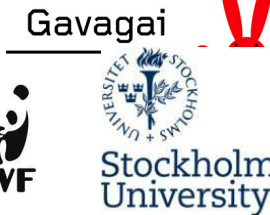




## How Ground Truth 2.0 Citizen Observatories are enhancing Earth Observation

Joan Masó (CREAF)



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 689744.

This presentation reflects only the author's view and the EU Agency is not responsible for any use that may be made of the information it contains.



# The four COs active in H2020 SC5



- From citizen-based data collection to knowledge sharing for joint decision-making, cooperative planning and environmental stewardship
- Considers the social and the technical dimensions
- Six demo cases



- Sustainable custodianship of EO data
- Meet the demands of food production
- Calibrate/validate satellite-based soil moisture products with CS in-situ sensors
- Campaign-based approach for engaging citizens



- Inventory of citizen observatories and sustainability
- Accelerate the uptake of Citizen Observatories
- Facilitate adoption in EO communities



- Crowdsourcing platform used to collect images and text from citizens
- Calibration and validation of satellite imagery using the crowdsourcing

with serious gaming and machine learning  
 Parnassos river, Greece (urban) and  
 Thessalonika (rural)

## Landsense

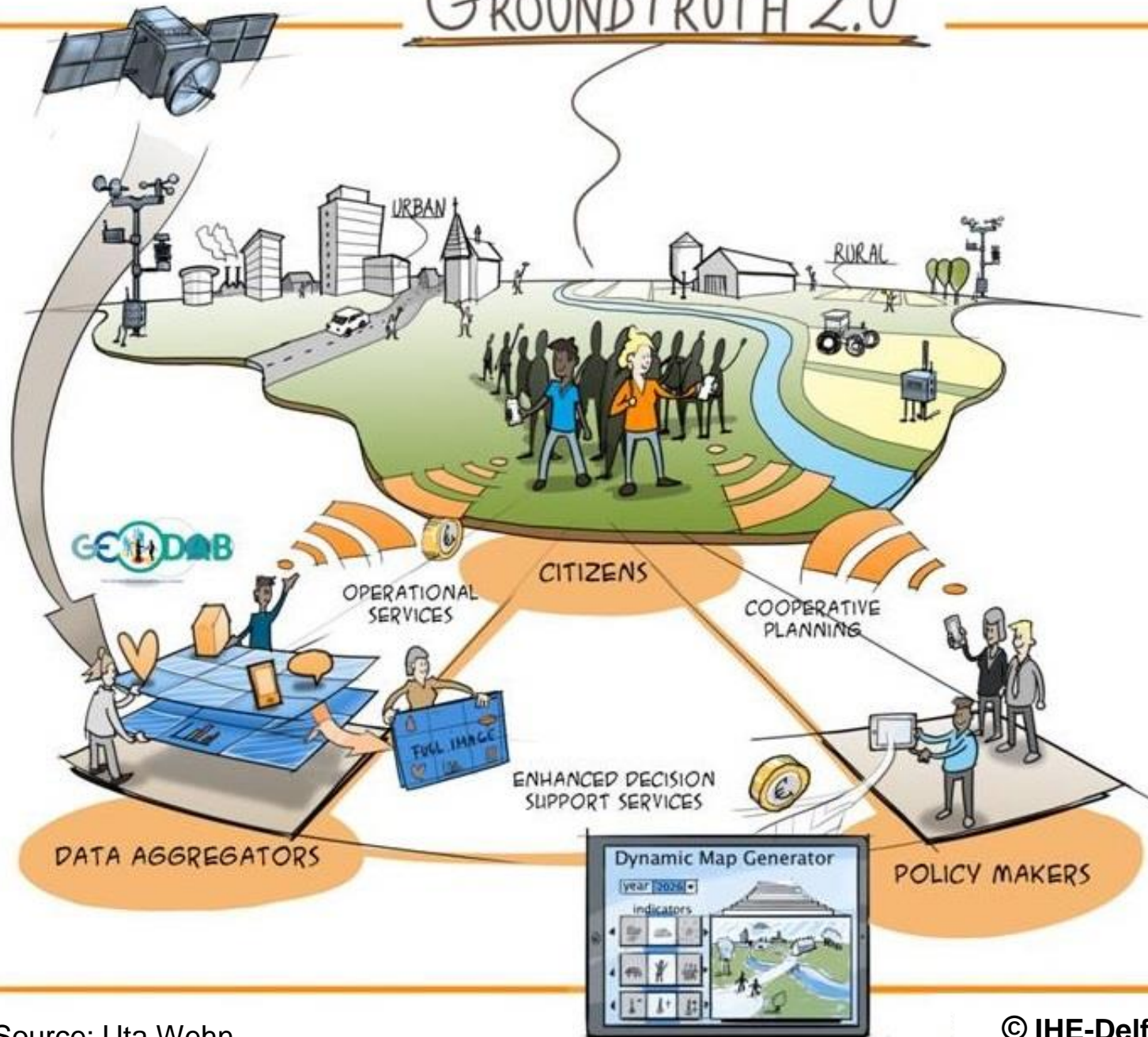


platform

- Emphasis on services
  - Photoquest (pictures in 4 directions), change detection in alerting about bird habitat risks, single sign-on
- Three demo cases on landscape changes, agriculture and habitat monitoring



# GROUNDTRUTH 2.0



## OBSERVATION

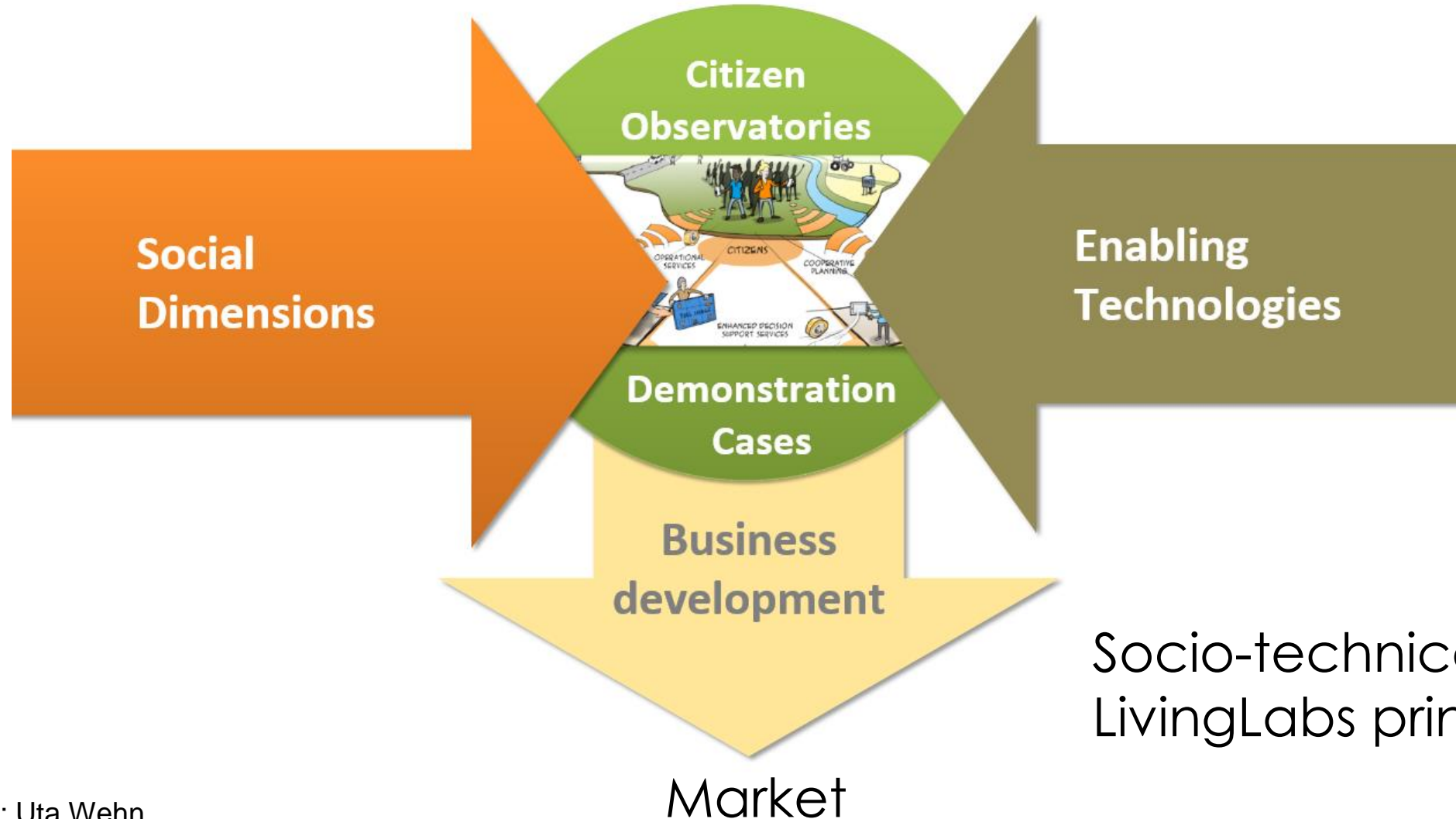
atics - Z\_GIS, University of Salzburg

One of the EC funded  
Citizen Observatories  
that goes...

... from citizen-based  
data collection to  
knowledge sharing for  
**joint decision-making,**  
**cooperative planning**  
and **environmental**  
**stewardship**



# groundtruth2.0 methodology





# Building a Citizen Observatory

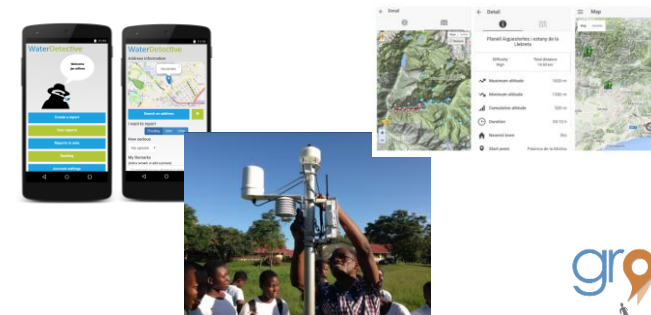
## Co-design

- Define the goals
- Determine all stakeholders (citizens, scientist, decision makers)
- Set workshops where stakeholders decide what they need
- Create the community that runs the observatory



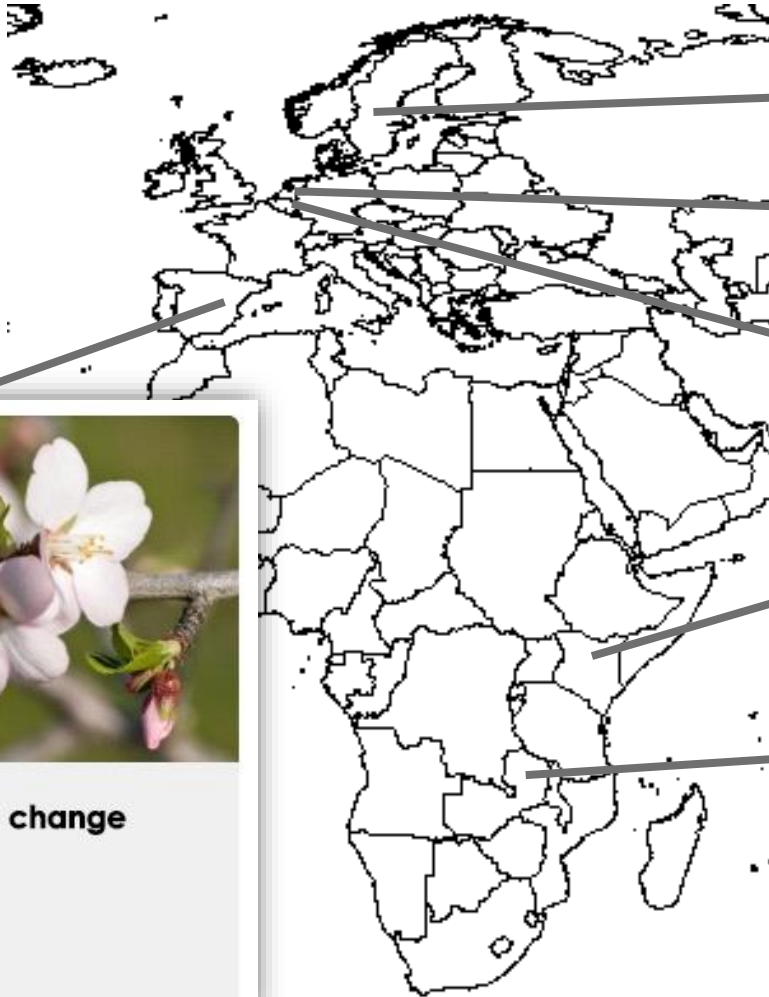
## Technical components

- Create a list of existing technical components
- Select the components
  - Include considerations for data quality and interoperability
- Personalize and configure the components





## groundtruth2.0 observatories



**Water quality management in socio-ecological systems**

Sweden



**Biodiversity conservation**

Kenya



**Sustainable natural resource management**

Zambia



**Preparing for climate change**

Spain





# BELGIUM OBSERVATORY\_

Meet Mee Mechelen 





## WHY WE FOUNDED A CITIZEN OBSERVATORY

One of the main challenges in Mechelen is **air pollution and noise disturbance**. These issues have an impact on health, quality of life and social cohesion in all neighbourhoods and villages of Mechelen.

## HOW MEET MEE MECHELEN WILL CONTRIBUTE

The citizen observatory “Meet Mee Mechelen” aims to be an online and offline meeting place where we gather and build data, **information** and knowledge about **air quality and ambient noise** and make it accessible for everyone, to support policy making and initiatives for a better living environment.





ZAMBIA OBSERVATORY

Niti Luli

Sesheke West & Mufulani  
CBNRM Observatory





## WHY WE FOUNDED A CITIZEN OBSERVATORY

In Sesheke West, inadequate information, transparency, coordination and communication between different governance levels,, are limiting benefits of **sustainable resource management** and undermine trust in conservation efforts, which results in continuous **natural resource degradation**, making communities poorer.

## HOW THE NITI LULI CITIZEN OBSERVATORY WILL CONTRIBUTE

The “Niti Luli” platform will provide the virtual space for a “**permanent community meeting**” of local communities, government agencies, NGOs and donors, improving coordination between government agencies and donors, and giving communities more influence in decisions **affecting their lives and livelihoods**.





# NETHERLANDS OBSERVATORY

Grip op water **Altena** 



## WHY WE FOUNDED A CITIZEN OBSERVATORY

If we do not take measures, our urban and rural areas will keep being affected by **local flooding** because of the extreme weather resulting from climate change.

## HOW GRIP OP WATER WILL CONTRIBUTE

The citizen observatory is a place (on- and offline) where collected **observations, knowledge and warnings** are shared, where bottlenecks and measures are constructively discussed along short communication lines and where it is clear which actions are taken by which party.





# SPAIN OBSERVATORY

RitmeNatura.cat





## • WHY WE FOUNDED A CITIZEN OBSERVATORY

- Catalonia lacks a space in which to create collective knowledge about the local **impact of climate change on nature** and its rhythms in Catalonia, to contribute to better adaptation policies.

## • HOW RITMENATURA.CAT WILL CONTRIBUTE

- The Observatory **will store phenological data**, in particular observations collected by citizens, and make it accessible in real time, with the aim of influencing decision making.





# SWEDEN OBSERVATORY

VattenFokus



## WHY WE FOUNDED A CITIZEN OBSERVATORY

Water health in Flen, and in Sweden in general, is deteriorating due to current lifestyle choices and **water consumption patterns**. Without a life-cycle perspective of what is going in and what is being taken out, we risk fixing one and starting many more problems.

## HOW THE CITIZEN OBSERVATORY FLEN WILL CONTRIBUTE

Our mission is a citizen observatory that supports all stakeholders to collaborate in the governance and management of **aquatic ecosystems by collecting data**, sharing knowledge, and make accessible data that complements established governmental initiatives.





# KENYA OBSERVATORY

Maasai-Mara Citizen bservatory



## ● WHY WE FOUNDED A CITIZEN OBSERVATORY

● The Maasai Mara CO was founded to support the balancing of **sustainable livelihoods** with sustainable **biodiversity management** in the Mara ecosystem.

## ● HOW THE MAASAI MARA CITIZEN OBSERVATORY WILL CONTRIBUTE

● The Maasai Mara citizen observatory will constitute a multi-stakeholder platform for generating and sharing of data, information and knowledge to improve policy making and implementation for **sustainable livelihoods and biodiversity management** in the Mara ecosystem.





# How to prevent six silos that does not contribute to Earth Observation?



Environmental quality of life in Flanders

Belgium



Sustainable natural resource management

Zambia



Weather and climate-proof water management

The Netherlands



Preparing for climate change

Spain



Water quality management in socio-ecological systems

Sweden



Biodiversity conservation

Kenya





de-silo, de-siloing, de-siloed *verb, transitive*

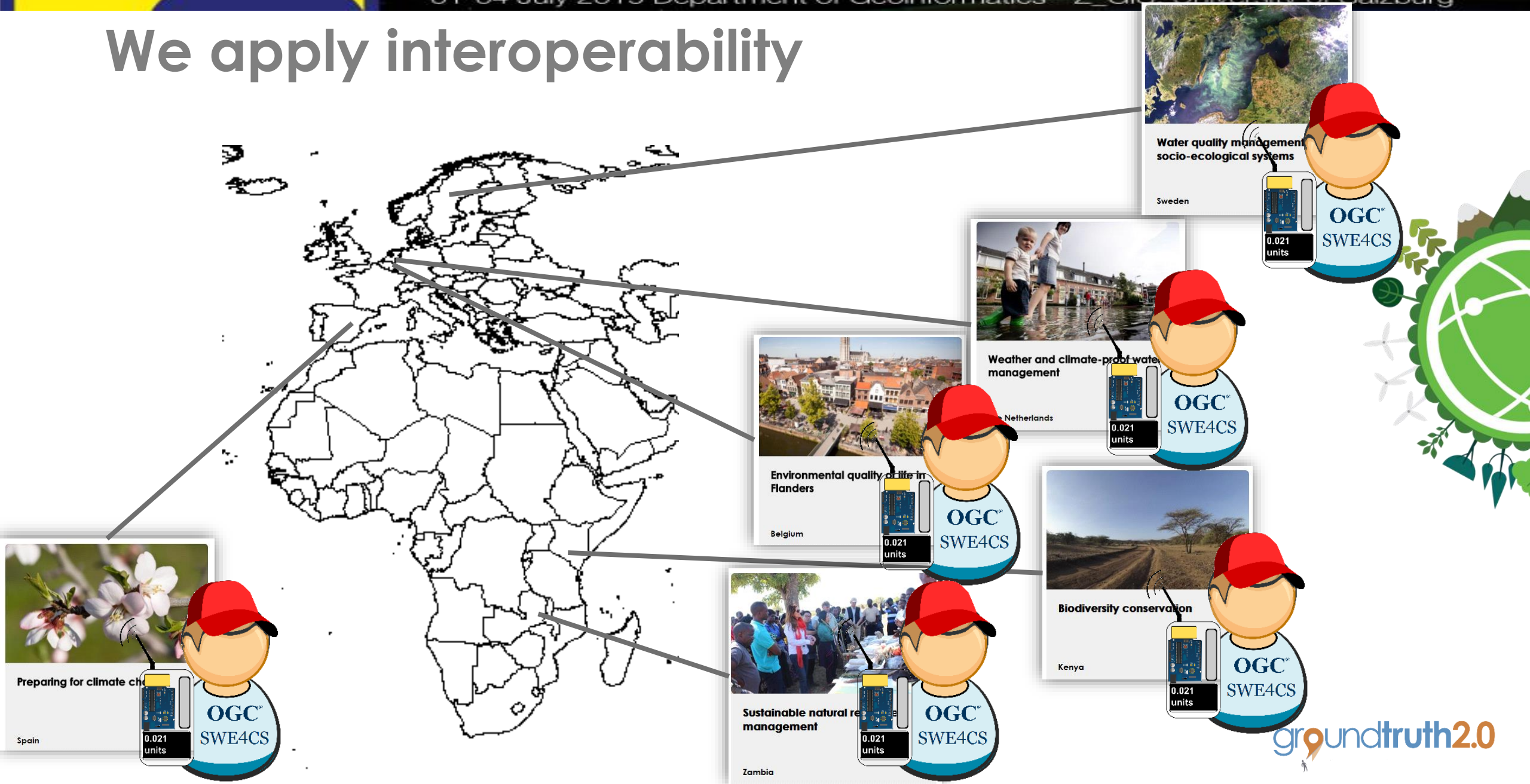
1. To integrate data from disparate sources maintained by separate departments.  
To *de-silo* means to get rid of silos

From: <https://www.pcmag.com/encyclopedia/term/70006/de-silo>





# We apply interoperability





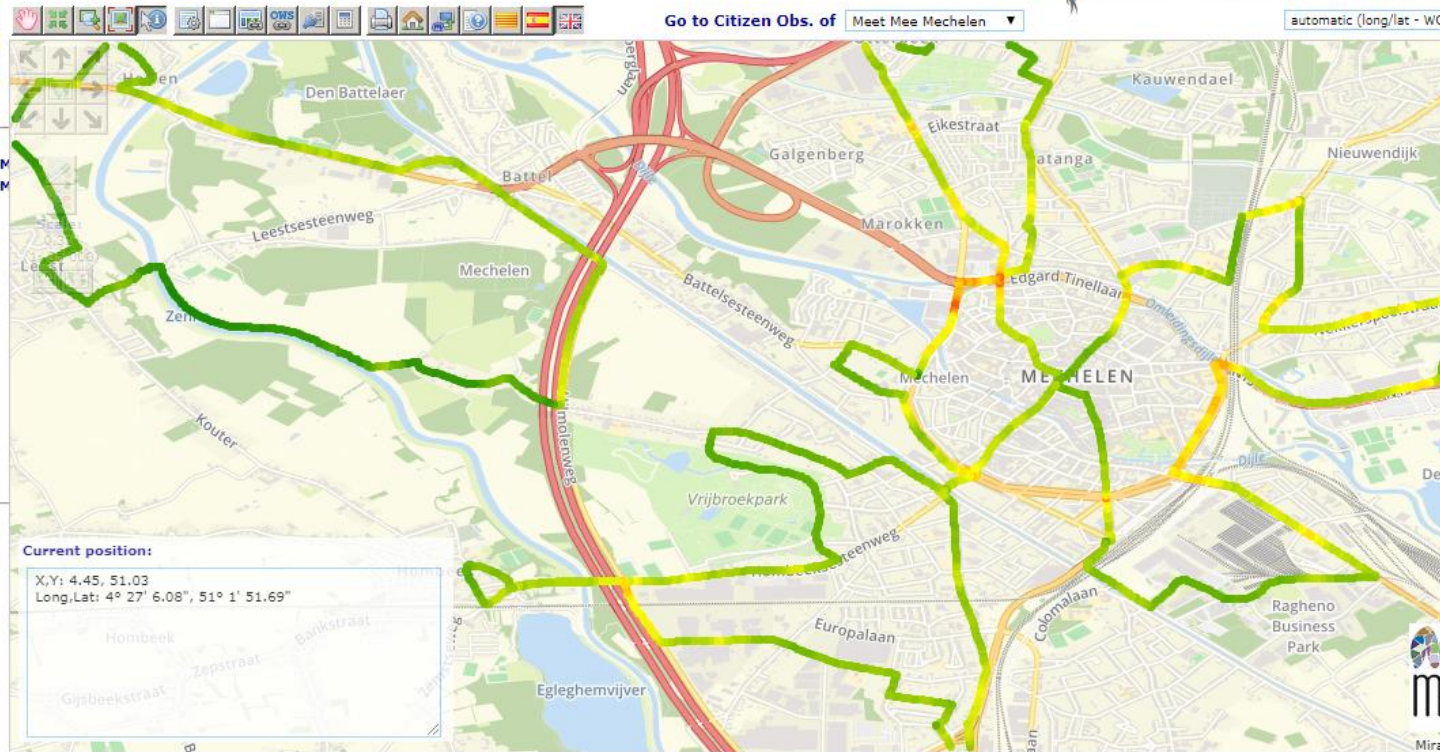
## Meet Mee Mechelen



## Citizen Observatories

groundtruth2.0

Environmental knowledge discovery of human sensed data



Consulta - Google Chrome

localhost/gt20/consulta\_de\_cop.htm

Point X,Y: 4.47, 51.03 Long,Lat: 4° 28' 22.09", 51° 1' 57.25"

### Meet Mee Mechelen

Campaign period: Oct-Nov2017  
Date and time of the first observation: 2017-11-06 08:11:40+01  
Date and time the last observation:  
Mean black carbon concentration( $\text{ng}/\text{m}^3$ ): 7744  
Minimum black carbon concentration( $\text{ng}/\text{m}^3$ ): 2008  
Maximum black carbon concentration( $\text{ng}/\text{m}^3$ ): 16945  
Standard deviation of the black carbon concentration( $\text{ng}/\text{m}^3$ ): 4598  
Total number of observations: 23  
Number of days with observations: 13  
Uncertainty on average ( $\text{stan\_dev}/\sqrt{n}$ )\* 2.228/mean): 0.29  
Uncertainty (half length conf. interval at 95% confidence)( $\text{ng}/\text{m}^3$ ): 2245.7599999999999

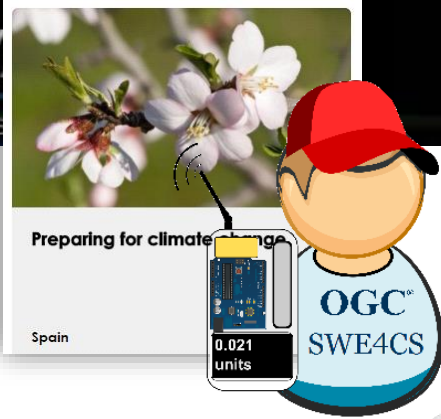
### Meet Mee Mechelen

Campaign period: Oct-Nov2017  
Date and time of the first observation: 2017-11-06 08:11:39+01  
Date and time the last observation:  
Mean black carbon concentration( $\text{ng}/\text{m}^3$ ): 7979  
Minimum black carbon concentration( $\text{ng}/\text{m}^3$ ): 2008  
Maximum black carbon concentration( $\text{ng}/\text{m}^3$ ): 20078  
Standard deviation of the black carbon concentration( $\text{ng}/\text{m}^3$ ): 5061  
Total number of observations: 23  
Number of days with observations: 13  
Uncertainty on average ( $\text{stan\_dev}/\sqrt{n}$ )\* 2.228/mean): 0.31  
Uncertainty (half length conf. interval at 95% confidence)( $\text{ng}/\text{m}^3$ ): 2473.49

### Meet Mee Mechelen



# RitmeNatura.cat



Consulta - Internet Explorer

Point X,Y: 2.49, 42.25

### Fenodato observations

**Observation time:** 2016-06-01T22:00:00.000Z  
**Complete tweet:** #FenoDato especie papaver\_rhoeas fase floracion lugar 42.146400,2.459735 dia 2/6/2016 https://t.co/QbnNycEnsX  
**Tweet ID:** 738267783855779840  
**Tweeter user name:** Elenotes  
**Reported name:** papaver\_rhoeas  
**Common name:** Amapola  
**Scientific name:** Papaver rhoeas  
**Phenophase:** floracion  
**Phenophase id:** Floración

### Fenodato observations

**Observation time:** 2016-06-01T22:00:00.000Z  
**Complete tweet:** #FenoDato especie quercus\_ilex fase floracion lugar 42.146400,2.459735 dia 2/6/2016 https://t.co/wWP56eckGh  
**Tweet ID:** 738271806403039232  
**Tweeter user name:** Elenotes  
**Reported name:** quercus\_ilex  
**Common name:** Encina  
**Scientific name:** Quercus ilex  
**Phenophase:** floracion  
**Phenophase id:** Floración

### Fenodato observations

**Observation time:** 2016-06-01T22:00:00.000Z  
**Complete tweet:** #FenoDato especie quercus\_ilex fase floracion lugar 42.133955,2.464429 dia 2/6/2016 https://t.co/wWP56eckGh  
**Tweet ID:** 738271806403039232  
**Tweeter user name:** Elenotes  
**Reported name:** quercus\_ilex  
**Common name:** Encina  
**Scientific name:** Quercus ilex  
**Phenophase:** floracion  
**Phenophase id:** Floración





# VattenFokus



Water quality management  
socio-ecological systems

Sweden



OGC®  
SWE4CS

## Citizen Observatories

groundtruth2.0  
Environmental knowledge discovery of human sense

Go to Citizen Obs. of Vatten Fokus

automatic



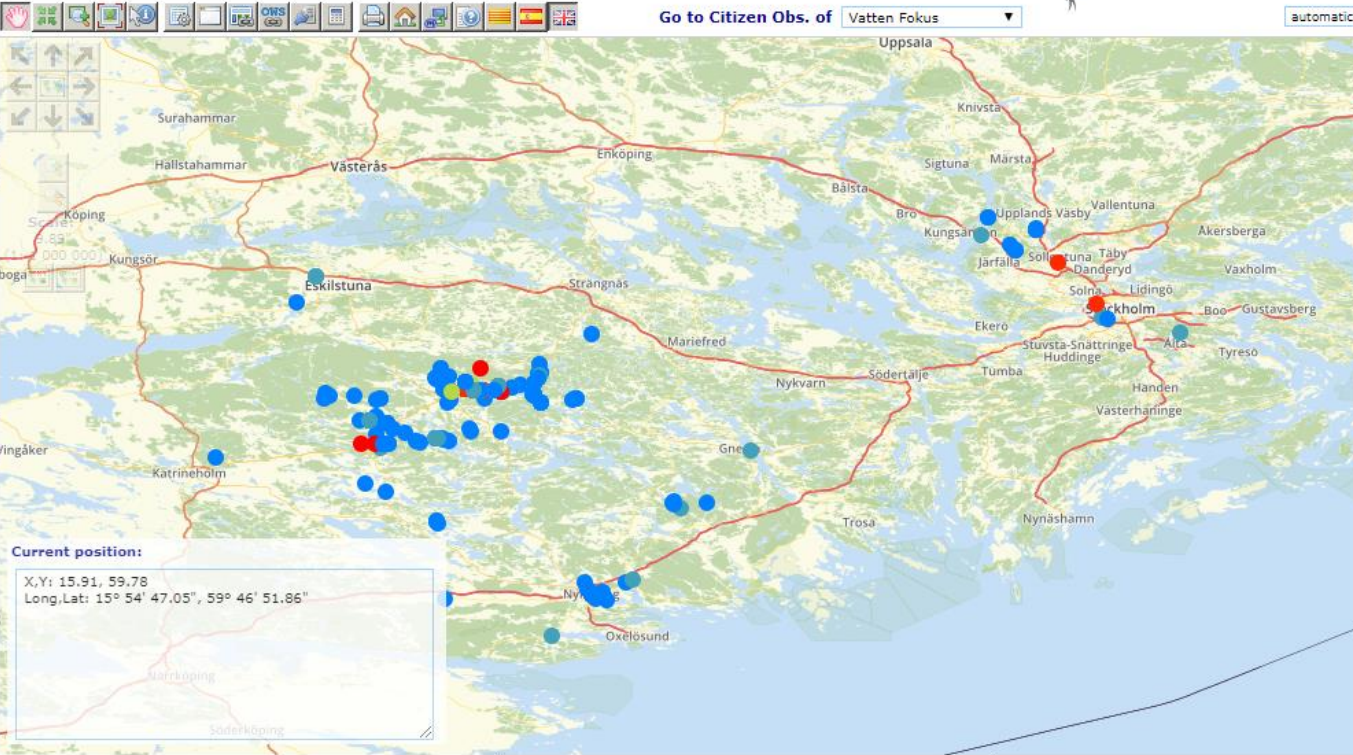
- OSM-LUM**
- + ☒ LUM. Coimbra version and LUM
  - + ☐ LUM. Coimbra version and LUM
  - ☐ LUM. Coimbra version
  - + ☒ LUM. Heidelberg version
    - Heidelberg level 2
    - Heidelberg. Level 1
  - ☐ LUM. Creaf-RS version
  - ☒ Vatten Fokus
    - Nitrate
    - Phosphate
    - Water color

mg/L

- Clean waters. No risk of eutrophication
- Water at risk of eutrophication
- Polluted waters. Risk of strong eutrophication

### Reference layers

- ☒ OSM
- ☐ Default
- ☐ Bright



Consulta - Google Chrome  
localhost/gt20/consulta\_de\_cop.htm

### Vatten Fokus

**User ID:**  
**Sample ID:** 39544  
**Creation Date:** 21/04/2018 17:55  
**Modification date:** 21/04/2018 17:55  
**Sample date:** 21/04/2018 0:00  
**Group ID:** Dunkern, Group ID: 38438  
**Site name:** Hemma  
**Sample date/time:** 21/04/2018 0:00  
**Total number of participants:** 4

**Notes:**  
**Freshwater body type:** Other  
**Other freshwater body type:** Lake  
**Land use in the immediate surroundings:** Agriculture  
**Other the land use in the immediate surroundings:**  
**Bank vegetation:** Grass  
**Other bank vegetation:**  
**On the water surface:** LitterFoam  
**Pollution sources in the immediate surroundings:** Other  
**Evidence of water uses:** FishingBoatingPublic water supply  
**Other evidence of water uses:**  
**Evidence of aquatic life:** Plants below the surfaceFloating plantsFrogs/toads  
**Other evidence of aquatic life:**  
**Algae presence:** No algae  
**Estimated the water flow:** Slow  
**Estimated water level:** Average  
**Nitrate(mg/L):** 1.50  
**Phosphate(mg/L):** 0.075  
**Water Quality Secchi Tube (Turbidity):**  
**Result:**  
**Estimated water colour:** Colourless  
**Other estimated water colour:**



# Interoperating with other projects

- Ground Truth 2.0  
Vatten Fokus or Meet  
Mee Mechelen  
together with HackAir  
data



CitSciLE

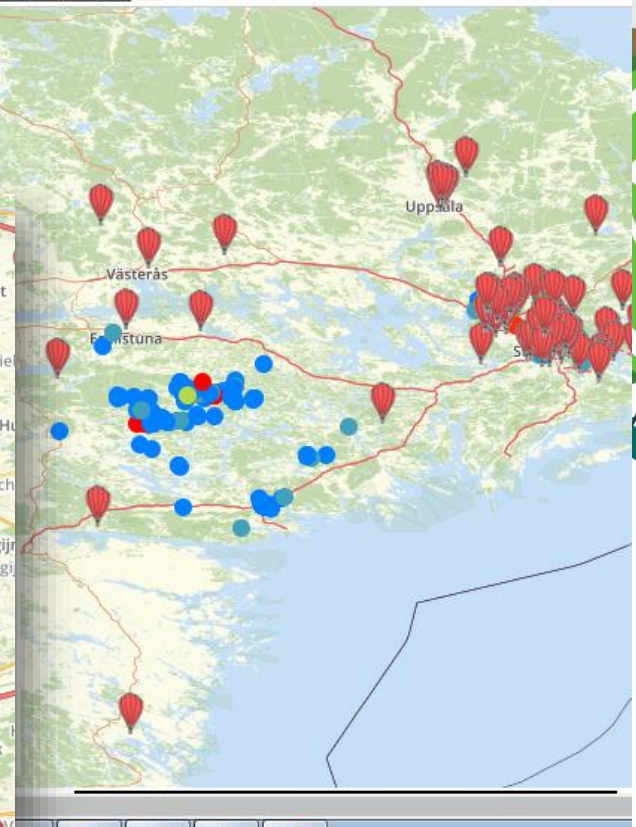
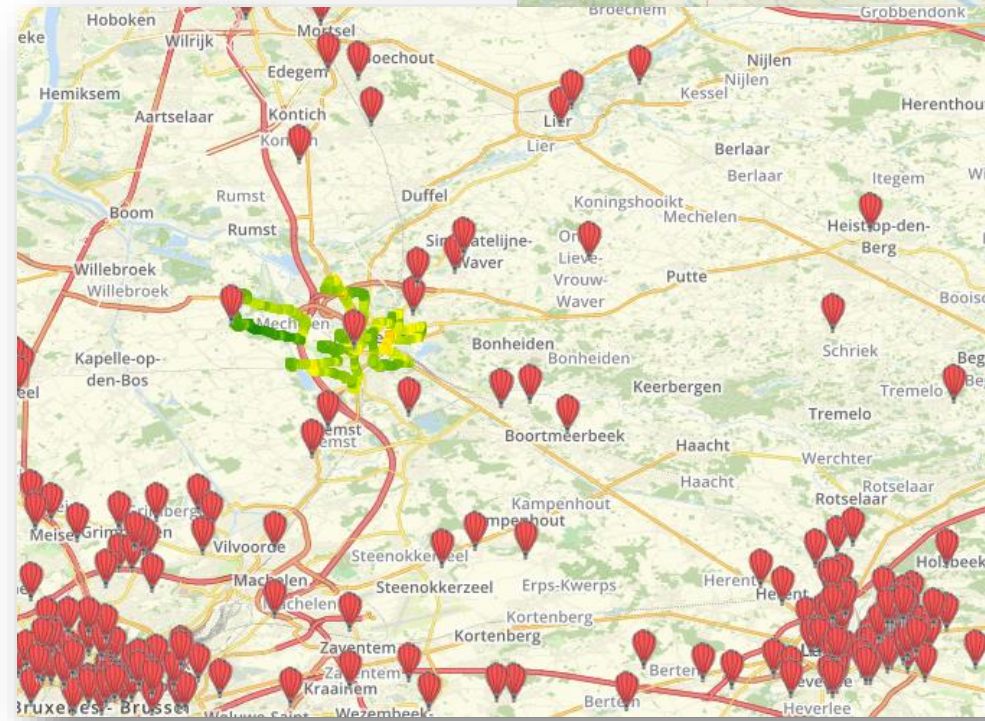


Citizen Science

☒ Hack Air PM10

## CitizenObservatories

Go to Citizen Obs. of Vatten Fokus





# Data quality

## Evaluation

- Apply an assessment method to a set of observations (or observation parameters) to quantify the *uncertainties* present
  - Selecting a measurement
  - From a list of values (domain)
  - Doing metrics (statistics)



## Documentation

- Presenting the results in an understandable and comparable way
- In the metadata describing the set of observations

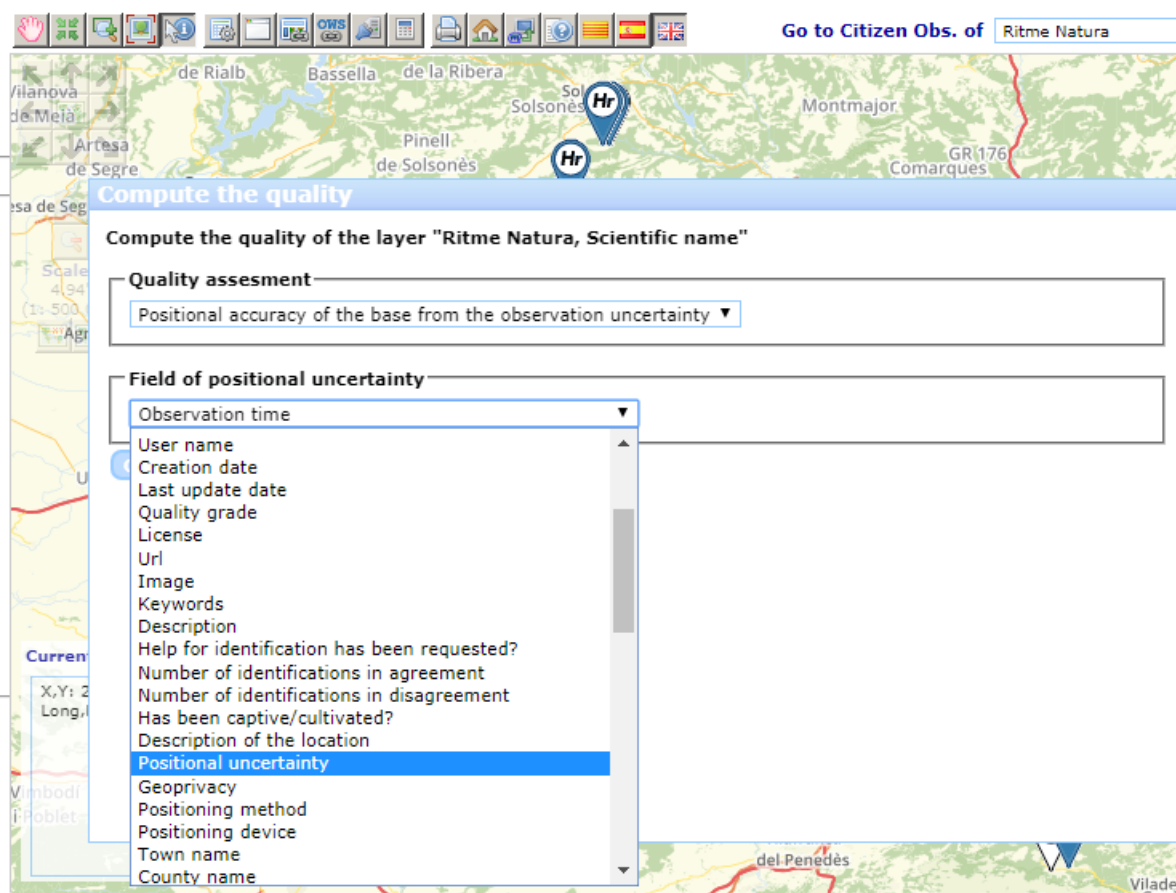


```
<gmd:DQ_QuantitativeResult>  
  <gmd:value>  
    <gco:Record>  
      <qml:HalfLengthConfidenceInterval>  
        <un:values/>11<un:values>  
      </qml:HalfLengthConfidenceInterval>  
    </gco:Record>  
  </gmd:value>  
</gmd:DQ_QuantitativeResult>
```



# Quality evaluation and documentation

## Citizen Observatories



Go to Citizen Obs. of Ritme Natura

**Compute the quality**

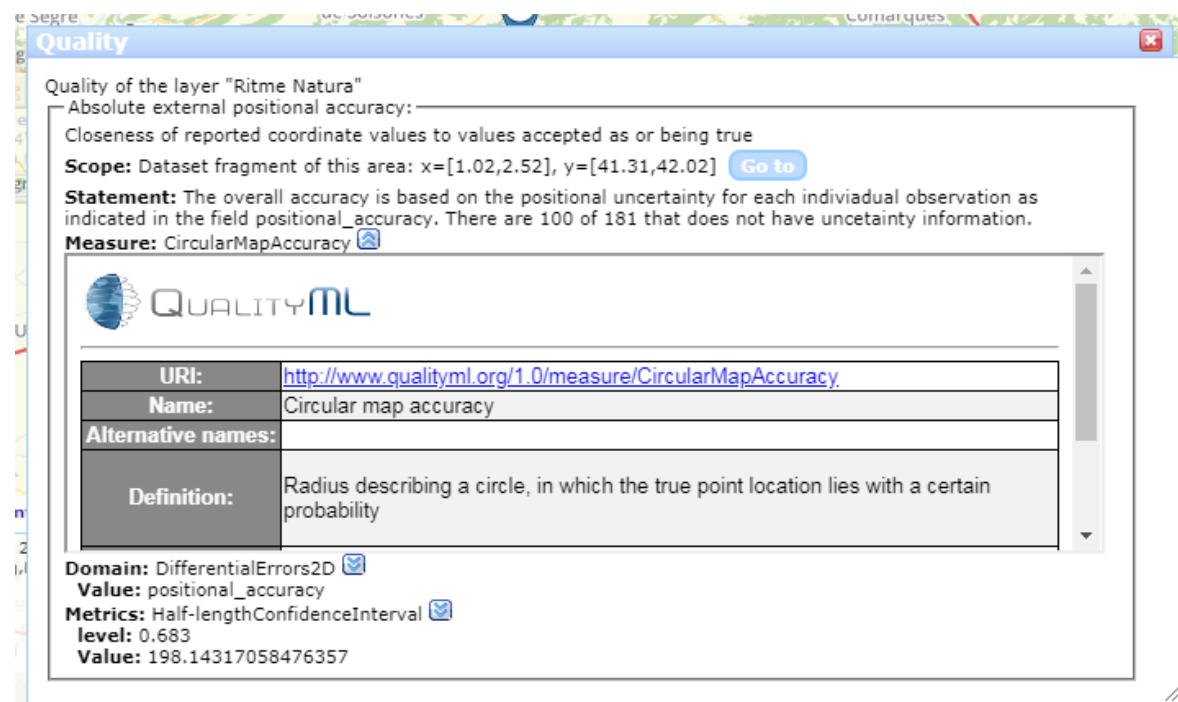
Compute the quality of the layer "Ritme Natura, Scientific name"

**Quality assesment**

Positional accuracy of the base from the observation uncertainty ▼

**Field of positional uncertainty**

- Observation time
- User name
- Creation date
- Last update date
- Quality grade
- License
- Url
- Image
- Keywords
- Description
- Help for identification has been requested?
- Number of identifications in agreement
- Number of identifications in disagreement
- Has been captive/cultivated?
- Description of the location
- Positional uncertainty**
- Geoprivacy
- Positioning method
- Positioning device
- Town name
- County name



**Quality**

Quality of the layer "Ritme Natura"

Absolute external positional accuracy: Closeness of reported coordinate values to values accepted as or being true

**Scope:** Dataset fragment of this area: x=[1.02,2.52], y=[41.31,42.02] [Go to](#)

**Statement:** The overall accuracy is based on the positional uncertainty for each individual observation as indicated in the field positional\_accuracy. There are 100 of 181 that does not have uncertainty information.

**Measure:** CircularMapAccuracy

<b>URI:</b>	<a href="http://www.qualityml.org/1.0/measure/CircularMapAccuracy">http://www.qualityml.org/1.0/measure/CircularMapAccuracy</a>
<b>Name:</b>	Circular map accuracy
<b>Alternative names:</b>	
<b>Definition:</b>	Radius describing a circle, in which the true point location lies with a certain probability

**Domain:** DifferentialErrors2D

**Value:** positional\_accuracy

**Metrics:** Half-lengthConfidenceInterval

**level:** 0.683

**Value:** 198.14317058476357



# Thanks

Joan.Masó@uab.cat

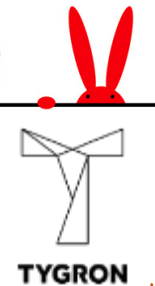
## Research & Academia



## SMEs & Industry



Gavagai



## NGOs



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Responsibility for the information and views set out in this publication lies entirely with the authors.