

SENSORS AND CITIZEN SCIENCES FOR CLIMATE OBSERVATION: WHAT METHODOLOGY ?

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Introduction

Citizen sciences are commonly defined as science by nonscientists or a form of science enacted and developed by citizens themselves, the participation of the general public in the research design, data collection and interpretation process together with scientists.

The purpose of this paper is to present the opportunities and potential challenges of citizen science and the use of low-cost sensors as a means to complement institutional or scientific data collection.

Why use citizen science ?

- ✘ Citizens are more and more interested by environmental knowledge
- ✘ Information is not always available at a scale and resolution necessary to understand environmental changes
- ✘ Collaboration between public and professional scientists can also be educational to both sides from a knowledge transfer perspective
- ✘ Problems solving, co-diagnostics, co-monitoring and solutions, co-design and co-implementation lead to better results and outcomes
- ✘ Societies and communities feel the full impact as end-users affected by scientific discoveries

Methodology

Polycentric Approache

- Shared responsibilities in the monitoring and management process concerning the observed ressources
- From top down knowledge to informal, flexible, localized decision-making, largely based on local knowledge and dialogue
- Help Citizens to familiarize themselves with scientific concepts.
- Citizens can watch, observe, control, monitor and submit data about complex problems

Asking right questions

- How can we involve managers and elected officials in the observation process ? They have access to information that scientists do not have access to.
- How can we create and animate an observer's network ?
- What are the direct societal impacts - societal enhancements, territorial approaches of our scientific activity ?
- How can we link societal experimentation and participatory observation ?
- How can we share our data with citizens ? What types of citizen data can we use ?
- What are the concerns of the communities impacted ?

Key succes factors (KPI)

- Increasing the availability of open and affordable technologies that allow the collection, geolocation and analysis of new large datasets, which take into account the perception of the receiver
- Willingness of citizens to participate in complex tasks by contributing and sharing knowledge and expertise
- Digital cooperation between new and existing users thanks to cloud computing

Exemples of Citizen Science Projects For Climate Observation



Understand the effects climate change is having on our earth's natural processes. Phenology is the study of periodic plant and animal life cycle events and how these are influenced by seasonal and inter-annual variations in climate. **Mobile App.**
<https://www.climatewatch.org.au/>



Amateurs and enthusiasts share data from their personal pro or not pro weather stations via the Internet. **Web site**
https://www.infoclimat.fr/stat_ions/static.php



Monitors the impacts of climate change, tourism and urban development on ecosystems at the urban-bush interface in the upper Blue Mountains. Capturing long-term records of the presence and movement of flora and fauna. **Camera**
<https://www.bmwhi.org/ecological-monitoring>



Cloud observations matched to satellite overpasses are especially helpful in ground to satellite and remote sensing data. **Mobile App.**
<https://observer.globe.gov/>



Collect data on cloud type, height, cover, and related conditions from all over the world. Observations are sent to NASA for comparison to similar information obtained from satellites. **Mobile/online App.**
<https://scool.larc.nasa.gov/>

Conclusion

Citizen knowledge is valuable and can effectively contribute to climate observation. Mobile devices and especially smartphone are low-cost sensors that can be used initially. Whilst taking privacy concerns into account, we can adopt a holistic approach involving citizens, and their sensors and data collection which can contribute and help to address the many climate monitoring issues.

Bibliography

- Paul, J. D., & Buytaert, W. (2018). Citizen science and low-cost sensors for integrated water resources management. In *Advances in chemical pollution, environmental management and protection* (Vol. 3, pp. 1-33). Elsevier.
- Robinson, Lucy Danielle, et al. "Ten principles of citizen science." *Citizen science: Innovation in open science, society and policy*. UCL Press, 2018. 27-40.
- Masson, Valéry, et al. "City-descriptive input data for urban climate models: Model requirements, data sources and challenges." *Urban Climate* 31 (2020): 100536.