



ExCiteS

Extreme  
Citizen  
Science



# Citizen Science in Open Science context: measuring & understanding impacts of deeper public participation in science

Muki Haklay, Extreme Citizen Science group  
Department of Geography, UCL

Twitter: @mhaklay / @ucl\_excites



European  
Research  
Council

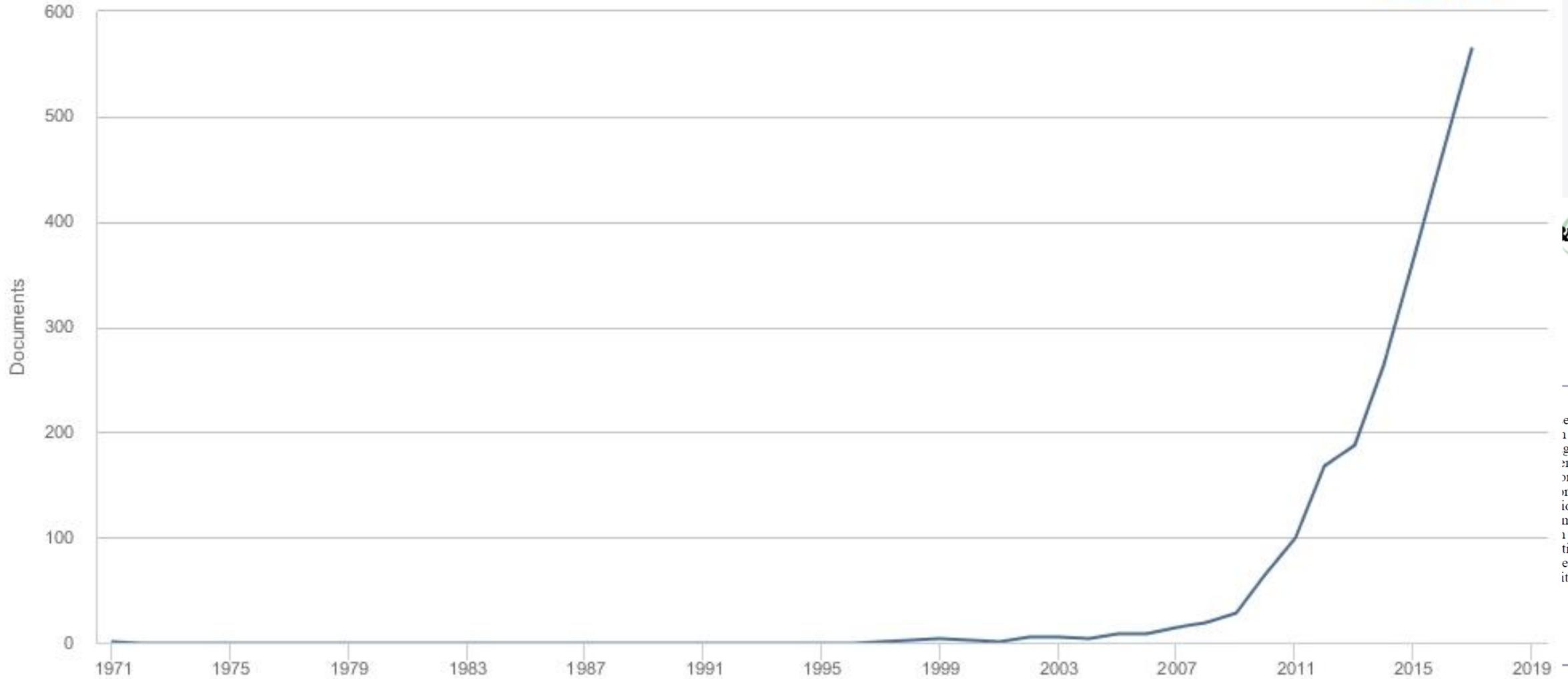


# Synopsis

- Overview of citizen science activities today across Europe – Modes of participation; Relationships between scientists and the public; Disciplines; and Cultures
- Positioning citizen science within wider public engagement – example from DITOs
- Emerging policy responses to citizen science
- Measuring & evaluating



Scopus



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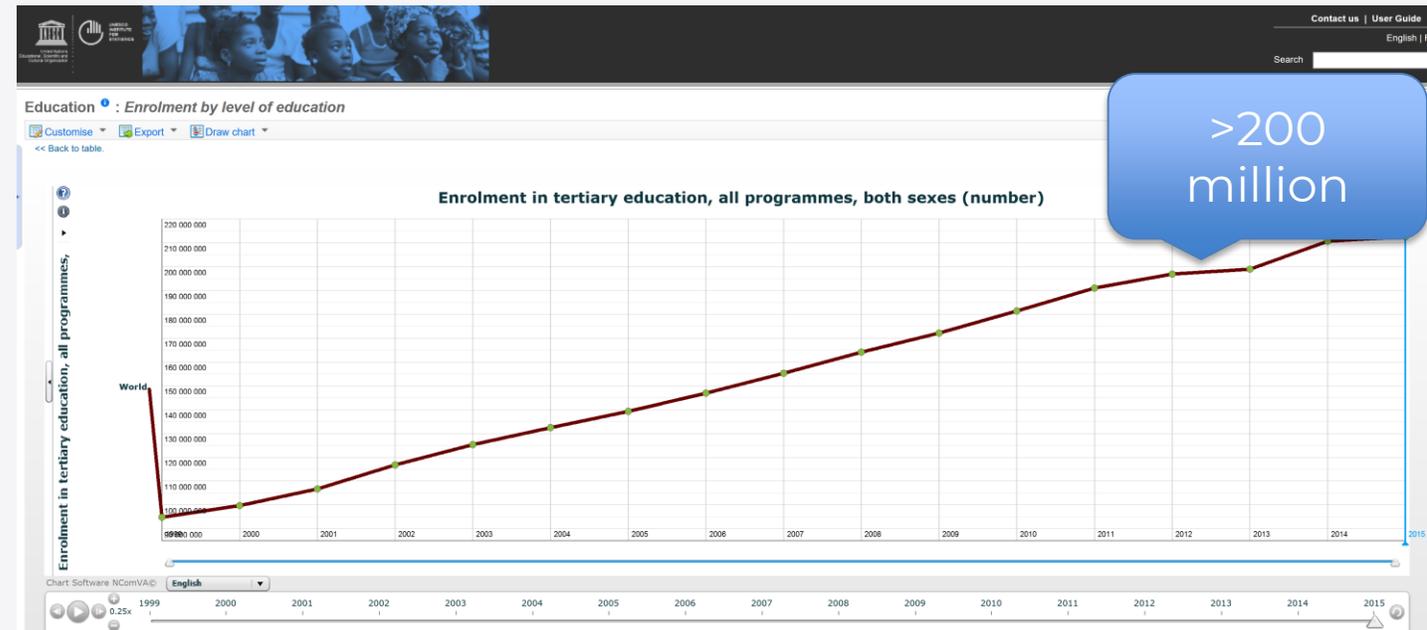


# Underlying trends

- Levels of education (esp. rise in higher education)
- Technological developments (Web, mobile phones, broadband)



R Nial Bradshaw





# Citizen Science

Long running  
Citizen Science

Citizen  
Cyberscience

Community  
Science

Ecology &  
biodiversity

Meteorology

Archaeology

Volunteer  
computing

Volunteer  
thinking

Passive  
Sensing

Participatory  
sensing

DIY Science

Civic Science



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# Biodiversity

- Innovations in what and where information can be capture: Sauvages de ma rue helps identify the distribution of wild plants in dense urban areas.

The screenshot shows the Tela Botanica website interface. At the top, there is a green header with the Tela Botanica logo and a 'Menu' button. Below the header, there is a navigation bar with a back arrow and 'RETOUR À LA LISTE' on the left, and 'PROJET PUBLIC' with a globe icon on the right. The main content area features a circular logo with a red flower and green leaves, followed by the title 'Sauvages de ma rue' and a descriptive paragraph: 'Découvrez le programme de sciences participatives Sauvages de ma rue, Participez en saisissant vos données et posez vos questions liées au programme'. A green button labeled 'VISITER LE SITE WEB' is positioned below the text. The footer contains a navigation menu with 'PRÉSENTATION' (underlined), 'MEMBRES (151)', 'FORUM', 'PORTE-DOCUMENTS', 'WIKI', and social media icons for Facebook, Twitter, and Email. Below the menu, there is a section titled 'OUTILS'. The main text area below the menu describes the project: 'Sauvages de ma rue est un programme de science citoyenne : c'est à la fois un projet pédagogique animé par l'association Tela Botanica et un projet scientifique du laboratoire CERSP du MNHN. Le projet Sauvages de ma rue a pour but de permettre aux citoyens de reconnaître les espèces végétales qui poussent dans leur environnement immédiat, les plantes qu'ils croisent'.



# Meteorology

- Volunteers continued to contribute observations
- Met Office WOW approaching 15 million
- Volunteers also use automatic weather stations

The image shows a composite of two digital interfaces. On the left is the desktop version of the Met Office WOW (Weather Observations Website). It features a navigation menu with 'Home', 'Sites', 'Enter Observations', 'Photo Gallery', 'Support', and 'Education'. A search bar prompts users to 'Enter a location or Site ID' with a 'Locate' button. Below the search bar is a map of East Anglia, England, with numerous green location markers, each labeled with a site ID and a numerical value (e.g., 7.7, 5.9, 7.6, 8.5, 7.6, 6.8, 5.2, 9.2, 9.8, 10.3, 10.1, 9.6, 10.3, 6.3, 6.8). On the right is a mobile app interface for Chris Holcroft's Twitter profile. The profile shows 6,628 tweets. A tweet from Chris Holcroft (@geomet\_Chris) is highlighted, dated 13/Apr, reporting 'Bassingbourn WX Obs 03:40, 13/Apr: PR 1007.6 hPa, Falling. Wind "Calm". Dir SE. TMP 1.6 oC. RH 86%. Rain today 0.0mm.' Below this is a retweet from BBC Weather (@bbcweather) reporting 'Hundreds of #lightning strokes across Eng/Wales this afternoon. Even more in N France/Belgium. MattT' with a map of the region showing lightning strikes as red and orange crosses.



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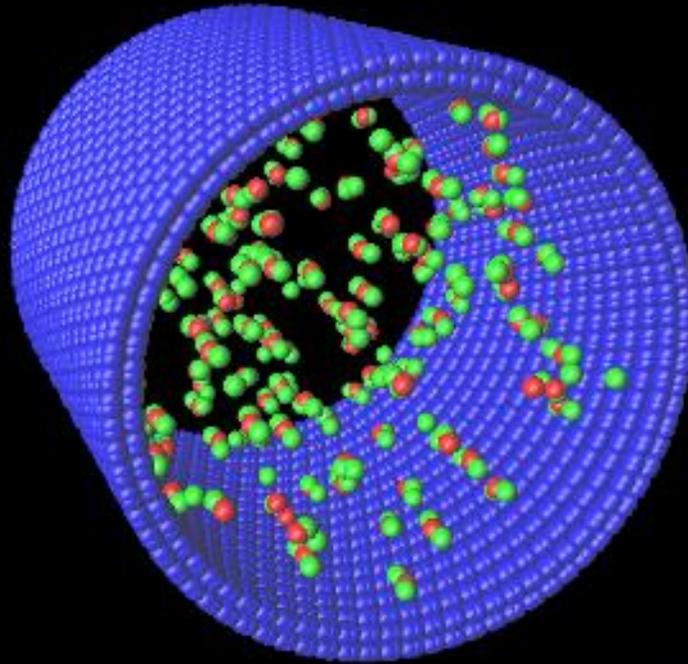
DIY Science

Civic Science



# Volunteer computing

Computing for Clean Water 



Prog: 10.0%

 world community grid.  
technology solving problems

Powered by  



Tasks 

 **FightAIDS@Home - Vina**   
World Community Grid  
ready 75.0% 

Elapsed time: 04:03:30  
Task Name: FAHV\_x3NF6\_B\_IN\_FBPb\_rig\_0205859\_0382\_8  
Deadline: Sat 29 Mar 2014 07:10:29 pm

---

 **FightAIDS@Home - Vina**   
World Community Grid  
ready 20.0% 

Elapsed time: 02:07:44  
Task Name: FAHV\_x3NF6\_A\_IN\_Y3a\_rig\_0205304\_2274\_4  
Deadline: Sat 29 Mar 2014 09:40:34 pm

 Computing will resume when battery charge reaches 90% (currently 73%)





# Volunteer Thinking



## Geo-Wiki interface

The screenshot shows the SIGMA - FIELD SIZE interface. On the left sidebar, the 'Measure Tool' displays three area measurements: 3.1170 ha - Medium, 2.254 ha - Small, and 1.031 ha - Very small. Below this is the 'Sigma Field Size' section with 'Stop', 'About', and 'Leaderboard' buttons. The 'Overview' section shows validation statistics and a 'Zoom to Point' button. The main map area features a red box and a yellow grid. On the right, the 'What field sizes do you see inside the red box?' section includes a list of categories with 'dominant' indicators and a 'Comment' field. Below that is a 'Skip Reason' section with buttons for 'View in Google Earth', 'View Examples', and 'Ask experts for help'. The map is annotated with letters a through k pointing to various UI elements.

- a) area measuring tool
- b) fields that has been delineated and measured by a participant
- c) overview board with a work that has been done by a participant
- d) system of grids
- e) access to different open layers, e.g. Google or Bing
- f) buttons to select fields a participant sees in a red box: very large, large, medium, small, and very small, no fields
- g) skip buttons
- h) button to open current location in Google Earth Application
- k) view examples
- l) ask experts for help



# Passive Sensing

- In passive sensing, participants download a software, and sometimes connect a sensor, to allow for a wide network of observation.
- Quake-Catcher provide detailed seismographic observations

QCN

HOME ABOUT QCN JOIN QCN NEWS LEARNING RESEARCH MY QCN/BOINC HELP DESK

Check out the new sensors!

The new O-NAVI sensors have been received and are ready to ship!

READ MORE

### The Quake-Catcher Network

The Quake-Catcher Network is a collaborative initiative for developing the world's largest, low-cost strong-motion seismic network by utilizing sensors in and attached to internet-connected computers. With your help, the Quake-Catcher Network can provide better understanding of earthquakes, give early warning to schools, emergency response systems, and others. The Quake-Catcher Network also provides educational software designed to help teach about earthquakes and earthquake hazards.

SEARCH

LOG IN

Please use your BOINC account to sign in. If you don't have one, please

REGISTER!

Username

Password



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# Participatory Sensing



**OdourCollect**  
392 Tweets

**ODOUR COLLECT**

Follow

**OdourCollect**  
@Odourcollect Follows you

Mapping odours with #CitizenScience for citizens' empowerment. Smell and share!  
Idea by @RosaAriasAlv developed by @ibercivis Seed and main tool of @dNOSES\_EU

Barcelona, España [odourcollect.eu](http://odourcollect.eu) Joined December 2016

428 Following 284 Followers

Followed by Citizen Science Global Partnership, CitSci TC, and 31 others you follow

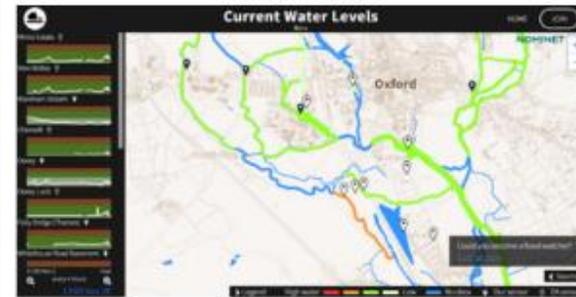


# DIY Science



Imane Baiz, CRI Paris

## Join the Flood Network Community



### BECOME A FLOODWATCHER - KEEP AN EYE ON THE MAP

You don't need any fancy technology to become a Floodwatcher. You can take readings from gaugeboards or take photos and we can include them in our data. We're building a network of people and sensors around the country to monitor flooding at a local level.

The information helps people to make better decisions during floods and quickly shares knowledge of a changing situation. We combine Environment Agency data with crowdsourced sensors in ditches, streams, drains and even under floorboards to give a near real-time picture of levels.

### INSTALL A FLOOD MONITOR

Do you live within 40m of a river or stream and have broadband? Would you like to know water levels when you're not home? Flood Monitor contributes to the resilience of your community by sharing this information.

You can install a Flood Monitor and see your readings live on the map every 15 minutes. Flood Monitors (£250) are available to groups or individuals who'd like an unobtrusive, low-cost way of monitoring water levels and contributing this to a bigger community.

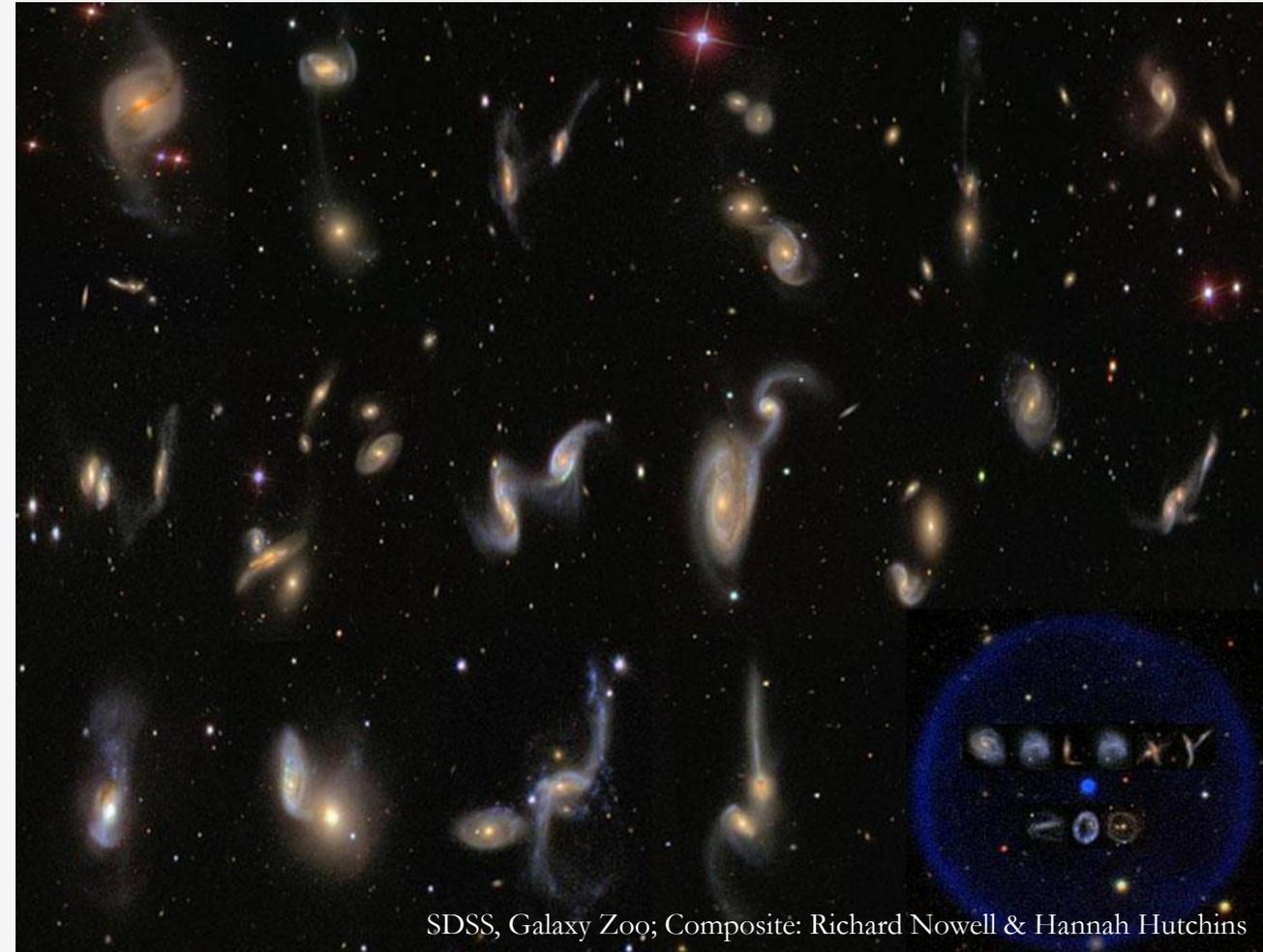
If you'd like a sensor then [email us](#) and we'll get in touch. We have a small supply of sensors to donate to community groups and individuals can buy one for £250.





# Astrophysics: counting galaxies

- Need to assemble large data sets of classifications
- The classifications can only partially automated, and need human assistant
- Use of cognition and crowdsourcing





# RCT: PatientsLikeMe Lithium Study

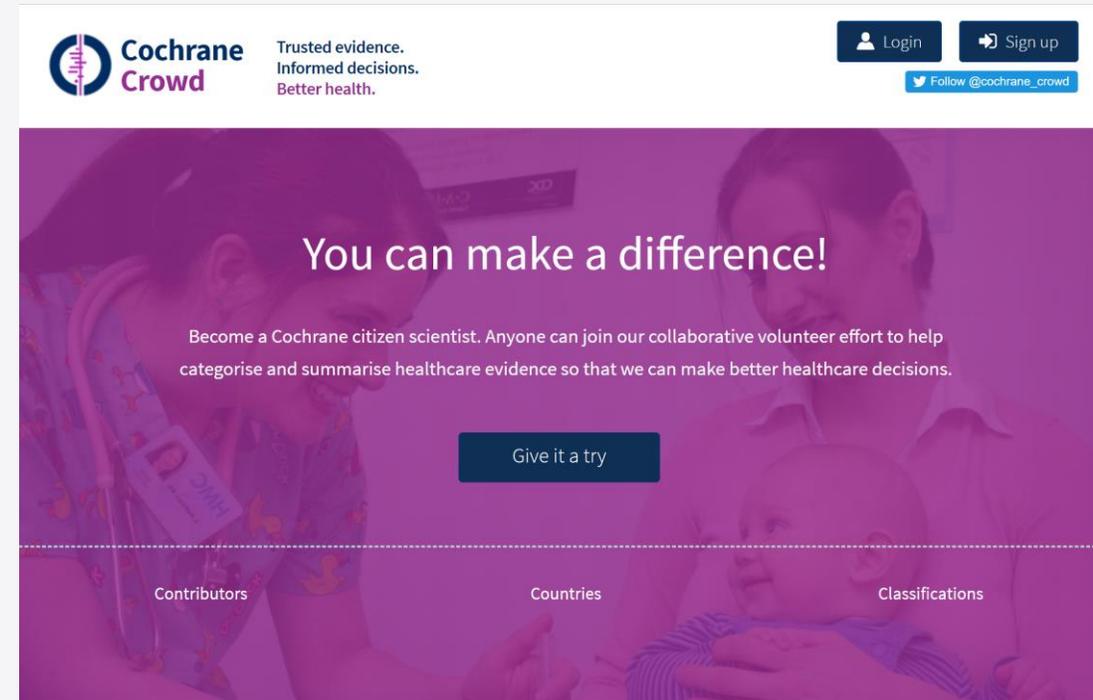
- Participants discussed the initiation of the study
- Participants volunteered to self experiment, with control drawn from other participants.

The screenshot shows a webpage from PatientsLikeMe. At the top, there is a search bar and navigation links: Newsroom Home, About PatientsLikeMe, What's New, Media Kit, Social Media, and Contact. The main heading is "Nature Biotechnology: ALS Lithium Study - The Results". Below this, it lists the publish date as Sunday, April 24, 2011, and the category as "Front Page Research Section, More Research". The source URL is provided as <http://www.nature.com/nbt/journal/vaop/ncurrent/abs/nbt.1837.html>. There are social media sharing icons for email, PDF, print, RSS, and a plus sign. The main text of the article begins: "In 2008, a small Italian study was published suggesting that the drug Lithium could slow the progression of ALS. In response, hundreds of members of PatientsLikeMe began taking the drug and using a new tool and a matching algorithm to conduct a patient-lead observational study. The results of that study, published in Nature Biotechnology, show that we were unable to replicate the promising findings of the Italian group, but that PatientsLikeMe may provide a useful way of conducting observational studies faster and cheaper than existing trial methods." Below the text is a "Download All Files" section with a small image of a line graph. Underneath the image, there are three download options: "Download preview (3.47 KB)", "Download low-res (3.47 KB)", and "Download high-res (29.22 KB)". At the bottom of the page, there is a footer with navigation links: About Us, Contact Us, Blog, News, Careers, FAQs, Funding, Data for Good, Openness, Privacy, User Agreement, and Crisis. The copyright notice reads "© 2005-2018 PatientsLikeMe. All Rights Reserved. Information on PatientsLikeMe.com is reported by our members and is not medical advice." and the logo for Business Wire NewsHQ is visible in the bottom right corner.



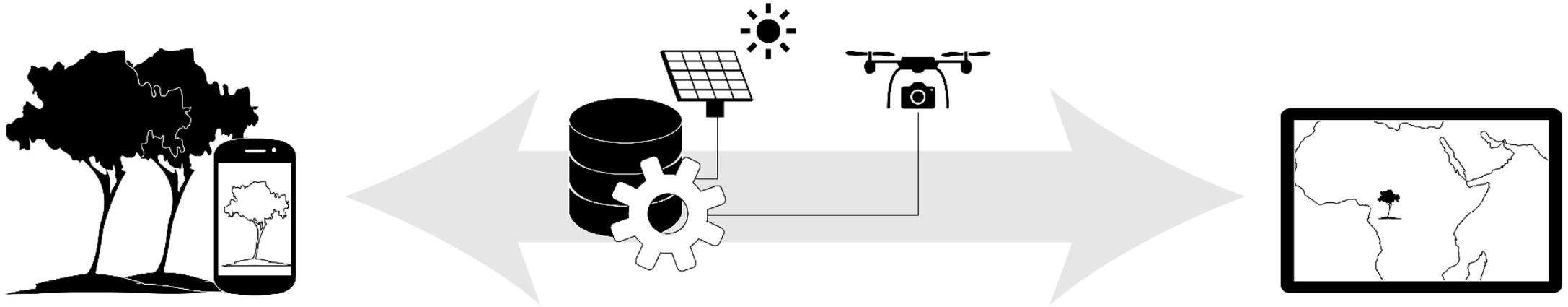
# Crowdsourcing RCT results

- Biomedicine developed statistical techniques to merge results from multiple studies (meta-analysis)
- Cochrane Crowd is a system for the classification of journal abstracts to assist systematic reviews and meta-analysis



The screenshot shows the Cochrane Crowd website. At the top left is the Cochrane Crowd logo with the tagline "Trusted evidence. Informed decisions. Better health." To the right are "Login" and "Sign up" buttons, and a social media link "Follow @cochrane\_crowd". The main content area features a purple-tinted background image of a healthcare professional with a stethoscope and a family. The headline reads "You can make a difference!" followed by the text: "Become a Cochrane citizen scientist. Anyone can join our collaborative volunteer effort to help categorise and summarise healthcare evidence so that we can make better healthcare decisions." A "Give it a try" button is centered below the text. At the bottom, there are three navigation links: "Contributors", "Countries", and "Classifications".

# Geography/Anthropology: Towards Intelligent Maps



Data collection

*Sapelli, ODK, EpiCollect, CyberTracker*

Data repository and management

*GeoKey*

Data analysis and visualisation

*Intelligent Maps*



**Sapelli** | Collector



**GeoKey**



**Sapelli** | Viewer



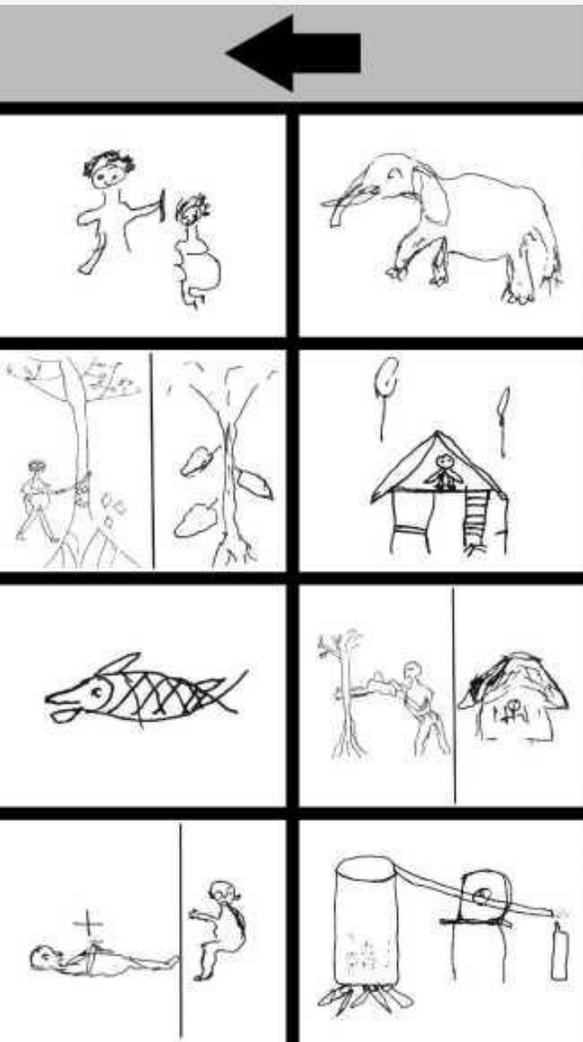
Sapelli is an open-source project that facilitates data collection across language or literacy barriers through highly configurable icon-driven user interfaces. We encourage people to download the app from the [Google Play store](#), or from our [GitHub repository](#) and deploy it for their own purposes.

The sequence of interfaces that will be presented to the user in the project is described in the project's XML file. The transmission of complete records is handled autonomously by the Sapelli platform, which periodically checks for connectivity and determines the most appropriate means by which to transmit the compressed data to another phone or a [GeoKey](#) web server.

This website should help to get started with creating bespoke data collection apps that meet individual requirements.



# Gbiné, Cameroon





#### Level 4



#### Extreme Citizen Science

- Collaborative science - problem definition, data collection and analysis

#### Level 3



#### Participatory Science

- Participation in problem definition and data collection

#### Level 2



#### Distributed Intelligence

- Citizens as basic interpreters
- Volunteered thinking

#### Level 1



#### Crowdsourcing

- Citizens as sensors
- Volunteered computing



# **POLICY AND PRACTICE**



# Citizen Science emergent: environment

- Prof. Jacquie McGlade, head of European Environment Agency, 2008 (Aarhus + 10):

**'Often the best information comes from those who are closest to it, and it is important we harness this local knowledge if we are to tackle climate change adequately... people are encouraged to give their own opinion on the quality of the beach and water, to supplement the official information.'**



# EEA WaterWatch

WaterWatch - Bathing water quality for Europe

The screenshot displays the EEA WaterWatch web application interface. On the left, a sidebar titled "Official data" lists bathing water quality categories: Unknown, Excellent, Good, Sufficient, Insufficient sampled, Poor, and Closed. The main map area shows a coastal region with several data points represented by colored icons. A "Citizen Observation Layer" dialog box is open, allowing users to submit observations. The dialog includes a "Rating" section with five options: Very bad, Bad, Moderate, Good, and Very Good. Below the rating, there are checkboxes for various attributes: Clean, Safe, Scenic, Equipped, Dirty, Polluted, Unsafe, and Crowded. The dialog also shows the time "Edited seconds ago" and buttons for "Delete" and "Save". The top navigation bar includes options for "Rating tool", "Print", "Layers", "Basemap", and "Share", along with a search bar. The bottom of the page features the "bing" logo and the "European Environment Agency" logo.



# Community of practice - associations

- (2012)-2014 – Citizen Science Association
- 2013 – European Citizen Science Association
- 2014 – Australian Citizen Science Association
- 2017 – African & Asian Citizen Science networks



CITIZEN SCIENCE  
ASSOCIATION



EUROPEAN  
CITIZEN SCIENCE  
ASSOCIATION



Australian  
Citizen Science  
Association



# Local networks emerging

- Across Europe, national networks emerging

Bürger schaffen Wissen  
Die Citizen Science Plattform

Mitforschen Blog Citizen Science Über uns

Forum Citizen Science 2019

## Jetzt anmelden zum Forum Citizen Science 2019!

Wir freuen uns, Ihnen dank vieler spannenden Einreichungen im Call das Programm für das Forum Citizen Science 2019 in Münster präse dürfen. Ab jetzt können Sie sich für das Forum anmelden. Wir freuen Teilnahme.

© Sergey Mukhametov

Zum Forum Citizen Science 2019 →

### Citizen Science Portalen

Adminstreret af Citizen Science Netværket

FORSIDE OM PORTALEN NYHEDER PROJEKTER CITIZEN SCIENCE SYMPOSIUM 2019 VÆRKTØJSKASSE

## Citizen Science Netværket

**4. JUNI: STIFTENDE MØDE FOR DET DANSKE CITIZEN SCIENCE NETVÆRK**

Kære alle, Vi vil gerne invitere til et stiftende møde for det danske citizen science netværk. Dette møde følger op på

Ciencia Ciudadana EN ESPAÑA

I FORO INTERNACIONAL #CC ÚNETE QUÉ ES EL OBSERVATORIO INICIATIVAS RECURSOS

Mapa de proyectos de Ciencia Ciudadana en España

Mapa: © OpenStreetMap contribuyentes

PROYECTOS

PERSONAS

INSTITUCIONES



# Policy awareness and impact



HOME · BLOG

## Accelerating Citizen Science and Crowdsourcing to Address Societal and Scientific Challenges

SEPTEMBER 30, 2015 AT 6:00 AM ET BY TOM KALIL AND DAVE WILKINSON



Summary: Today, the White House is hosting

While only a fraction of Americans are formally trained to contribute to science, engineering, and technology through citizen science and crowdsourcing projects.

**Citizen science** encourages members of the public to ask questions, making observations, conducting experiments, developing technologies and open-source code, members of the public contribute to the scientific process.

Through **crowdsourcing** - an open call for voluntary assistance to study and tackle complex challenges by conducting research in ways that professional scientists working alone could not. For example, understanding the structure of proteins related viruses in [preparing for, responding to, and recovering from disasters](#).

114TH CONGRESS  
2D SESSION

## H. R. 6414

To encourage and increase the use of crowdsourcing and citizen science methods within the Federal Government to advance and accelerate scientific research, literacy, and diplomacy, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

NOVEMBER 30, 2016

Mr. TONKO (for himself, Mr. MCKINLEY, and Mr. KILMER) introduced the following bill; which was referred to the Committee on Oversight and Government Reform

## A BILL

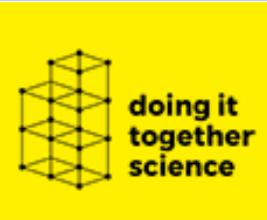
To encourage and increase the use of crowdsourcing and citizen science methods within the Federal Government to advance and accelerate scientific research, literacy, and diplomacy, and for other purposes.



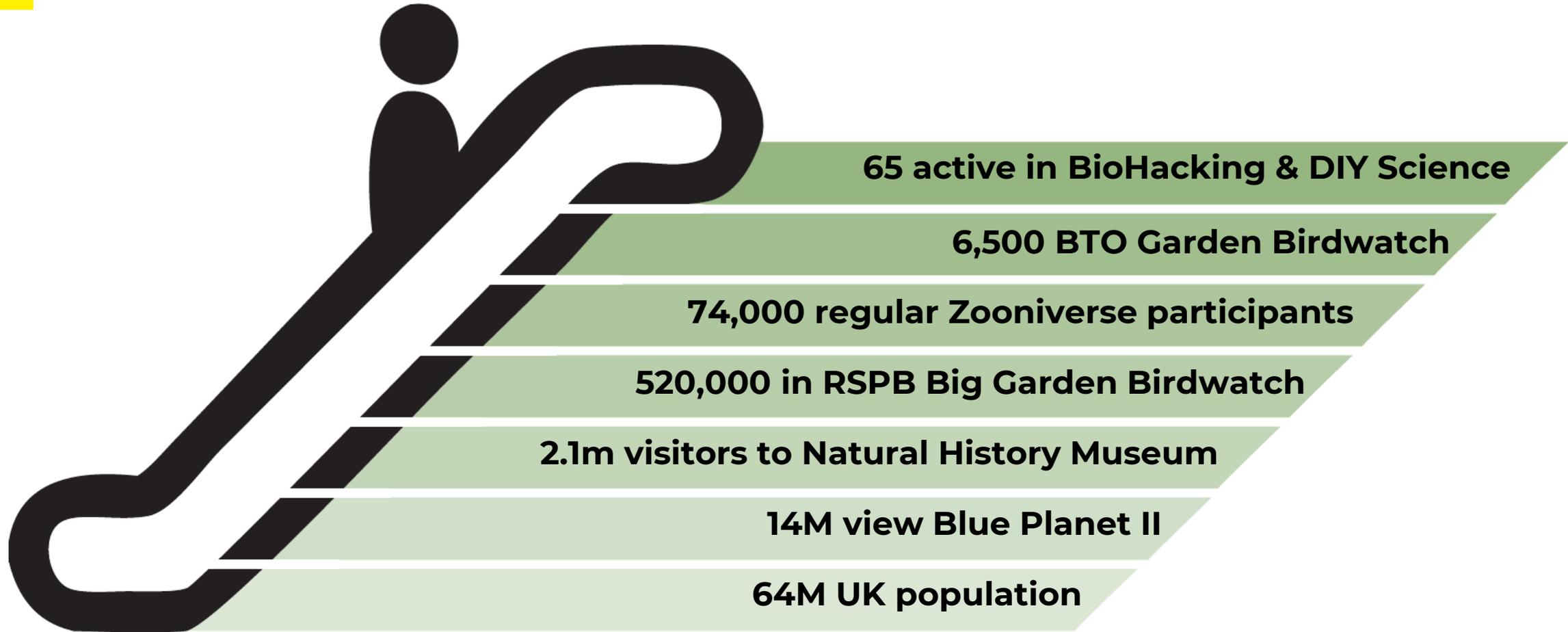
Whenever possible, **citizen science** should be encouraged, where citizens become providers and users of data. This will reinforce and give new meaning to the policy of open access to publications and data; this openness should enable citizens and citizen groups to participate in evidence-based policy and decision-making. This could give rise to new types of partnerships, such as “P4P”s or “P4.0s” where “people” are working together with the public and private sector. This could be systemically implemented on European, national and regional levels.



# **MEASURING & EVALUATING**

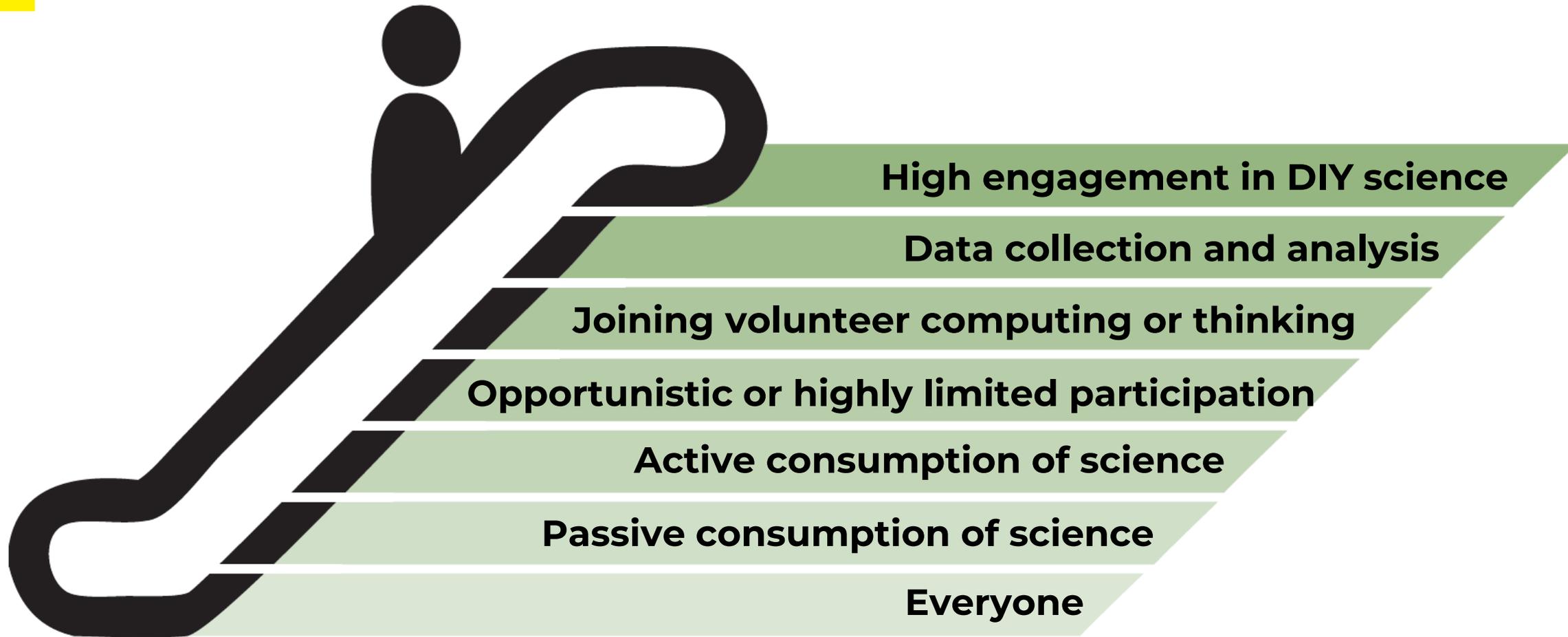


# UK Engagement Escalator





# 7 Levels of Engagement





- Likely to be unhelpful, and potentially damaging interventions in citizen science evaluation

PNAS PNAS PNAS

OPINION

## Toward an international definition of citizen science

Florian Heigl<sup>a,1</sup>, Barbara Kieslinger<sup>b</sup>, Katharina T. Paul<sup>c</sup>, Julia Uhlir<sup>d</sup>, and Daniel Dörler<sup>a</sup>

Public participation in scientific projects is flourishing globally as part of projects labeled “citizen science” (CS). Already, a number of professional networks for CS stakeholders have been founded, for example, the US-based Citizen Science Association, the European Citizen Science Association, and the Australian Citizen Science Association.

But what exactly qualifies as CS? It is interpreted in various ways (1) and takes different forms with different degrees of participation (2). In fact, the label CS is currently assigned to research activities either by project principal investigators (PIs) themselves or by research funding agencies. Against this backdrop, critical observers of CS, such as Guerrini et al. (3), have drawn attention to important legal and ethical issues including intellectual property and scientific integrity. Similarly, Vayena and Tasioulas (4) note the importance of protecting the interests of research participants in

23<sup>rd</sup> March 2018, Vienna



Österreich *forscht*  
www.citizen-science.at

# Quality Criteria for Citizen Science Projects on *Österreich forscht*

Version 1.1

Developed by the Citizen Science Network Austria working group on quality criteria.

## Chairs of the working group:

Florian Heigl<sup>1</sup> & Daniel Dörler<sup>1</sup>

## Members of the working group:

Pamela Bartar<sup>2</sup>, Robert Brodschneider<sup>3</sup>, Marika Cieslinski<sup>4</sup>, Marlene Ernst<sup>5</sup>, Steffen Fritz<sup>6</sup>, Irmgard Krisai-Greilhuber<sup>7</sup>, Jennifer Hatlauf<sup>1</sup>, Susanne Hecker<sup>8</sup>, Thomas Hübner<sup>9</sup>, Barbara Kieslinger<sup>2</sup>, Peter Kraker<sup>10</sup>, Thomas Krennert<sup>9</sup>, Gerit Oberraufner<sup>11</sup>, Katharina T. Paul<sup>7</sup>, Brigitte Tiefenthaler<sup>12</sup>, Michela Vignoli<sup>13</sup>, Theresa Walter<sup>14</sup>, Ronald Würflinger<sup>15</sup>, Maria Zacharias<sup>16</sup> & David Ziegler<sup>17</sup>



# Evaluating Citizen Science goals

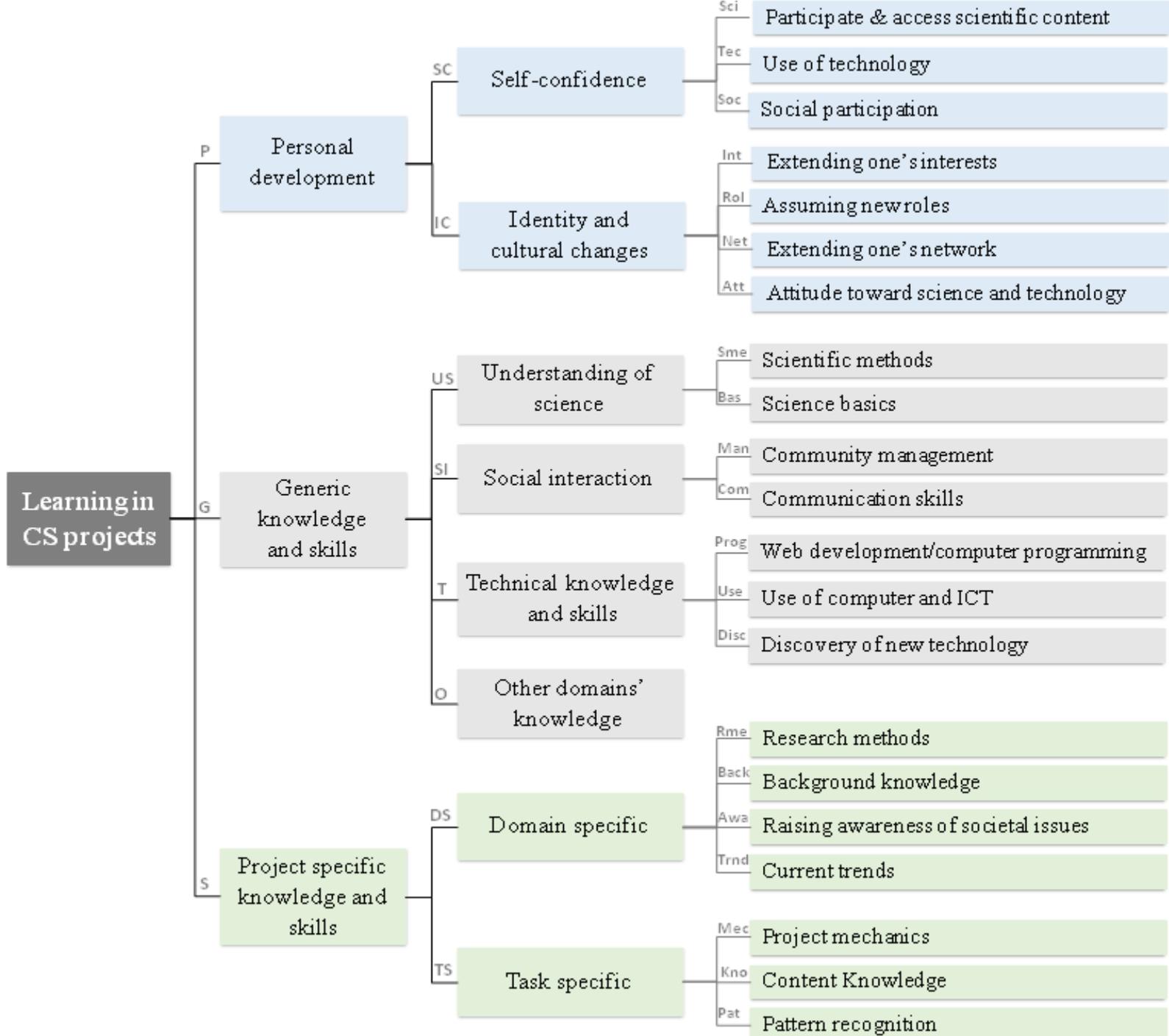
- Each citizen science project is a balancing act between the scientific goals, scale and depth of engagement, benefits to different stakeholders - NO PROJECT CAN DO IT ALL

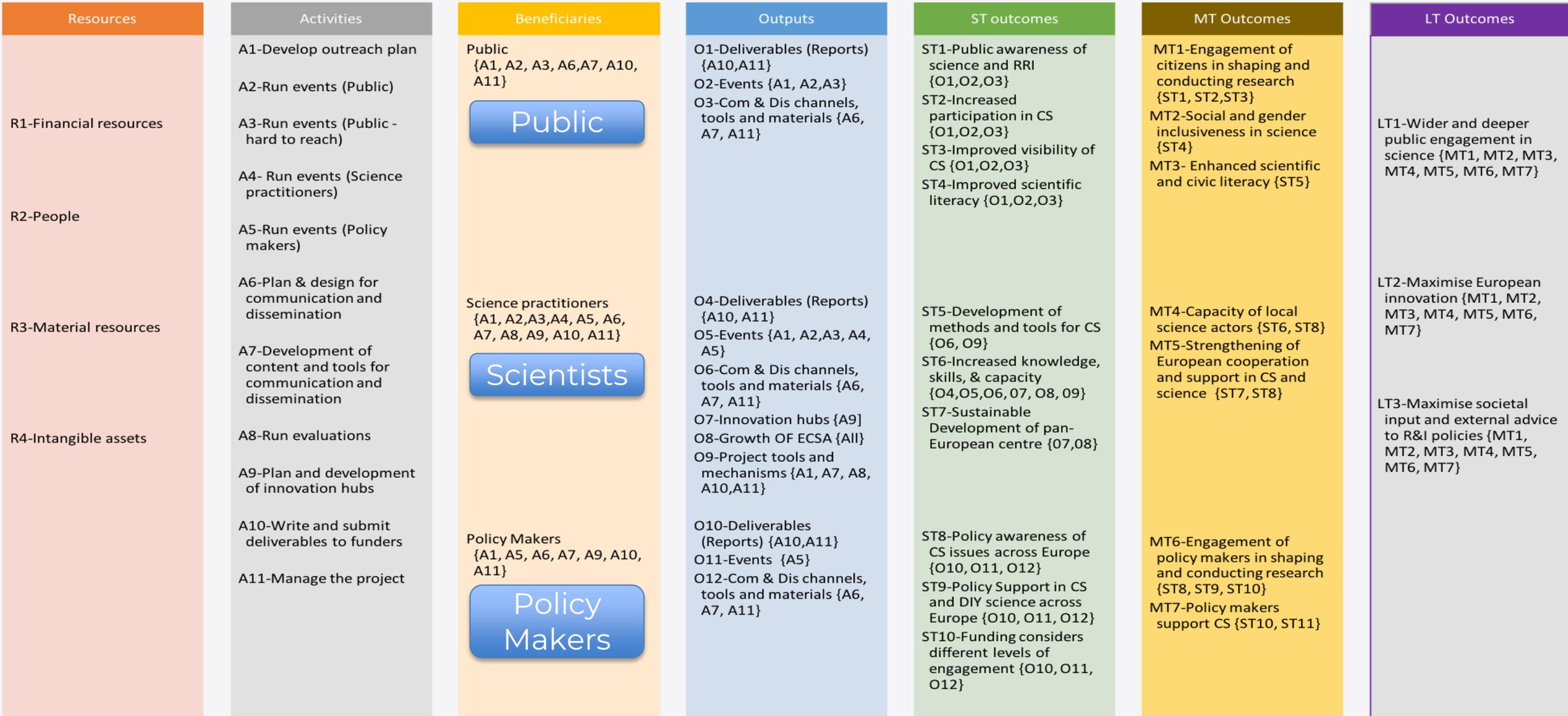




## A taxonomy on learning outcomes in citizen science projects. 3 main categories:

1. **personal development,**
2. **generic knowledge & skills,**
3. **project-specific knowledge and skills**







# Evaluation: sensitivity required!

- Citizen Science require considerations according to discipline, culture, type of activity, and level of engagement
- There cannot be a “silver bullet” for evaluation, and rigid criteria can cause harm - by excluding certain activities, sending message to newcomers and innovators that “there is no space for them” etc.
- Mix methods are necessary.



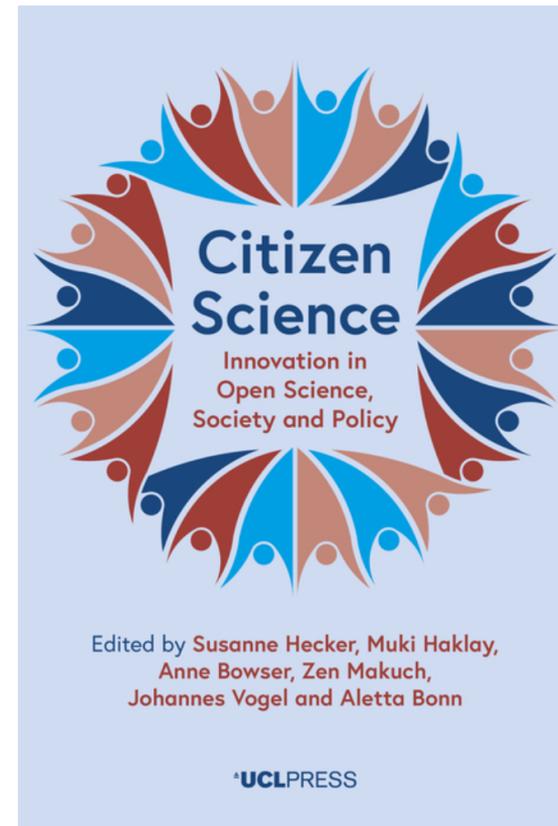
# Some possible directions

- “preregistration” model – identify goals, levels of participation, scale and register them before a citizen science project
- “Logic Model/Theory of Change” model – develop several templates for citizen science projects, adapt them for a specific project, and use for evaluation
- “Key Performance Indicators” model – project designers set KPIs out of a set, and need to report on them



## Citizen Science

- Open access
- 580 pages
- 31 chapters
- 121 authors



[Return to results](#)

Edited by **Susanne Hecker, Muki Haklay, Anne Bowser, Zen Makuch, Johannes Vogel and Aletta Bonn** | October 2018

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Open Access PDF

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Paperback

ISBN: 978-1-78735-234-6

£30.00

Pages: 580

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# Summary

- Citizen science has historical precedents, but new types of activities and participants. This is the result of societal and technical trends.
- Citizen science includes a wide range of activities, and is gaining recognition among the public and within the area of research
- Not everyone wants deep engagement, but there are methodologies for a fully participatory process
- Policy and funding awareness open up new opportunities



## Extreme Citizen Science blog

UCL'S INTERDISCIPLINARY RESEARCH GROUP ON EXTREME CITIZEN SCIENCE

SEARCH

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// you're reading...

ANTHROPOLOGY, ARTICLES, BIODIVERSITY, CAMEROON, ECOLOGY, INDIGENOUS PEOPLES, MAPPING

### Ready, Set, Report! Five forest communities are showcasing a new style of conservation

POSTED BY SIMON HOYTE - JUNE 28, 2017 - [LEAVE A COMMENT](#)

**FILED UNDER** AFRICA, ANIMALS, ANTHROPOLOGY, CAMEROON, COMMUNITIES, COMMUNITY DEVELOPMENT, DEVELOPMENT, ELEPHANTS, GIS, GREAT APES, INDIGENOUS, PARTICIPATORY DEVELOPMENT



#### RECENT POSTS

- Reuniting people and maps: Participative Mapping 2017 at Cal Poly August 22, 2017
- Being a jury member at LERU's Citizen Science Summer School August 2, 2017
- LERU Summer School – Citizen science and public participation in the digital age July 20, 2017
- Ready, Set, Report! Five forest communities are showcasing a new style of conservation June 28, 2017
- Presenting the DITOS Logic Model at the Citizen Science Association Conference May 31, 2017
- In Memory of Gill Conquest May 17, 2017
- Interview the Researchers: What was "Into the Night"? April 27, 2017
- A Citizen Science Training Day April 26, 2017
- Learning DIY glow-worm making March 22, 2017

The work of ExCiteS is supported by EPSRC, ERC, EU FP7, EU H2020, RGS, Esri, Forest People Program, Forests Monitor, WRI and all the people in communities that we've worked with over the years

### EXTREME CITIZEN SCIENCE (EXCITES)



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UCL Home / [Extreme Citizen Science \(ExCiteS\)](#)

## Extreme Citizen Science (ExCiteS)



Extreme Citizen Science (ExCiteS) is a situated, bottom-up practice that takes into account local needs, practices and culture and works with broad networks of people to design and build new devices and knowledge creation processes that can transform the world.



Doing it Together Science (DITOS)



McGonN...

#### Tweets by @UCL\_ExCiteS

- ExCiteS Retweeted @openupsci: Opening up science for all! Last week or so to contribute to our @NERCscience survey on public engagement with environmental science and #citizenscience. We want your views!! Pls RT.
- ExCiteS @UCL\_ExCiteS: Crowdfunding to help mobile healthcare and education projects in Cameroon and Congo, supporting Bayaka healers and Baka hunter-gatherers justgiving.com/crowdfunding/b...

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