

Stakeholders in environmental citizen science and the benefits of partnership

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The voices of stakeholders in citizen science have often been neglected within the academic literature. This research addresses facilitator stakeholders who have the expertise to support citizen science growth as well as advocate citizen science in a range of fields, particularly policy, academia, industry and education. Qualitative methods were used to interview UK citizen science stakeholders about their opinions and experiences of working in partnership with other stakeholder groups. The interviews of 26 stakeholders were analysed using template thematic analysis. The interviewees identified 22 different stakeholder groups that they partnered with and recognised collaboration as important for their citizen science project to achieve its full potential. Benefits associated with collaborations revolve around five categories: project management, sharing of information, leading positive change, creating connections and advertisement of the organisation. This research should be seen as an introduction to wider stakeholder collaboration in citizen science projects and a recognition of the need for further research on this topic.

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1. Introduction

Citizen science positively contributes to scientific research, social-ecological systems and/or outcomes for participants [1]. From the "ebird" project, it was noted that the expansion of stakeholder collaborations increased the academic and non-academic outputs [2]. More widely, decision-makers need to understand who they can partner with and the benefits of expanding their collaborative networks.

Previous research has assessed the collaboration between citizen science initiatives and citizen scientists. This has contributed to our understanding of who volunteers in citizen science [3, 4], the benefits of collaboration to collect large temporal and spatial datasets [5] and the advantage of reduced financial pressures [6]. However, there is little research assessing collaborations between facilitator stakeholders. These are organisations or individuals, who are not primarily citizen scientists, who support or run any stage of the project or benefit from the outcomes. The results of this paper are taken from an ongoing wider qualitative project examining the perceptions and understandings of citizen science stakeholders. The objective of this article is to further the understanding of partnerships in citizen science initiatives by addressing the following research questions. First, how diverse are the stakeholder groups involved in citizen science projects? Second, what are the benefits of collaboration in citizen science projects?

2. Methods

Stakeholders of environmental citizen science projects in the United Kingdom (UK) were recruited through purposeful sampling. Individuals and organisations were recruited through targeted emails, an online recruitment poster and snowball sampling. Recruitment had a success rate of 20.1% leading to 27 online semi-structured interviews that were conducted between April to July 2021. One interview was omitted as their definition of citizen science differed from the one used by the researcher and other participants. Interviewees belonged to ten different stakeholder groups and fifteen of the participants had previously volunteered as citizen scientists (Table 1).

Stakeholder Type	Number of Participants	Number of stakeholders who have participated in citizen science
Academic scientist	2	0
Business and industry employee	2	1
Citizen science coordinator/manager/practitioner	3	2
Environmental educator	1	1
Funder	2	1
Policy scientist/government employee	3	1
Civil society organisations and informal groups (e.g. NGO's)	2	1
Record centre employee	2	1
School teacher	4	3
Other	2	2
Environmental educator AND citizen science coordinator/ manager/ practitioner	1	1
Policy scientist AND funder	1	0
Academic scientist AND citizen science coordinator/ manager/ practitioner	1	1
Total	26	15

Table 1: Interviewees self-identification of the stakeholder group they belonged to and if they have participated in citizen science projects themselves

The interview material was coded using template thematic analysis which uses hierarchical levels for deeper investigation [7]. All aspects of the interviews relating to collaboration were identified and separated into three groups: 1) the identification of stakeholders, 2) what makes a successful partnership, and 3) the benefits of collaboration. These were then further divided into subcategories as outlined in the results.

3. The Diversity of Citizen Science Stakeholder Groups

All participants discussed the stakeholders they collaborated with, bar one business employee who had no external partners as their project was run within a company. Stakeholders discussed by interviewees have been categorised into 22 groups (Box 1). The answers from interviewees working in similar roles were combined. There was little difference in the number of stakeholders discussed. Almost all interviewee sets considered well-known stakeholders, such as charities and trusts, within the interviews. Stakeholder groups discussed by at least eight sets of interviewees are highlighted with an asterisk in Box 1.

Box 1: Citizen science stakeholders identified by interviewees.			
Business and industry	Ecological consultants and property developers	Media	Site managers
Care homes	Educators and educational institutions	National libraries	Software developers
Charities and trusts*	Funders*	Partnership coordinating bodies	University students and alumni
Citizen science hubs	Government agencies	Record centres and data information facilities	Working groups
Citizen science initiatives and programs*	Landowners	Religious organisations	
Community groups	Local councils/MPs	Research institutes, scientists and academics*	

4. What makes a Successful Partnership

Twenty-one interviewees discussed the importance of partnership in citizen science, drawing from their opinions and personal experiences. There was a consensus amongst interviewees that collaboration and partnership in citizen science are important:

“Citizen science by nature is very collaborative and I don’t think that projects can be effectively run without people working together and being on the same page. . . page...” (Practitioner/educator).

Seven interviewees highlighted three factors that make a successful partnership. First, communication and understanding each other were identified as important by a range of stakeholder groups. Second, a government employee and business-person discussed the need for standardisation and data quality assurance:

“...our partners have to be convinced that the data that we are providing is of sufficient quality and comparable to their own data...” (Government employee).

Thirdly, two interviewees considered the need to foster positive relationships. This was particularly important to one business employer who discussed the necessity for mature business-like partnerships.

Despite the positivity shown by many interviewees about how partnerships benefited their project, one interviewee recognised collaboration issues between the stakeholder groups they worked with:

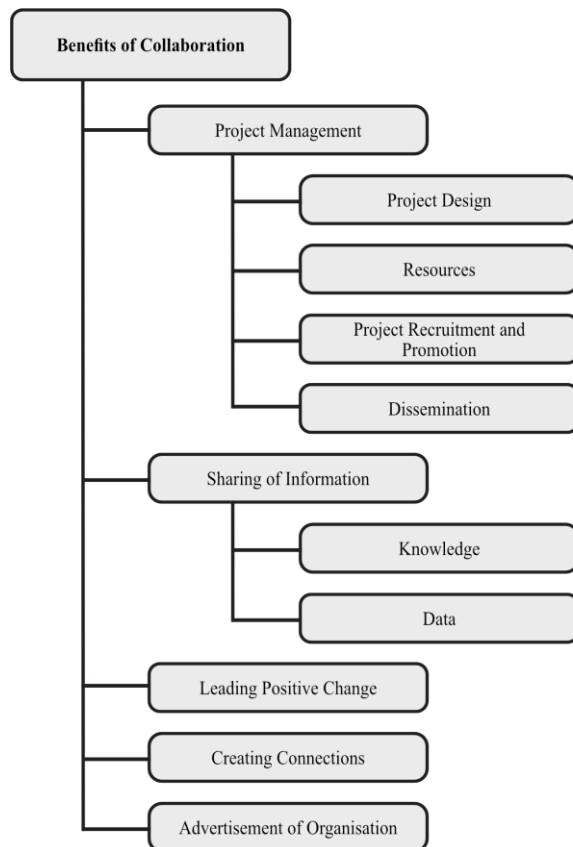
“I don't really think they collaborate a great deal at all actually. I think that's half the problem. I always work with a local expert so that when I disappear over the horizon they still have a local contact to work with. We normally continue to have a relationship with them as an umbrella charity but I don't know if they collaborate amongst themselves a great deal” (Practitioner).

Drawing upon experience, this practitioner identifies that when they left a site the communication between other stakeholder groups broke down.

5. The Benefit of Collaboration

Seventeen interviewees discussed the benefits they gained from working in partnership. This was not a topic which was predetermined during interviews but rather a reoccurring theme that was identified within the data analysis. Interviewees understanding of benefits can be divided into five main categories (Figure 1). In this article creating connections and advertisement of the organisation will not be considered as less than three interviewees discussed these topics.

Figure 1: A thematic map showing stakeholders understanding of the benefits of collaboration and the requirements for successful partnerships.



5.1 Project Management

The 12 interviewees who discussed project management referred to their understanding that partnerships can positively impact the creation, running and data dissemination of a citizen science project. Interviewees discussed the benefit(s) of having access to facilities, training and resources, such as financial and human resources. They also noted how collaboration may benefit project design, focusing on the improvements of methodologies and desired outcomes:

“...a single designer of a project will have a single outcome in mind probably of benefit to their organization... the more you can talk about these kinds of things with two or three other key partners who may have a similar requirement to use citizen scientists brains and time, then better projects could be designed...” (NGO employee).

This interviewee identified that decision-makers should be designing projects with their partners to promote a larger range of desired outcomes to be considered.

In addition to resources and project design, there was an agreement that partnerships contributed to a wider reach across communities for recruitment and dissemination. Two interviewees highlighted the importance of partnering with well-known organisations:

“...people trust known organizations... they tend to get better numbers of people to do stuff because they're trusted and they think that their information will be used in the way they want it to be used...” (NGO employee).

Both interviewees discussed the idea that well-known organisations are trusted by either the public who are being recruited or organisations that use the data. Although not discussed in the interviews, potential participants may also have a greater awareness of well-known organisations and the events they run. Reduced awareness of projects has previously been described as a barrier to participation [8].

5.2 Sharing of Information

The sharing of information between collaborators was raised by seven interviewees. Three participants discussed the sharing of knowledge or obtaining learning opportunities. Four interviewees discussed how data can be shared nationally and internationally. As one stakeholder engaged in marine citizen science eloquently stated:

“...in our field, the sea connects us all up and connects lots of different stakeholders and countries so that's why we share data and compare data...” (Government employee).

5.3 Leading Positive Change

Interviewees from a range of stakeholder groups saw citizen science as a way to enact positive changes. Two interviewees indicated that citizen science could help inform

policies or enable government agencies to investigate issues. One PhD student identified a patient advocacy group as a stakeholder. They found that working with this group gave them

“...a bigger reason for doing it, it wasn't just a PhD project, this was people's lives...” (Academic).

6. Discussion

There is a need to understand the diversity of facilitator stakeholders for researchers to continue to explore their role in citizen science as well as highlighting the variety of potential partners available to citizen science initiatives. In this research, 22 stakeholder groups were identified by interviewees, representing a wide range of expertise that can be utilised during all stages of the project. Future work should expand on this research, addressing facilitator stakeholder networks within citizen science projects and quantifying the number of projects that stakeholders are collaborating with.

Fostering collaborations was important to interviewees; however, there is a need for data quality assurance, relationships to have a mature and business-like approach, and for partners to communicate and understand each other. Relationships and communication are important for citizen science to be fully utilized, and the earlier they are established, the better the outcomes for all involved [9]. To recognise what partners wish to achieve, decision-makers need to identify their collaborators' motivations to support initiatives. There is little research addressing stakeholders' motivations. Instead, the literature focuses on the motivations of citizen scientists [3, 8, 10]. Motivations held by stakeholders in science, policy and practice include advising policy, gaining personal benefits, informing conservation and educating the public [11]. Understanding partners' underlying motivations may help foster better relationships. Strengthening relationships, supported by adequate management and protocols, can in turn alleviate concerns surrounding data quality [9].

Understanding the benefits of multi-stakeholder collaboration in citizen science is important. This research found that the benefits of collaboration could be organised into five groups: project management, sharing of information, leading positive change, creating connections and advertisement of the organisation. As this was a topic developed through data analysis, and not through interviews, it is expected that there may be further benefits of collaboration in addition to those discussed in this article. Advantages of stakeholder collaborations found in other sectors include enabling multi-perspective interpretation and increasing the potential for the findings to be implemented in industry and policy [12].

One interviewee recognised issues regarding the sustainability of their citizen science initiatives. The practitioner highlighted concerns that once they left a site the communication between local stakeholder groups began to break down. Maintaining long-term collaborations is vital and should be considered during the planning stage.

Although no other issues with partnerships were raised during the interviews it is expected that they mirror problems that occur in other multi-stakeholder workplaces. For example, challenges of health services research collaborations include competing partner priorities and different expectations of timescales by stakeholders, risking ongoing engagement [12]. Further research should focus on the limitations of collaboration in citizen science and mechanisms to alleviate these challenges.

To summarise, interviewees identified 22 stakeholder groups that they collaborated with and identified them as being important for citizen science initiatives. It is recommended that project facilitators should be involved in the planning of citizen science projects to discuss the desired outcomes, expectations of data quality, the project timeline and begin fostering positive relationships. Stakeholder collaboration has many benefits including assisting with project management, sharing information and leading positive change. Future research in citizen science needs to focus on facilitator stakeholders to further develop an understanding of collaboration and what motivates stakeholders to partake in initiatives.

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Ethics statement

The research underpinning this paper had institutional ethical approval from Loughborough University (LEON 4933).

Data availability statement

This article is part of an ongoing wider qualitative project examining the perceptions and understandings of citizen science stakeholders. The data is currently unavailable publicly but will be made available upon the publication of the PhD that it is attached to (expected 2024). Requests for the interview guide and template codes can be made to the author.

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