

# DELIVERABLE 2.1

## The Bristol Approach for Citizen Science



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**“ParCos – Participatory Communication of Science”**  
**A HORIZON 2020 RESEARCH AND INNOVATION ACTION**

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## SUMMARY

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Deliverable D2.1 - The Bristol Approach for Citizen Science - provides a framework for issue and people-led citizen science which is being developed, tested and refined within the ParCos project. It is the output of Task 2.1 Models of Civic Empowerment. This report introduces the ParCos project, key terminology (e.g. citizen science, participatory citizen science, science communication), and The Bristol Approach - reflecting on its previous use in projects and how it will be developed for citizen science. The report contains the first version of the Bristol Approach to Citizen Science published in month 6 of the project and it focuses on what is needed to support delivery of the three ParCos case studies. An updated version will be published in month 30 (June 2022) of the project which will draw upon the learning from the use of the framework within each of the case studies. The updated framework will integrate the various methods and tools created within the ParCos. A 2<sup>nd</sup> report and the final methodology will be published on the ParCos Platform and also on an updated version of The Bristol Approach website will be created showcasing the ParCos case studies.

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# 1 INTRODUCTION

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Deliverable 2.1 - The Bristol Approach for Citizen Science - provides a framework for issue and people-led citizen science and is the output of Task 2.1 Models of Civic Empowerment in Work Package 2 (WP2) of ParCos. This report contains an introduction to ParCos, citizen science, participatory citizen science and science communication, as well as The Bristol Approach and how it is being updated for citizen science. It contains the first version of the framework, with a focus on what is needed to support delivery of the three ParCos case studies (Belgium, Finland & UK). An updated version of the framework and an accompanying report will be published in June 2022 (month 30 of project) and this will draw upon the learning from using the framework within each of the case studies and will integrate the methods and tools created within ParCos.

## 1.1 THE PARCOS PROJECT

Participatory science and engaging activities are key to ensuring science communication increases public engagement in science. This can be achieved through collaborations between scientists and the non-scientist public. However, concerns about public science literacy are on the rise. The EU-funded PARCOS project will work to create participatory science stories that link to source material that the public can interpret for themselves. The project will explore ways to ensure diversity and inclusion in science participation and communication. It will also discuss the creation of engaging stories for the public that include the public in science activities and the interpretation of the outcomes. By disseminating stories alongside evidence, the audience will be invited to tell their own stories using the ParCos tools.

## 1.2 PURPOSE AND ROLE OF THIS DELIVERABLE

This deliverable sits within WP2 ‘Supporting Community-led science practice’ under Task 2.1. ‘Models of Civic Empowerment’. The purpose of the task is to expand upon The Bristol Approach, to create a framework that supports a people and issue-led process for citizen science and engagement creating Deliverable 2.1 (Bristol Framework). The first version in month 6 (June 2020) focuses on what is needed in the case studies being delivered in WP4 of ParCos. An updated version will follow in M30 (June 2022) which integrates what is learned from the case studies and it will integrate the new methods and tools created in the project.

Key activities undertaken within this task are to:

- Extend the approach so it provides improved support for empowering citizens in communicating the outcome of citizen-led science initiatives, drawing upon the work within WP3 (Finding and telling stories from science data) and WP6 (ParCos Platform).
- Support case study 1 and 3 to use the Bristol Approach in their own contexts.

- Understand how the Bristol Approach can be used to scaffold activities of ‘secondary science’ inquirers who begin science activities after engaging with participatory science stories developed in the case studies.

This is the first report and will be followed by one in June 2022 and the final version of The Bristol Approach for Citizen Science will also be published on the ParCos Platform and The Bristol Approach website <https://www.bristolapproach.org/bristol-approach/> along with the PARCOS case study examples (content from Deliverables 5.1, 5.2 and 5.3)

## 2 PARTICIPATORY CITIZEN SCIENCE

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### 2.1 WHAT IS CITIZEN SCIENCE AND SCIENCE COMMUNICATION?

In the Oxford English Dictionary Citizen science is defined as ‘scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions’. The European Commission uses this definition and it says that ‘citizen Science is often linked with outreach activities, science education or various forms of public engagement with science’ (European Commission 2016, p. 54).

Citizen science is a rapidly expanding field and has links to a range of concepts including open science and open innovation. Open science deals with issues such as accessible (or open access) to data and publications, open evaluation and policies, as well as developing open source tools. Citizen science can enable open science but it is also an aim of citizen science i.e. involving citizens in research, opening up the process of creating new knowledge through participation and creating greater understanding of science (Hecker et al., 2018). Engagement in citizen science can also stimulate participation in policy-making.

Historically, science and innovation opportunities have only been available to a minority of the population, such as staff in universities or large companies with research departments. Citizen science offers the potential to open up research to society, enabling it to become more inclusive and providing opportunities for the public to ‘learn about science, to understand and discuss scientific methods, standards and values and develop their overall scientific literacy’ (Hecker et al., 2018a, pp.7). This can increase awareness of scientific research and also involve society in addressing problems faced in everyday life as well as global challenges. It also provides opportunities for citizen science participants including learning opportunities, empowerment, enjoyment, social engagement and enhanced scientific capital (Edwards et al., 2018).

Citizen science expands public participation in science and supports alternative models of knowledge production. However, there are a wide variety of approaches to citizen science which can involve different levels of participation e.g. ranging from professional scientists designing projects which citizens input to part of the project through to participatory citizen science where they are involved in all stages of the research from generating the ideas,

through to doing the planning, undertaking the research and disseminating the results. This is explored further in Section 2.3.

Science communication is a core element of the citizen science process and a key focus of ParCos (Participatory Science Communication). Within the scientific literature science communication has traditionally been divided into two paradigms. The first view is as the one-way transmission of information from ‘expert’ scientists to the general public. Whilst other models view it as a dialogue and discussion between the public, experts and decision-makers (Holmen and Kappel, 2019). Key to the success of citizen science is the need for more open science communication and the use of multiple forms of media within the research process i.e. motivating people to get involved in projects and stay involved (Hecker et al., 2018a). Novel forms of partnerships and more engaging approaches to news making are also required as alternatives to the traditional broadcast media and newspapers e.g. this can include social media (Hecker et al., 2018b).

## 2.2 THE TEN PRINCIPLES OF CITIZEN SCIENCE

The European Citizen Science Association (ECSA) is a non-profit association set up to encourage the growth of the Citizen Science movement in Europe in order to enhance the participation of the general public in scientific processes. They draw upon more than 200 individual and organizational members from over 28 countries across the European Union and beyond. ECSA developed the ‘Ten Principles of Citizen Science’ <https://ecsa.citizen-science.net/engage-us/10-principles-citizen-science> which is shown in Box 1. This was developed in collaboration with an international community of citizen science practitioners and researchers to set out their shared view of the characteristics that underpin high quality citizen science.

## 2.3 PARTICIPATORY CITIZEN SCIENCE

The ECSA Ten Principles of Citizen Science emphasise inclusiveness and societal benefits. Whilst citizen science has the potential to bring societal benefits, inclusivity is not an automatic outcome of the projects. Participation is a potent term, complex in nature and open to multiple interpretations (Haklay, 2018). In fact, citizen science projects take very different approaches to the type and level of citizen participation. At one end is ‘contributory’ citizen science, where projects typically ask citizens to participate in scientific data collection. At the opposite end is ‘extreme’ citizen science which opens up participation in all aspects of research and seeks to involve people from a wide range of backgrounds (Haklay 2013). Haklay (2018) argues that participation should be valued at many levels which could range from occasional contribution through to deep engagement in shaping research projects and carrying them out from start to finish. ‘Different people, with different life histories, interests and responsibilities, need the opportunity to engage in different levels of participation in citizen science’ (Haklay, 2018, pp. 61). What is important is that a citizen science project is transparent about the approach used and considers what it is asking from participants and understands why they want to get involved and how they will benefit from participation.

### **Box 1: The Ten Principles of Citizen Science (ECSA, 2015)**



1. Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding.  
*Citizens may act as contributors, collaborators or as project leaders and have a meaningful role in the project.*
2. Citizen science projects have a genuine science outcome.  
*For example, answering a research question or informing conservation action, management decisions or environmental policy.*
3. Both the professional scientists and the citizen scientists benefit from taking part.  
*Benefits may include the publication of research outputs, learning opportunities, personal enjoyment, social benefits, satisfaction through contributing to scientific evidence, for example, to address local, national and international issues, and through that, the potential to influence policy.*
4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process.  
*This may include developing the research question, designing the method, gathering and analysing data, and communicating the results.*
5. Citizen scientists receive feedback from the project.  
*For example, how their data are being used and what the research, policy or societal outcomes are.*
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.  
*However unlike traditional research approaches, citizen science provides opportunity for greater public engagement and democratisation of science.*
7. Citizen science project data and metadata are made publicly available and where possible, results are published in an open-access format.  
*Data sharing may occur during or after the project, unless there are security or privacy concerns that prevent this.*
8. Citizen scientists are acknowledged in project results and publications.
9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data-sharing agreements, confidentiality, attribution and the environmental impact of any activities.

The ParCos project is situated at the ‘extreme’ or participatory end of citizen science – working with citizens around problem identification, definition, data collection, analysis and through to communication and evaluation. At the heart of ParCos project is empowering citizens for participation in research and innovation using participatory citizen science.

Frameworks to orchestrate civic engagement are continuously emerging to boost civic action and innovation in many sectors including citizen science. One example is the participation palette (see Figure 2) developed by LUT University which is a framework that portrays the current levels of participation when it comes to ICT enabled participatory initiatives. The palette is based on the work from the ladder of participation (Arnstein, 1969), levels of participation and engagement (Hakley, 2013) and the types of participation in citizen science (Shirk et al., 2012). Each of the five tones in the palette represents a deliberative act of civic participation. It shows that the highest levels of empowerment are achieved when citizens are co-creators or even more so when fully in control. However, to achieve this requires creating an environment where citizens can act autonomously in mobilising around a common issue, conducting scientific experimentation and finding evidence, in learning and applying new skills and accessing necessary materials and tools to further their aims. In the ParCos project we will be adapting The Bristol Approach (a people and issue led participatory design framework) for citizen science which is discussed in detail in Section 3.

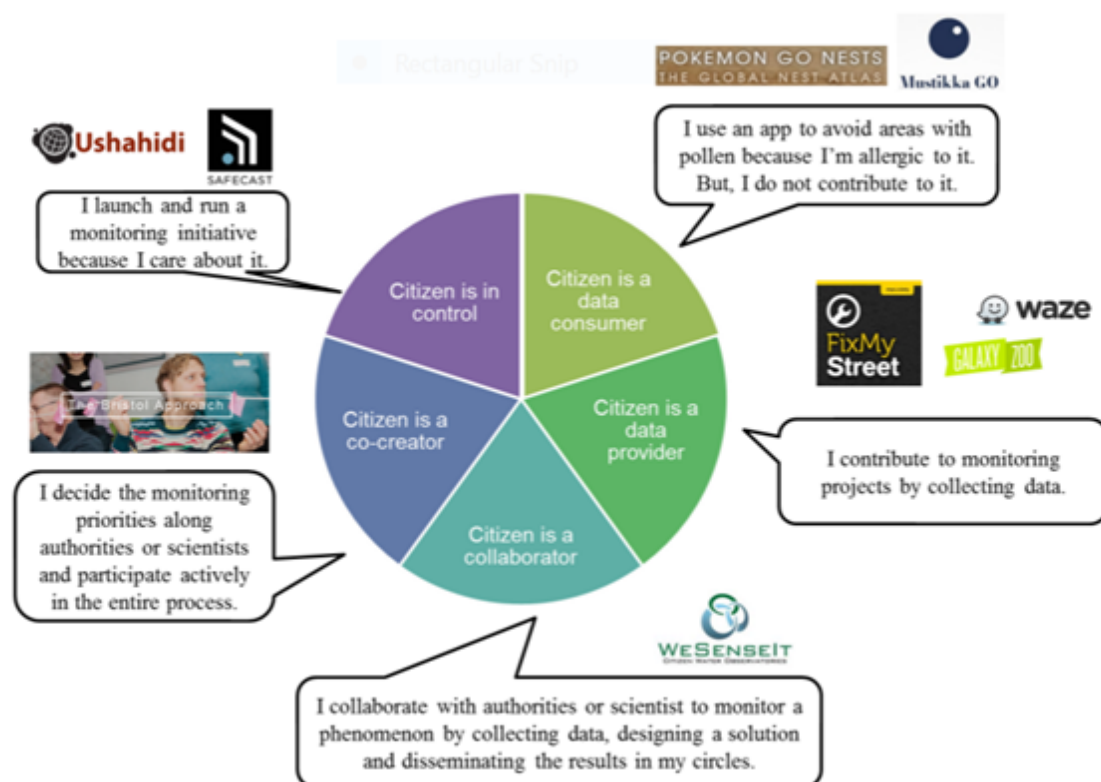


Figure 2: Palette of participation in technology-enabled civic engagement (Palacin-Silva / Porras, 2018).

Participation can be examined along many axes including gender, ethnicity, socio-economic status, education or location. The majority of citizens who participate in citizen science are well educated (Haklay, 2018) and finding ways of engaging less educated and less privileged participants is an important goal if citizen science genuinely wants to move towards involving everybody. There is a need to open up the range of voices, values and visions directing and shaping citizen science projects and to include wider societal perspectives (Stevens et al, 2014). Therefore, within the design of citizen science projects, it is important to consider issues of power, exploitation and commitment to engagement. It is important that participation is meaningful and adjusted to participants’ own interests, histories and ways of thinking and learning. If the sense of meaning is lacking, potential participants may refuse to be involved or withdraw rapidly, leaving only the ‘usual-suspects’ (Peltola & Arpin, 2018). This is a topic the ParCos project will be exploring further in Task 2.2. of WP2, where we will be creating a set of ‘Principles for diversity and inclusion’ to be used and further developed within the ParCos citizen science case studies.

## 3 WHAT IS THE BRISTOL APPROACH?

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### 3.1 THE BRISTOL APPROACH

The Bristol Approach is a participatory design methodology, which is people and issue led rather than pushing pre-determined ‘solutions’ onto people. It is a six-step framework (see Figure 3) which provides a set of tools and a way of working that helps different groups to tackle the pressing issues in their community and create a greater understanding of the topic. The starting point for The Bristol Approach is the belief that citizens should have a leading role in imaging, designing and building their future. It provides opportunities for those least often heard to share their knowledge and wisdom and it has people and their everyday experiences and knowledge at its heart (Stewart-Hall and King, 2018).

The framework was originally developed by KWMC in collaboration with Mara Balestrini (Ideas for Change) and Bristol City Council, and it was called ‘The Bristol Approach to Citizen Sensing’. It built upon the learning from previous work by Balestrini and KWMC. ‘Citizen sensing is an approach that develops and uses lightweight technologies with local communities to collect, share and act upon data’ (Balestrini et al., 2017, p.2282). In doing so it enables communities to become more aware of how they can tackle local issues. Balestrini et al. (2017) report on the development and uptake of the City Commons Framework for Citizen Sensing. They describe how the framework builds upon the Participatory Action Research phases - plan, act, observe, reflect (Whyte, 1991) and integrates the principles of participatory design (Foth and Axup, 2006; Muller, 2003; Schuler and Namioka, 1993) with user centred design (Boehner and DiSalvo, 2016; Sanders and Stappers, 2012).



**Figure 3: The Bristol Approach – The 6 Step Framework (The Bristol Approach, 2020)**

The Bristol Approach to Citizen Sensing has six steps as illustrated on Figure 3 and it is designed to be used in an iterative way where move around the circle. At the centre of this is the idea of City Commons which is described in Section 3.2. Below each step is described:

1. **Identification:** The 1st step involves identifying issues people care about (matters of concern), mapping community organisations, business and others affected by the issues and who might be interested in working together towards a solution.
2. **Framing:** The 2<sup>nd</sup> step involves exploring the issues identified in more detail and framing it as a shared goal. Identifying if and how technology and data can be utilised, uncovering resource available and identifying gaps in resources and knowledge that need to be filled.
3. **Design:** The 3<sup>rd</sup> step involves co-designing and identifying the tools and interactions that are needed to tackle the issues at stake. Identifying skills and the creation of a governance and management protocol around data and technology is crucial here.
4. **Deployment:** The 4<sup>th</sup> step involves taking the tools out into the community to be tested and collecting data. Privacy and security issues need to be considered, considering the needs and views of the participants. Key to this phase is the organisation of events to enable social interactions between the different

participants with different levels of knowledge and skills. This phase contributes to the city commons e.g. open source technologies, open data and new skills.

5. **Orchestration:** The 5<sup>th</sup> step involves sustaining engagement as well as scaling it up to engage a broader group of people. This includes drawing attention to what has been made (including sense making and sharing of the data collected), encouraging others to use the tools created and data collected (contributing to the city commons) and celebrating what has been co-created.
6. **Outcome:** The 6<sup>th</sup> step involves reflecting on the goals and assessing if and how they were achieved. Finding out what has been learned, sharing insights gained, and identifying new opportunities. It involves ensuring the outputs are accessible and contributing to the city commons.

The early citizen sensing work that led to the development of The Bristol Approach to Citizen Sensing was focused on a project with two strands of activities (pilot projects). The first was ‘Dampbusters’, where sensing technologies were co-designed to address the problem of damp homes in an area of Bristol where residents face challenges such as fuel poverty and unemployment (Balestrini et al., 2017; KWMC, 2016). The second was ‘Change Creators’, where a group of eight 18-25 year olds from Bristol took part in a creative leadership programme and developed two projects using the framework: diversifying mental health support and reducing food waste (Stewart-Hall and King, 2018). The Bristol Approach to Citizen Sensing was then used in the EU funded REPLICATE project around air quality and smart city issues (REPLICATE, 2020) and next on blue spaces and smart cities in the RESPIRES project (RESPIRES, 2020). The ParCos consortium will be using and adapting The Bristol Approach to foster and support a people and issue-led process for citizen science, which is discussed in detail in Sections 4 and 5.

### 3.2 THE CITY COMMONS

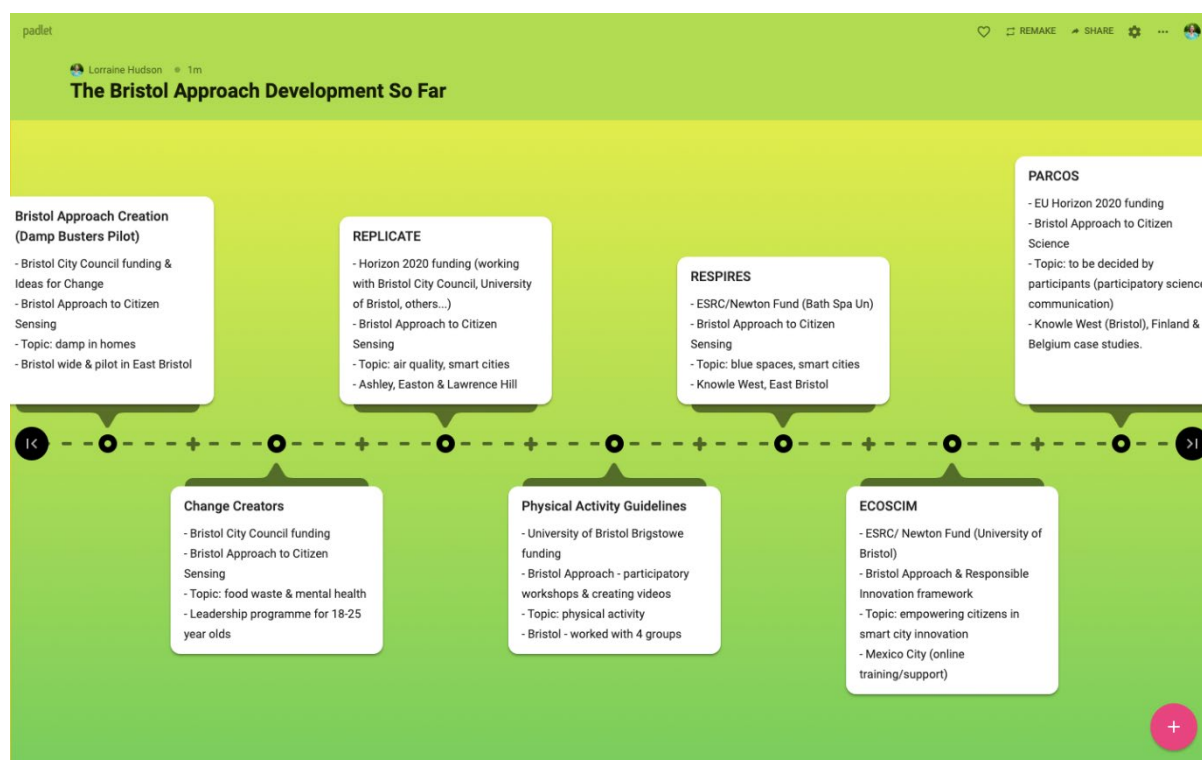
At the heart of the Bristol Approach is the development of a ‘City Commons’; where resources, tools, expertise and technologies are shared and used for common good. A commons is alternative to the traditional private/public forms of ownership and management of resources (Balestrini et al., 2017). Examples of commons vary from community gardens through to Wikipedia and Creative Commons. They are characterized by attributes such as community governance and openness (Foster and Iaione, 2016), altruism and behaviours likely to benefit others (Benkler, 2006; Ostrom, 2015). The Bristol Approach promotes the development of a City Commons – in terms of broadly accessible capital, such as data, technology, skills, knowledge creation, which is managed by a community of contributors. A key principle of the commons is that of the ‘low floor/high ceiling’, which ensures there are no barriers to taking part (‘a low floor’) but that every stakeholder can be challenged to the best of their abilities (‘a high ceiling’) (Evans et al., 2017).

## 4 ADAPTING THE BRISTOL APPROACH FOR PARCOS

### 4.1 REFLECTING ON USING THE BRISTOL APPROACH – CHALLENGES & LEARNING

Within the ParCos project, KWMC have started Task 2.2. by reflecting on their use of The Bristol Approach in previous projects, with the aim of identifying and exploring the challenges and key learning, and using this to help inform the development of the framework for use in participatory citizen science.

The first step was mapping previous projects where The Bristol Approach had been used by KWMC (or was currently being used) on a timeline, which is illustrated on Figure 4. It shows the project name, funding source, how the methodology is being used or developed (e.g. citizen sensing, participatory design, responsible research & innovation and in ParCos it is being developed for citizen science).



**Figure 4: Development of The Bristol Approach so far (2016-2020)**

The next step was a desktop study which involved reading through existing reports, papers and website content related to the various Bristol Approach projects to capture challenges and key learning mentioned. The next step was talking to individual KWMC staff involved in delivering those projects to explore this further and to capture further learning. Using the information collected we started to map the challenges experienced during projects which use The Bristol Approach. Categories were posted on Padlet (see Figure 5) and staff added comments to the online notes and added further notes. In addition, an online meeting was held on 25<sup>th</sup> March 2020 with staff involved in citizen sensing projects to explore this in more detail. Finally, a table was compiled (see Table 1) which provides details on activities

involved in implementing the different steps of The Bristol Approach, common challenges encountered and key learning so far.

padlet

Lorraine Hudson + 1 • 3h

### Bristol Approach: Challenges Experienced

**Matters of concern - sense of urgency to address issues but the ability to do so?**

👍 1 🗨️ 0

[Add comment](#)

**Brokering power relationships**

👍 2 🗨️ 0

[Add comment](#)

**Technology often doesn't work**

👍 1 🗨️ 0

[Add comment](#)

**Coordinating multiple partners & their views**

👍 2 🗨️ 0

1 comment

**Anonymous 2mo**  
This is a challenge, but is likely to be an issue across the board when engaging with stakeholders from different backgrounds. The coordination may not be too difficult, but managing expectations and also creating an equal/equitable space to share views is more of a challenge. ZBG.

[Add comment](#)

**Disengagement during the process when get into detail of data collection**

👍 0 🗨️ 0

[Add comment](#)

**Transparency of decision making process**

👍 2 🗨️ 0

[Add comment](#)

**When the data has been gathered, how/ by what process are the findings shared.**

👍 0 🗨️ 0

[Add comment](#)

**Criteria for selecting issues to explore further**

👍 0 🗨️ 0

[Add comment](#)

**Location of events - travel issues**

👍 0 🗨️ 0

2 comments

**Anonymous 2mo**  
We have held events at KWMC as well as in communities where we have been working (eg East Bristol) and also travelled to events internationally to share the Bristol Approach. I don't know what is meant by the challenge - is it in regards to carbon footprint associated with more international delivery (this is a potential issue) or that local people cannot reach events in Bristol? ZBG

**Lorraine Hudson 2mo**  
This was an insight about access to events within Bristol, importance of holding them in local areas?

[Add comment](#)

**Early phases time consuming**

👍 0 🗨️ 0

[Add comment](#)

**Rewards and benefits to participants - what does this mean in practice?**

👍 1 🗨️ 0

[Add comment](#)

**By later phases running out of time due to issues holding up process**

👍 1 🗨️ 0

2 comments

**Penny Evans 2mo**  
Not sure what this means/

**Lorraine Hudson 2mo**  
The early stages of the Bristol Approach (Identification, Framing, Design) take a lot of time and so if a project is time bounded (e.g. by funding) then by later stages there is less time.

[Add comment](#)

**Tensions around ownership of sensors - IP issues**

👍 1 🗨️ 0

[Add comment](#)

**Accuracy of sensors**

👍 0 🗨️ 0

1 comment

**Anonymous 2mo**  
I think that understanding the ability of the sensors is key. Even if they may only be indicative, if we are sure to communicate their limitations, accuracy may not be the issue - rather as another note that the technology doesn't work or is not delivered on time.

[Add comment](#)

**Legacy - what does it look like? Resources/lifespan/maintenance of technology**

👍 1 🗨️ 0

[Add comment](#)

**Data literacy issue - how can we support participants to develop these skills**

👍 1 🗨️ 0

1 comment

**Anonymous 2mo**  
I feel that data, understanding what it is and the process is key to the Bristol Approach. If people were already completely skilled in this area, we would not need it. Making sense of data workshops, and other engagement with people is an important way to help participants develop and hone these skills. ZBG

[Add comment](#)

**Sensor calibration & funding for this?**

👍 0 🗨️ 0

[Add comment](#)

**Who makes the decision?**

👍 1 🗨️ 0

1 comment

**Anonymous 2mo**  
This is especially challenging when working with partners in local government. ZBG

[Add comment](#)

**Technical knowledge & skills - not all participants have this**

👍 0 🗨️ 0

1 comment

**Anonymous 2mo**  
I see the Bristol Approach as a tool to address imbalances in technical knowledge and skills, not everyone needs to have a high level of skill in this area, and ensuring that the other knowledge and skills people have is also valued alongside the tech expertise, is an important aspect of the BA, not sure if it is a challenge or just an aspect of this kind of work. ZBG

[Add comment](#)

Figure 5. Padlet Board showing online notes collecting information on the challenges experienced during using The Bristol Approach.

**Table 1: Bristol Approach – reflecting on The Bristol Approach to Citizen Sensing Work So Far**

	What does this step involve?	How did we do it?	Challenges	Learning
<b>Step 1: Identification</b>	Starts with engaging people – identifying issues they care about and are prepared to give their time & energy to address. Map out of who is affected by the issue and who might be interested in working together to find a solution (including organisations who can provide support). Agree shared goals, how they will be assessed and what funds needed.	Working with artists to have ‘hot spot conversations’ out in the community in creative ways (e.g. could be a game rather than direct questions), city network analysis (i.e. identifying other organisations working on these issues), networking events etc.	<ul style="list-style-type: none"> <li>• <b>Time consuming</b> – early stages have lots of activities good for raising awareness and engagement but time consuming and line has to be drawn for project to move on at some point (done after a number of recurrent issues surfaced). The time intensity can then put pressure on later steps of the process as running out of time.</li> <li>• <b>Decision making</b> – scale of activities and number of participants means decisions had to be taken and need to decide who is making these.</li> <li>• <b>Transparency &amp; criteria for choosing issues-</b> process behind the selection of the issues. Some issues so complex – focus and framing caused divisions. Essential to be transparent about likelihood of issues being taken forward i.e. clear criterion for assessing, determining and eventually choosing ‘sense-able’ issues is needed</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Location</b> – where activities held is important i.e. consider any geographical divide and social/cultural ones</li> <li>• <b>Interact in person</b> – face to face conversations and visits to groups generated interest which engaged lots of people with diverse range of interests</li> <li>• <b>Be patient and open-minded</b> – identifying issues takes time and requires open, two-way communication</li> <li>• <b>Collaborate</b> – running a networking event in collaboration with other organisations helped to broaden networks</li> <li>• <b>Rewards</b> – everyone will have a different motivation for taking part. Understand what people want/expect in return. Relating incentives to issue/shared goal</li> </ul>



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Union’s Horizon 2020 research and programme under grant agreement No



			<ul style="list-style-type: none"> <li>• <b>Rewards and benefits to participants</b> – clearly understanding what this means in practice.</li> </ul>	
<b>Step 2: Framing</b>	Exploring issues in more detail, framing it as shared goal, demystifying how data and technology can be utilised to help achieve aims, uncovering resources that are already available and identifying gaps in resources/knowledge need to be filled.	Interrogating the issues (i.e. how active is the issue, can sensor technology & open data help tackle issue, is the issue realistic in scale - can what we create make a real change?), artist facilitated workshops exploring issues in more detail, contacting and revisiting community groups, review existing and missing knowledge, skills etc.	<ul style="list-style-type: none"> <li>• <b>Matters of concern</b> – powerful way of harnessing the energy of communities but also means expectations and urgency to address it are high which can be hard to manage (issue of wanting to go further than what planned in initial activity)</li> <li>• <b>Complex notions</b> - need to ensure everyone understands any terminology during framing stage to make participants feel involved and process inclusive</li> <li>• <b>Brokering power relationships</b> – need to manage process so all voices heard and no one person or organisation dominates the process and decision making</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Criteria for issue selection</b> – develop &amp; agree criteria (i.e. how pressing is the issue/ is it measurable within constraints of project), think about who is doing the choosing and make process as inclusive as possible.</li> <li>• <b>Be transparent &amp; set realistic expectations</b> – not all issues can be taken forward or addressed</li> <li>• <b>Harness &amp; maintain energy</b> – creative workshops led by artists can create a buzz around issue and bring diverse people together. Think about how to maintain energy and communication</li> <li>• <b>Focus on people not tech</b> – demystify terms/jargon such as ‘data’ and avoid introducing ‘tech’ so everyone valued for knowledge and expertise, not just for their technology skills</li> </ul>
<b>Step 3: Design</b>	Co-design or select any tools as appropriate that will help tackle the issue i.e. collecting data, analysing and	Range of activities e.g. co-design workshops, maker sessions, hack day. Working with artists/makers as	<ul style="list-style-type: none"> <li>• <b>Decision making</b> - tedious to make collaborative decisions on every step of the process. The decision to choose one technology over another can</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Design requires time &amp; iteration</b> – important to test a basic working prototype rather than perfect each piece in isolation</li> </ul>

	<p>visualising data, creating physical objects etc. Co-create governance and data infrastructure. Discuss ownership and privacy concerns and agree how the data you collect will be managed.</p>	<p>facilitators, using creative approaches to design and to help to dissolve hierarchies. Maintain energy and support participants to develop their skills. Creating tech tools in collaboration. Sharing roles and budgeting together.</p>	<p>cause tensions in the community and can lead to disengagement</p> <ul style="list-style-type: none"> <li>• <b>Travel</b> – can be an issue for attendance at co-design workshops, need to be held in local area. Factor in access and inclusion to budget e.g. pay for people to get transport and book an accessible venue.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>User experience</b> – understand what is important to participants and why</li> <li>• <b>Find ways to make co-creation work</b> – co-design sessions good for idea generation but small number of people do most making. Create parallel lines of engagement involving different skills. Create shared on online space to allow participants to share documents and pictures on their own terms.</li> <li>• <b>Involve people with range of skills</b> – have open &amp; transparent process to people can get involved in activities they want to do</li> <li>• <b>Low floor / high ceiling (for accessibility)</b> – make sure no barriers to taking part (low floor) but that everyone is challenged to the best of their abilities (high ceiling). Consider - how can you ensure that everyone can access ideas and opportunities?</li> </ul>
<p><b>Step 4: Deployment</b></p>	<p>Taking the tools into the community to be tested and collecting data</p>	<p>Creating on-ground engagement team developing and maintaining good relationships between participants. Deployment, training, data agreements set up. Developing skills as well as deploying tools.</p>	<ul style="list-style-type: none"> <li>• <b>Coordinating activities with multiple partners</b> - tricky without a strategy to do that. Need to manage expectations and create an equal / equitable space to share views which is also a challenge.</li> <li>• <b>Technical skills and data literacy</b> - often requires new skills to be learned, otherwise it</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Have a project manager</b> – to coordinate work with local partners who have existing relationships with communities or an effective communication tool (but can be hard to agree on this!)</li> <li>• <b>Encourage openness and inclusion</b> - make resources open and accessible as this encourages others to</li> </ul>

			<p>means only a few people being able to do certain tasks. How skills and training is funded and managed can be a source of tension in terms of progressing a project and managing the data.</p> <ul style="list-style-type: none"> <li>• <b>Tensions around IP</b> – tensions can arise around ownership of prototype when a participant wanted to commercialise it</li> <li>• <b>Technology issues</b> – often the tech doesn’t work and causes delays the project</li> <li>• <b>Sensor issues</b> – understanding the ability of sensors early is key as issues can arise due to them not working, accuracy or not being delivered on time</li> <li>• <b>Keeping people engaged</b> – there can be disengagement when start to get into detail of data collection</li> </ul>	<p>contribute their own resources/tools.</p> <ul style="list-style-type: none"> <li>• <b>Factor in skills development/sharing</b> – as you develop tools factor in how you will integrate training alongside deployment and skills sharing opportunities</li> <li>• <b>Opportunities for social entrepreneurship</b> – discuss ownership and licensing issues as part of the development process</li> </ul>
<b>Step 5: Orchestration</b>	Drawing attention to what created, sharing tools and data with others and celebrating what co-created	Sense making data workshops, data hack day, sharing learning with extended network etc. Working with artists around creating tangible ways of sharing information (e.g. live illustration or	<ul style="list-style-type: none"> <li>• <b>Communication of findings</b> – once the data has been gathered, how and by what process will the findings be shared?</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Open up new data</b> – using public events such as hack days to open up and communicate new data</li> <li>• <b>Share findings with stakeholders</b> – engage with wide range of stakeholders from community activists to business, policy makers as this can help bring about change</li> </ul>

		performance event) and asking provocative questions.		<ul style="list-style-type: none"> <li>• <b>Share success at the right time</b> – pick the right moment to share success stories is key to gaining further support i.e. could be the need to have strong body of evidence before public awareness campaign.</li> </ul>
<b>Step 6: Outcome</b>	Evaluating whether the goals have been achieved, capturing and sharing learning and identifying new opportunities.	Use of different evaluation methods and events e.g. evaluation dinner.	<ul style="list-style-type: none"> <li>• <b>Keeping participants involved in evaluation</b> – if projects are long it can be a challenge to keep them involved through to collective evaluation</li> <li>• <b>Legacy</b> – important to understand what this looks like? For example; what resources, lifespan, maintenance of technology etc. will be required</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Embed evaluation in earlier steps</b> – if evaluation is left to step 6 then it is hard to keep participants engaged in collectively doing this so important to find ways of embedding this throughout</li> </ul>

#### 4.2 TRAINING THE PARCOS CONSORTIUM TO USE THE BRISTOL APPROACH

The ParCos project has three case studies (Belgium, Finland and UK). They will use The Bristol Approach as a methodological framework to guide their citizen science activities, with activities aligned to different steps of the framework. Therefore, the next step was to run an online training session on The Bristol Approach for all the ParCos consortium members. The session was held on the 16th April 2020 (see Figure 6) using Microsoft Teams and lasted 1 hour and 15 minutes. It was attended by 10 members of the ParCos consortium including participants from all 4 partner organisations.



## Bristol Approach Training

16<sup>th</sup> April 2020



**Figure 6. Screenshot of The Bristol Approach Training Slides**

The purpose of the session was to introduce The Bristol Approach, to update people on how the framework has developed and been used in other projects (including questions around this), and to explore how it could be adapted for use within ParCos for the purpose of participatory citizen science. The topics covered in the training session were:

- ⇒ Bristol Living Lab (KWMC)
- ⇒ Development of the Bristol Approach & reflecting on its use
- ⇒ The Six Steps of the Bristol Approach Framework
- ⇒ Adapting the Bristol Approach for Citizen Science (links to ParCos work packages)
- ⇒ Exploring the Challenges & Lessons Learnt
- ⇒ Questions & Next Steps



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### 4.3 REFLECTING ON THE BRISTOL APPROACH TRAINING

The training session on the 16<sup>th</sup> April was audio recorded and transcribed. There was lots of discussion and the key discussion points are summarised below.

For Step 1 (identification) there was a discussion around how open this stage needs to be. For example, would it be an issue if the ParCos consortium members leading a case study had already picked a topic area (e.g. climate change) and then worked with participants (citizen scientists) around identifying the issues of interest to them within that topic? There was concern this would not be in the spirit of The Bristol Approach. KWMC recognise that projects will always have boundaries, in particular influenced by the source of project funding, related deadlines and any outputs agreed with the funder etc. The advice was this was ok, as long it was made transparent to potential participants (citizen scientists) when getting them involved. As a consortium we agreed that part of the case study pre-planning should be to scope and identify any project boundaries and to think about how to communicate this with potential participants.

Following on from this there was discussion about how project coordinators practically approach potential participants for the citizen science case studies, as identifying issues (Step 1) depends on the fact you have people who want to get involve. It was explained that as part of Step 1, KWMC would usually go out in into the community to have conversations with people about getting involved in the project. Depending on whether a project has an open focus (or a predetermined topic focus) they would think about good places to meet with people who might be interested; this might be through existing community networks and events, at a community centre or using other approaches to recruit people e.g. social media, paper flyers etc. Generating ideas for how to do this could be done as part of the pre-planning phase for the case studies and it would be important to consider how many participants they were seeking to involve e.g. what would be realistic within the boundaries of the projects - funding, timescales etc.

In discussing Step 2 (framing), someone asked whether The Bristol Approach can be used to explore issues where technology is not the solution as the diagram specifically mentions ‘harnessing the power of technology and data’ in Step 2. The answer was yes, The Bristol Approach to Citizen Sensing has a technology (or sensing) focus but the adapted version for Citizen Science could have projects not involving technology. However, technology is often an enabler and plays some role in the project such as data collection and storage or communications.

For Steps 1 (Identification), 2 (Framing) and 3 (Design), KWMC talked about how they work with artists and makers. In the creation of The Bristol Approach arts-based methods were applied in a variety of ways and we commissioned artists to be embedded in the project from the start. In step 1, this involved ‘deep hanging out’, having conversations with people in unlikely places (e.g. chip shops) and creative ways, perhaps starting with a game rather than direct questions, as a way of listening, learning and developing relationships. Employing artists from a performance background as workshop facilitators to dramaturgically create shape and structure, use play to flatten hierarchies and create safe spaces to co-create. There was a question about whether there are fees to cover the artists in projects or whether they

do it for free out of idealism or whether there were sponsors? KWMC explained that they make sure there is a budget in place for this, as it is fundamentally important to pay artists. A follow up question asked about whether KWMC had a consolidated pool of people, did we use different people in different projects or do these artists build experience across the projects? KWMC have a multitude of different ways in which they engage with people who work with them and the community. Through the commissioning process KWMC support people who want to become established makers and artists. Bristol is a very divided city and we try to widen up the opportunity to be an artist/maker to more diverse communities. The aim is to include lots of different voices, lots of different experiences and expertise, creating an inclusive arena to share ideas. KWMC have a pool of associates they work with but we are always continually widening that pool and engaging lots of different people so you don't come out with the same ideas from the same people.

For Step 4 (Deployment) we discussed ideas around data literacy, sharing knowledge and skills around technology, and making sense of data. The concept of a 'data advocate' was raised – the idea that you don't have 'data experts' but 'data advocates' whose role it is to help people make sense of data.

For Step 5 (Orchestration) there was a question around how The Bristol Approach can support secondary science inquirers who begin science activities after engaging with participatory science stories developed in the case studies. We discussed that sharing information in each step (about the process as well as the data captured) would be important and that the tools, data and knowledge would feed into the City Commons. The development of the Bristol Approach to Citizen Science will include thinking about methods and tools to support this. Accessing the City Commons will create a way of enabling secondary science inquirers (a new audience) to be able understand what has happened during the citizen science process. We will support them to engage with the outputs, to reinterpret them but also empower them to be able to follow a similar process. The ParCos project will support this through the training in WP4 (Task 4.2). We also discussed that we would need to consider the most effective way of sharing this information, finding a balance so we shared what was needed but didn't overload the project participants.

For Step 6 (Outcome) it was recognised that it was good that evaluation was already a key part of The Bristol Approach Framework, as it was noted that this was often missed out in projects. We discussed that in projects it was important to ensure that evaluation was embedded throughout the process and done systematically. We recognised that the development of tools in ParCos (Task 3.3 – Evaluation Report) would help with this in a citizen science communication context.

An issue discussed which relates to the ongoing legacy of projects, such as ParCos, was the creation of spaces for engaging with citizens beyond the boundaries of individual projects. The idea that in projects, such as ParCos, we engage people but at the end of the project it would be good to continue those conversations in a third sphere space so that people continue to build upon the initiatives, sharing knowledge and skills and looking for new opportunities. This also feeds into the City Commons idea. KWMC explained this was how The Factory (their community maker space) operates. It is a space where we run projects, training

and skills development, host events and take on commissions and do commercial work. There is a membership scheme so local people can come and use the space for their own projects. The Factory is a place where people can come together and collaborate and share ideas, a place they can continue to be part of a community beyond an individual project.

At the end of the training session the consortium members decided it would be good to have some further sessions to start the process of planning and development for the three case studies and also linking into key deliverables within ParCos. These follow on sessions are discussed in Section 5.

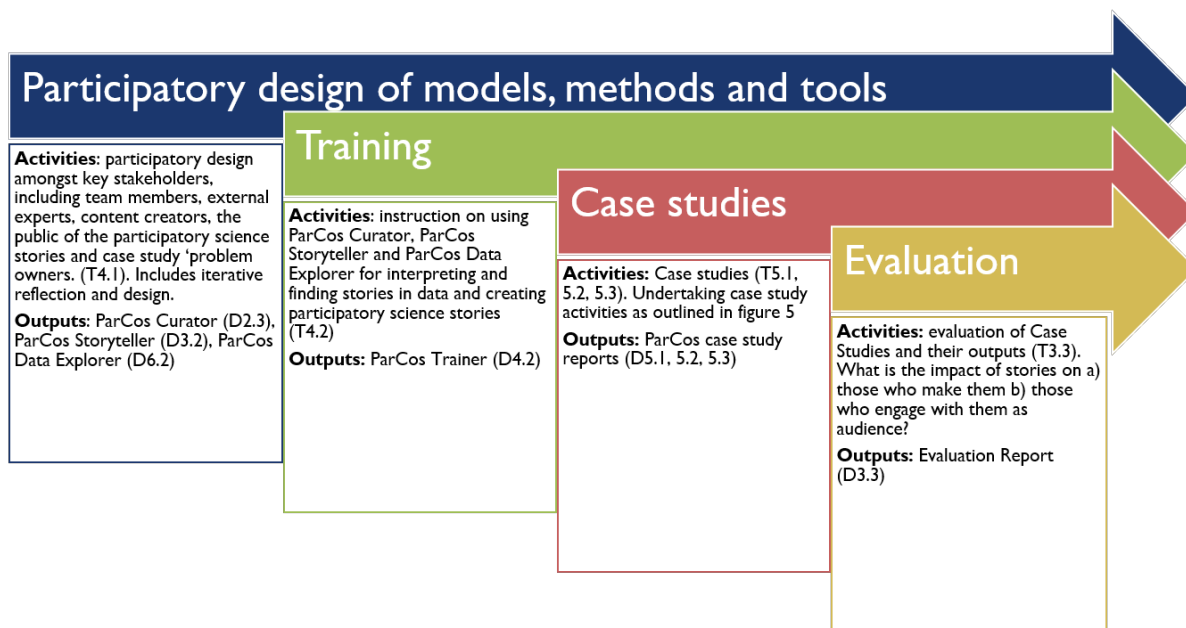
## 5 DEVELOPING THE BRISTOL APPROACH FOR CITIZEN SCIENCE

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### 5.1 A FIRST VERSION OF THE BRISTOL APPROACH FOR CITIZEN SCIENCE

Having reflected on the use of The Bristol Approach, considered the key challenges and learning so far and shared this within the ParCos Consortium through training, we started the process of updating the framework for its use in citizen science. The first version focuses on providing improved support for empowering citizens within participatory citizen science projects and communicating the outcome of citizen-led science initiatives. At the heart of the ParCos project is the participatory design methodology (The Bristol Approach to Citizen Science) as illustrated by the blue arrow on Figure 7, which will be supported by methods and tools created within the project. Below this sits the green arrow which will create a training package of science communication tools to teach people how to use them beyond the original team involved in the citizen project. A key element of this will be to consider how the Bristol Approach and this training can be used to scaffold activities of ‘secondary science’ inquirers who begin science activities after engaging with participatory science stories developed in the case studies.





**Figure 7: Overview of the ParCos Methodology**

Below we have mapped out Version 1 of how the Bristol Approach will be updated with supporting tools and methods created during the ParCos project so it becomes a framework for citizen science.

### Version 1: The Bristol Approach to Citizen Science

#### ⇒ Pre-planning

From the training we recognised that to support the three case studies within ParCos to use The Bristol Approach in their own contexts, it would be important to run some ‘Scoping Sessions’ to support the case study leads in starting to plan their citizen science projects. This would include identifying project boundaries (i.e. funds and resources, timescales, criteria in bid such as topics we said the case study would focus on) and starting to explore how they would approach potential participants (citizen scientists) and how this would be done (methods). This is also an opportunity to agree terminology and how we are using this within the ParCos, which is an issue that is being discussed within the consortium monthly meetings with the idea of creating a glossary of terms. For example, it is important to be clear on what is classified as a ‘science’ issue. These sessions will start in Month 7 of the project (July 2020)

#### ⇒ Step 1: Identification

In Step 1 we will identify the citizen scientists (case study participants) and the science issues they are interested in. As part of selecting participants the case study leads will take

into consideration issues of diversity and inclusion. This will be informed by (and feed into) the work being done to develop the ‘Principles for Diversity and Inclusion’ which is Deliverable 2.2. from Task 2.3 in Work Package 2.

The case study leads will work with the participants to start mapping who else they could work with as part of the project e.g. wider stakeholders which might include researchers, community organisations, business, local government and others affected by the issues or working in related areas.

As part of the process of doing Step 1, the case study leads should consider the use of arts-based methods. This will be informed (and feed into) the Guidebook on the use of arts-based methods which is Deliverable 3.1 being developed in Task 3.1. of Work Package 3.

### ⇒ **Step 2: Framing**

The 2<sup>nd</sup> step involves the participants exploring the issues identified in Step 1 in more detail. At this point the project team is forming and it is important for the case study lead to facilitate the process in an inclusive way and manage any power dynamics or tensions. The team are framing the issue as a shared goal; defining a research project aim and questions to answer within this. As part of this the case study lead (member of ParCos consortium) will work with them to help them explore what knowledge already exists (i.e. reviewing relevant literature, local information etc). They will also need to discuss what resources are available through the ParCos project and other sources, project timescales and what might be achievable within the time available, and start to identify any gaps.

The case study lead should also seek to understand why individual participants want to get involved, what they want from the process and how they will benefit in taking part. This will be important in making the process inclusive, supporting people to get and stay involved, and to evaluating the outcome of the process overall and for individuals. They will also need to consider the individual needs of participants e.g. if they have a disability and particular accessibility issues i.e. the need for financial support to cover travel or childcare to participate in the project.

In Step 2, consideration should be made of how to use arts-based methods as way of facilitating some of these activities, again guided (and feeding into) Deliverable 3.1 – Guidebook on the use of arts-based methods.

### ⇒ **Step 3: Design**

The 3<sup>rd</sup> step involves co-designing the research project, including identifying the research methods and the interactions that will be needed to explore the issue. Identifying what data will be collected and how it will be stored, discussing technology and other resource requirements. Considering the key skills needed will be crucial here and deciding what roles people will take on in the project. There should be further consideration of any

inclusion issues within the team. Any limitations and biases of the research should also be considered and managed. It will be important to create a governance and management protocol here, dealing with any legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution and the environmental impact of any activities.

Step 3 will be supported by the development (and testing) of Deliverable 2.3 - ParCos Curator, which is a toolkit to support content creation and reuse within participatory science stories developed in Task 2.3 (Practices for data curation and reuse). It will also be important to consider how evaluation methods will be used in the case study projects which links to Task 3.3 (Evaluation Methods) and Deliverable 3.3 (Evaluation framework and report). This is discussed further in Step 6.

#### ⇒ **Step 4: Deployment**

The 4th step involves collecting data using the methods, tools and protocols selected in Step 3. Privacy and security issues need to be considered, considering the needs and views of the participants. Key to this phase is the organisation of events to enable social interactions between the different participants with different levels of knowledge and skills. This phase contributes to the city commons e.g. open data, new skills, open source technologies.

The team will need to start thinking through how to analyse the data being collected e.g. participatory sense making of the data. This will be supported by Deliverable 2.3 (ParCos Curator) mentioned in Step 3. It will also feed into Task 6.2. (Civic Data Interfaces) and Deliverable 6.2 (ParCos Data Explorer). This is concerned with the creation of a data dashboard to support interacting with scientific data, in finding stories and patterns to support sense-making in conjunction with the Guidebook on arts-based methods (Task 3.1).

#### ⇒ **Step 5: Orchestration**

The 5<sup>th</sup> step involves sustaining engagement as well as scaling it up to engage a broader group of people. It includes data analysis, interpretation, sense making - finding the stories and communicating the results. It also involves encouraging others to make use of the data and tools created (contributing to the city commons), celebrating what has been co-created and capturing lessons learned. A core element of this will be understanding how The Bristol Approach to Citizen Science can be used to scaffold activities with secondary science enquirers (i.e. other people who begin science activities after engaging with participatory science stories developed in each case study). The citizen scientists will receive training to engage with wider members of the community (or general public) and communicate their projects.

Step 5 will be supported by and feed into the development of the ParCos Curator (Deliverable 2.3) and ParCos Data Explorer (Deliverable 6.2), both mentioned in the earlier

steps. It will also feed into Task 4.1. (Ideation of science communication tools through participatory design). It will inform the development of the Deliverable 3.2 - ParCos StoryTeller (M18), a report of storytelling techniques for visual and immersive media. This is developed in Task 3.2 (Telling stories through different media) which is concerned with the creation of new digital content for communicating science stories through novel media including broadcast media, VR and AR technologies together with end users including citizen scientists, professional producers, viewers etc.

Step 5 will also be supported by Task 4.2 (Design and creation of training package for the science communication tools) which is creating Deliverable 4.2 (ParCos Trainer). This is a training package for educating future content creators on how to use the science communication tools created in ParCos.

### ⇒ **Step 6: Outcome**

The 6<sup>th</sup> step involves reflecting on the project aims and assessing if and how they were achieved and the wider outcomes. Finding out what has been learned, sharing insights gained and identifying new opportunities. Also understanding what impacts the project has had on the individual participants and whether it met what they wanted to achieve from being involved. It involves ensuring outputs are accessible (e.g. open access if there are no privacy or security concerns) and contributing to the city commons. Citizen scientists should be acknowledged in project results and publications, and be aware of how their data is being used.

Step 6 will be supported by and feed into Task 3.3 (Evaluation methods) which is creating Deliverable 3.3 (Evaluation framework for communication tools). Step 6 and all other steps also feed into developed Deliverable 6.3. (ParCos Platform). The Bristol Approach to Citizen Science framework and the 3 case studies (Deliverables 5.1, 5.2 and 5.3) will also be shared on an updated version of The Bristol Approach website <https://www.bristolapproach.org/bristol-approach/>

## 5.2 AN UPDATED VERSION OF THE BRISTOL APPROACH FOR CITIZEN SCIENCE

The next step to enable the updating of The Bristol Approach to Citizen Science is starting the 3 Case Studies (Deliverables 5.1. - Belgium, 5.2 - UK, 5.3 - LUT) within ParCos. These start in Month 7 (July 2020) and finish by August 2022 (M32). Alongside the case studies various methods and tools will be created, as described in Section 5.1. Table 2 shows how the timing of the deliverables aligns with creating an updated version of The Bristol Approach to Citizen Science framework by Month 30 (June 2020).

**Table 2: Schedule for updating The Bristol Approach for Citizen Science and how it aligns to other ParCos deliverables**

<b>Step in Bristol Approach to Citizen Science</b>	<b>Activity &amp; Parcos Deliverable</b>	<b>Timing</b>
Pre-planning & case study development	Scoping session for 3 Case Studies (Deliverable 5.1, 5.2, 5.3)	D5.1, 5.2., 5.3 - Starts M7, delivery date M16 & M32
Step 1 - Identification	D2.2 – Principles for diversity and inclusion D3.1 – Guidebook on the use of arts-based methods	Starts M1, delivery date M36 Starts M1, delivery date M6 & M30
Step 2 - Framing	D3.1 – Guidebook on the use of arts-based methods	Starts M1, delivery date M6 & M30
Step 3 - Design	D2.3 – ParCos Curator D3.3 – Evaluation report (framework)	Starts M1, delivery date M9, M16 Starts Mx, delivery date M6, M28, M36
Step 4 - Deployment	D2.3 – ParCos Curator D6.2 – ParCos Data Explorer D3.1 – Guidebook on the use of arts-based methods	Starts M1, delivery date M9, M16 Starts M6, delivery date M22 Starts M1, delivery date M6 & M30
Step 5 - Orchestration	D2.3 – ParCos Curator D3.2 – ParCos Storyteller D6.2 – ParCos Data Explorer D4.1 – Participatory Design Report D4.2 – ParCos Trainer	Starts M1, delivery date M9, M16 Starts M1, delivery date M18 Starts M6, delivery date M22 Starts M1, delivery date M12, M16, M22 Starts M9, delivery date M27, M32
Step 6 - Outcome	D3.3 – Evaluation report (framework)	Starts M1, delivery date M6, M28, M36

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