



## **The impact of Citizen Science activities on participant behaviour and attitude: Review of existing studies**

Anthony Morrow, The Conservation Volunteers

[a.morrow@tcv.org.uk](mailto:a.morrow@tcv.org.uk)

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## 1. Introduction

This report is part of a project undertaken by SEWeb and The Conservation Volunteers to work with individuals and communities across Scotland to measure the impact that engagement in Citizen Science activities has upon participant's environmental values, attitudes and behaviours towards the environment and its positive management. Citizen Science has a significant role to play in achieving a wide range of outcomes for people and the environment. It is recognised as a tool for engaging people with the environment and increasing their understanding of its value. Research shows that through participating in projects which monitor the local environment, people increase their knowledge and awareness of the biodiversity of their local greenspaces (5). However there has been little research to explore the impact of Citizen Science activities on their wider lives and lifestyle choices in relation to the environment and sustainability. This project will review existing literature and survey people engaged in a range of citizen science activities, gathering information on changes in attitudes and behaviours.

This review of existing literature has been written to help inform those involved in the development of Scotland Environment Website (SEWeb) and to increase understanding of the research carried out to date on the effects participation in Citizen Science or public monitoring activities has on participant attitudes and behaviours. It was SEWeb's public engagement strategy aims to provide better information on the environment, increasing people's knowledge and engagement with the natural world through activities to result in improved environmental stewardship.

The review precedes a field-based study undertaken by TCV with volunteers actively engaged in Citizen Science or public monitoring. The information gathered in this review will inform development of the approach for the field study, aimed at measuring and evaluating the impact that Citizen Science or public monitoring activities have on attitude and behaviour in both new and established participants. The review is also intended to help refine the areas targeted for analysis to improve understanding of any causal relationship and, if there such a relationship exists, how this can be strengthened and encouraged through SEWeb.

*Literature was sourced via exhaustive online research of international and UK based projects, including through Scientific Journals, Google Scholar and citations therein. A total of over 30 journals were researched and the ones referenced and selected for this review were those with most relevance to understanding the effect Citizen Science and public monitoring activities have on attitudes and behaviours of participants.*

## 2. Summary

To date there has been little research on the impact that participation in Citizen Science or public monitoring activities has on long-term behaviour of individuals. Previous research has clearly shown that Citizen Science and public monitoring activities can provide a useful and effective tool with for engaging participants with nature. In relation to behaviour and attitude it is clear that knowledge alone is not enough affect a sustainable change, however the experiential learning afforded to participants in Citizen Science and public monitoring activities provides more than simply knowledge and can have a prominent effect upon the subsequent behaviours and attitudes of participants. The complex relationships between motivation, group dynamics and experience and understanding are integral to affecting the long-term behaviour of participants, something that future Citizen Science and public monitoring projects should take into consideration during development to ensure they fulfil their purpose.

A basic summary of each project can be found in the appendix section for those interested in further reading.

### 3. Key Themes

Despite only a minimal amount of research in this area to date, there are a number of key themes that recur throughout. These themes impact upon volunteer engagement with Citizen Science and public monitoring activities and also play a key role in affecting behaviour following participation. Although there is clear overlap between themes and complex relationships between them, they can be roughly grouped under the following headings: Motivation; Group Dynamics; Understanding and Experience.

#### 3.1 Motivation

Increased motivation of participants is widely noted as an indicator for behavioural change. Understanding the motivation for a participant's initial involvement in Citizen Science activities and capitalising on these motivations for continued involvement are key in affecting changes in behaviour – in fact we should be moving “beyond demographic indicators” and researching the needs and motivations of the prospective audience to fully engage with them (3). The result of this would be greater investment in projects on behalf of participants which Crall et al (2) surmise would encourage substantial behaviour change. A study on the current state of Citizen Science as a tool for research and public engagement in 2012 (4) goes one step further than this and suggests that activities that are devised by participants themselves and address health, conservation or environmental issues can lead to long-lasting strong ties and commitment.

Longer-term engagement with participants on projects can potentially fill the gap that is required to affect direct behaviour of participants. Participants may need to be “motivated and believe that their actions matter” for them to take more direct action as a result of their participation, a point highlighted by Jordan et al: “Projects with long-term and intensive engagement of public members or those that result in visible environmental changes have been associated with participant actions such as future engagement in projects or involvement in agencies that manage resources” (5).

Empowerment of individuals through their participation in Citizen Science plays a role in behaviour change for participants, fostering citizenship (6) but also giving individuals the opportunity to engage in public discourse from an angle of greater understanding and

- Understanding participant motivation is important
- Participants need to know that their actions matter or see visible changes as a result
- Citizen Science projects devised by participants themselves lead to sustained commitment
- Citizen Science leads to ‘connectedness to nature’: a precursor for behaviour change

experience, that being with the agency of scientists (1). This allows contribution to “both sides of the decision making” in relation to policy management and environmental issues (1) and highlights the role Citizen Science plays in empowering individuals to become more actively involved.

In a reflective study on the challenges faced in changing behaviours related to the environment, Schultz (8) suggests that increased motivation for a task and “connectedness to nature” are potential routes for increasing pro-environmental behaviours. Citizen Science in this context allows a deeper connection to nature through experiential learning, negating the effect “technology-mediated lifestyles” have on connection to nature, and therefore pro-environmental behaviours.

The majority of available research addresses the theme of motivation in the context of individuals, but there is an important aspect to understand in relation to group dynamics and learning which overlaps with motivation.

### 3.2 Group Dynamics

In regards to Citizen Science, the impact of targeting groups and the effect of collective community behaviour on that of associated individuals has not been researched in depth. Motivation is noted as a key element in catalysing community activity, with both extrinsic (such as motivation by money) and intrinsic (doing an activity because it is felt to be worthwhile) factors playing a role (7), especially when “challenging social norms”, biases or preconceptions about environmental problems (8). Massung et al assessed the impact of these motivating factors and found that feedback from social peers can act as a strong motivating tool for participants, and more importantly that raising awareness of the work of the group and this new behaviour as a “social norm” can help to speed up the spread of behaviour. These conclusions are consistent with previous research that highlights the increasingly collaborative nature of Citizen Science and how interaction with like-minded communities can improve both learning and motivation (4), and the importance for participants to be able to share their experience and passion for biological recording with peers, including time for conscious

- Feedback from social peers is a strong motivating tool for participants
- Raising awareness of group behaviour can speed up acceptance of new behaviours as a “social norm”
- It is important to give groups time for conscious reflection and sharing of experience
- Apps can impact upon a wider community and spark interest

reflection (6). Jordan et al note that many participants in their study reported a behaviour change in terms of them speaking to others about the issue, highlighting again the importance of opportunity to share experience with others (5).

Of particular interest in the study by Massung et al is their comment on the potential influence that data collection through apps can have upon the wider community, drawing attention to a situation or problem and potentially leading to some volunteers taking a more active role as their interest is sparked. Again, this can be related to the motivation of the individual and understanding how to engage with them through the correct medium as well as conveying a targeted message (3).

It is important to remember that behaviour change within communities or groups is an evolutionary process and continually changes over time (7).

### 3.3 Understanding and Experience

Citizen Science is widely recognised as a vital tool in increasing the understanding of the role of science in participants, reflected in the wide variety of subjects that are now accessible and the various ways in which people can engage with them (4). Both knowledge and awareness are consistently found to be increased by participation (5), and although they alone are not strong indicators of behavioural change they do have an important role to play as one potential route for motivating individuals. Crall et al found that participation increases learning, process skills and self-reported intentions to engage in pro-environmental behaviours although their findings should be interpreted with caution as they are not statistically significant despite being consistent with previous research (2).

Three further interesting conclusions about experience are also highlighted in research to date. Firstly that active participation in specific activities during childhood has been shown to have a strong effect on related behaviour in later life (3), an important consideration for future Citizen Science and public monitoring work with children alongside their motivation for involvement. Secondly the positive impact that working with an expert can have upon participant motivation and therefore potentially on future behaviour (7) and finally the importance of capitalising upon the experience of participants (3) to increase motivation for a

- Knowledge and awareness are a route to increasing motivation for participants
- Active participation in childhood results in related behaviours later in life
- Working with an expert increases motivation
- The experience of the participants should be used to share learning in the group

project and to share learning within the group, as highlighted in section 2.2.

Schultz concludes that a “lack of widespread change in behaviour has resulted from an overemphasis on knowledge and awareness in conservation efforts” (8) and we can conclude that although both are factors in behaviour change, there are others to also consider for future studies.



## **4. Recommendations**

As a result of this review, a number of recommendations can be made for future areas of study.

### **4.1. The TCV/SEWeb project**

- Engage with individuals on a longer-term basis rather than a one-off workshop/activity
- Ensure that the motivations of the volunteers are understood and fulfilled
- Encourage group discussion and time for reflection
- If possible, use an “expert” to increase motivation of participants for the subject
- Monitor the behaviour change over time if possible and also beyond the end of the engagement with the project

### **4.2 SEWeb**

- Apps have a potentially integral role to play in highlighting subjects in a wider community context and increasing motivation of participants beyond their initial engagement
- A wider range of activities, beyond invasive species projects, is required to engage with participants
- Offer opportunity for individuals or groups involved in projects to share their experiences and learning with each other both during and beyond the length of the project

### **4.3 Considerations for future study**

- It is vital to ensure emphasis during design is placed upon understanding the motivations for participation of individuals and groups – their consultation should be sought during the development phase of Citizen Science and public monitoring projects aimed at affecting behaviour
- Additional research is required to determine if planned changes in behaviour results in actual changes

- Measurement of observed behaviour rather than reported behaviour would yield stronger results as to the actual impact participation has on behaviour

## References

1. Cooper, C. B; Links and Distinctions Among Citizenship, Science and Citizen Science; *Democracy and Education, Vol 20, No.2*; 2012
2. Crall, A.W et al; The Impacts of an Invasive Species Citizen Science Training Program on Participant Attitudes, Behaviour and Science Literacy; *Public Understanding of Science, 0(0), 1-20*; 2012
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4. Dickinson, J. L et al; The Current State of Citizen Science as a Tool for Ecological Research and Public Engagement; *Front Ecol Environ, 10(6), 291-297*; 2012
5. Jordan, R.C et al; Knowledge Gain and Behavioural Change in Citizen Science Programs; *Conservation Biology, Volume 25, No. 6, 1148-1154*; 2011
6. Lawrence, A; Reluctant Citizens? The Disjuncture Between Participatory Biological Monitoring and Environmental Governance; *Paper presented at the International Sociology Association Conference 'Environment, knowledge and democracy', Luminy, Marseilles, France*; 2005
7. Massung, E et al; Using Crowdsourcing to support Pro-Environmental Community Activism 2013
8. Schultz, P. W; Conservation Means Behaviour; *Conservation Biology, Volume 25, No. 6, 1080-1083*; 2011

## **Appendix**

### **Cooper, C. B; Links and Distinctions Among Citizenship, Science and Citizen Science**

The role that Citizen Science potentially can fulfil in increasing public participation in decision making in relation to policy management and environmental issues

### **Crall, A.W et al; The Impacts of an Invasive Species Citizen Science Training Program on Participant Attitudes, Behaviour and Science Literacy**

An invasive species focused one-off engagement with Citizen Science, including a training day for participants and evaluating on self-reported behaviour change

### **Department of Culture, Media and Sport; Culture on Demand, Ways to engage a broader audience; 2007**

Commissioned to Freeminds on behalf of the Department of Culture, Media and Sport this is an in depth look at good practice when engaging with a broad audience

### **Dickinson, J. L et al; The Current State of Citizen Science as a Tool for Ecological Research and Public Engagement**

Highlights the wide variety and number of Citizen Science subjects that are now in existence and public engagement with them. Focus on importance of increasing public understanding of the role of science and how participation can support advancement of science

### **Jordan, R.C et al; Knowledge Gain and Behavioural Change in Citizen Science Programs**

An invasive species focused, large scale Citizen Science project carried out in New York/New Jersey over a two year period. Minimal reporting of actual impact upon behaviour

### **Lawrence, A; Reluctant Citizens? The Disjuncture Between Participatory Biological Monitoring and Environmental Governance**

Addresses the gap between participation in data collection and governance by volunteers, focusing on the importance of empowerment for changing behaviour

**Massung, E et al; Using Crowdsourcing to support Pro-Environmental Community Activism  
2013**

The impact that targeting groups rather than individuals and how this affects community norms and everyday practices. Data collection through Apps is a main focus for research

**Schultz, P. W; Conservation Means Behaviour**

A reflective paper highlighting the importance of connection to nature as an indicator for pro-environmental behaviours and Citizen Science's role as an experiential learning tool