Scotland Counts

Co-Creation and Community Based Environmental Monitoring (CBEM) Citizen Science Pilot Projects

April 2016

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1. Co-Creation and Community Based Environmental Monitoring (CBEM) Citizen Science

This report aims to provide an introduction to Co-creation and Community Based Environmental Monitoring (CBEM) Citizen Science projects. It aims to explain the two types of Citizen Science approach and describe how the approaches have been piloted in Scotland by The Conservation Volunteers (TCV) with the support of Scottish Natural Heritage (SNH), Scottish Government, Scottish Environmental Protection Agency (SEPA) and Forestry Commission Scotland (FCS).

1.1 Citizen Science

Citizen Science can be simply defined as the involvement of volunteers in scientific research.
As described in TCV's previous work, across the scientific community, there is widespread recognition that Citizen Science "offers a means of doing substantial, thoughtful public outreach and of tackling otherwise intractable, laborious or costly research problems" (Gura, 2013). Participation in Citizen Science is increasingly recognised as a valuable tool for connecting people with nature and influencing the adoption of sustainable lifestyles. At a community level Citizen Science has been shown to be an agent for empowering communities to act as environmental stewards, protecting and improving their local and global environment.

1.2 Co-creation Citizen Science

Historically, early Citizen Science projects were largely contributory – where the planning, design and analysis of the project was normally led by professional scientists, with the citizens only becoming involved as participants who collected data to feed into the project. Co-created projects sit on the opposite end of the scale. The UK Environmental Observation Framework describes this process as one in which projects are designed collaboratively - scientists and participants or communities work together in partnership and at least some of the volunteer participants are involved in most or all steps of the scientific process.

This co-creation approach has been used in many different areas ranging from involving patients in the design of new NHS services through to involving consumers in developing new products. It is applied to co-created Citizen Science through which the project team may be established by a community approaching a group of scientists with a question or issue they would like to resolve, (e.g. several members of a natural history group approaching a university with an idea). The project team includes individuals from the voluntary community working alongside scientists (and/or policy makers) in partnership. The project team members work together to define goals, set the experimental approach, and analyse, interpret and communicate the findings. This approach requires willingness from all parties to listen and adapt, and an ongoing commitment to the project.

Co-created Citizen Science works well for projects that:

- Benefit from establishing a community-led or volunteer-led monitoring scheme. All parties have a stake in the project and the longevity of involvement provides opportunities for training and sharing of expertise. It does, though, require time and ongoing commitment.
- Involve small numbers of participants and in situations where all parties are willing to listen and adapt, so that a consensus can be reached.
- Require repeat measurements over time (and which therefore need a greater commitment from participants).

- Are targeted at a specific, locally relevant environmental problem or question.

(Tweddle, J.C., Robinson, L.D., Pocock, M.J. & Roy, H.E (2012). Guide to citizen science: developing, implementing and evaluating citizen science to study biodiversity and the environment in the UK).

The type of co-creation described above is "full-co-creation". Co-creation can be used for more midpoint Citizen Science projects where we introduce the idea of undertaking Citizen Science surveys but let the group develop their own methodology and aims.

Over the course of the Scotland Counts project we have trialled the idea of using co-creation, for example when partnering with Cornerstone to trial a nature engagement and Citizen Science pilot at their Galashiels branch. The pilot helped participants with physical and learning difficulties (ASD etc) to work as a supported group, identify and record wildlife they encounter on countryside visits with their group and at home in their gardens and local greenspaces. The Citizen Science pilot project was designed around the participants to fit with their interests and abilities. The two group's trialled sets of Citizen Science survey styles to see what worked best with the varying interests and abilities of the people supported by the centre.

1.3 Community Based Environmental Monitoring (CBEM) Citizen Science

Another similar approach to community led Citizen Science is CBEM. CBEM is an umbrella term for the direct involvement of local community members in monitoring, either through their participation in collaborative monitoring efforts, or by training and contracting local workers (volunteers) to carry out monitoring projects. It involves the gathering of information by local residents over a period of time.

Community Based Environmental Monitoring (CBEM) lies broadly within the field of Citizen Science and was first defined in 2003 as 'a process where concerned citizens, government agencies, industry, academia, community groups and local institutions collaborate to monitor, track and respond to issues of common community concern' (Whitelaw et al, 2003).

TCV and Kerry Riddell had previously carried out a research project in the United States where CBEM is more established and these were her findings:

- CBEM works bests if it comes 'from within' a community, either initiated by them or developed through a co-created process. Successful CBEM projects take time and patience to set up and should be a partnership involving stakeholders from the community, government agencies, local community groups, NGOs and academia. Access to scientific expertise in data collection and interpretation is essential.
- Support from a coordinating and/or enabling body such as a university or NGO is an important factor in achieving long term sustainability of a CBEM project. Funding is also important.
- To galvanise and sustain volunteer participation CBEM must fit with the values, needs and aspirations of a community and have relevance to the life of volunteers. Outcomes must be achieved too, in particular an influence on local decision making. Monitoring activities often work best if they are one of a range of environmental stewardship activities that volunteers can participate in.
- A robust *process* is essential; this should include a plan for communicating data to volunteers and community members and support to volunteers to communicate their findings to scientists and local decisions makers confidently. Providing volunteers with a sense that their monitoring activity is valued and will influence decisions is critical to the sustainability of the project.

In 2015/16 TCV ran a number of pilot projects to investigate using Co-creation and CBEM approaches with community groups in Scotland. Case study examples of both approaches are explored below.

2. Co-created Citizen Science recording with Space to Grow, Maryhill

2.1 Pilot Summary

The Conservation Volunteers worked with the community group 'Space to Grow' in Maryhill, Glasgow to enable a group of keen volunteers to co-create and trial a suitable method of recording wildlife. The volunteers were supported to find the most suitable recording methods for their needs, interests and abilities. The various recording methods were narrowed down to using OPAL surveys to gather and record data, which was trialled and found suitable for the participants.

The pilot aimed to;

- enable a group of volunteers from Space to Grow to establish their own co-created project
- support the group to establish a pilot engaging in outdoor environmental recording activities (Citizen Science), using the co-created methodology
- improve the group's health and wider community integration through their participation
- increase participants skills and knowledge about local wildlife and the environment
- trail an engagement methodology for Citizen Science with Space to Grow with a view to producing guidance for other similar groups to use

2.2 Pilot Methodology

A group of active volunteers had developed around the new Space to Grow community gardening project in 2014/5. Through discussions with interested participants from Space to Grow, we discovered they were interested in getting involved in surveys which would allow them to learn more and record the wildlife which was in the garden, as well as allowing volunteers to get involved with monitoring wildlife in the wider area. We agreed to set aside days to trial a range of Citizen Science surveys that appealed to the group, matched their abilities and topics they wanted to learn more about in order to monitor and record the local wildlife and environment.

We carried out a series of initial communications to establish interest and plan logistics. We then met with the Space to Grow volunteers to discuss our pilot project and pinpoint what aspects of the natural world they would be most interested in and gather information on what the community would like to monitor, and what information may support Space to Grow work.

It was identified that there would be 4 delivery sessions within the Wyndford Estate and surrounding greenspaces. It was also clear that Space to Grow volunteers were most interested in learning about local terrestrial invertebrates, air quality (lichens), tree ID and health and earthworms and soil.

From here the participants and TCV set dates and put a programme of delivery in place.

- 2 x 2 hour staff discussions with Space to Grow volunteers to explore and identify their wildlife recording interests to help steer the pilot project's learning
- 4 x 3 hour Citizen Science sessions involving up to 8 attendees per session

2.3 The Pilot Group

Maryhill and the Wyndford Estate in Glasgow experience a range of low socioeconomic status factors. The 2012 Scottish Index of Multiple Deprivation (SIMD) results for the 4 main Wyndford data zone wards showed an average level of employment deprivation of 41% (with one zone recording 49%) and an average level for income deprived of 40%. In this context the opportunities for volunteers to experience local biodiversity, nature and general science activities are extremely limited. Nonetheless, TCV's recent project showed huge enthusiasm to learn about local greenspaces and biodiversity.

The pilot group consisted of 8 adults from the ages of 45 to near or beyond retirement age who regularly volunteer in the community garden. In general the group were in good health though one member experienced mild mental health issues and some physical disabilities. The group were all from the Wyndford Estate except for one member who lived locally. The group was led by a TCV staff member.

2.4 The Monitoring Activities

The Wyndford Estate is an area of the city of Glasgow. Located in the Maryhill district in the Northwest of the city, Wyndford is bounded by Maryhill Road to the north and the River Kelvin to the south. Within the Wyndford Estate there are an array of open spaces and greenspaces planted with well established trees and shrubbery. Adjacent to the Wyndford Estate is the Kelvin Walkway; both environments provide a home for local wildlife and Citizen Science recording options within an urban setting.

As a co-creation pilot, the idea was to work in collaboration and offer a range of ideas and methods around Citizen Science recording. Together, the group and TCV went through these options, looking at the benefits and drawbacks of each.

Space to Grow looked at FSC identification keys, Nature Detectives guides and OPAL surveys. The group quite quickly settled on the simple choice of recording method using the OPAL surveys. The group found that the OPAL survey pack subjects are what they wanted to learn more about and found the survey instructions easy to follow. The group were provided with an OPAL survey pack relating to our Citizen Science subjects. The OPAL booklet, recording sheet and ID guide were portable enough that it was taken on our survey sessions and used when they undertook their gardening tasks.

From our discussions it was identified that there would be 4 delivery sessions within the Wyndford Estate and surrounding greenspaces. It was also clear that Space to Grow volunteers were most interested in learning about and recording the following OPAL surveys:

- **Session 1: Bugs Count Survey**
- **Session 2: Air Quality Survey (Lichens)**
- **Session 3: Tree Health Survey**
- **Session 4: Soil and Earthworm Survey**

The group were very interested in the above topics because they were inspired to know more about the insects they saw visiting the garden. They wanted to determine if the type of insects they saw were good and whether they would benefit their garden. The group thought that acquiring the skill to identify such insects would benefit the group to help distinguish between beneficial and pest insects.

The Space to Grow group were curious about the different types of trees in their local area and whether the trees have any pests or diseases that may spread into their garden and surrounding greenspaces. The group felt it was important to learn how to look for signs and identify features that may present pests or diseases. Through these discussions, it was commented that they always wondered what those 'things' growing on the trees are and were amazed to find out that lichens are important and are used to indicate air quality.

As a group of gardeners the quality and type of soil is very important. When the group discovered that there was a Soil and Earthworm survey they were eager to gain knowledge to understand the role earthworms have in recycling plant nutrients and aerating the soil whilst investigating the soil make up of the Wyndford Estate.

During all OPAL surveys we took wildlife recording equipment with us to capture and sample specimens. Bug pots, sweep and butterfly nets to capture live specimens so that they could be viewed closely by the group without issues of fear of stings etc. The group learned how to use the nets safely and correctly to protect the insects from damage and allowed them to be released when safe to do so. Lichens were collected from fallen branches and leaves from trees to aid learning and identification with hand lenses and ID guides. As the pilot progressed, gradually record collecting became something they did within most of their usual activities.

From the start we discussed with the group whether their interest was in long term monitoring or purely a series of engagement sessions. Some were interested in longer term monitoring and the group expressed that they would like to keep a record of the information and data collected for their use and to submit records to contribute to data sets to indicate an abundance and variety of biodiversity in an urban area. However the main focus of most of the project was engaging volunteers in learning more rather than setting up systems of long term monitoring.

Photo 1: Space to Grow learning how to catch insects using a butterfly net.

Photo 2: Space to Grow identifying lichens within the Wyndford Estate to help determine the air quality of Maryhill.

Photo 3: Space to Grow hunting for worms and testing the pH of the soil.

Photo 4: Measuring the girth of trees within the Wyndford Estate.

2.5 Pilot Learning

To ensure that the experiences of the pilot help inform our future approach, we noted as much detail as possible of the progress made throughout. From these experiences below we can make some recommendation to help improve similar future projects.

2.5.1 Engagement

1. How easy was it to recruit the participants?
2. What resources were required to engage the participants?
3. What was the 'hook' for participants, why did they want to get involved?

The group of 8 were easy to recruit due to the great success of our Community Food Growing project, "Space to Grow". An opportunity arose to create an exciting new pilot in Maryhill with the community group and it has successfully begun to support local participants to learn and develop their knowledge of wildlife around the Wyndford Estate and surrounding greenspaces.

Space to Grow were introduced to a variety of Citizen Science engagement surveys and resources. The group looked at FSC identification keys, Nature Detectives guides and OPAL surveys. The group commented that the FCS identification keys and Nature Detectives were okay but preferred the survey style, layout and resources provided in the OPAL survey packs.

The group were enthused by the different OPAL surveys and thought the majority were easy to take part in. They all thought that they had enough materials/equipment to be able to carry out the surveys. We let the groups decide what they were capable of. As well as providing packs to the groups, TCV staff went over each individual survey with them so that they could try them out themselves. Due to the easy to follow step-by-step guides of most of these surveys, the participants commented that the felt confident enough to carry on by themselves. However, continued contact and repeat visits were required and carried out by TCV staff and this proved very important in maintaining enthusiasm and involvement with the surveys.

There was a genuine interest to discover and record the local wildlife. All of the participants had a general interest in finding out more about their area and in taking part in something new with a range of specific interest including lichens, trees and insects.

2.5.1a Recommendations for Future Engagement

- Practical sessions with the groups covering any difficulties with the surveys and helping them understand the natural progressions between different surveys proved very important to engaging the group.
- Even though the groups enjoyed the different surveys, it was noted that it might be much easier for them to look out for specific indicator species & upload photographs due to time commitments and the difficulty with bringing extra equipment/materials.
- Tailoring the activities that linked in with particular groups' specific interests, their availability and surveys which are applicable to their site was essential.

2.5.2 Set Up

1. What did we need to do to prepare participants?
2. How much dialogue was required with participants in order to organise the project?

There was quite a lot of dialogue at the beginning of the project to explain the method of co-creation and that the group would be engaged in 'hands-on' Citizen Science sessions which would allow them to voice their aspirations and concerns for the local environment and develop confidence and skills to carry out surveys.
The group decided that our sessions would take place on a Monday as all the group members were available. Text messaging was the best form of communication followed by a letter sent to the participants households. We texted the group a few days before our session and the morning of the session to ensure everyone was attending.

We provided clear information, for example explaining that if possible we would spend the session outside going through the surveys and that no experience was necessary. We also gave a talk to the Space to Grow group on the benefits, personally, locally and nationally to the individual and to wildlife of Citizen Science. Regular visits greatly helped the group form the method they were most comfortable with and kept the momentum going at the beginning. Group enthusiasm was high and gained real momentum as each participant built confidence to conduct the OPAL survey.

2.5.2b Recommendations for the Future Set Up:

- We carried out the OPAL surveys in their community garden and local greenspaces known to participants. Sharing of experience and local knowledge worked well. Making sure that the participants understood why the surveys were important was crucial and focusing on their areas of interest was key.

2.5.3 Training

1. What training was required?
2. How long did it take?

Practical sessions were important to introduce the OPAL surveys. These sessions allowed TCV staff to go over each survey in detail with the group so that they felt they could replicate them themselves and inform other/new members on how to run them. In order to conduct the range of surveys, onsite training took place before carrying out the survey, roughly 1 hour depending on numbers, weather and interest. The group were used to a 3 hour work day from working in the garden. Basic wildlife training was provided to the group to aid identification and expand knowledge. Training on how to complete the OPAL recording sheets was also done. We looked at the specimens related to each survey through collecting specimens before our survey or going on a short nature walk exploring the subject matter. The group decided that the training and the survey would be carried out on the same day.

The first session was a slow confidence building process although the group were in good spirits. Through carrying out more sessions the groups enthusiasm grew with their confidence. It was noted that the availability of follow up sessions was important. Repeated follow up sessions were also important in maintaining the motivation of the groups.

Furthermore an additional training session focussed specifically on iSpot was carried out. iSpot was promoted and demonstrated as a resource for identifying flora and fauna to a group who have limited or no ID skills. The session demonstrated ways iSpot could be used by the group and collated their feedback on iSpot.

The group were fully engaged in trialling the use of iSpot and in the weeks following the training a member of Space to Grow with a Smartphone got the group together, logged into iSpot on the Smartphone and as a team they uploaded an observation they had seen the previous week to iSpot and within minutes an expert on iSpot successfully identified the unknown bird – very happy and excited group members. When the group got their identification they progressed to Google the bird species to find out further information. This shows that even in

groups with limited confidence and skills, given some support and additional training, iSpot can be a very empowering tool for community groups to use which they can go on to use under their own steam in future.

On the whole, iSpot has proved to be well-liked by Space to Grow and a welcomed tool and resource to help identify wildlife they encounter especially for a group of individuals who are underrepresented and currently possess basic wildlife identification skills. iSpot will most definitely support the groups recording activities.

Even though iSpot is a great asset and tool to help identify wildlife for Space to Grow, a common barrier that keeps surfacing for this group is the resources needed to use and access iSpot (computer, camera, IT skills and internet facilities). In spite of this, these resources can be available at the Maryhill Hub and via group members yet it is uncertain if group members will remain keen and enthusiastic to use iSpot as additional preparation is required to access such facilities.

2.5.3c Recommendations for the Future - Training:

- The surveys were simple enough to be carried out by all. This was good as no previous experience was necessary. However, some surveys e.g. air quality and tree health survey proved to be slightly difficult for some participants.
- It was crucial that the training offered was flexible. Offering a range of surveys and adapting to their skills and interest as well as working around the other commitments of the groups was essential in maintaining involvement and engagement.
- It would be useful to consider ways to integrate iSpot for those with limited internet access or skills. For example allowing the user to enter information offline and upload when there is internet available and possible paper submissions to iSpot.
- Do not over complicate the survey terminology. Keep the dialogue simple and to the groups needs and abilities.
- Allow the group to choose their preferred survey method.

2.5.4 Data and Feedback

1. Was the data accurate?
2. Was it usable?
3. How simple was the processing?
4. What feedback was provided to participants?
5. How appropriate was the feedback for the participants (what did they think of it)?

Overall the surveys were simple enough that anyone could take part. Participant's knowledge for the site helped with recording and accuracy. At the start of the sessions TCV recorded the data on the OPAL survey sheet. As confidence grew, group members took the lead and recorded data themselves. The data generated from the OPAL surveys were either input to OPAL via online or sent by post. This way the data could be verified by an expert and the data stored within OPAL records.

Furthermore, contact was made with Glasgow City Council and Glasgow Museum Biological Records Centre. The records collected were sent to the Glasgow Museum Biological Records Centre to be verified and to collate this information as there aren't many records for this area.

A few group members were keen to take photographs rather than writing a record and description then used iSpot to aid identification. The Space to Grow group have a dedicated iSpot page which they upload content.

The group are now able to collate useable records and upload photographs to iSpot and this enabled their knowledge and confidence to grow as the pilot went on.

2.5.4d Recommendations for the Future - Data

- Citizen Science surveys tend to be aimed at all and accessible to all. This worked well as participants experience and knowledge varied within groups.
- To aid motivation and involvement, if the participants were able to see how their data is stored within these organisations and how the data may be used for policies. For example if a co-creation project is to develop more into monitoring where the group has control and management of the data then it needs to be stored in a way which means the participants have more control over and access to the data.

2.5.5 Participants

1. Who were the participants?
2. What was their role (i.e. did they just turn on the monitor or did they submit data and/or play a role in designing the activity?
3. How did they find the experience of participating?

The participants were volunteers of the Space to Grow community group. The group consisted of 8 dedicated volunteers who have been volunteering at their community garden for over a year. The role of the pilot was to look at wildlife recording methods and design a route for them to become involved that suited their interests and abilities.

The participants thought the OPAL surveys were very informative and most of the surveys were applicable and suitable for their site. They were all very interested in taking part in the surveys and enjoyed learning about them and trying them out. Participants were encouraged to explore and expand their knowledge about their natural environment through the OPAL surveys. TCV staff continuously monitored the participant's engagement levels and praised them on the responses to the wildlife surveys.

The participant's enjoyed being able to send their records to the Glasgow Museum Biological Records Centre and view their own data on iSpot. Initially this was done by TCV and now the group have taken this role on. The group felt like they have been rewarded with the knowledge that their efforts are appreciated and that their records are valuable. It also puts Maryhill on the biological recording map.
The sessions were supported by TCV staff and even though they are keen it was apparent that due to time constraints and difficulties factoring in these surveys into their existing programme of activities the group may struggle to keep on using these surveys outside of dedicated sessions.

2.5.5e Recommendations for the Future - Participants:

- The group showed the possibilities of using Citizen Science in their wider work, for example with new volunteers at the community garden.
- The group volunteer their time to look after their community garden which creates time constraints.
- It is also apparent that ongoing support and advice such as that provided by TCV staff was key in maintaining involvement and motivation of the groups.

2.5.6 Outcomes

1. What wider outcomes were achieved through the pilot (knowledge, attitudes, behaviour change)?

The pilot project showed a wonderful level of enthusiasm and willingness from the community of Maryhill. We engaged the group to participate in 'hands-on' Citizen Science sessions allowed them to voice their aspirations and concerns for the local environment and develop confidence and skills to carry out community based monitoring.

This has given the participants a better understanding of the relevance of science in protecting and improving the local environment and supporting the community in working together to gather knowledge about the world around them, protect and develop their environmental assets, build capacity, confidence and citizenship.

Through Citizen Science we encouraged Space to Grow volunteers to unravel and explore their local greenspaces by discovering the wildlife and biodiversity on their doorstep. These sessions addressed issues such as isolation, lack of training, lack of new experiences and opportunities to meet new people and bring a greater sense of purpose and involvement in something collectively important.

Overall, the project has encouraged a more diverse range of individuals to spend time outdoors, to engage in Citizen Science in their local green spaces and have considerable benefits for individual health and wellbeing as well as for the community as a whole. From the feedback questionnaires we know that participants found the pilot:

Feedback from participants:

- "Pure enjoyment – no difficulty"
- "It is a fascinating project"
- "Citizen Science is important and everyone should get involved, whether it is a little or a lot. It will benefit everyone"
- "Overall I enjoyed it and it was not too difficult"
- "It was interesting and also fun to get involved in"
- "Nice to get outdoors"
- "Very interesting as well as relaxed"
- "Easy to understand and use various guides"
- "I'm learning skills I always wanted but never got round to it. A deeper understanding of what I see everyday"
- "Fun and informative for all ages and abilities"

Recommendations from the feedback from participants show that:

Through the surveys we asked for feedback on what the group would need to continue to take part in these surveys. The feedback suggested that training, guidance and encouragement were the main issues. It is possible to combat these with additional funding to support the group and to provide resources. Space to Grow has now been successful in gaining another years funding to continue the project and we are pleased that Citizen Science will be a key element of the ongoing project.

<u>What support would you/your group need to continue to take part in Citizen Science surveys like theses ones?</u>

- "More help, guidance and training. Possibility more materials and equipments"
- "Training and guidance"

- "Continuing guidance and encouragement"

Through the survey we asked for feedback on how you would like to see this project develop in the future. The feedback indicates there is a need for regular monitoring sessions to be organised as through the project a real interest has developed to continue to monitor the environment and wildlife for the long term.

How would you like to see this project develop in the future?

- "More sessions would be good, once a month would be ideal"
- "More sessions done the more we learn"
- "Regular recording sessions throughout the year would be good"
- "Mentoring and training opportunities"

2.5.6f Recommendations for the Future - Outcomes

- Citizen science surveys like the OPAL surveys are a great way for community groups to learn more about their local wildlife and environment and to use the information to help them in the conservation and maintenance of the site.
- Provide more follow up sessions to assist with guidance, training and mentoring.
- Make available more regular sessions to touch base with the group to provide ongoing engagement and encouragement to continue to record.
- Provide sessions throughout the year to monitor changes in species and the environment.

2.5.7 Recommendations

Overall, we believe that the co-created pilot project has been a success. We have drawn together the recommendations from the project in the overall conclusion section.

As a final point co-creation is easy when the main aim is engagement. Participants are involved in what they want to do. We can allow Space to Grow to follow and carry out surveys they find interesting as the main focus is not about producing data and results. It is merely the engagement to enthuse and provide a community group who would not normally take part in Citizen Science activities the opportunity to develop skills and knowledge to inspire, encourage and introduce the concept of long term monitoring.

In the next co-created case study we explore opportunities to develop and deliver a co-created project which is more focused on the results and feeds into council and policy requirements but allows the project to be co-created with volunteers.

3. Co-created Citizen Science recording linked to flooding with a local community group in Clackmannanshire

3.1 Pilot Summary

TCV and Clackmannanshire Council are working in partnership to develop a co-created pilot project linked to flooding with a local community group in Clackmannanshire. We are currently in the development phase of the project and our meetings have been very positive and productive.

Clackmannanshire Council are assisting us to identify specific information and/or data lacking linked to flooding and ways we can help fill these data gaps through delivering a Citizen Science pilot project with volunteers. Thus our Citizen Science activities will be meaningful and useful and guided by the flooding / resilience / Natural Flood Management (NFM) theme. At the same time, as with any co-created Citizen Science project, the group will be given the flexibility to plan a design how they want the project to develop.

The Principle Roads and Flooding Officer, Sustainability Officer, Countryside Ranger and Citizen Science Coordinator have explored a range of opportunities for a flooding related topic to pilot a Citizen Science project in Clackmannanshire and prepared a diverse list of ideas:

1. **Photograph key vantage points on Hillfoots burns to monitor sediment chokes and blockages**

Background
Sediments are the building blocks of discrete habitats, such as bars, which, depending on their character, are subsequently colonized by different species. Such features can also change the flow depth and velocity. In general, however, the more natural and varied the channel character, the higher the ecological value.
Deposition of sediment and vegetative debris along with growth of vegetation act to increase the chance of flooding through their influence on channel roughness and blockage potential (i.e. at structures such as culverts and bridges). This can act to reduce conveyance and increase afflux and associated in-river water level and hence flood risk. (Delivering benefits through evidence - Key Recommendations for sediment management – A Synthesis of River Sediments & Habitats (Phase 2))

Measures may therefore need to be taken to plan and undertake sediment removal or other sediment-related activities to manage and reduce flood risk. The effects of these activities on the natural environment must be understood to ensure that protecting people and property from flooding can be achieved whilst also delivering the greatest possible environmental benefits.

Aim – photograph key vantage points on the Hillfoots burns to monitor sediment chokes and blockages at:

1. Tillicoultry confluence to River Devon
2. Alva burn A91 Road Bridge
3. Dollar burn water race + beneath MLR Bridge to the south

The aim would be take a photograph at an agreed vantage point to monitor sediment chokes and blockages on the above burns. We can also correlate this to river and rainfall levels, for example taking a photo of Dollar burn and a photo of the river level/rainfall gauge. Further to this we can also tie in invasive non native species monitoring along the river banks.
We want to improve our understanding of the interactions between sediments choke and blockages over time in the context of flood risk management. This information would be useful to Clackmannanshire Council to investigate how sediments move over time.

2. **Photograph targeted hotspots of gullies to monitor blockages and observe if pluvial flooding will/has occurred**

Background
Gullies or road drains as they are sometimes called. These gullies collect the water running off public road and other paved surfaces.

Gullies are usually located adjacent to the kerb where the road meets the footway and have a metal grating as a cover. Sometimes these gratings can become blocked on the surface with mud or leaves and prevent the water draining. Also, on occasion the gullies get blocked at its outlet pipe or cannot handle the capacity of water flowing and overflow onto the road.

Aim – photograph targeted road gullies to monitor blockages of drains that may cause pluvial flooding in Hillfoot towns

3. **Monitor stretches of watercourses** – Hillfoot Burns and/or stretches of the River Devon

Aim - Identify a range of watercourses, monitor via taking photographs

3.2 Pilot Project Development

There has been a delay is developing and delivering this pilot project due to severe weather resulting in localised flooding in Clackmannanshire. The demand and efforts on staff have been huge and now we are able to spend time and take the project forward.

Although the project will be co-created with participants, the preferred option to invest time and efforts is option 1- photograph key vantage points on Hillfoots burns to monitor sediment chokes and blockages. With this rough outline of a project in place we will now engage interested volunteers and work with them to develop how the project will be evolved to suit their interests and experience.

3.3 The Monitoring Activities

It is hoped that volunteers will monitor identified sites throughout the year on a regular basis and from the same vantage point – via taking a photograph and making a note of what they see and description of the day.

Through regular monitoring we are able to chart climate change as well as wear and erosion. By undertaking projects such as this we are able to pinpoint pressure sites, such as flooding areas, bank erosion and sediment build up along burns and rivers, which allows us to take action to protect and improve our local environment for the future.

We will be able to can track and monitor the changes across the seasons.

3.4 Set Up

Safety is imperative. It is recognised that access to key points along the River Devon and Burns will need to be easily accessible and not in direct danger during every element of weather. Permissions from the landowner would need to be sought and/or made aware of our work.

3.5 Engagement

In this co-created project we explored opportunities for the council to identify specific information and/or data lacking linked to flooding and ways we can help fill these data gaps through delivering a Citizen Science pilot project with volunteers.

In the Space to Grow co-created project the aim was primarily engagement activities. In contrast, for this co-created project we want to develop a project design that produces valuable data but needs to be co-created with volunteers. Thus the next stage of the planning process will involve giving volunteers the opportunity to plan and design how the project is steered with input from the council. This is a challenge where we want to generate useful data for the council but at the same time fulfil the needs, interests and abilities of the volunteers.

The two co-created case studies mentioned above illustrate the progression between co-created engagement techniques (Space to Grow - which is easier) and trying to still use the co-created approach here but with tighter parameters about what we actually want the volunteers to achieve.

A follow up report will be distributed once the flooding pilot project has been completed.

In the final case study we examine the Community Based Environmental Monitoring (CBEM) approach where we built up engagement sessions, skills and confidence and we really encourage and want the community group to take control of their long term monitoring project.

4. Community Based Environmental Monitoring (CBEM) with Friends of the River Kelvin (FORK)

4.1 Pilot Summary

The Conservation Volunteers worked with the community group 'Friends of the River Kelvin' (FORK) in Hillhead, Glasgow to facilitate a Community Based Environmental Monitoring (CBEM) project. A process where concerned citizens collaborate to monitor, track and respond to issues of the local community. Together TCV and FORK created and trialled a suitable method of recording the environment and wildlife. The volunteers were supported to find the most suitable recording methods for their needs, interests and abilities. The various recording methods included FSC identification keys, Nature Detective sheets and a selection of Citizen Science mobile Apps though like the Space to Grow group the participants narrowed this down to using OPAL surveys as their preferred method to gather and record data.

The pilot aimed to;

- enable a group of volunteers from Friends of the River Kelvin to establish their own CBEM project
- support the group to establish a pilot engaging in outdoor environmental recording activities (Citizen Science), using the CBEM methodology
- enable Friends of the River Kelvin to collect longer term monitoring data for their own purposes
- increase awareness and value in engaging participants with the River Kelvin and environment
- increase participants and wider community knowledge about local wildlife and the environment
- trail an engagement methodology for Citizen Science with Friends of the River Kelvin with a view to produce guidance for other similar groups to use

4.2 Pilot Methodology

TCV launched an exciting new pilot project with FORK to assess the level of interest of local people and volunteers in getting involved in recording information about the wildlife and environment of the River Kelvin. TCV consulted with FORK members and volunteers during FORK's Summer Gala event and interested participants completed our questionnaire. The questionnaire allowed us to gather information on what the community would like to monitor, and what information may support FORK's work.

From the questionnaire it was identified that there would be a number of delivery sessions at the Ha'Penny Bridge House, Lower Kelvin Walkway by the Glasgow Botanic Gardens. It was also evident that FORK members and volunteers were most interested in the OPAL surveys learning about local terrestrial invertebrates, water invertebrates and the health of the River Kelvin and air quality (lichens).

Following on from the questionnaire, discussions with Sally Johnston, FORK's Chair we agreed to set aside days to trial a range of Citizen Science surveys that appealed to the group, matched their abilities and topics they wanted to learn more about in order to monitor, track, record the local wildlife and environment and respond to issues of the local community. The surveys would compliment a range of conservation activities that FORK normally undertake by the River Kelvin and surrounding greenspaces.

- 1 x 5 hour summer gala engagement event with FORK members and local people to present the questionnaire to explore and identify their wildlife recording interests to help steer the pilot projects learning
- 4 x 3 hour Citizen Science sessions involving up to 10 attendees per session

4.3 The Pilot Group

FORK is a group of people who care passionately about the river Kelvin and its wildlife. The group organises and holds regular clean ups of the river every month and hosts its annual summer gala on the river. FORK wanted to expand their skill set to be able to identify, monitor and record their local environment and wildlife to contribute to the wider picture of science and it was clear that Citizen Science engagement would be ideal.

The majority of pilot volunteers were FORK members who consisted of adults from the ages of 25 to near or beyond retirement age and the children of the adults from the ages of 4 to 10 years old.
The pilot also attracted participants from the nearby Glasgow University and local residents. Most volunteers were from the local area and had an interest in the local wildlife and environment. The group was led by a TCV staff member.

4.4 The Monitoring Activities

The Glasgow Botanic Gardens is an arboretum and public park located in the West End of Glasgow. FORK has its own HQ at Ha'Penny Bridge House, beside the river and within the Lower Botanic Gardens. The House lies on the Kelvin Walkway, popular with walkers, commuters, cyclist, dog-walkers and runners.

The Lower Kelvin Walkway boasts a range of habitats for local wildlife and many Citizen Science recording options within an urban setting.
The River Kelvin is a haven for wildlife with kingfishers, dippers, herons and otters just a few of the many species that can be glimpsed along its length. There is also a wide variety of trees, shrubs and plants along the river and surrounding greenspaces.

As a CBEM project, the design of the recording was to engage the direct involvement of local community members in monitoring. The aim was to start with their participation in collaborative monitoring efforts which could evolve over time to them carrying out monitoring projects over a period of time.

Through the questionnaire it was identified that the choice of recording method using the OPAL surveys would best to suit the group's needs and capabilities as it is easy to follow the survey instructions. Just like Space to Grow, FORK was provided with an OPAL survey pack relating to our Citizen Science subjects. The OPAL booklet, recording sheet and ID guide were portable enough that it was taken on our survey sessions and extra booklets were available in Ha'Penny Bridge House for volunteers attending their other conservation tasks.

The introductory training sessions enabled the group to get a flavour of how to develop their own monitoring projects in the near future. It was identified that there would be 4 delivery sessions taking place at the Ha'Penny

Bridge House, Lower Kelvin Walkway within the Glasgow Botanic Gardens to learn how to undertake the variety of wildlife and environmental surveys they are most interested in.
The results from the questionnaire and through discussions with FORK members the first three sessions were dedicated to learning more about three key surveys: it was evident that the group were most interested in gaining knowledge to monitor, track and record the following OPAL surveys:

- **Session 1: Bugs Count Survey**: The group learned and discovered the incredible variety of invertebrates living in and around a range of habitats in the Lower Kelvin Walkway.

- **Session 2: Water Survey:** In the Water Survey the group learned about water pollution and that many aquatic invertebrate animals cannot survive in polluted water, so their presence or absence indicates the extent to which a body of water is good or bad quality to help determine the health of the river.

- **Session 3: Air Quality Survey (Lichens):** In the Air Survey the group studied lichens found on trees and also looked for tar spot fungus on sycamore leaves to generally identify the state of air pollution in the Lower Kelvin Walkway.

- Based on their experiences in sampling these three surveys the fourth session was dedicated to looking at how the group could start to extend their experience to evolve from group engagement sessions to longer term monitoring. It was recognised early on that their passion lies in monitoring the River Kelvin. Because of this, FORK members wanted to revisit the Water Survey in the fourth session in more depth to gain a better understanding of how to carry out the survey themselves, where to send records of their results and discuss how the group will take the monitoring forward with monthly sessions.

As with the Space to Grow group we took wildlife recording equipment with us to capture and sample specimens. The group learned about health and safety when working in and near a large river to collect information on water clarity, pH and kick sampling to identify the presence or absence of indicator freshwater invertebrates.

During their Bugs Counts survey FORK recorded a beetle amongst other species and sent their records to the Glasgow Museum Biological Records Centre. It was discovered that they recorded a species of beetle previously not recorded in the Lower Kelvin Walkway area. To the group this was a huge achievement in the sense of successfully recording specimens especially the beetle as well as contributing to larger data sets for their local area. Essentially this is a small example of how monitoring can support the work of a group like FORK. By discovering the beetle it enabled them to talk through social media channels about an interesting and important find on the river and use this as a way to encourage more people to value the river and get involved in their volunteering activities.

As mentioned above FORK's interest lies in the River Kelvin. A member of FORK is a long standing dedicated riverfly monitor volunteer with the Clyde River Foundation. They have been sampling on the River Kelvin since early 2013. Even though this member has been involved in long term monitoring of the River Kelvin they welcomed the chance to grasp the approach of CBEM. Along with this they appreciated our efforts of trying to emphasise and encourage other FORK members of the progression of volunteers from taking part in engagement sessions moving onto becoming frequent monitors for the River Kelvin.

Photo 1: FORK searching for insects to identify and record.

Photo 2: FORK testing the River Kelvin's pH and water clarity.

Photo 3: FORK identifying lichens to help determine the air quality.

4.5 Pilot Learning

To ensure that the experiences of the pilot help inform our future approach, we noted as much detail as possible of the progress made throughout. From these experiences below we can make some recommendation to help improve similar future projects.

4.5.1 Engagement

1. How easy was it to recruit the participants?
2. What resources were required to engage the participants?
3. What was the 'hook' for participants, why did they want to get involved?

An initial list of FORK members, local residents and contacts was compiled from the questionnaire results. The interested participants were contacted via email outlining the project details including session topics and dates. This resulted in a list of participants which included local residents and existing FORK members.

Similarly to Space to Grow, the core group was fairly easy to recruit due to their involvement with other FORK activities and interest in the River Kelvin and surrounding greenspaces. This project adds real value to their already existing programme of activities and increases awareness of the value of the River Kelvin and encouraged more people to get involved through Citizen Science.

The group were inspired by the different OPAL surveys and thought the majority were easy to take part in. They all thought that they had enough materials/equipment to be able to carry out the surveys. We let the groups decide what they were capable of. As well as providing packs to the groups, TCV staff went over each individual survey with them so that the group could try them out themselves. Due to the easy to follow step-by-step guides of most of these surveys, the participants commented that they felt confident enough to carry on by themselves. However, as experienced with Space to Grow, though to a lesser extent, continued contact and repeat visits were required and carried out by TCV staff and this again proved very important in maintaining enthusiasm and involvement with the surveys.

There was a real interest to discover, monitor, track and record the local wildlife. All of the participants had a general interest in finding out more about their area and in taking part in something new with a range of specific interest including terrestrial and water invertebrates, lichens and the wider environment.

4.5.1a Recommendations for Future Engagement

- Attending the Summer Gala day to promote the project and distribute the questionnaire to collate information on the participants and their interests worked very well and enabled a much wider collection of people in the area to learn about Citizen Science and get involved in the project.
- Practical sessions with the groups covering any difficulties with the surveys and helping them understand the natural progressions between different surveys proved very important to engaging the group.
- Even though the group enjoyed the different surveys, it was noted that more interest lied in learning about the health of the River, kick sampling for specific indicator species. It was also recognised that it may be easier for them to upload photographs to iSpot as a record for example due to time commitments.
- As with the previous projects, tailoring the activities that linked in with particular groups' specific interests, their ability, availability and surveys which are applicable to their site was essential.

4.5.2 Set Up

1. What did we need to do to prepare participants?
2. How much dialogue was required with participants in order to organise the project?

As mentioned above, emails were sent to promote the project, to explain who we are, and that we would be covering a range of Citizen Science surveys identified by FORK members and local residents and that it is essential for us to collate feedback on the pilot project.

The core group who responded decided that our sessions would take place on a Sunday as all the group members were available. We informed the participants that we were going to go through OPAL surveys. We provided clear information, for example explaining that if possible we would spend the session outside going through the surveys and that no experience was necessary. We used social media to further promote our project and to attract new participants.

Continued liaison was required over the months of the project, for example to provide more OPAL survey packs, phone conversations if any part of the survey was unclear and arrange follow up sessions with the group.

4.5.2b Recommendations for the Future Set Up:

- We carried out the OPAL surveys in their patch within and near the river known to participants. Sharing of experience and local knowledge worked well. Making sure that the participants understood why the surveys were important was crucial and focusing on their areas of interest was key to ensure the future of long term monitoring would be of interest to the group.
- It was fairly easy to set up the project due to FORK being an active and established group in the community. It may be worth targeting established groups for CBEM projects.
- The use of social media, Facebook, Twitter and blogs worked well to promote the project and drum up interest with FORK members, the nearby Glasgow University and local residents.
- It was key to have a good working relationship with the chair and key members of the FORK to disseminate information widely to members.

4.5.3 Training

1. What training was required?
2. How long did it take?

In parallel with Space to Grow, practical sessions were important to introduce the OPAL surveys. These sessions allowed TCV staff to go over each survey in detail with the group so that they felt they could replicate them themselves and inform other/new members on how to run them. In order to conduct the range of surveys, onsite training took place before carrying out the survey, roughly 1 hour depending on numbers, weather and interest. Basic wildlife identification training was provided to the group to aid identification and expand knowledge. Training on how to complete the OPAL recording sheets and using recording equipment was also covered. The group decided that the training and the survey would be carried out on the same day.

In general the group felt they could take part in the survey although it was noted that the availability of follow up sessions was important. Repeated follow up sessions were important in maintaining the motivation of the group and to assist more difficult parts of the survey.

Additionally iSpot was integrated into the CBEM sessions on an ongoing basis. It was apparent FORK had the resources to use iSpot, found iSpot easy to use and grasped the concept of iSpot quickly. We found that integrating iSpot in a number of their sessions was an effective way to build their confidence with its use. This showed how useful it was as a tool, in particular in building capacity of volunteers with a range of identification skills to develop longer term monitoring projects.

4.5.3c Recommendations for the Future - Training:

- The surveys were simple enough to be carried out by all. This was good as no previous experience was necessary. However, some surveys e.g. air quality proved to be slightly difficult for some participants.
- As well as providing training on the survey method it is worthwhile to incorporate iSpot into the sessions to convey that iSpot is a useful resource to aid identification and build their confidence to use iSpot.

4.5.4 Data and Feedback

1. Was the data accurate?
2. Was it usable?
3. How simple was the processing?
4. What feedback was provided to participants?

5. How appropriate was the feedback for the participants (what did they think of it)?

On the whole the surveys were simple enough that anyone could take part. Participant's knowledge for the site helped with recording and accuracy. As a CBEM project FORK need to have control and ownership of the data generated from their monitoring efforts. The data generated from the OPAL surveys were either input to OPAL via online or sent by post. This way the data could be verified by an expert and the data stored within OPAL records. The issue with FORK submitting records to OPAL is that the records are collated as a whole to help OPAL understand which species were found most, where species can be found in the UK and information used to write scientific articles. On a local level there is no way to find out what their records will be used for by OPAL.

In addition, contact was made with Glasgow City Council and Glasgow Museum Biological Records Centre. The records collected were sent to the Glasgow Museum Biological Records Centre to be verified and to collate this information on their database as there are not many records for this area.

In this respect the use of iSpot might be more useful for FORK to submit and store data. It would be beneficial for FORK to create an iSpot account and utilising iSpot would be a way to actively submit and store all records collated in one place.

Most importantly, FORK has kept paper copies of their records at Ha'Penny House where anyone is able to access them. The group plan to build up a robust set of records through long term monitoring of the environment. The collected data will be used for their own knowledge and understanding and interest for influencing site management plans for example, the data could be used to sway the council to improve greenspaces to benefit wildlife, prohibit construction in areas where there is an abundance of biodiversity and for Glasgow City Council Local Biodiversity Action Plan.

Alike with the co-created project, it was vital to provide feedback to the group once their records were submitted and verified to these organisations.
The group thought it was a good motivation to see where the records go and that they have been successfully verified. It was expressed that a sense of satisfaction that their role in monitoring the environment is playing an important part for larger organisations. Crucially the group really felt motivated and organised to monitor the environment for the long term to start to assemble records for their own data sets that could really make a difference to the local environment and their data could hold power to control site management and local decision making.

Overall the group now have essential knowledge to allow them to identify, record, store and submit records.

4.5.4d Recommendations for the Future - Data

- Citizen Science surveys tend to be aimed at all and accessible to all. This worked well as participants experience and knowledge varied within groups.
- Conversely, it would aid motivation and involvement, if the participants had more control and access to data they are generating. For example if they could see direct impacts for the data they are producing to influence site management.
- Thus as a CBEM, it is important for the group to keep and store their results before they send the records off for their own knowledge/understanding, interest and for influencing site management. So far this was achieve through some duplication by keeping paper copies of their records as well as submitting to OPAL. It would be good in the longer term to develop more integrated data management options.

- It would be valuable for groups to be provided with better tools to give them more control over data they collect and how they can manage the date. Therefore follow up sessions to look more at iSpot and SEWeb would be useful. SEWeb especially which could allow the group to build their own survey around what data is already recorded. For example on the River Kelvin, the group can assess what role they can play in monitoring information for the long term and how it can help protect and improve the river.
- Providing the group with simple record sheets where they could list all of their findings each month and compare them – something visual and easy for them to see how much they are finding out about the environment and chart any changes in the environment.

4.5.5 Participants

1. Who were the participants?
2. What was their role (i.e. did they just turn on the monitor or did they submit data and/or play a role in designing the activity?
3. How did they find the experience of participating?

FORK is a society formed in 1991 to build public awareness and commitment to the care and maintenance of the Kelvin and its tributaries preserving a rich natural habitat and a place of unspoilt beauty in the heart of the city, FORK exists to improve the state of the River Kelvin and its environment. So far FORK mainly do litter picks and runs an annual Gala on the river but they are interested in looking at other ways to increase public awareness and protect the River Kelvin therefore Citizen Science and CBEM offers a great way to achieve this.

The core participants were volunteers and members of FORK and local residents. The group consisted of volunteers who have been volunteering with FORK for a number of years. The role of the pilot was to work together with FORK to design the CBEM project to begin to collect monitoring records of the wildlife and environment for the long term.

4.5.5e Recommendations for the Future - Participants:

- The group showed the possibilities of using Citizen Science in their wider work, for example with new volunteers and incorporating into litter picks and Citizen Science activities as part of their annual Gala.
- As with Space to Grow group, the volunteers give their time to look after the River Kelvin and greenspaces which can create time constraints. They also found that ongoing support and advice such as that provided by TCV staff was key in maintaining involvement and motivation of the groups.

4.5.6 Outcomes

1. What wider outcomes were achieved through the pilot (knowledge, attitudes, behaviour change)?

This pilot proved hugely valuable and enjoyable. Participants increased their knowledge and the wider community has engaged in appreciating the wildlife value of their area. Participants were encouraged to get outside and active, with considerable health and wellbeing benefits and started to build a community of people committed to learning about and protecting their local environment: “loved it - simple, clear science. I thoroughly enjoyed today out by my favourite river and seeing others enjoy themselves is great”.

By and large, the pilot has provided the opportunity to work together with FORK and local residents to design a CBEM project specifically tailored to their interest, needs and capabilities to help increase their skills to monitor and value their own environment for the long term.

Participants found the surveys appealing and the group thought of ways they could use them during their existing activities and to organise new activities specifically focussing on monitoring the environment. From the feedback questionnaires we know that participants found the pilot:

- "Very enjoyable"
- "Good fun but important activity"
- "Loved it, simple clear science"
- "Great leadership and excellent materials gives confidence to take part"
- "I think information was made accessible to people regardless of previous knowledge and experience"
- "I really enjoyed learning about the environment and it gave me the feeling that I can actually do something myself"
- "Great way to enthuse and involve people with environmental issues"
- "Very informative, great that there were lots of people there who were enthusiastic about the topics covered
- "Well led and a way to get insights into environmental surveys"
- "Identification of different organisms was a little bit challenging but the ID guide was quite useful"
- "The Citizen Science project has made me more aware of the nature around me and given me confidence to take part in environmental monitoring"

On reflection, the group really enjoyed the outdoor sessions especially that it was "simple clear science" that everyone can get involved and understand. It was mentioned that the OPAL resources provided to them had all the necessary information needed to carry out the survey. From the questionnaire we know that the level of science pitched to the group was ideal for them to comprehend and to take forward the surveys themselves.

FORK's Chair Sally Johnston: "The Citizen Science project with The Conservation Volunteers has been a really rewarding one for FORK, attracting families and a wide range of keen citizen scientists who have been really enthusiastic and embraced the materials and information that Amanda introduced us to. We've spotted species not previously recorded by the River Kelvin, learnt how to monitor, identify and record, and it feels useful to be feeding this information into a national database. FORK now feels confident enough to take on a series of Citizen Science days and aims to involve those who came to this first project to design and lead on the next series"

Recommendations from the feedback from participants

Through the surveys we asked for feedback on what the groups would need to continue to take part in these surveys. The feedback suggested that materials, training and equipment were issue. It is possible to combat these with additional funding to support the group and to provide resources. Depending on capacity TCV can signpost potential funding avenues for the group to apply for.

<u>What support would you/your group need to continue to take part in Citizen Science surveys like theses ones?</u>

- "People to guide"
- "More materials and training"
- "Materials and equipment to collect the data"
- "We feel we would be able to call for help if/when needed"
- "Regular guidance/training and materials"

Through the survey we asked for feedback on how you would like to see this project develop in the future. The feedback indicates there is a need for regular monitoring sessions to be organised by FORK members as there is a real interest to continue to monitor the environment and wildlife for the long term.

How would you like to see this project develop in the future?

- "Organise regular monthly sessions"
- "Annual, seasonal activities would be great"
- "Regular meetings to do surveys and data collection on water quality, botany and further training"

4.5.6f Recommendations for the Future - Outcomes

- Citizen science surveys like the OPAL surveys are a great way for the community to learn more about their local wildlife and environment and to use the information to help them in the conservation and maintenance of the site.
- Provide more follow up sessions to assist with guidance, training and mentoring.
- Make available more regular sessions to touch base with the group to provide ongoing engagement and encouragement to continue to record.
- Provide sessions throughout the year to monitor changes in species and the environment.

4.5.7 Recommendations

On the whole, we believe that the CBEM pilot project has been a success. We have drawn together the recommendations from the project in the overall conclusion section.

5. Overall conclusions, Co-created and CBEM Citizen Science Pilot Projects

On the whole the co-created and CBEM pilot projects have had many successes, lots of enthusiasm and both Space to Grow and Friends of the River Kelvin saw the value of Citizen Science. Both groups enjoyed and benefitted from being involved and considerably developed confidence and skills.

The evidence of our pilots shows that groups need ongoing support to stay involved and motivated in monitoring and Citizen Science, particularly if we want to engage those outside traditional bio-recording communities. Our Space to Grow community group fits the criteria of individuals who would not normally bio-record and are inspired and encouraged to continue monitoring through the influence and presence of TCV.

We have found considerable enthusiasm in many areas and groups, but equally that to engage community groups fully in Citizen Science, and in particular to move from short term engagement, to longer term monitoring programmes, requires ongoing involvement of professional staff who are skilled in designing flexible sessions which improve participants skills and confidence. However, above both of these, the pilots would suggest the most important element of the ongoing staff involvement is in maintaining enthusiasm.

Through piloting the above Citizen Science projects we have built a large network of 'entry level Citizen Scientists' and we need to create more opportunities for their ongoing support and development as individuals and for community groups. Three key issues are present in both the Space to Grow and FORK Citizen Science pilot:

- All our pilots suggest ongoing support is required. How do we resource this?

- How do we move groups like Space to Grow and FORK from enjoying engagement sessions, taking part in one off surveys and get participants actively monitoring and recording their own areas for the long term.

- Capturing and storing data – do community groups continue to monitor record and store data on BRISC recording sheets or there is a need to create a new method for groups to capture and store monitoring data.

5.1 Key recommendations

- Recruit local support, having a lead person to organise things and help maintain momentum is very useful.

- Look for links with other groups nearby. For example linking the Space to Grow and FORK groups added considerably to both groups' resources and motivation.

- Provide Citizen Science survey options but allow the groups to choose their preferred survey method.

- Keep in touch regularly and provide positive and constructive feedback; it is appreciated by the participants.

- It is important to tailor the sessions to the audience with particular groups' specific interests, their ability and surveys are applicable to their site. For example try not to be too technical and formal; Space to Grow is a group who possess basic wildlife ID knowledge and it worked best to use species common names rather than referring to them by their Latin name and FORK's sessions were tailored to their interests in the River Kelvin.

- Make sure participants understand "Why?" - What will results be used for and how can they use the data for their purposes. iSpot will help support the recording activities.

- Be very clear and upfront with the simplicity of the co-creation approach. Co-creation can just be about the engagement, a hook into Citizen Science activities, getting outdoors and meeting new people.

- It is essential that participants understand the CBEM approach. They may need support to develop from taking part in initial engagement sessions to building up confidence and skills to monitor the environment for the long term on a regular basis.

- To sustain and develop a long term CBEM projects, long term support, training and funding avenues would benefit the community groups greatly.

- We found OPAL surveys to be a really valuable tool - participants found them enjoyable and accessible. It would be invaluable for projects like this if the data from the OPAL surveys could be more easily managed and manipulated to help groups to develop their own recording and monitoring projects.

- Groups would also benefit from the support of scientific expertise in data collection or an enabling body, for example a University. This would be the next step for a group like FORK; to tie them in with a University who could work with them to help them collect and manage their data.

- However, simple methods can be used effectively to track change from their monitoring results. This can be in the form of photographs, keeping a journal and/or excel sheet.

- These methods of recording data need to be suited to the group. It is important to remember that not all individuals/community groups have access to technology (internet, computer, Smartphone, etc.) thus allowing the participant the ability to write data offline on paper on a BRISC recording sheet and submit the sheet via post or upload data direct to local recording centres and/or recording data on an excel.

- It would add value to suggest or provide a list of simple wildlife guides and FSC sheets, with iSpot to help support the community groups and recording activities

- Dedicated sessions to explore iSpot and SEWeb are also useful. These online resources are valuable to co-created and CBEM projects to allow data submission and store data in the one place. These resources can also provide the group suggestions to create their own survey method.

In conclusion there has been an impressive interest in the Scotland Counts Co-created and CBEM pilot projects which we believe shows great potential for further engaging community groups in environmental monitoring. However, whilst there is great enthusiasm there is a low level of skills and confidence and we believe ongoing support, encouragement and advice and further tools to aid data management are required to move participants in programmes such as Friends of the River Kelvin and Space to Grow from being enthusiastic participants, to being independent, proactive long term environmental monitors.