



Citizen science for official statistics: dream or reality?

Statistics Netherlands

Olav ten Bosch, Sofie De Broe, Kris Vanherle, Ben Laevens

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 - Traffic measurements
 - Solar energy
- CS in general
- CS for official statistics (offstats)
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Example 1: air quality

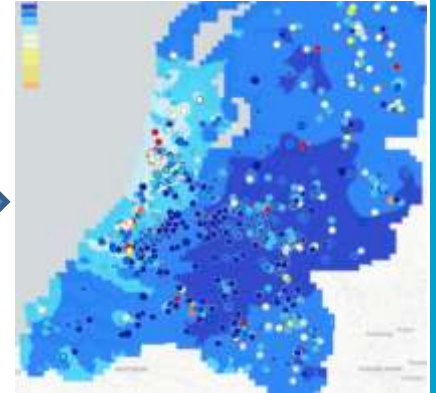
AQ sensor



Luftdaten



Opensensemap



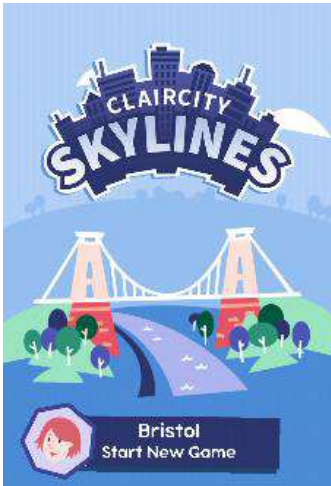
Take-away:

Data from citizen sensors is merged with official (calibrated) measurements and combined into data portal of official authorities

Example 1: air quality



Citizen play...



make choices.....



and generate data to be used for local policies

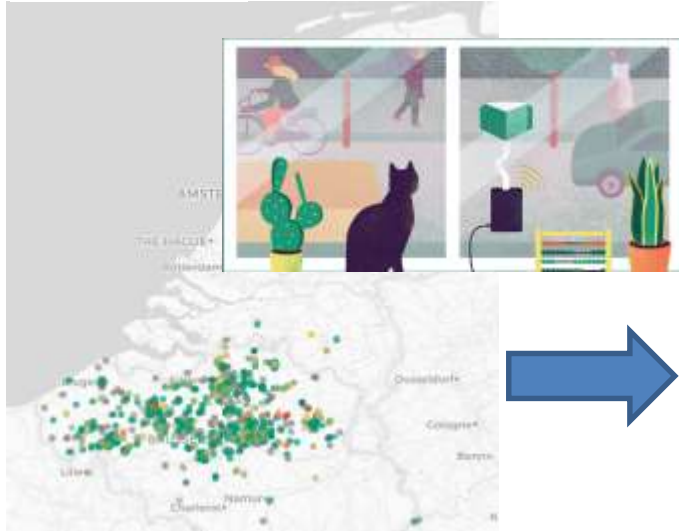
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Take-away: Citizen science can use unexpected modes, one is **gamification**



Example 2: traffic

TELRAAM.net



Highway traffic loops

More complete picture on Mobility

Municipalities ask Telraam to start a project for Local mobility policies

Take-aways:

- Citizens may measure *local phenoma* adding to the general picture
- **Governmental** organisations *sponsor* a succesful citizen science project generating useful data in return



Example 2: traffic

Telraam setup is *privacy-safe* by design:

- **No images** are sent over the line
- Image processing **directly** on raspberry pi
- **Counts** pedestrians, cars, bicycles, trucs
- Transparent **open source** firmware
- **Approved** by the Belgian Data Protection Authority (DPA)

Take-away:

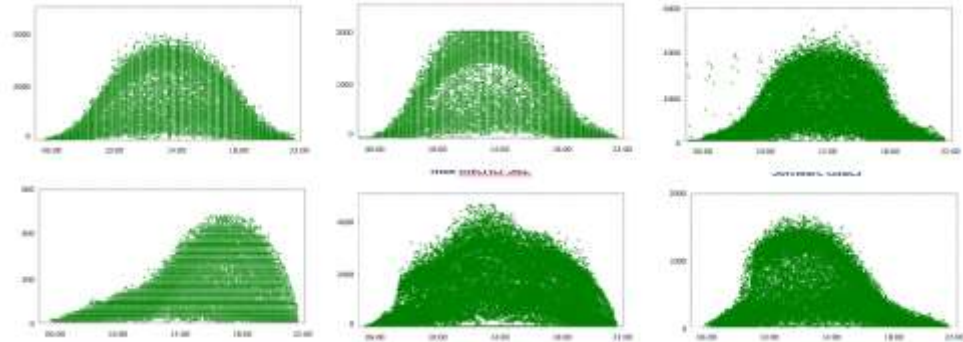
- The **privacy design** of a CS project is important for acceptance



Example 3: Solar energy



 PVOutput



Citizens connect their solar panels to the leading international data portal to monitor it.
Data is valuable for estimating solar power yields.

Take-aways:

- Machinery can be connected more and more **directly** to CS data portals
- Citizen science projects operate **internationally**



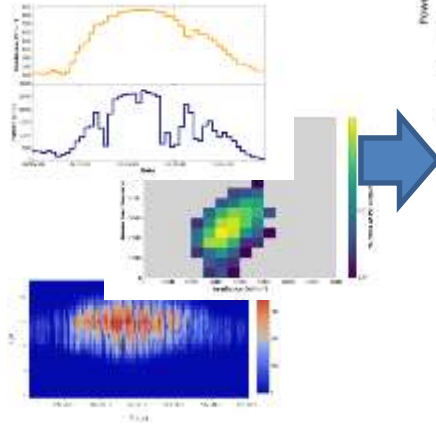
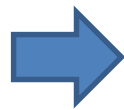
Example 3: Solar energy



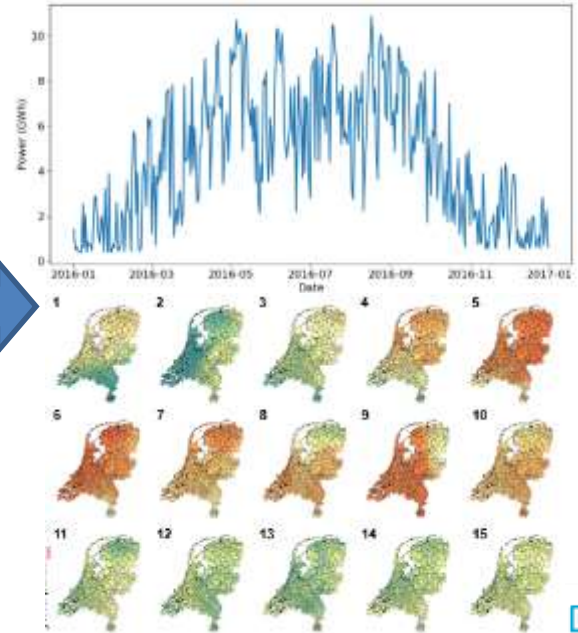
Solar panel yields /
15 min.



Satellite data



Modelling



Daily and regional
solar power estimates

See Laevens et al.: <https://arxiv.org/abs/2003.01728>



Other examples



MOSQUITO ALERT



Citizen science to investigate and control disease-carrying mosquitoes

Home OpenEnergyMonitor

Energy Use Heat Pump Monitoring

SmartPhones 4 Water



S4W = Young Researchers + Citizen Science + Mobile Technology

ecsa | European Citizen Science Association

ECSA 10 Principles of Citizen Science



Sovon
Dutch Centre for Field Ornithology

Met Office WOW WeatherObservationsWebsite

WOW! WOW-NL



Koninklijke Nederlandse Meteorologische Instelling
Het Koninklijk Nederlandsche Weerwonder



Cos4Cloud



We observe

WIKIPEDIA

List of citizen science projects

Project name	Disciplines	Sponsoring organization(s)
Monitoring & Reporting Burden during a Crisis of Observations (MORCO)	Astronomy	European University
North Atlantic Kestrel	Astronomy	ESA, BSAI
Straw Hat Project	Astronomy	British Astronomical Society
UK Starry Skies	Astronomy	UK
Learn About Our Climate	Astronomy	Parliamentary Centre for Science, Energy, Transport, & the Environment, Centre for Science and Technology, National Science Foundation
Blackout India	Geography, Biology, Energy Consumption	Blackout India (voluntary)
My Nature Challenge 2013	Biology, Computer Science, Environmental Science	Environment
My Nature Challenge 2014	Biology, Computer Science, Environmental Science	Nature Institute
My Nature Challenge 2015	Biology, Computer Science, Environmental Science	Environment Institute
Springwatch Project	Ecology, Biology, Health	University of Exeter, Royal Botanic Gardens, Kew, Natural History Museum
Using Honey Bee Waxing Scales	Ecology, Biology	Using Honey Bee Waxing Scales
Plant Spots?	Phytophthora, Biology, Genetics, Plant Medicine, Health	Environment
10000	Health in urban climate	Health in urban climate
Protonium	Mathematics	Australian Mathematical Society, University of Wollongong, UNSW, UNSW Canberra
University of	Citizen Science, Education	Technische Universiteit Delft
Texas A&M University	Engineering, Environmental Science, Biology	Learning Systems
Texas A&M University	Biology, Life Sciences, Ecology	The Beech Branch, Texas A&M University
Texas A&M University	Ecology, Environmental Science, Biology	The Beech Branch, Texas A&M University

Take-away: CS projects come and go. Success depends on many factors.

Definition

Citizen science is scientific research conducted, in whole or in part, by amateur (or nonprofessional) scientists, also known as "public participation in scientific research" (Wikipedia)

Variants:

community science, crowd science, crowd-sourced science, civic science volunteer monitoring, online citizen science, community-led monitoring, volunteer monitoring, participatory research, public-participation, activist science, citizen-driven research, crowdsourcing, data donation



CS data characteristics

Survey data

- Designed by NSI
- Well structured
- Relatively stable
- High quality

- Small volumes, processed in waves
- Statistical classifications

CS data

- Some influence?
- Well structured
- Relatively stable
- Quality depends

- big, continuous process & monitor
- Measuring concepts

- Often an API!

Web data

- Not designed by NSI
- Sometimes messy
- May change any time
- Quality depends on source

- Can be big, continuous processing & monitoring
- Concepts used in practice



3 levels of engagement (Bonney et al.)

1. **Contributory projects**, initiated and designed by professional scientists in which volunteers contribute data according to the specified methodology
2. **Collaborative projects**, where scientists still lead the project, but volunteers can not only contribute data but also aid in the project design, data analysis, or dissemination of findings
3. **Co-created projects**, where both scientists and volunteers are involved in all parts of the project.



From CS consumer to CS player?

0. *Traditional surveys*: offstats select 'volunteers'
1. **Contributory projects**: like a survey designed by the statistical office but with voluntary participation
2. **Collaborative projects**: stats office designs a CS project and stats office and citizens / volunteers both profit from results
3. **Co-created projects**: stats office and citizens / volunteers design a CS project together and all profit from the results.
4. *CS consumer*: stats office monitors CS projects and uses data if applicable and sufficiently representative



Wrap up

- Citizen science projects are **numerous** and come and go
- **Data** from CS projects can be useful input for offstats
- Some other organisations use CS as a **strategic instrument**
- Citizens might add **local phenomena** to the global picture
- The **privacy design** of a CS project is important
- Dream or reality?
 - The **passive use** of CS data by offstats is **reality**
 - The **active involvement** (co-creation / collaborative work) in a CS project is – for now - a **dream** but could be promising



Thank you



Question, ideas, suggestions

Olav ten Bosch

o.tenbosch@cbs.nl

[linkedin.com/in/olavtenbosch](https://www.linkedin.com/in/olavtenbosch)



awesome

www.awesomeofficialstatistics.org

