CITIZEN SCIENCE:
THEORY AND PRACTICE

Social Impact and the Value of Inclusion in Citizen Science: A Case Study of 23 Citizen Science Initiatives

COLLECTION:
IMPACT ASSESSMENT AND EVALUATION

CASE STUDIES: APPLICATION AND INTEGRATION

ubiquity press

STEFANIE SCHUERZ
ALEXANDRA ALBERT
BARBARA KIESLINGER
ANTONELLA PASSANI
MARGARET GOLD

*Author affiliations can be found in the back matter of this article

ABSTRACT

There is an increasing focus on social inclusion practices in citizen science (CS), which promise broad benefits for individuals, communities, and society at large. However, despite the best intentions of CS practitioners to understand the effectiveness of inclusive practices, there is still limited evidence regarding the effects of social inclusion in CS activities. The article uses a case study of 23 CS initiatives (CSIs) from three European Union (EU)-funded projects (European Citizen Science [ECS], IMPETUS, and Co-designing Citizen Social Science for Collective Action [CoAct]) to explore social inclusion processes—specifically the motivational factors of project practitioners, project design, and implementation—and outcomes at individual, community, and societal levels. This article has 3 main objectives: to understand the factors driving project practitioners to implement social inclusion; to explore how "being inclusive" influenced how project activities were designed and implemented; and to explore the extent to which the inclusive nature of a project contributes to outcomes at the individual, community, and societal level. The article sheds light on the social value of inclusive CS practices, looking at the effects of such activities on participants and communities, and the broader impact they might, in turn, elicit. Building on an analysis of the data collected from the 23 CSIs, the benefits of social inclusion as they are perceived by project practitioners are clustered into three categories: 1) personal development and growth; 2) community transformation; and 3) societal change. The article concludes with recommendations on what else is needed to further the impact of inclusive CS practices.

CORRESPONDING AUTHOR:
Stefanie Schuerz
Centre for Social Innovation, AT
schuerz@zsi.at

KEYWORDS:
Social Inclusion; impact assessment; social impact; policy impact; transformative change; qualitative research; empowerment

TO CITE THIS ARTICLE:
Schuerz, S., Albert, A., Kieslinger, B., Passani, A. and Gold, M. 2026. Social Impact and the Value of Inclusion in Citizen Science: A Case Study of 23 Citizen Science Initiatives. *Citizen Science: Theory and Practice*, 11(1): 56, pp. 1–15. DOI: https://doi.org/10.5334/cstp.1002

INTRODUCTION

Citizen Science (CS) is often framed through its potential for strengthening democratic values and democratising science (Irwin 2002), promising benefits for individuals and communities (Pasgaard et al. 2023) and transformative change at the societal level (Varga et al. 2023). The literature points to participant empowerment, improved social conditions, and shifts in policy agendas as important impacts that can positively influence participants' lives (Vohland et al. 2021), but these are mostly framed as potential rather than validated outcomes.

There is growing attention to expanding diversity and inclusion in CS beyond the "usual suspects" (Pateman and West 2023), and achieving the meaningful engagement of less well-represented, marginalised, or minoritised groups, but evidence of the impact of these efforts remains sporadic. Assessing whether inclusion measures have been effective is itself challenging, as it requires investment beyond the core CS activities and thus adds to the burden put on participants (Kieslinger et al. 2022a). Simultaneously, both inclusionary practices and their assessment risk reducing participants to demographic groups and reifying categories of marginalisation (Pateman and West 2023).

While meaningfully engaging diverse participants in CS is broadly recognised as challenging, it is highly necessary—especially for societally marginalised people, who stand to gain the most. Pateman and West's (2023) comprehensive review describes how a lack of diversity can unintentionally cascade, replicating existing power structures, depriving underrepresented groups of opportunities to gain new knowledge, skills, or upward mobility, and leading to data that may be unrepresentative or misleading.

Particularly where a funding call explicitly refers to inclusion, there is a risk that "doing social inclusion" is treated as a simplistic box-ticking exercise. In this article we draw on citizen social science (CSS) frameworks to define inclusive CS as both a process and an outcome, a framing that strives to transform how CS is structured, valued, and sustained by emphasising the equitable involvement and empowerment of participants throughout research (Butkevičienė et al., 2022). This places inclusive CS within a broader understanding of social inclusion as a societal goal concerned with equal access to opportunities, reduced inequalities, and the meaningful participation of marginalised groups. Inclusive CS operationalises this goal by attending to the structural and intersectional factors that determine who is excluded and why, and by designing activities that genuinely reflect the needs, knowledge, and agency of underrepresented communities.

Achieving this requires clarity about what "social inclusion" means and which communities are "underrepresented" or "left behind." In European Union (EU) regulatory texts, social inclusion is part of broader policy to ensure participation, equal opportunities, and reduced inequalities. The Horizon Europe Strategic Plan 2025–2027 (EC DG RTD 2024) expects research and innovation results to contribute to social inclusion through better, wider, and more equal access to opportunities and by addressing inclusion-related challenges across society. Similarly, inclusive participation in actions to achieve the Sustainable Development Goals underpins the pledge to "leave no one behind" in the UN 2030 Agenda for Sustainable Development (UN 2015).[1] The United Nations Development Programme (UNDP) has identified five key causal factors for being left behind, which can also help to understand who is underrepresented in CS initiatives (CSIs): (1) Discrimination, such as biases or exclusion based on one's identity; (2) geography, such as isolation or lack of access to transportation or infrastructure; (3) governance, such as unjust laws or lack of political voice; (4) socio-economic status, such as poverty, poor health, or distance from the labour market; and (5) shocks and fragility, such as higher exposure to conflict, the impacts of climate change, or economic downturns (UNDP 2018). While it is tempting to treat these factors separately, in practice most people face more than one kind of deprivation, disadvantage, or discrimination (UNDESA 2016).

When involving vulnerable, underrepresented or "easy-to-ignore" societal groups (Wöhrer et al. 2021), it is therefore crucial to understand the heterogeneity within populations and communities and the high degree of intersectionality of factors, so that people are not homogonised into specific groups (Bäckstrand 2003; Ottinger 2010). In our sample, participants were considered underrepresented or vulnerable on the basis of contextual factors that broadly align with the UNDP causal factors. Such groups include—but are not limited to—women with health conditions, children from low-income or refugee families, persons with disabilities, and less-obvious groups such as fishing communities, whose engagement is hindered by immense workloads and intense suspicion of outsiders and academics. Inclusive CS practices addressing these factors are thus methodologically aligned with "extreme citizen science" (Haklay 2013), taking into account local needs, practices, and cultures when designing and implementing CSIs. Internal hierarchies and power dynamics within communities can also cause people to be left behind, especially in emotionally or ideologically charged contexts, as shown in studies engaging migrant communities in environmental monitoring or health research (Machado et al. 2023; Fiske, Prainsack, and Buyx 2019).

Lessons learned from practice have led to concrete recommendations for more inclusive participation (e.g., Varga et al. 2023), which are being implemented in the current cohort of European CS projects. Tools that support "leaving no one behind" are also being developed, like the

EU-funded CitiObs project's toolkit for diverse and inclusive community-based environmental monitoring.[2] Inclusive CSIs are also increasingly initiated by underrepresented groups themselves, for example, in the health domain, where patients drive research based on the CARE principles (collective benefit, authority to control, responsibility, and ethics) for Indigenous Data Governance, which centre data sovereignty and community authority as a more radical form of inclusion than participatory approaches that retain external research control.[3]

Three EU-funded projects that sought to address the lack of diversity in CS through more inclusive practices offered an opportunity to examine the drivers of and barriers to social inclusion across a diverse range of cases. Drawing on 23 CSIs realised within these projects, we (i) seek to understand the factors driving project practitioners to implement inclusion practices and investigate how they have been implemented; (ii) explore how "being inclusive" influenced how project activities were designed and implemented; and (iii) explore the extent to which the inclusive nature of a project contributes to specific outcomes at the individual, community, and societal level.

The findings are presented in two sections. The first outlines operational insights into how social inclusion has been implemented in the CSIs, including practical considerations and contextual factors that form the basis for meaningful engagement (objectives i and ii); the second presents findings on the impact of social inclusion at the micro, meso, and macro levels (objective iii). The discussion brings both together and outlines recommendations for inclusive citizen science.

METHODOLOGY

RESEARCH DESIGN

This exploratory article aims to contribute empirical insights into the practices, challenges, and perceived social value of inclusive citizen science as reported by the CSI practitioners engaged for this study. It adopts a qualitative case study approach to examine how social inclusion was conceptualised, operationalised, and experienced across the 23 CSIs supported through ECS, IMPETUS, and CoAct. Rather than evaluating the effectiveness of the three projects themselves, it analyses qualitative data generated through their impact assessment and evaluation activities. The analysis takes an interpretive perspective, seeking to understand the reasons why CSI teams decided to adopt inclusive practices (objective i), and how the practitioners who implemented these CSIs articulated them (objective ii), while exploring the extent to which inclusive approaches contributed to perceived outcomes at the individual, community, and societal levels (objective iii).

Although each project implemented a distinct impact assessment approach tailored to its structure and objectives, all shared a comparable theoretical orientation towards participation, inclusion, and social impact in CS,[4] while differing in the operationalisation of variables, data collection procedures, and assessment tools (Kieslinger et al. 2017; Schäfer et al. 2020; Passani, Janssen, and Hölscher 2021; Kieslinger et al. 2024).

CONTEXT OF THE THREE PROJECTS

European Citizen Science (ECS; 08/2022–07/2026, GA 101058509) aimed to widen and strengthen the CS community in Europe through capacity-building and awareness-raising activities. Project partners implemented nine inclusive pilot initiatives exploring different approaches to engaging underrepresented groups and integrating social inclusion practices into CS activities.

IMPETUS (07/2022–06/2026, GA 101058677) aimed to strengthen recognition and support for CS through an accelerator programme providing financial support, mentoring, and training to CSIs across Europe. Through three open calls, it supported 129 initiatives addressing environmental and social challenges, with social inclusion being an explicit selection criterion.

Co-designing Citizen Social Science for Collective Action (CoAct; 01/2020–12/2022, GA 873048) adopted a citizen social science approach in which citizen groups sharing a social concern collaborated with academic researchers as co-researchers throughout the research process. Through an open call, it funded three citizen social science initiatives focusing on gender equality.

SELECTION OF CITIZEN SCIENCE INITIATIVES

The 23 CSIs included in this analysis were selected through purposive sampling based on three criteria: Relevance to social inclusion, availability of qualitative data, and analytical diversity. Relevance was defined as the extent to which initiatives explicitly addressed social inclusion, either by targeting underrepresented or marginalised groups, incorporating inclusive design principles, or positioning inclusion as a central project objective, with particular attention to groups potentially affected by one or more of the UNDP causal factors (UNDP 2018). As the quality and depth of documentation varied substantially across and within the three projects, preference was given to initiatives where richer qualitative material was available, including interview transcripts, impact assessment reports, and final project documentation. Finally, cases were selected to ensure analytical diversity and avoid duplication of highly similar initiatives.

Of the nine ECS pilots, seven were selected; one continued with IMPETUS funding and was therefore included in the IMPETUS dataset, and one was excluded

due to insufficient data. Within CoAct, two of the three funded initiatives consented to follow-up interviews and were included. Within IMPETUS, 63 of the 81 initiatives in the first two accelerator cohorts (2023 and 2024) explicitly engaged with vulnerable or underrepresented groups. Following the thematic analysis of the ECS and CoAct datasets, IMPETUS cases were comparatively examined and 14 selected where they complemented the themes emerging from the qualitative coding.

Figures 1 and 2 provide an overview of the analysed CSIs.

DATA SOURCES

The analysis draws on multiple qualitative data sources generated through the impact assessment and evaluation activities conducted within ECS, IMPETUS, and CoAct. For ECS and CoAct, the primary data source consisted of semi-structured interviews with CSI leads and team members, following a common guide focusing on the reasons for CSI teams to introduce inclusion practices, target groups and participation strategies, challenges and barriers encountered, perceived outcomes and impacts of inclusive practices, and lessons learned. Seven (ECS) and two (CoAct) interviews were virtually conducted in mid-2024, lasting 30 to 60 minutes.

For IMPETUS, the analysis drew on semi-structured interviews with CSI leaders and project team members; impact assessment reports written by CSI leaders, some of which included aggregated and anonymised results of participant evaluation surveys (to which we had no direct access); and final project reports submitted by CSI teams.

	Initiative		Topic / Issue	Target Group	Location	Type(s) of Engagement
ECS	1	**Odour Collect**	Mapping odour pollution	Older population	Spain	Interaction with mobile phone app; artistic engagement
	2	**Viikki Library**	Biodiversity monitoring	Older population; unemployed	Finland	Nature walks; aligning CS activities with social events; integrating eco-social education with social support
	3	**Latvia Place Names**	Toponyms (local place names)	Older population; teenagers	Latvia	Storytelling; data entry
	4	**Berlin BioBlitz**	Biodiversity monitoring	Young migrants; refugees; students with learning difficulties	Germany	Interaction with mobile phone/tablet and iNaturalist app
	5	**AGORA**	Climate change adaptation	Migrants; women aged 65+; young people	Spain	Co-design workshops for climate adaptation solutions
	6	**Marine Vertebrates**	Marine vertebrates observation	Fishers, tourists	Croatia	Training and awareness raising activities; interaction with Marine Ranger App
	7	**Pisuna**	Community environmental monitoring and natural resources assessment	Fishers, hunters	Greenland	Observation of species during regular work; community meetings to discuss observations and co-develop policy recommendations
CoAct	8	**Women On Top**	Female workforce challenges and needs in remote and rural areas	Rural women	Greece, Cyprus	Co-design workshops
	9	**Single Step**	LGBTI in the labour market	LGBTI people	Bulgaria	Co-design workshops; survey co-creation

Figure 1 Analysed citizen science initiatives (CSIs) of European Citizen Science (ECS) and Co-designing Citizen Social Science for Collective Action (CoAct).

		Initiative	Topic / Issue	Target Group	Location	Type(s) of Engagement
IMPETUS	10	**Acting4DHH**	Accessibility and mobility of cities for deaf and hard of hearing (DHH) people; DHH-hearing interactions	Deaf and hard of hearing (DHH) community	Greece	Co-design; participatory mapping
	11	**Oeiras Experimenta**	Climate resilient crops	Public; institutionalised youth	Portugal	Co-creation of educational materials; training programs
	12	**LBI Accessibility Audits**	Accessibility and mobility of cities for residents with reduced mobility	Residents with reduced mobility	United Kingdom	Participatory workshops, co-design of a survey, accessibility audits
	13	**Obstetric Coevolution (ObCoe)**	Mental health of postpartum women	Pregnant women	Spain	Co-production of educational resources
	14	**Dear Green Place**	Mental health in urban green spaces	Young people	Scotland	Indoor and outdoor data collection workshops; collaboration with a local artist to coproduce artworks from the data and ideas gathered
	15	**SeaPaCS**	Impact of marine plastic pollution on local biodiversity	Local residents; migrant fisherman; sailors; divers; students	Italy	Interviews; training sessions; co-production
	16	**Citizen Observatory of Apuan Waters**	Quality of natural water resources	Local residents	Italy	Training on water quality monitoring; data interpretation and report editing; participatory data collection
	17	**Map4Rec**	The perception and use of urban green space	Temporarily displaced children and young people from the Ukraine aged 9-14	Netherlands	Co-design of a location-based game; participatory mapping; data collection quests
	18	**Heat Watchers in Action (HWiA)**	Urban extreme heat and thermal discomfort; unequal effects of climate change	Low-income households with children aged 10-12	Spain	Co-creation; multi-stakeholder discussions to implement proposed solutions; capacity-building sessions to train future facilitators
	19	**EndoHealth**	Exploring endometriosis from the perspective of affected women	Women with endometriosis	Spain	Co-design, co-creation, cross-sectional study conducted using the co-created questionnaires
	20	**Vyakulani Africa**	Transmitting African culinary knowledge across generations and communities	Women (also elderly) from the Africa diaspora	Belgium	Co-design of problem framing, development of data gathering instrument, data collection, analysis and interpretation
	21	**Luna**	Lack of scientific data on phenomenology throughout the menstrual cycle	People with menstrual cycles	Slovenia	Qualitative questionnaires, situation comparison questionnaire, co-design of recommendations
	22	**River PRO**	Enhancing proactive river conservation	Residents, farmers, high school students (disadvantaged backgrounds; learning disabilities)	Italy	Community of Practice workshops; participatory mapping; environmental monitoring (water sampling and analysis (PH, temperature, turbidity, etc.); co-design data review sessions
	23	**UNIQUE**	Inclusive accessibility, mobility, and urban planning	People with disabilities	Spain	Co-design of the project, testing and validating prototypes; co-creation of dissemination and training plan

Figure 2 Analysed citizen science initiatives (CSIs) of IMPETUS.

The IMPETUS interviews were conducted virtually by IMPETUS consortium members at the midpoint of the accelerator programme (November 2024 and 2025), lasted up to 30 minutes, and focused on project objectives, inclusion practices, implementation challenges, and perceived social impacts. All interviews were transcribed prior to analysis. Direct quotes in the results section are taken verbatim from the interviews to exemplify the observed concepts, letting the original actors speak for themselves and document their experiences (White et al. 2014).

DATA ANALYSIS

The analysis was conducted in two iterative phases combining inductive thematic analysis with elements of qualitative content analysis following Mayring (2014), a holistic and subjective procedure for interpreting and categorising qualitative data that allows clear links to be drawn between the research objectives and the findings. This was complemented by the conventional approach to content analysis (Hsieh and Shannon 2005), which avoids pre-conceived categories, allowing them to emerge from the data.

In the first phase, two researchers independently coded the ECS and CoAct interview transcripts inductively, allowing themes, patterns, and concepts related to inclusive CS practices to emerge directly from the data. All researchers then collaboratively reviewed and discussed the codes, consolidating them into broader thematic categories and sub-categories. This iterative process focused on identifying recurring inclusion strategies, forms of participation, perceived outcomes, and tensions across the cases.

In the second phase, this emergent thematic structure served as a comparative analytical framework for examining the IMPETUS dataset. Rather than coding all IMPETUS materials line by line, cases were comparatively analysed and selected where they aligned with or expanded on the identified themes and patterns. This allowed for triangulation (Leech and Onwuegbuzie, 2007) across datasets, strengthening the robustness, credibility, and trustworthiness of the analysis by reducing personal bias and cross-checking findings.

The final thematic categories, which structure the findings, were thus developed iteratively between February and June 2025 through dialogue between the coded interview material, documentary sources, and comparative cross-case analysis. The codebook developed during this process is linked in the Data Availability Statement to support transparency and reproducibility.

Reflexivity and researcher positionality

Although involved in aspects of the implementation, impact assessment, and evaluation of ECS, IMPETUS, and CoAct, the authors did not design or carry out the CSIs analysed, which were implemented independently by external organisations, researchers, and community actors. We thus had access to project documentation, evaluation processes, and practitioner reflections, but needed to pay reflexive attention to potential biases, including the risk of overemphasising successful inclusion narratives. To mitigate this, we relied on comparative interpretation across multiple cases and datasets, collaborative coding, and explicit discussion of analytical assumptions and interpretations.

RESULTS: ANALYSIS OF INCLUSIVE PRACTICES AND THEIR EFFECTS

The following two subsections first analyse the inclusion practices of the examined CSIs before exploring their effects, outlining the social value of inclusive citizen science.

SOCIAL INCLUSION IN THE EXAMINED CITIZEN SCIENCE INITIATIVES

Drawing on the five UNDP causal factors for being left behind (discrimination, geography, governance, socio-economic status, and shocks and fragility), our analysis elicited strategies that helped address barriers towards participation and enabled inclusive practices in CS. The main barriers in our data relate to contextual aspects—such as where CS takes place, the language of communication, and the materials, tools, and technologies used—as well as to personal perceptions and values, including perceived hierarchies and potential gatekeepers. The strategies we encountered to overcome these barriers are described below.

Contextual setting and flexible engagement formats

The findings highlight the importance of appropriate timing, venues, and spatial configurations in supporting social inclusion. As one practitioner explains: "Because everyone can't go to the library, we have to go where they are." (ViikkiLibrary). Co-creating engagement activities with target communities can enhance feelings of ownership while reducing resistance and the perception of outsider dominance, which is especially relevant for communities with historical distrust of researchers or governance entities (MarineVertebrates, AGORA, EndoHealth, ObCoe; see also Robinson, Delany, and Sugden 2024; Sardo et al. 2025).

Language and terminology have been identified as important barriers to participation, extending beyond multilingualism to include competing frames of reference and differing contextual understandings across disciplines and practices (Compagnucci et al. 2021). Our analysis

confirms the good-practice principle that simplified communication materials and shared vocabularies can help bridge these divides. In addition, co-creation and co-design processes can support the development of a shared language among participants, thereby reducing communication barriers and helping to make initiatives meaningful and accessible to all involved. (ObCoe, Map4Rec, HWiA, EndoHealth) Methodological choices play a crucial role in addressing these challenges. In the second iteration of Acting4DHH, the project team drew on citizen social science approaches to better align activities with the needs and preferences of deaf and hard of hearing (DHH) participants, adapting the design and pace of the project by reducing the number of activities, slowing the cadence of engagement, and dedicating additional time to building a shared understanding of project objectives and terminology. Project materials also needed particular attention, because written outputs do not directly correspond to sign languages and therefore required additional time and effort to ensure accessibility and effective communication.

Motivations

In this sub-section, we consider "motivations" as the factors that encourage participants to become involved and remain engaged in CS activities. Our data show that flexibility and enjoyment in engagement formats are important and should be considered alongside each other when analysing the role of motivation in CS projects. Personal motivation, arising from strong emotional connections to an issue or from access to information directly relevant to individuals' lived experiences, can be a powerful driver of engagement for both participants and project organisers. For example, the Luna project engaged 87 citizen scientists in collecting real-time data on their menstrual cycles and reporting daily reflections. While it offered no remuneration, it gave participants access to their own cycle data and the opportunity to investigate personal research questions in a supported environment. A project's potential to create a sense of community can also be a powerful motivating factor. In LatviaPlaceNames, which focused on cultural heritage and storytelling, one practitioner observed: "The sense of belonging, that's something that motivates the elderly people, when they can talk about their places, their families, their people around them." In other instances, people may need incentives to take the time to participate, which need not be monetary: Partners found that offering "a cup of coffee for the climate" (AGORA) or a "nature movie night" with a well-known science communicator (ViikkiLibrary) helped to motivate people to show interest in and ultimately contribute to a project. Similarly, finding the right formats for the group to be engaged is important—gamifying activities can work well with young people (BerlinBioBlitz), while art-based methods proved a helpful addition for collaboration with DHH people (Acting4DHH). Both intrinsic and extrinsic motivations thus proved helpful: Practitioners named enjoying an activity, being in nature, doing something artistic or tactile, and getting out of routines as factors that can draw participants in or keep them engaged.

Value-based, trusted relationships

Mutuality in the sense of reciprocity is another essential factor of inclusive CS, which can only thrive when the process gives back to individuals and communities (see Hetland 2020; Receveur et al. 2022). One practitioner described the relationship she built with a fisherman who called her several times a week to share sightings of unusual dolphin and rare fish species: "You know, they really open up if you give them. So I gave him a story about this dolphin, how we have been tracking it for the last two years. They like to be updated and when they are, they feel more into it to report other stuff as well." (MarineVertebrates). Such exchanges serve to educate while building trust and strengthening relationships between collaborators. CSIs ensured mutuality by understanding what might be valuable and impactful to a specific individual or community involved in a project and taking steps to integrate these wants and needs into the overarching methodological approach. The co-creation of suitable collaborative activities (AGORA, OeirasExperimenta, Acting4DHH, ObCoe, Map4Rec) and the co-design of solutions (WomenOnTop, HWIA, DearGreenPlace) both proved helpful tools to achieve this mutuality.

CSIs working with communities that showed some resistance to collaborating found it helpful to gain an understanding of potentially contentious topics and start with less controversial ones to avoid creating apprehension, as one practitioner explained: "We are researching large marine vertebrates, dolphins and sea turtles. If we do some task with dolphins, it's much more difficult to approach the fishermen. But if we have a project with sea turtles, they're totally interested, because sea turtles are a lucky charm and they don't destroy the nets. They're not competing with them for the fish" (MarineVertebrates). Such entry points can build mutual trust, a recurring theme in our CSIs that has been described as foundational in community-based participatory research (Skarlatidou et al. 2024).

Trust is also intertwined with identity and intersectionality: Only when people feel safe and trusted are they willing to share experiences and contribute. As one of the interviewed researchers notes in relation to their work on the challenges faced by women in rural areas: "We don't want to go and ask them specifically about gender equality or gender stereotypes. For many, many reasons,

we feel that this approach really narrows the field rather than letting them express everything that concerns them" (WomenOnTop).

Partnerships, communities, intermediaries

The importance of partnerships, networks, collaborations, and community "champions" was a clear theme in our data. Individuals and institutions acting as champions can be pivotal in initiating and maintaining engagement in CS and can help translate project intentions into transformative social outcomes (AGORA, Pisuna, WomenOnTop, DearGreenPlace, Acting4DHH). Closely related is the need for specific expertise and facilitation skills, which may lead intermediaries and community partners to act as boundary-spanning agents that align institutional and community practices. Many IMPETUS CSIs worked in this way, with scientists collaborating with associations directly representing neglected or excluded groups (Acting4DHH, LBIAccessibilityAudits, DearGreenPlace). The direct involvement of such civil society organisations facilitated the CS work by providing a trusted environment in which the new activity could build on pre-existing practices and social dynamics. These projects show most clearly how social inclusion may arise and be highly beneficial in the context of needs-driven research.

However, gatekeepers can also block participation (Den Broeder et al. 2016). One researcher trying to engage migrant communities in Spain reflected: "Well, it wasn't easy to establish contact. At first we tried to reach NGOs like the Red Cross or the big ones that have a refugee program. But in the end we had a woman who has many contacts, because she is from Venezuela too. She was the leader of the community with a lot of friends and so we reached them because of her" (AGORA).

Roles, responsibilities, and capacities

Finally, we found that roles within a CSI need to be clearly defined and communicated to manage expectations and enable meaningful collaboration, especially in socially charged research settings where researchers often face conflicts due to misaligned expectations with community leaders, activists or intermediaries (MarineVertebrates, Pisuna, RiverPRO; see also Robinson, Delany, and Sugden 2024; Kieslinger et al. 2022a; Lin Hunter et al. 2024). A diversity of roles can also help, as one researcher explains: "I was very happy to have several teachers in the group because that meant that no one expected me to act as the authority figure. It also meant that I had no legal responsibility [i.e., duty of supervision]." (BerlinBioBlitz). Tied to this, a conscious investment in skills and capacity can also be key, as specific barriers can arise for groups with, for example, low digital literacy or limited mobility, such as elderly participants using mobile technology. ViikkiLibrary, for instance, supported older participants with digital infrastructure, while BerlinBioBlitz used gamification to reduce barriers for young people.

While this section has focused on how CSIs can become more socially inclusive by addressing barriers to participation, the next shifts attention to the outcomes of these efforts, examining the forms of social value that practitioners involved in this study identified as emerging from inclusive CS practices.

THE SOCIAL VALUE OF INCLUSIVE CITIZEN SCIENCE

While Irwin (2002) argues that CS contributes to a democratisation of science, social inclusion in CS broadens this towards equity and justice. Scholars have highlighted that the genuine co-production of knowledge requires an egalitarian relationship between researchers and public participants, in which local and experiential knowledge is valued equally to academic knowledge (Chilvers and Kearnes 2016; Robinson, Delany, and Sugden 2024; Skarlatidou et al. 2024), and there is growing agreement on the need for reciprocity and returning value to communities—be it in the form of knowledge, social resources, or advocacy outcomes (Hetland 2020; Receveur et al. 2022). The duty of care towards participants and communities is an emerging theme with transformative implications for CS practice (Slade et al. 2024), raising questions about assessing the long-term impact of CS not just on scientific outputs but on social cohesion, health, wellbeing and empowerment—areas still understudied and in need of further empirical evidence (Nascimento et al. 2018). Three categories of social value emerged from our analysis of the ECS, IMPETUS, and CoAct CSIs: 1) Personal development and growth; 2) community transformation; and 3) societal change.

Personal development and growth—the micro level

The first category concerns participants' personal development and growth. This includes first and foremost what people gain on an individual level from their participation, such as learning new skills, building new capacity, gaining new knowledge, and changing their points of view on specific topics, which may include increased trust in science. Examples include being able to identify species of marine mammals in the Mediterranean Sea (MarineVertebrates), better understanding climate change and related misinformation (AGORA), a different perception of marine plastic pollution and a related change in fishers' practices (SeaPaCS), and learning to use new technologies such as smartphones or specific apps (OdourCollect, ViikkiLibrary).

Other examples reported in this category were empowerment, behaviour change, novelty, and enjoyment. An increased sense of empowerment was a key outcome in several CSIs (WomenOnTop, SingleStep, LatviaPlaceNames, EndoHealth, ObCoe, Luna). One practitioner described how it felt to overcome obstacles to join co-research activities, since many of the rural women participating in her research on employment opportunities in Greece and Cyprus "never stopped to think about what they don't like about their lives, and many of them have great resistance in imagining ways where things can become better" (WomenOnTop). She saw "sparks" develop through the collaborative research process, which may lead to greater changes in the future, allowing the women to identify and capitalise on economic opportunities. Empowerment can also take the form of increased social capital: In CitizenObservatoryofApuanWaters, CSI leaders reported increased interaction among citizen scientists around shared objectives, strengthening pre-existing relationships, creating new connections across age groups and social backgrounds, and raising trust among participants. In other cases, such as SeaPaCS, empowerment is reflected in an enhanced perception of agency, whereby participants developed a stronger sense that their actions could help to change or influence marine plastic pollution.

New knowledge and skills, social capital, and empowerment leading to longer-lasting behaviour changes were reported in Acting4DHH, which sought to address accessibility issues in public urban spaces in Thessaloniki, Greece, for the DHH community. The collaboration of 20 DHH and hearing participants reportedly created community bonding and solidarity between the two groups; it helped to overcome social biases and barriers, with participants becoming more conscious of, and thus patient with, frictions in DHH-hearing communication, leading to individual behaviour changes amongst the participants.

Opportunities for novelty were also described, with citizen scientists trying something new and unfamiliar to them and thereby gaining a new perspective on their lifeworlds (AGORA, BerlinBioBlitz, ViikkiLibrary). This can also serve as a motivating factor, as one researcher explains: "There were like 20 people who wanted to participate because they wanted to do something new." (AGORA) Participants might also access new spaces that would have otherwise remained unexplored, opening existing natural or cultural resources to new groups and their enjoyment. Describing a BioBlitz he implemented with students from underserved communities, one practitioner noted: "It was a really nice spot and none of them had ever been there. [...] You have to do it in early summer because then everything is in bloom, and several people said they really liked the beautiful flowers. I think you shouldn't underestimate the fun factor or the beauty factor." (BerlinBioBlitz).

Community transformation—the meso level

A recurring benefit observed within the CSIs is that citizen scientists are being heard, valued, and respected within and beyond their communities. This includes actively making space and time for people to meet and talk where usually there is none. As one practitioner notes: "In Italy and Spain we did an extra focus group with women over 65 in rural areas. And it was a really good experience because they were really involved and engaged because they said that nobody wants to hear the opinion of elderly women. So it was really nice in that sense." (AGORA). So many older women from this small rural community wanted to join that the methodology had to be adapted from a focus group to a co-design workshop. This also shows that some populations and their specific needs are not sufficiently perceived and addressed within society, especially when intersectional identities are at stake. As one researcher noted: "Most of the time we talk about women as if they are one homogeneous group and as if they need the same things and they have the same experiences, which couldn't be further from the truth. [...] So visibility is a big part of inclusion." (WomenOnTop). A core benefit of inclusive CS thus lies in making tangible the needs, challenges, and capacities of marginalised voices, helping to empower otherwise disenfranchised populations—a cornerstone of democratic societies. In EndoHealth, implemented at the Hospital Clinic of Barcelona, women with endometriosis were supported in co-creating patient-centred therapeutic content, giving them a voice in their treatment and fostering a sense of community and empowerment among those who may feel isolated and misunderstood.

Through this, inclusive CS also contributes to participants' sense of community and belonging by empowering a community to learn about itself and better understand its own needs (SingleStep); by strengthening ties between stakeholder groups that come together to solve a common problem (LatviaPlaceNames, Pisuna, WomenOnTop); or by making meaningful decisions that affect a community's long-term potential to thrive (Pisuna, MarineVertebrates, UNIQUE). Inclusive practices can thereby affect participants' sense of commitment to and ownership of a project and its goals, which is tied to an overarching sense of responsibility. As one researcher notes about community-led natural resource management in Greenland: "What we see all the time is that when people themselves are given responsibility, they become much more responsible and they actually become more restrictive about their own use of resources and about their colleagues' use of resources than when it's the government." (Pisuna) This also demonstrates the potential of inclusive CS practices to change participants' relationship to their environment, which is especially beneficial where "conflicting interests" might be at stake. In coastal Croatia, where fishers and

dolphins are in direct conflict since dolphins are known to rip fishing nets to retrieve fish, MarineVertebrates engages fishers in mapping large marine vertebrates, and opened a dialogue on the value of dolphins as a keystone species in the Mediterranean, slowly creating space for fishers to take on a more custodial role towards their natural competitors. Similarly, fishers monitoring plastic pollution in SeaPaCS reported changes in perception and working practices. Inclusive CS can thus also contribute to overcoming barriers, breaking down biases and ingrained cultural practices, as well as addressing negative attitudes and "competing interests"—be they aversions to dolphins, the government, or changing established routines (MarineVertebrates, AGORA, WomenOnTop, UNIQUE).

CSIs can be transformative for those participating in them, building understanding and cohesion between groups with different experiences (UNIQUE, Luna). Inclusive CS also provides opportunities for different stakeholders to interact beyond the usual networks of collaborators and participants. Collaborations between researchers, public sector organisations, and the public can lead to improved management of local, context-specific issues and more effective participation of the public, in particular underrepresented groups, in local decision-making processes. For example, OeirasExperimenta studied climate-resilient crops by restoring an old farm and establishing a multidisciplinary research hub in Oeiras, Portugal. Besides involving the public in farm activities, it collaborated with two social inclusion organisations and the local educational centre for institutionalised youth, integrating underrepresented groups in the research hub and giving them greater visibility in the research. In VyakulaniAfrica, CS helped a migrant community to transmit knowledge intergenerationally and enhanced its public perception: Older women were trained to adapt traditional recipes into easy-to-follow formats, which were presented to younger generations and to non-Africans interested in African cuisine—an intangible cultural asset that can play a key role in diaspora communities.

Societal change—the macro level

The final cluster of perceived benefits relates to projects enabling participants to become agents of change in society, aligning with the UNDP "leave no one behind" pledge by enacting change through inclusive, catalytic, and accountable strategies, policies, and financing. One important aspect is participants' perception of their contributions as meaningful and effective for a broader cause, such as tackling climate change or biodiversity loss (MarineVertebrates, LatviaPlaceNames, AGORA). In some instances, projects also increased participants' civic engagement by enabling them to move from being newcomers to active citizens who contribute valuable insights to communities and have voices that matter (Map4Rec, UNIQUE).

This can take the form of enabling evidence-based policymaking by collecting data for decision-making (ObCoe, EndoHealth), providing blueprints and recommendations to (local) governments (DearGreenPlace), and improving the quality and quantity of data (Pisuna, BerlinBioBlitz, HWiA). In qualitative terms, inclusive CS can tackle specific knowledge gaps around the experience of underrepresented groups that may have previously been excluded (LatviaPlaceNames, Acting4DHH, EndoHealth). LBIAccessibilityAudits integrated the lived experience of 12 residents with reduced mobility, generating crucial information on obstacles on streets and pavements from a pan-disability perspective. By co-designing accessibility audits with these participants, it embedded their experiences into urban planning in Islington (London), ensuring that future audits are more effective and genuinely take into consideration residents' needs. Inclusive CS can also generate more complete, richer datasets: HWiA in Barcelona, Spain, sought to shed light on the unequal effects of climate change, with a particular focus on heat and thermal discomfort in urban low-income households with children. Five new datasets were published at the end of the project, generating a rich source of data on urban indoor heat stress that include a child-oriented perspective.

Inclusive CS projects may also enable citizens to directly contribute to policy decisions, although aligning research with existing (local) policy priorities can raise the likelihood of policy uptake (AGORA, Pisuna, DearGreenPlace, OeirasExperimenta). For instance, DearGreenPlace engaged young people in Edinburgh, Scotland, in generating evidence on how local shared outdoor spaces affect mental health and wellbeing. The initiative connected young participants with local policymakers at Edinburgh Council to have their say on local green space developments, and continues to work with the Council to ensure that young people's voices are heard at every stage. OeirasExperimenta, a collaboration between researchers and the municipality, included a municipal representative in its core team, so that project insights fed directly into local priorities and decisions. This is supported by an overall raised societal awareness of an issue, indicated, for example, by increased media attention surrounding the project (SeaPaCS, OeirasExperimenta, HWIA).

Finally, inclusive CSIs can support the development of scalable and impactful solutions from local action and offer insights into the local expression of broader (societal, environmental) issues, helping to bring local populations on board and support them in the implementation of solutions (WomenOnTop, MarineVertebrates, AGORA, RiverPRO).

DISCUSSION

Our case study of 23 CSIs explored inclusion as both a process and an outcome, documenting strategies for inclusion and how they contribute to outcomes at individual, community, and societal levels. We outlined practices relating to processual factors such as context, engagement formats, relationship-building, and roles and responsibilities, and identified the social value of inclusive CS practices. These range from manifestations at the personal level (micro), to community impact (meso) and lead up to initiating change at the societal level (macro). The outputs and outcomes vary considerably: In some cases, they are pragmatic adaptations to engagement practices that do not alter the overall process of a typical, research-focused CSI; in others, the initiatives were the starting point for the creation of new interest groups or indeed the development of longer-term policy interventions.

Figure 3 situates the strategies and outcomes along the micro to macro spectrum. At the micro level are adjustments on the personal level: Providing flexibility and ensuring enjoyment of an activity, investing in skills and capacity building, and respecting individuals' (intersectional) identities. Towards the community-oriented meso level, but still in conversation with the individual, are interventions related to roles and responsibilities, venues and spatial configurations, and thematic entry points, with mutuality and trust-building as a highly interrelational strategy. Between the meso and macro levels are mediating aspects—partnerships, specific communities and intermediaries, champions, and gatekeepers—that can increase the chances of macro-level impact.

We consistently find that inclusive CS is resource intensive. Successful engagement requires time and flexibility to meet communities where they are, and CSIs too often underestimate what meaningfully engaging underrepresented communities entails, including raising and managing differing expectations, managing competing timeframes, and following up beyond the formal project period.

Inclusive practices also risk reifying differences when working only with "vulnerable groups," while broad engagement often leads to only the most privileged and dominant groups participating. It is therefore crucial to purposefully involve minoritised and "easy-to-ignore" groups together with a broader audience. Better documentation of how social inclusion is integrated into monitoring indicators and evaluation frameworks can

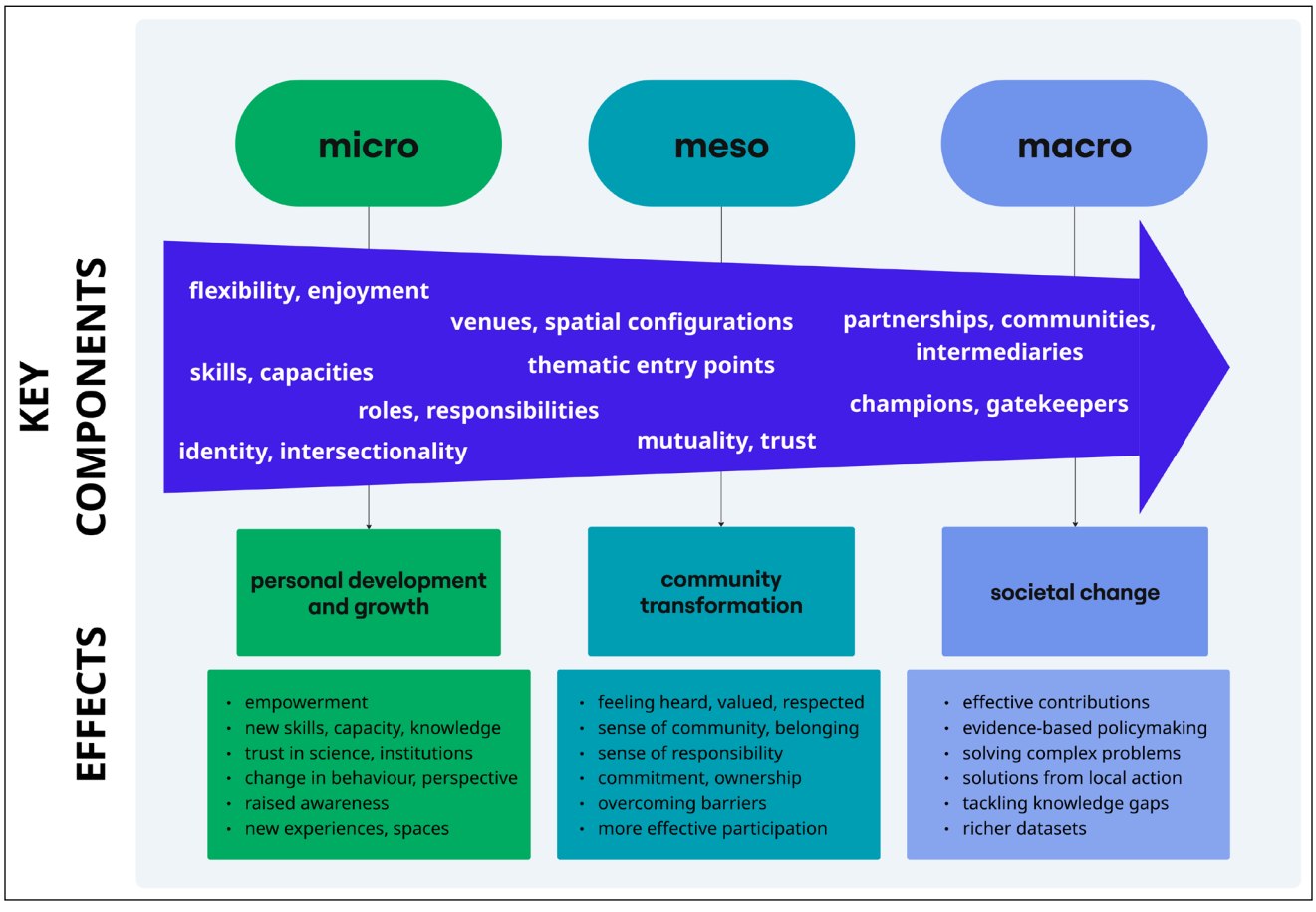

Figure 3 Components and effects of social inclusion in citizen science.

help to demonstrate in a more nuanced way how CSIs are making practical steps to ensure that no one is left behind. This specific aspect of monitoring and evaluation is modelled in the IMPETUS impact assessment methodology (Passani and Ancona 2023). Other practical ways to address this are through the use of co-evaluation strategies such as those developed in CoAct (Kieslinger et al. 2022a, b) that are linked to, or help inform an initiative's overall evaluation approach.

There are many different ways to examine inclusion in CS. This analysis contributes reflections on numerous examples of inclusive CS implemented under the umbrella of three EU-funded CS programmes. Our approach was not without limitations, particularly due to the diversity of data and insights we worked with. However, every effort was made to align the different data types gathered during the three overarching "umbrella" projects. Future research should build on these insights, and this approach, by analysing inclusive CS practices more systematically.

All CSI teams in our sample made concerted efforts to adjust their project designs and engagement formats to enact inclusion as a practice and thereby ensure inclusion as an outcome. These efforts were further aided by a significant project-based support structure that included training and mentoring over the course of the higher-level project lifecycle of ECS, CoAct, and IMPETUS. In turn, these efforts led to tangible impacts such as a greater sense of purpose and community among participants and a heightened influence on policy decisions.

LIMITATIONS

This study is exploratory in nature and presents several limitations. First, the three projects differed substantially in their structures, objectives, and impact assessment methodologies, resulting in uneven forms and levels of available data. Despite significant efforts to align the datasets analytically, direct comparisons between cases remained challenging.

Second, the study relies primarily on qualitative practitioner reflections, impact reports, and project documentation, which provide rich insights into inclusion practices and perceived impacts but do not allow for systematic assessment of the prevalence or long-term sustainability of reported outcomes. Due to time constraints and the structure of the projects, direct interviews with CS participants could not be systematically included. As such, the analysis reflects the perspectives of practitioners implementing inclusive CS activities and the evaluation material generated within the projects.

Third, the article focuses primarily on examples where inclusive practices were perceived as meaningful or effective. Cases where inclusion efforts were unsuccessful or participation could not be sustained were less extensively documented within the available datasets, so no clear failure cases were available for comparative analysis. Future research would benefit from more systematic examination of unsuccessful attempts at inclusion in CS and related barriers and tensions.

Finally, the analysis reflects the realities of contemporary impact assessment practice in CS, where methodologies, indicators, and reporting structures remain highly heterogeneous. Rather than a methodological weakness, this article approaches this as a reflection of the evolving and experimental nature of social inclusion assessment within the field.

CONCLUSIONS AND RECOMMENDATIONS FOR MORE INCLUSIVE CS

To ensure the meaningful participation of under-represented groups and establish safe and welcoming mechanisms for social inclusion, practical recommendations can help to ensure that potential changes towards more inclusive CS are taken up (Albert 2025). Building on the strategies observed in this case study, this article concludes with a set of five recommendations for CS practitioners and project leaders.

1. **Contextual adaptation:** Consider the context-specific requirements of inclusion, taking into account local social realities and the local context of the issue they are trying to address. Meet communities where they are, for instance, by starting with non-threatening entry points, and align research methods and engagement formats with community needs and preferences. Invest in skills development and actively address potential barriers (e.g., digital, mobility, accessibility). Connect to lived experience and emphasise enjoyment.
2. **Trust-building:** Ensure mutuality and reciprocity in the collaborative work, and tangible returns to participants and their communities. Avoid a narrow demographic framing, and respect participants in their intersectional identities. Clearly defined roles and responsibilities support expectation management and, in turn, trustful relationships.
3. **Communication:** Allow sufficient time to develop shared vocabularies and common understandings, and adapt project materials to the needs of the respective audience to ensure accessibility.
4. **Time and flexibility:** Factor in time and flexibility to build relationships when engaging underrepresented groups. Reflexively adapt engagement strategies to target groups, especially if these groups are vulnerable

or where contentious topics must be navigated. Plan also for follow-up beyond the project.

5. **Partnerships:** Work with community champions, civil society organisations, and other gatekeepers and multipliers to ease access to and better understand the communities you want to engage. Collaborating with local decision-makers during the CSI lifecycle can enhance uptake of the data generated to inform local priorities and decision-making.

DATA ACCESSIBILITY STATEMENT

The datasets generated and analysed during the current study are not publicly available because participant consent did not include provisions for public data sharing. The codebook used for the qualitative analysis is available on Zenodo: https://doi.org/10.5281/zenodo.21106943.

NOTES

1 https://sustainabledevelopment.un.org/post2015/transformingourworld.

2 https://citiobs.eu/toolkits/#the-leave-no-one-behind-toolkit.

3 https://www.gida-global.org/careprinciples.

4 All projects considered also other areas of impact such as scientific, economic, technological, and political/governance, but these are outside the scope of this article.

ETHICS AND CONSENT

This research was approved by the Bioethics Commission of the University of Barcelona (IRB 00003099) (CoAct) and the Kings College London ethics commission under reference number MRA-23/24-40068 (IMPETUS). For ECS, an ethics review was not required but continuous oversight was provided through an Independent Ethics Advisor (Helen Kara) who also reviewed the informed consent sheets used.

ACKNOWLEDGEMENTS

We thank all interview partners for their work implementing citizen science practices, as well as their contributions to this research through other inputs such as surveys and reports.

FUNDING INFORMATION

This work was supported by the European Union under grant agreements No. 101058509 (ECS), 101058677 (IMPETUS), and 873048 (CoAct).

COMPETING INTERESTS

Barbara Kieslinger serves as editor for CSTP but was not involved in the handling of this manuscript. Beyond that, the authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the conception and design of this work. Data collection and analysis was divided between IMPETUS (Alexandra Albert, Antonella Passani), ECS, and CoAct (Stefanie Schuerz, Barbara Kieslinger), while the theoretical framing saw stronger contributions from Margaret Gold. Barbara Kieslinger and Stefanie Schuerz led the primary coding process, while Alexandra Albert and Antonella Passani contributed through collaborative discussions, critical interpretation of the emerging themes, and comparative analysis of the IMPETUS cases. All authors contributed to the writing of the article in its entirety and to each individual chapter. Margaret Gold led on the introduction, Antonella Passani on the methodology, Stefanie Schuerz and Barbara Kieslinger on the analytical chapters, and Alexandra Albert on the discussion and conclusions. Stefanie Schuerz and Alexandra Albert finalised the work for submission.

AUTHOR AFFILIATIONS

Stefanie Schuerz orcid.org/0000-0002-3816-1294
Centre for Social Innovation, AT

Alexandra Albert orcid.org/0000-0001-5838-675X
University College London, UK

Barbara Kieslinger orcid.org/0000-0002-0671-1917
Centre for Social Innovation, AT

Antonella Passani orcid.org/0000-0003-3960-9449
T6 Ecosystems srl, IT

Margaret Gold orcid.org/0000-0003-4853-2463
Citizen Science Lab, Leiden University, NL

REFERENCES

Albert, A. (2025) *IMPETUS D4.4—Why inclusion needs to be at the forefront of citizen science—Policy Brief*. Zenodo. DOI: https://doi.org/10.5281/ZENODO.16993049

Bäckstrand, K. (2003) Civic science for sustainability: Reframing the role of experts, policy-makers and citizens in environmental governance. *Global Environmental Politics*, 3(4), 24–41. DOI: https://doi.org/10.1162/152638003322757916

Butkevičienė, E., Pučėtaitė, R., Norvoll, R., and **Canto, P.** (2022) *Co-creating youth-friendly societies through citizen social*

science. Recommendations for decision-makers in the European Union on how citizen social science can contribute to address the challenge of social inclusion for young people in Europe. Zenodo. DOI: https://doi.org/10.5281/ZENODO.10678027

Chilvers, J. and **Kearnes, M.** (eds.) (2016) *Remaking Participation: Science, Environment and Emergent Publics*. Routledge. DOI: https://doi.org/10.4324/9780203797693

Compagnucci, L., Spigarelli, F., Coelho, J., and **Duarte, C.** (2021) Living Labs and user engagement for innovation and sustainability. *Journal of Cleaner Production*, *289*, 125721. DOI: https://doi.org/10.1016/j.jclepro.2020.125721

Den Broeder, L., Devilee, J., Van Oers, H., Schuit, A.J., and **Wagemakers, A.** (2016) Citizen science for public health. *Health Promotion International*, daw086. DOI: https://doi.org/10.1093/heapro/daw086

EC DG RTD (European Commission. Directorate General for Research and Innovation). (2024) *Horizon Europe strategic plan 2025–2027*. Publications Office. DOI: https://doi.org/10.2777/092911

Fiske, A., Prainsack, B., and **Buyx, A.** (2019) Meeting the needs of underserved populations: Setting the agenda for more inclusive citizen science of medicine. *Journal of Medical Ethics*, *45*(9), 617–622. DOI: https://doi.org/10.1136/medethics-2018-105253

Haklay, M. (2013) Citizen science and volunteered geographic information – overview and typology of participation. In: D. Sui, S. Elwood, and M. Goodchild (eds) *Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice*. Springer. DOI: https://doi.org/10.1007/978-94-007-4587-2

Hetland, P. (2020) The quest for reciprocity: Citizen science as a form of gift exchange. In: Hetland, P., Pierroux, P., and Esborg, L. (eds) *A History of Participation in Museums and Archives: Traversing Citizen Science and Citizen Humanities* (1st ed.). Routledge. DOI: https://doi.org/10.4324/9780429197536

Hsieh, H.-F. and **Shannon, S. E.** (2005) Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. DOI: https://doi.org/10.1177/1049732305276687

Irwin, A. (2002) *Citizen science: A study of people, expertise and sustainable development* (1st ed.). Routledge. DOI: https://doi.org/10.4324/9780203202395

Kieslinger, B., Schäfer, T., Heigl, F., Dörler, D., Richter, A., and **Bonn, A.** (2017) The challenge of evaluation: An open framework for evaluating citizen science activities. DOI: https://doi.org/10.31235/osf.io/enzc9

Kieslinger, B., Schuerz, S., Mayer, K., and **Schaefer, T.** (2022a) Participatory evaluation practices in citizen social science: Insights from three case studies. *Fteval Journal for Research and Technology Policy Evaluation*, (54), 10–19. DOI: https://doi.org/10.22163/fteval.2022.567

Kieslinger, B., Mayer, K., Schaefer, T., and **Schuerz, S.** (2022b) *Whitepaper on co-evaluation of citizen social science*. DOI: https://doi.org/10.5281/ZENODO.7139025

Kieslinger, B., Schuerz, S., Schaefer, T., Montanari, C., Farook, Z., Haklay, M., Soacha, K., Alvarez, A., and **Cardenas, A.** (2024) *D8.1 Impact pathways assessment plan & metrics*. Zenodo. DOI: https://doi.org/10.5281/ZENODO.10704818

Leech, N.L. and **Onwuegbuzie, A.J.** (2007) An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, *22*(4), 557–584. DOI: https://doi.org/10.1037/1045-3830.22.4.557

Lin Hunter, D.E., Knebel, C.A., Newman, G.J., and **Balgopal, M.M.** (2024) Misalignment between citizen science project leaders and their organizations increases the challenges they face achieving project outcomes. *Society & Natural Resources*, *37*(7), 1017–1034. DOI: https://doi.org/10.1080/08941920.2024.2329914

Machado, S., Karsiem, S., Lavergne, M.R., Goldenberg, S., and **Wiedmeyer, M.** (2023) Respectful community engagement in health research with diverse im/migrant communities. *BMJ Open*, *13*(12), e077391. DOI: https://doi.org/10.1136/bmjopen-2023-077391

Mayring, P. (2014) Qualitative content analysis: Theoretical foundation, basic procedures and software solution. Klagenfurt, Germany: GESIS. Retrieved from https://nbn-resolving.org/urn:nbn:de:0168-ssoar-395173

Nascimento, S., Iglesias, J., Owen, R, Schade, S., and **Shanley, L.** (2018) Citizen science for policy formulation and implementation. In: Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J., Bonn, A. (eds.) *Citizen Science. Innovation in Open Science, Society and Policy*. UCL Press: London. https://www.jstor.org/stable/j.ctv550cf2.23

Ottinger, G. (2010) Buckets of resistance: Standards and the effectiveness of citizen science. *Science, Technology, & Human Values*, *35*(2), 244–270. DOI: https://doi.org/10.1177/0162243909337121

Pasgaard, M., Breed, C., Heines, M., Knudsen, L., Brom, P., Schmidt, A., and **Engemann, K.** (2023) Citizen science beyond science: A collaborative approach for transformative sustainable development. *Citizen Science: Theory and Practice*, *8*(1), 41. DOI: https://doi.org/10.5334/cstp.574

Passani, A., Annelli Janssen, and **Hölscher, K.** (2021) *Impact assessment framework*. Zenodo. DOI: https://doi.org/10.5281/ZENODO.4432132

Passani, A. and **Ancona, A.** (2023) *IMPETUS D5.1 Impact assessment methodology and collaterals*. Zenodo. DOI: https://doi.org/10.5281/ZENODO.10277363

Pateman, R.M. and **West, S.E.** (2023) Citizen science: Pathways to impact and why participant diversity matters. *Citizen Science: Theory and Practice*, *8*(1), 50. DOI: https://doi.org/10.5334/cstp.569

Receveur, A., Poulet, L., Dalmas, B., Gonçalves, B., and **Vernay, A.** (2022) Citizen science: How to extend reciprocal benefits

from the project community to the broader socio-ecological system. *Quantitative Plant Biology*, *3*, e20. DOI: https://doi.org/10.1017/qpb.2022.16

Robinson, D., Delany, J., and **Sugden, H.** (2024) Beyond science: Exploring the value of co-created citizen science for diverse community groups. *Citizen Science: Theory and Practice*, *9*(1), 13. DOI: https://doi.org/10.5334/cstp.682

Sardo, A.M., De Vito, L., Pringle, K.J., Hansen, M., Lamb-Riddell, K., Laggan, S., Cox, T., and **Williams, B.** (2025) Co-creation in citizen science: Sharing learnings and good practice from an indoor, airborne microplastics project. *Journal of Science Communication*, *24*(01). DOI: https://doi.org/10.22323/2.24010802

Schäfer, T., Kieslinger, B., Mayer, K., and **Schuerz, S.** (2020) *CoActD7.1: Impact assessment plan*. Zenodo. DOI: https://doi.org/10.5281/ZENODO.6076181

Skarlatidou, A., Haklay, M., Hoyte, S., Van Oudheusden, M., and **Bishop, I.J.** (2024) How can bottom-up citizen science restore public trust in environmental governance and sciences? Recommendations from three case studies. *Environmental Science & Policy*, *160*, 103854. DOI: https://doi.org/10.1016/j.envsci.2024.103854

Slade, M., Rennick-Egglestone, S., and **Todowede, O.** (2024) The transformative potential of citizen science for mental health. *The Lancet Psychiatry*, *11*(4), 246–248. DOI: https://doi.org/10.1016/S2215-0366(24)00008-7

UN (United Nations). (2015) Transforming our world: The 2030 Agenda for Sustainable Development. UN Resolution A/RES/70/1. https://docs.un.org/en/A/RES/70/1

UNDESA (United Nations Department of Economic and Social Affairs). (2016) *Report on the world social situation 2016: Leaving no one behind: The imperative of inclusive development*. New York, USA: United Nations. https://www.un.org/esa/socdev/rwss/2016/full-report.pdf

UNDP (United Nations Development Program). (2018) What does it mean to leave no one behind? A UNDP discussion paper and framework for implementation. https://www.undp.org/publications/what-does-it-mean-leave-no-one-behind

Varga, D., Doran, C., Ortega, B., and **Segú Odriozola, M.** (2023) How can inclusive citizen science transform the Sustainable Development Agenda? Recommendations for a wider and more meaningful inclusion in the design of citizen science initiatives. *Citizen Science: Theory and Practice*, *8*(1), 29. DOI: https://doi.org/10.5334/cstp.572

Vohland, K., Land-Zandstra, A., Ceccaroni, L., Lemmens, R., Perelló, J., Ponti, M., Samson, R., and **Wagenknecht, K.** (eds.) (2021) *The Science of Citizen Science*. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-030-58278-4

White, C., Woodfield, K., Ritchie, J., and **Ormston, R.** (2014) Writing up qualitative research. In: Ritchie J., Lewis J., Nicholls McNaughton C., Ormston R. (eds.) *Qualitative Research Practice* (pp. 368–400). Sage.

Wöhrer, V., Buchner, T., Kerschhofer-Puhalo, N., Kieslinger, B., Mayer, K., Stefanie, S., Streicher, B., et al. (2021) 'Hard to reach' or 'easy to ignore'. Strategies and reflections on including co-researchers. *Proceedings of Austrian Citizen Science Conference 2020 — PoS(ACSC2020)*, 017. DOI: https://doi.org/10.22323/1.393.0017

TO CITE THIS ARTICLE:
Schuerz, S., Albert, A., Kieslinger, B., Passani, A. and Gold, M. 2026. Social Impact and the Value of Inclusion in Citizen Science: A Case Study of 23 Citizen Science Initiatives. *Citizen Science: Theory and Practice*, 11(1): 56, pp. 1–15. DOI: https://doi.org/10.5334/cstp.1002

Submitted: 13 February 2026 **Accepted:** 28 October 2026 **Published:** 26 November 2026

COPYRIGHT:
© 2026 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See https://creativecommons.org/licenses/by/4.0/.

Citizen Science: Theory and Practice is a peer-reviewed open access journal published by Ubiquity Press.