



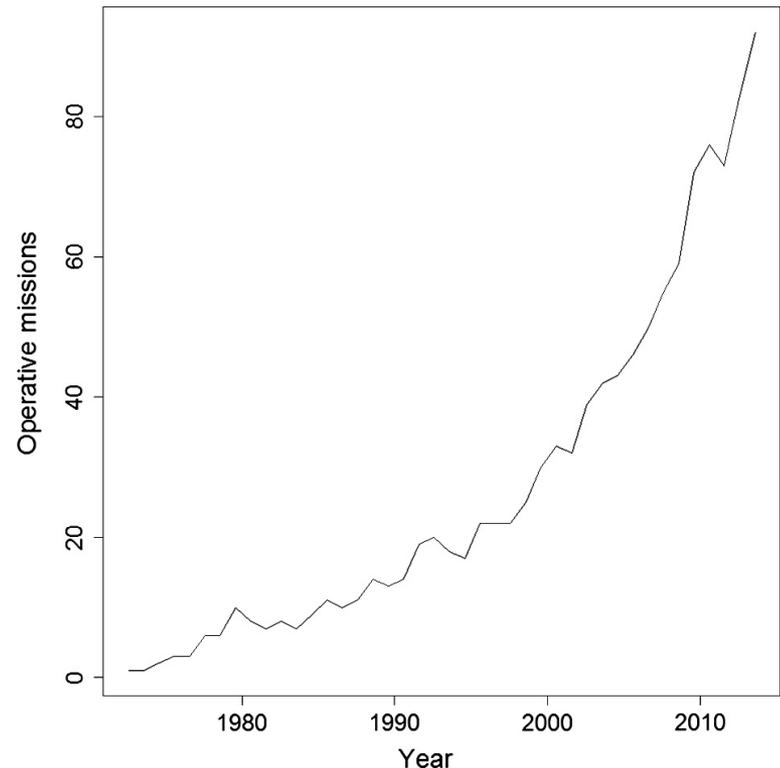
Data Democracy - increased supply of geospatial information and expanded participatory processes in the production of data

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The Changing Data Landscape

- According to [SINTEF](#), 90% of all data in the world was collected in the last 2 years.
- Vastly more will come from new satellites, sensor networks, and people over the coming decade.
- Crowd-sourcing and citizen science are not just about more data but about new and collaborative modes of production and consumption.



The number of near-polar orbiting, land imaging civilian satellites operational as of 1st August 1972 to 2013

Reflections on Citizen Science

Citizen Science is a form of open collaboration where members of the public participate in the scientific process, including asking questions, collecting and analyzing the data, interpreting the results, and problem solving.

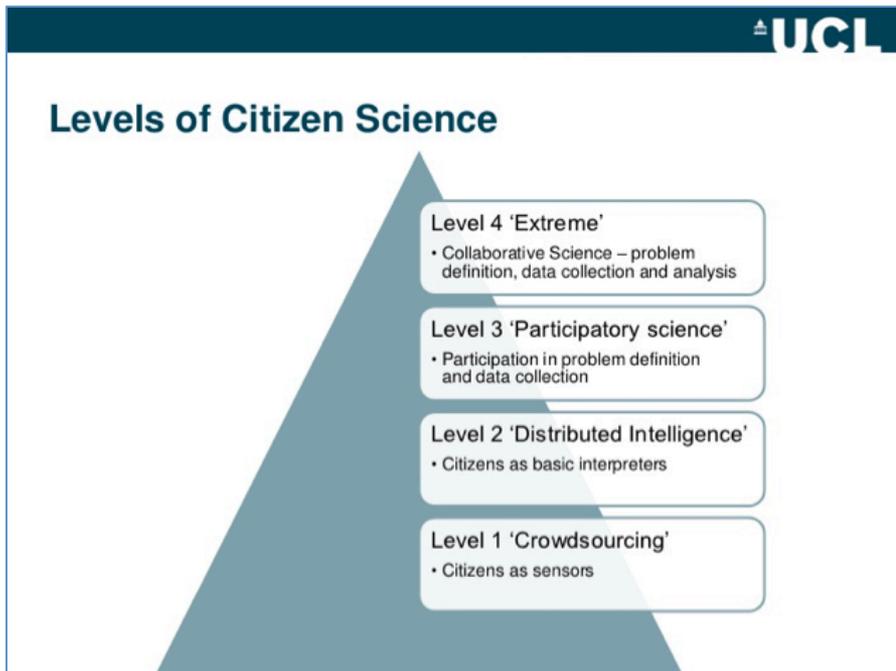
Citizen Science is a term used to cover a wider range of projects, with different aims, and methodologies.

Typology of Citizen-Generated Content Projects

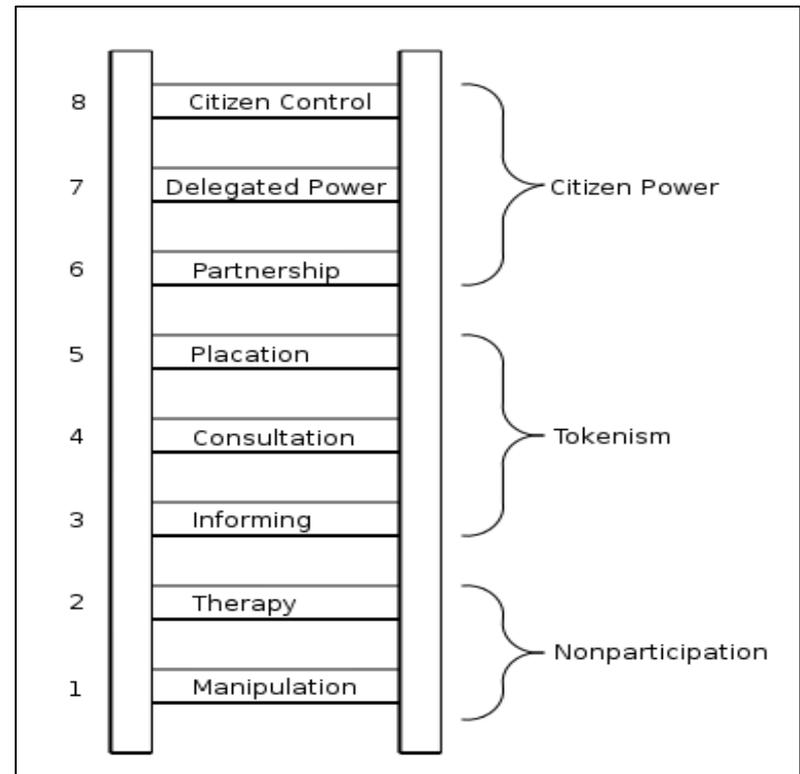
Type of project	Objective	Methodology
Citizen Science (CS)	Scientific knowledge/ public policy	Scientifically designed
Education CS	Awareness raising/educat.	Scientifically designed
Community CS	Community building/ Monitoring	Community-led, scientifically designed
Crowdsourcing	Resource sharing (money, time, tasks, computing)	Varied
Data Mining of Social Media	Profiling/marketing/policy	Data analytics

Projects can have multiple objectives and fall into more categories.

Dimensions of engagement/Participation

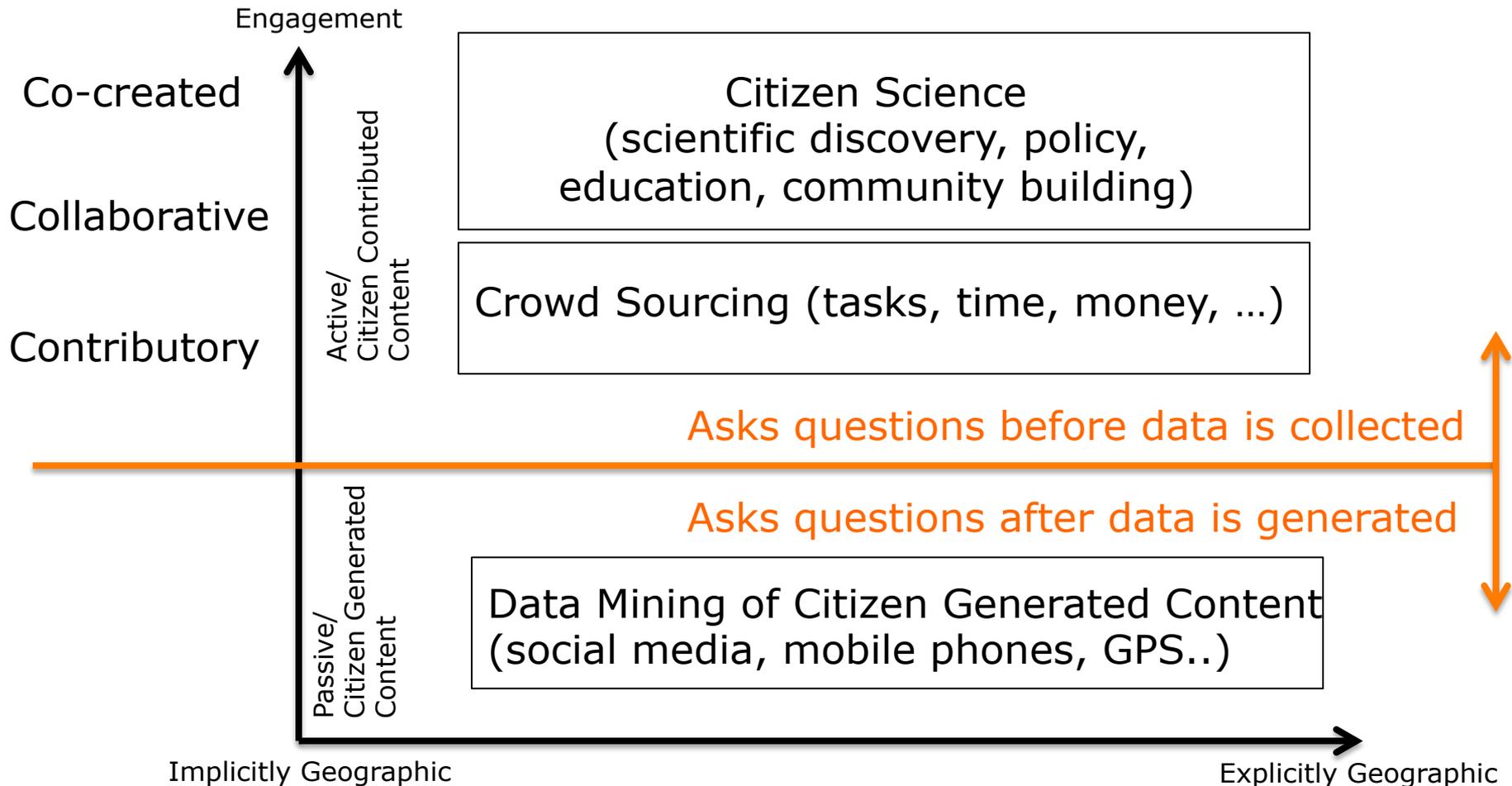


Source: Muki Haklay, UCL



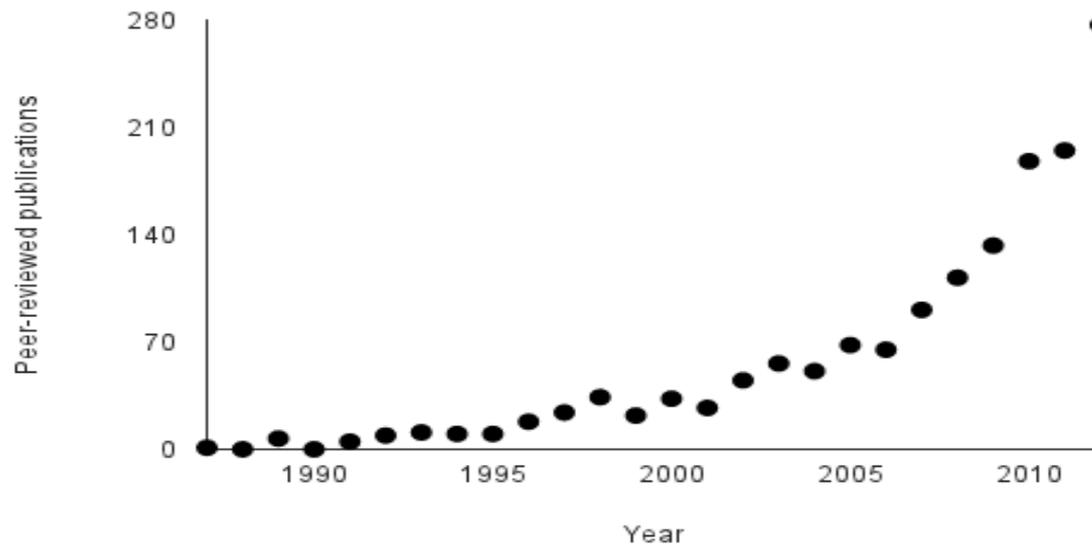
Source: S Arnstein, 1969

Summary of typology



The Rise of Citizen Science

Number of peer-reviewed paper about citizen science



Source: R. Bonney et al. 2014

But what impact of Citizen Science on Science itself?

- Knudsen et al. 2011 review some 250 scientific papers to see if they support claims about effects of climate change on timing of bird migration.
- [Cooper et al. 2014](#) analyzed how many of these 250 papers were based on citizen science.
- Almost 50% were, although the terms Citizen science was never used.

BIOLOGICAL REVIEWS

Challenging claims in the study of migratory birds and climate change

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Is Quality a Problem?

- Not Necessarily!
- Citizen Science projects are not new! They have been carried out for a century or more. The issue of quality is the same as in any scientific project: It depends on the quality of the scientific methodology, and QA/QC.
- If the objective of the project is community building or education, then quality of process and outcome may be more important than quality of measurement.
- Projects based on data from social media and BIG Data integration may have issues of quality but also ethics, scrutiny and access to sources. So quality is only one of several issues.

Open Issues

- Sustainability of engagement
- Reproducibility
 - Different agendas about publishing the data
 - Infrastructure for long term preservation and reusability
 - Consent, confidentiality, privacy, liability and IPR

Points for Discussion/action

- Educational programme in schools on citizen science and data management needed? How to foster multi-disciplinary thinking?
- How to empower communities to collect, analyse, understand and use data to improve their lives?
- What kind of infrastructures for sharing data, methods, experience needed to be usable by all in society?
- Are existing regulatory frameworks adequate? Do they need revising/harmonising?
- How can we design an international research programme on the value of citizen-generated content for policy, science, and society?

Final Question

- We live in societies that are fragmented and often polarized
- Lack of trust between society, science and policy-making
- Many Wicked Problems in which facts, interests, and values are inextricably meshed.
- Do we see citizen science as a way to “educate” and co-opt in our values and norms, or are we truly prepared to be challenged?