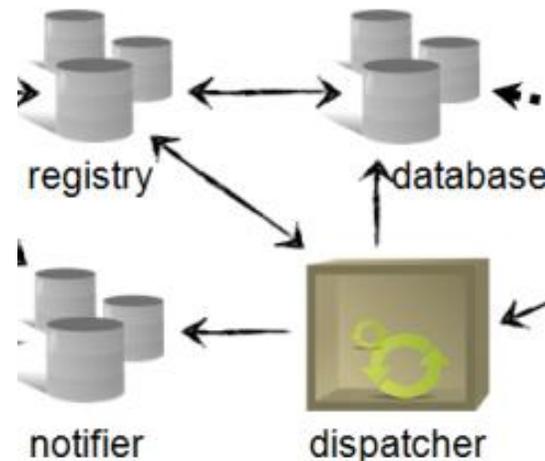


Application services

- Visualization
- notification service
- Schedule service
- data state

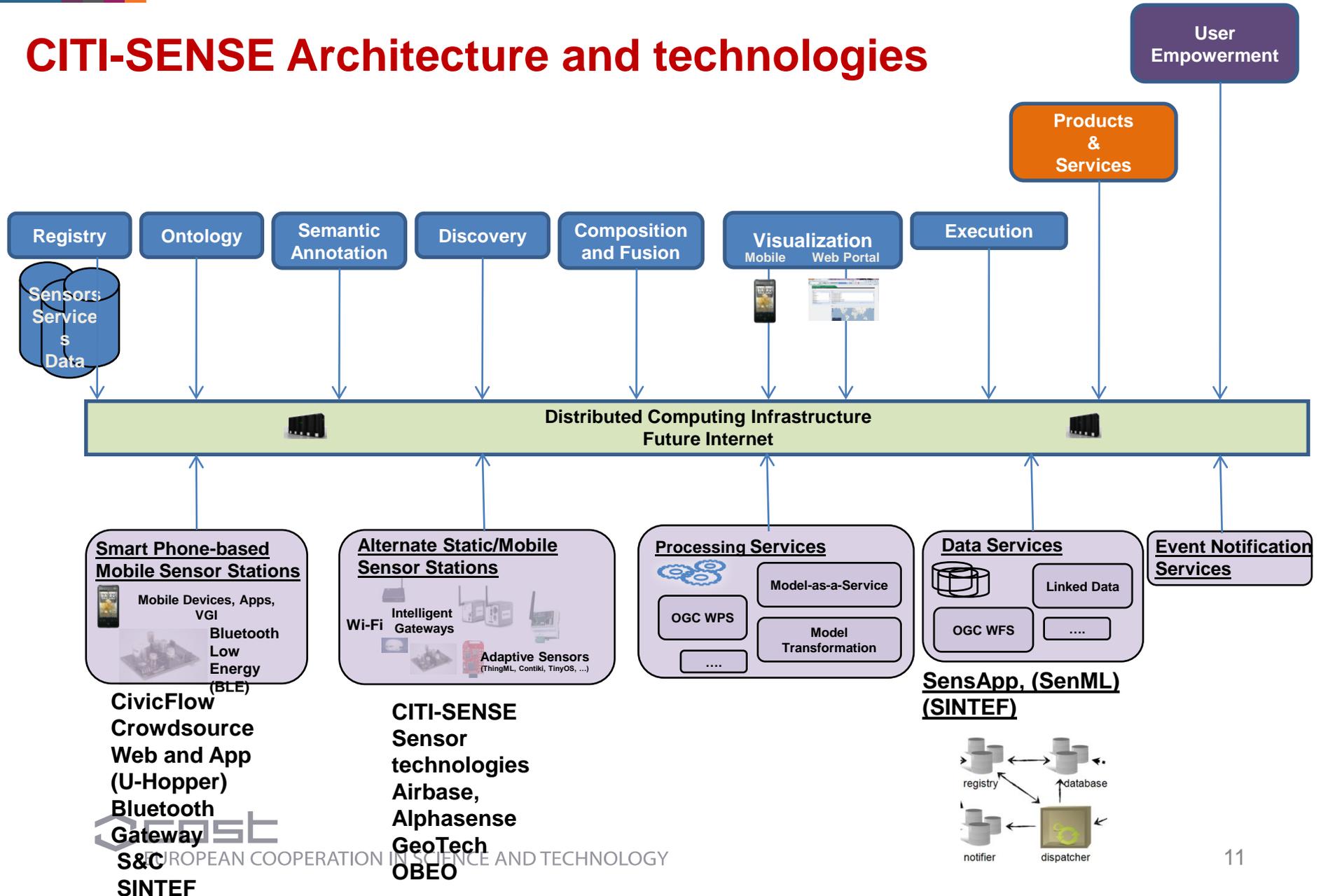
SensApp, (SenML)
•SINTEF

MobileApp
•NILU



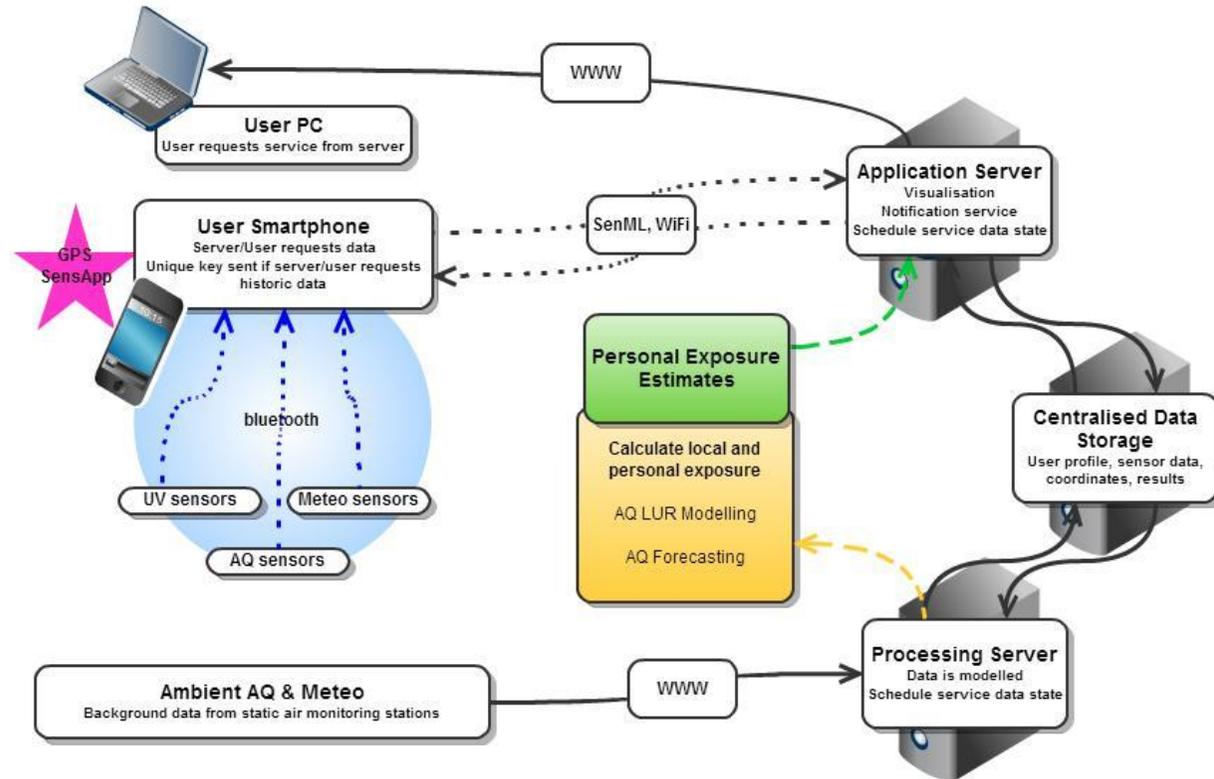
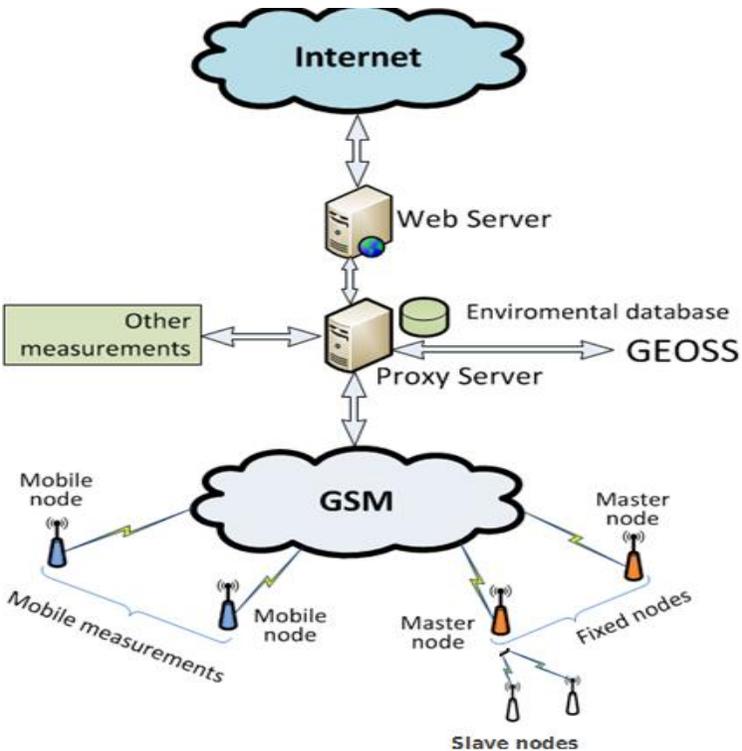
Achieved **RESULTS** and future activities

- CITI-SENSE Architecture and technologies**



Achieved RESULTS and future activities

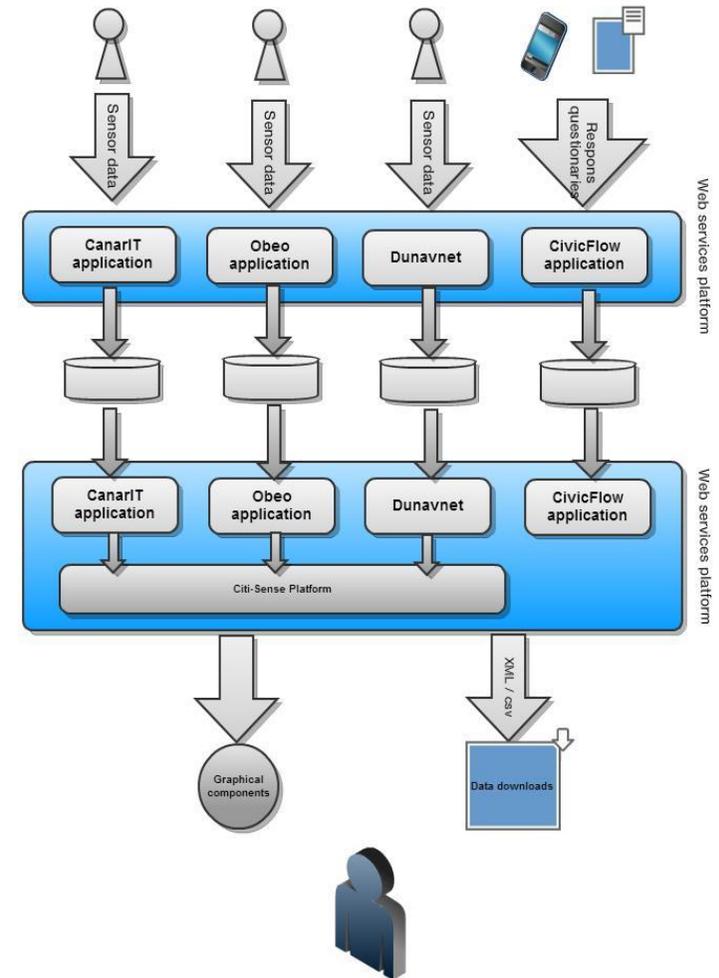
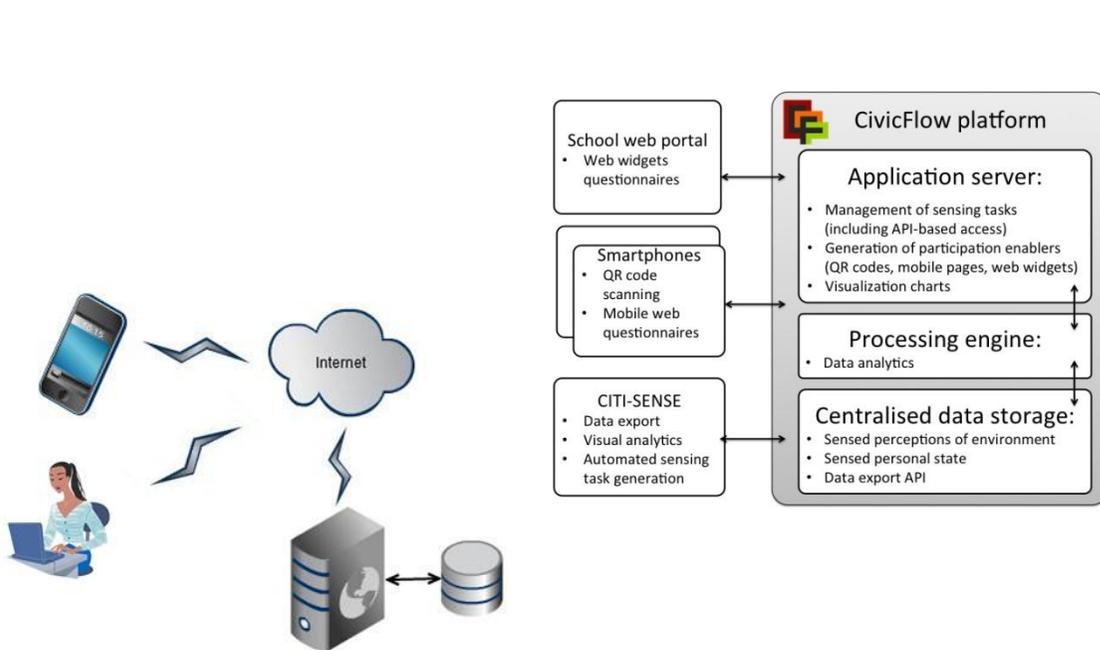
- CITI-SENSE E2E pilot implementation prototype – OAQ**



Step 1: Mobile sensor data transmitted to application server.
 Step 2: User requests service, coordinates provided. ID 'Yes'/'No'
 Step 3: Processing server fetches relevant data from DB.
 Step 4: Process server models data and stores results in DB. If unique ID supplied, this data is related to the user. If not, the data is stored only as Temp and is flushed after it has been sent.
 Step 5: Application server retrieves results and returns response to mobile phone.

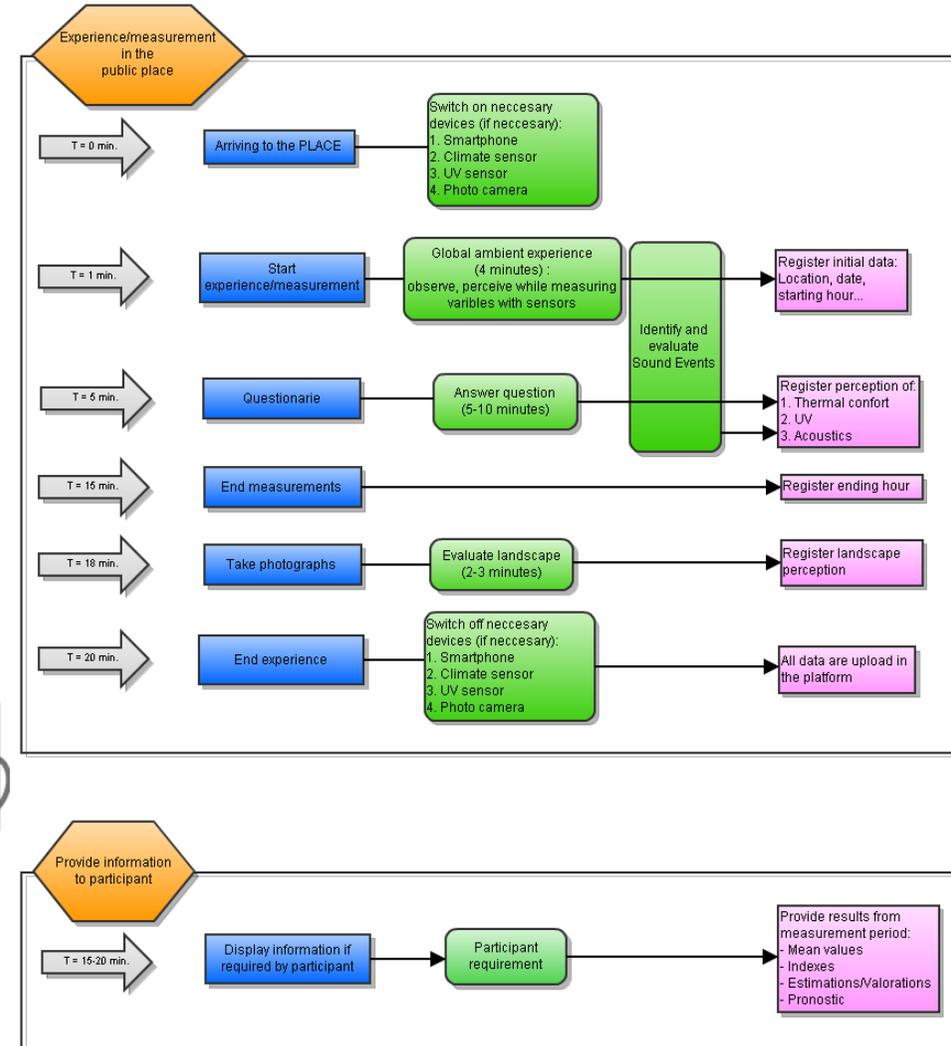
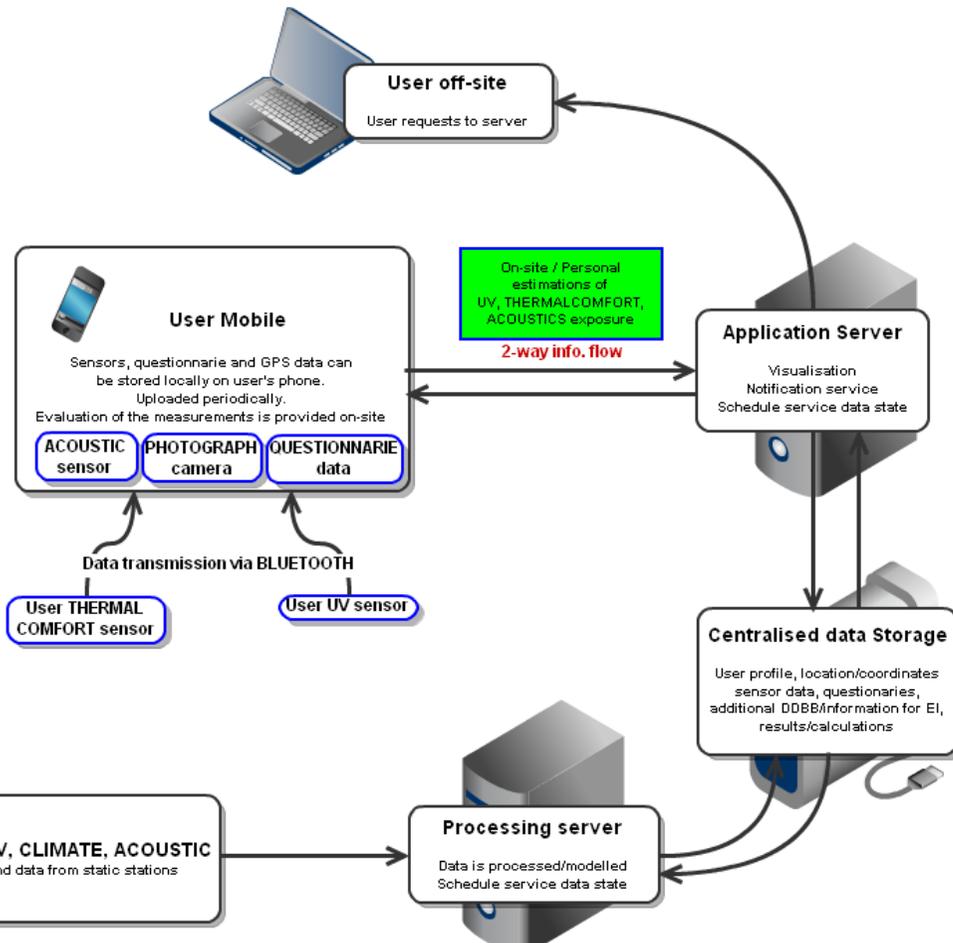
Achieved **RESULTS** and future activities

• CITI-SENSE E2E pilot implementation prototype –IAQ in school



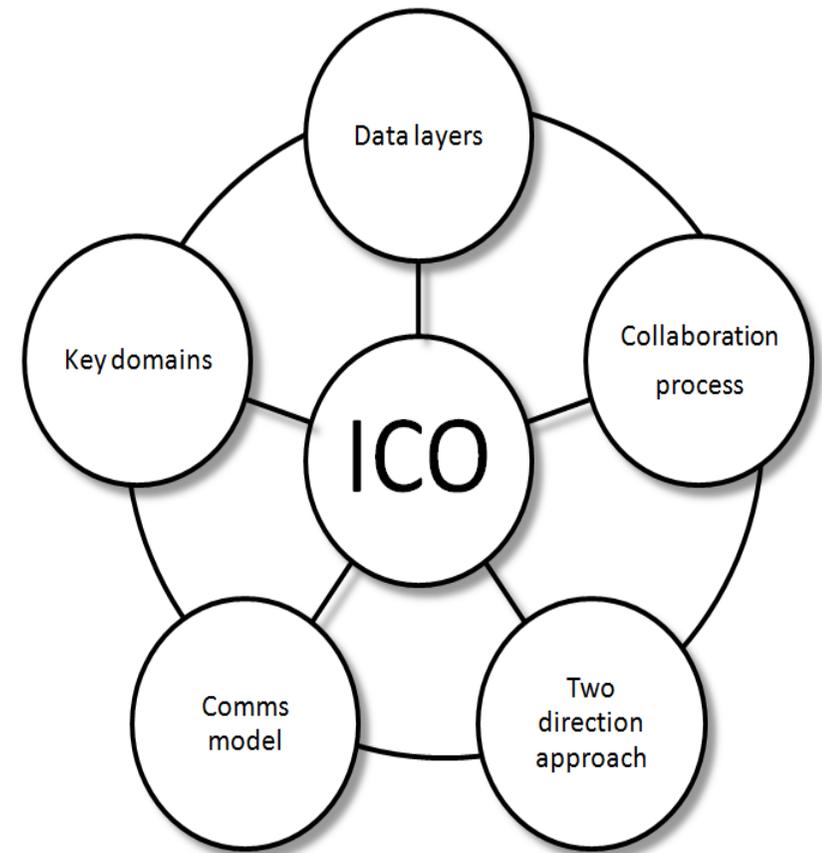
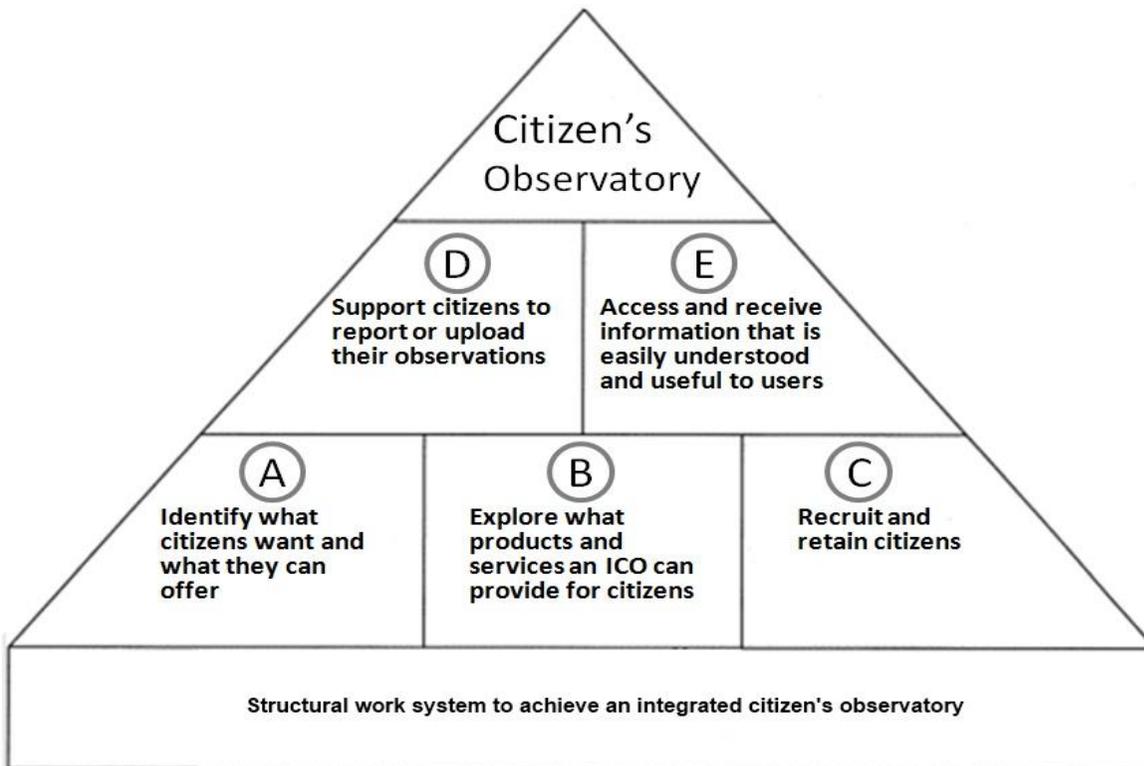
Achieved RESULTS and future activities

CITI-SENSE E2E pilot implementation prototype – Public space



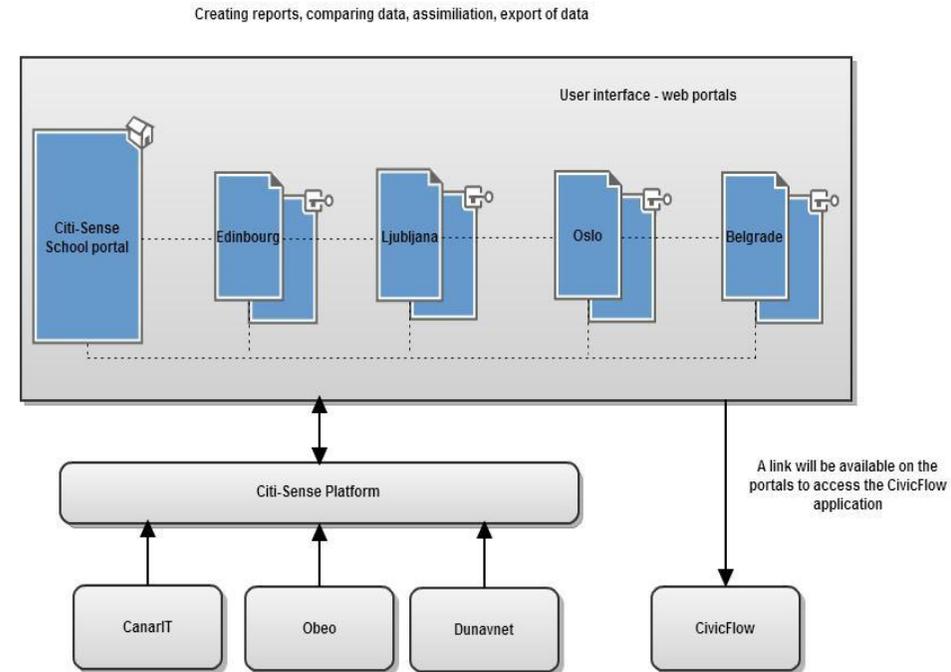
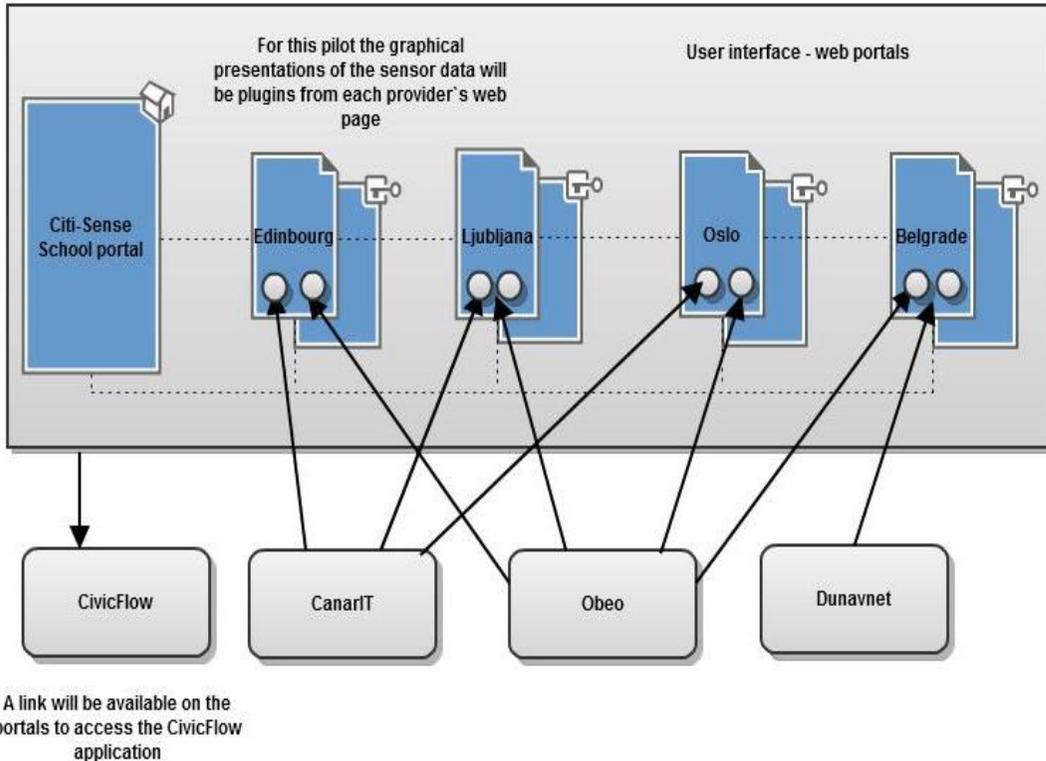
Achieved **RESULTS** and future activities

- **Provisional concept and framework of ICO**



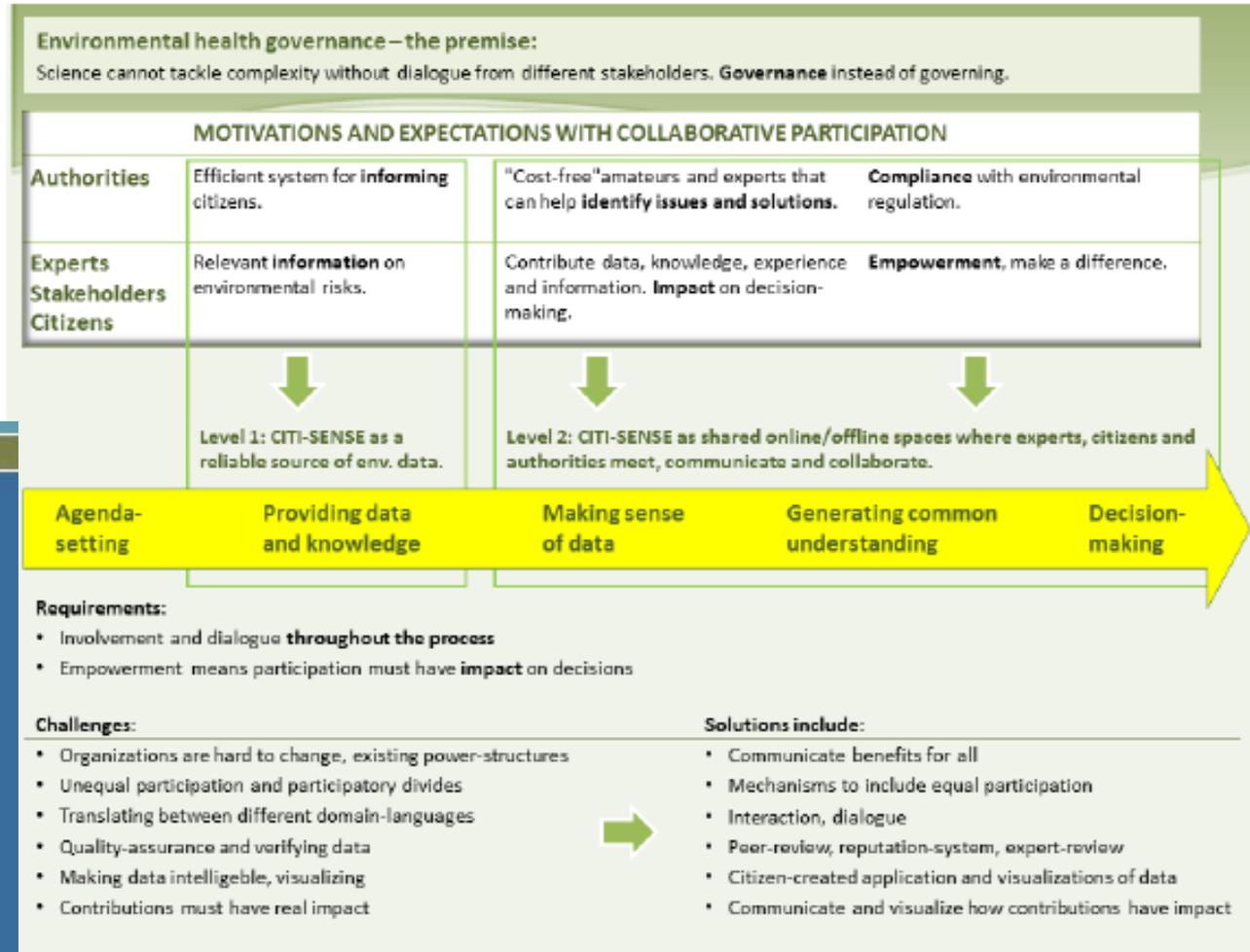
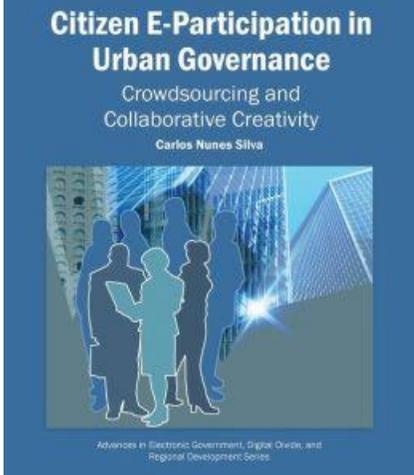
Achieved **RESULTS** and future activities

- **Internet application – Case studies on IAQ in school**



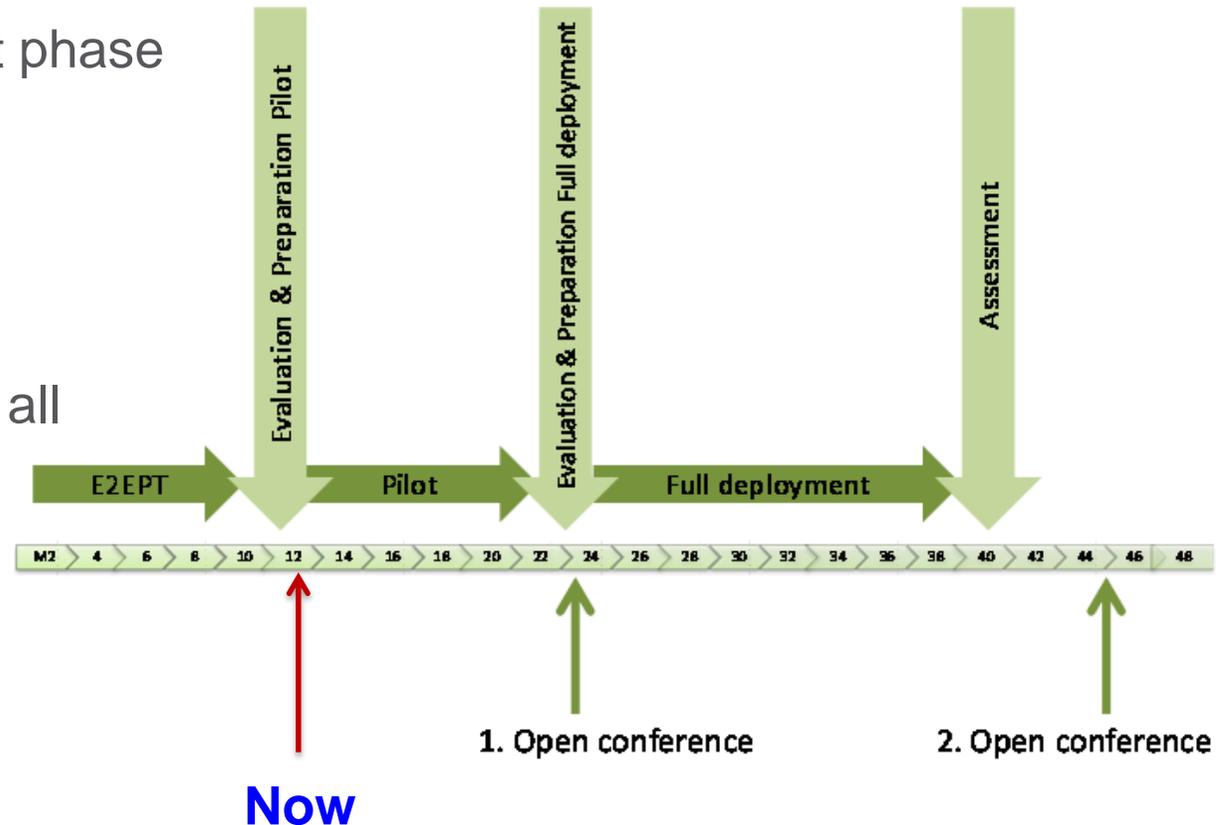
Achieved **RESULTS** and future activities

- Collaborative participation in environmental health governance**



Future planned Activities

- M1-18: E2E prototypes and pilot phase for selected sensors at selected locations
- M18-24: Interim period – pilot evaluation
- M24-36: Full implementation for all sensors at all locations
- M36-48: Finalization



CONCLUSIONS

- Review of existing MDB
- Theoretical studies
(ICO provisional concept, collaborative participatory)
- Practical approach
(CITI-SENSE architecture, building on existing infrastructure, e.g., OGC standards, GEOSS specifications)
- Planning for the case studies
(E2E prototypes, and pilot protocols)
- Thank you for your attention!
- If you are interested in knowing more about CITI-SENSE, please contact me, Hai-Ying Liu: hyl@nilu.no