WECOUNT

WeCount: Citizens Observing UrbaN Transport
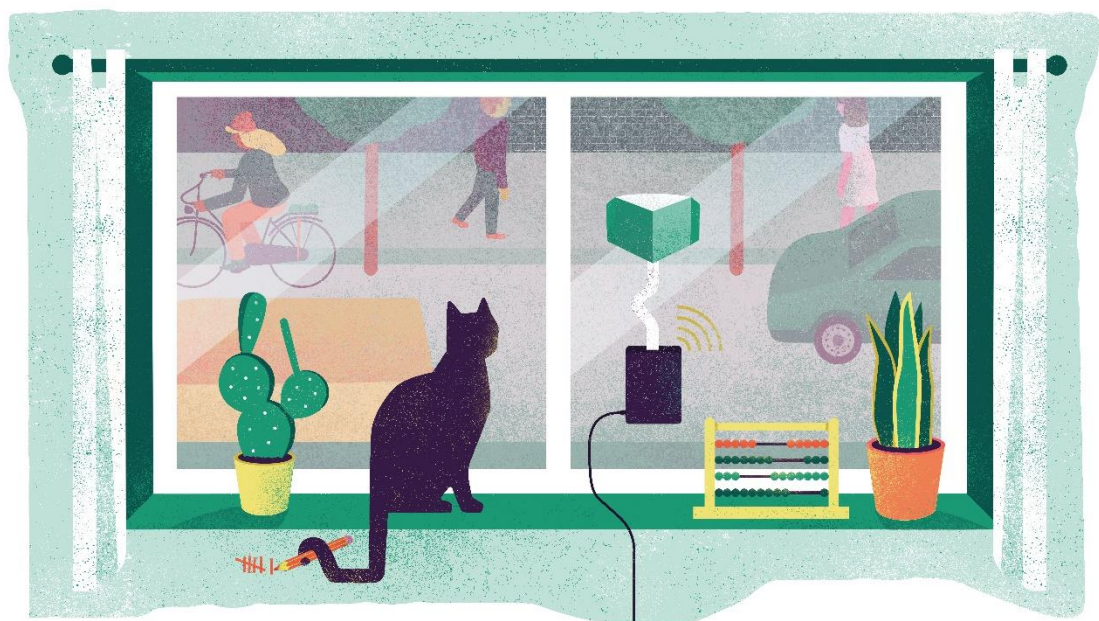
Deliverable 2.1: Infrastructuring local communities for citizen science interventions on mobility

Version 2

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Document Details

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Description	This document represents the second version of Deliverable 2.1 and describes the activities undertaken to develop the common engagement framework and methodologies to initiate and sustain citizens' participation in the five WeCount case studies. The result of this work package is the WeCount Engagement Framework and Toolkit (EFT) which is extensively described here. This is understood as an embedded and flexible set of resources, methods and tools for effectively engaging participants in WeCount across all phases of each WeCount case study location. This has been initially designed and implemented from both a review of existing literature and practitioners-oriented material, and from the experience of the two experimental WeCount case studies, i.e. the ones in Belgium and Spain. This second version extends the first one by including reflections on both the usage and effectiveness of the WeCount Engagement Framework and Toolkit and more generally on engagement from the different WeCount case studies.

Version History

Version	Updated By	Date	Changes / Comments
V1	Giovanni Maccani, Lucía Paz Errandonea, Valeria Righi, Martin Balestrini, Javier Creus	December 2020	First version of the WeCount Engagement Framework and Toolkit
V1.1	Giovanni Maccani	July 2021	Structure and method for data collection from case studies
V1.2	Lucía Paz Errandonea	July 2021	Interviews to case studies leader
V1.3	Enda Hayes, Anna Molter, Tomaž, Berčič, Elke Franchois	July 2021	Contribution from WeCount case studies
V1.4	Hannelore Depypere	August 2021	Review of structure and feedback
V1.5	Giovanni Maccani	September 2021	Final Version
V1.6	Kris Vanherle	September 2021	Final Review

Contents

DISCLAIMER

This Deliverable preserves the sections of the first version of Deliverable 2.1 dedicated to the description of the WeCount Engagement Framework and Toolkit (EFT). The additions refer to:

1. Update of content throughout sections 2 and 3. Specifically, the original content has been enriched with more tools and methods developed and used in WeCount and included in this embedded set of resources.

2. Chapter 4 represent the main addition from the first version and includes a reflection on if and how the framework has been used across the follower case studies (i.e. Ljubljana, Cardiff and Dublin) and of the case in Leuven and Barcelona (which were not complete at the time of submission of the first version). Since Ideas for Change as the leader of WP2 has been developing the WeCount Engagement Framework and Toolkit, all those used in Barcelona and Madrid are presented in Chapter 3. In other words, interviews, and specific research on the usage of it were not undertaken. Chapter 4 also includes reflections on engagement actions and related results achieved across all case studies.

1   Introduction

WeCount, Citizens Observing Urban Transport, is a Horizon 2020 funded project, part of a Science with and for Society (SwafS) call (H2020-SwafS-2018-2020). WeCount is a Citizen Science project working across five cities in Europe to empower citizens to take a leading role in the production of data, evidence and knowledge around mobility in their own neighbourhoods, and at the street level. The project follows participatory citizen science methods to co-create and use innovative low cost, automated, road traffic counting sensors (i.e. Telraam) and multi-stakeholder engagement mechanisms across five case studies in Spain (Madrid and Barcelona), Ljubljana, Dublin, Cardiff and Leuven. Following this approach, WeCount aims at quantifying local road transport (cars, HGV, active travel modes and speed), produce scientific knowledge in the field of mobility and environmental pollution, and co-design informed solutions to tackle a variety of road transport challenges. Moreover, the project provides cost-effective data for local authorities, at a far greater temporal and spatial scale than what would be possible in classic traffic counting campaigns, thereby opening up new opportunities for transportation policymaking and research.

This deliverable represents the second version of the document reporting activities undertaken as part of Work Package 2 (WP2) of WeCount: Shaping, Documenting, and Disseminating the WeCount Citizen Science Ecosystem. The main aim of the WP is, according to the proposal, "to build a comprehensive knowledge, resource and support environment aimed at enabling communities and pilot facilitators so they can successfully develop STEM and soft skills in order to organise citizen science interventions in their own contexts". The ultimate goal of the work conducted within WP2 is therefore twofold. First, from a local case study perspective, WP2 provides the common engagement framework and methodologies to initiate and sustain citizens' participation in the five WeCount case studies, while building a common protocol among consortium partners to provide (socio) technical support to case participants. Second, from a project point of view, WP2 contributes with new knowledge and resources on citizen science methodology in the domain of mobility/traffic counting and ensures that the knowledge can reach different publics. These curated contents are key to support and foster scaling and replicability of the WeCount citizen science case studies, beyond the end of the project.

The tangible outcome from WP2 is therefore a set of engagement methods, guidelines and recommendations for identifying and nurturing local communities and providing them support for leading citizen science actions in their contexts. This is used at two different levels addressing the objectives described above: (1) as a set of resources to facilitate and enable all local case studies within WeCount; and (2) as an important legacy of the project to foster its scalability - i.e. as a set of resources to enable others to replicate WeCount in other contexts beyond the end of the project.

To achieve this, IFC wit the support of M21 has led the development of an embedded framework and toolkit, understood as a curated set of tools, methods and resources, to inspire and facilitate communities and researchers in undertaking traffic and mobility - related citizen science interventions (within and beyond WeCount). This resource is called The WeCount Engagement Framework and Toolkit (WeCount EFT) and therefore focuses on proposing tools and methods to actively engage citizens across the five phases of a local WeCount case study, that, according to WP4 (i.e. the WP dedicated to the oversight and implementation of the five local cases), are: "Scoping and Community Building; Co-Design the Use Case; Data Collection; Data Analysis and Awareness; and Legacy and Reflection".

It is noted that, in addition to conducting an extensive review of the existing literature to inform its development, the WeCount EFT has been built from the experiences of the first two case studies, i.e. the ones in Belgium and Spain. While the first version of this deliverable focused primarily on presenting the actual WeCount EFT, this second version incorporates more details about the experiences of the local case studies in leveraging the proposed embedded framework and toolkit.

This document is structured as follows. Section 2 will provide an overview of the approach designed and implemented with respect to the tasks undertaken within WP2 (also included in version 1). This also includes a reflection on why a toolkit and engagement framework has been designed, e.g. as opposed to a fixed step-by-step methodology. Section 3, the core of this document, is dedicated to the description of the actual WeCount EFT, where the details of it are extensively tackled and presented (this section is updated from the first version of this deliverable). Section 4, i.e. the key addition of this second version, focuses on the case study's experiences with local engagement as well as on how the WeCount EFT has been finally used (or not used) and why. Finally, Section 5 provides concluding remarks and the plan for the next steps within this WP.

2 Approach

The main challenge when approaching the work within WP2 referred to the need of providing a set of resources that had to be, on the one hand, detailed enough to effectively inform local case studies and, on the other hand, flexible enough to acknowledge that each case study is very much situated in a specific socio-cultural-infrastructural context and addressing different mobility/traffic-related issues. This section presents the approach followed to its development. Thus, it includes a reflection on the concept of toolkits in citizen science and why this was found to be suitable (section 2.1); the steps followed for the development of the WeCount EFT (section 2.2), which in turn include carrying out a literature review of the topic (section 2.2.1) as well as the early-stage citizen science actions implemented to develop and test different tools and methods in the field with actual WeCount participants (section 2.2.2).

2.1 The Concept of Toolkit

With respect to the outcome of WP2, the first key decision that had to be taken was about what format should be used to maximise its effectiveness and usability while acknowledging the diversity across the focuses and the contexts of the case studies. More generally, the literature acknowledges that Citizen Science projects are typically heavily context dependent, and the learning outcomes are more situated and specific than transferable (Maccani et al., 2020; Craglia and Granell, 2014; Manzoni et al., 2019). These concepts apply very well to the WeCount case studies. Each case tackles a specific matter of concern either related to traffic or to which solutions can be deployed through a traffic counting citizen science intervention and the establishment of a related ecosystem. This makes the idea of a single, strict, step-by-step methodology that fits all cases, not viable.

In the past decade, projects - including dedicated EU funded initiatives such as the Eu-Citizen.science Horizon 2020 Project[1] - have been increasingly looking at ways to document methods and learning in an attempt to aid project replicability or scalability by equipping others to perform citizen science activities. The idea is to move away from strict step-by-step processes towards a more open and flexible set of resources that can be adopted and adapted to the local context, the issues experienced, and the specificities of the communities involved.

The format and concept of toolkits have emerged as a suitable way for citizen science practitioners to provide access to tools and methods, for example on how to: involve citizens in scientific research processes; collectively plan and design research studies; and even assemble environmental sensors and interpret complex data (Balestrini et al., 2020). The concept of the toolkit acknowledges that although citizen scientists' work is heavily influenced by local experiences and cultural traits, there are methods and strategies deriving from best practices that can be transferred across settings, making it easier for practitioners to enact or know how to run certain processes.

In this regard, citizen scientists across the five WeCount cases are conceptualised as motivated craftsmen, as opposed to followers of rigid methods. Craftsmen are passionate about the job and skilled in using a range of tools and adapting them to the specific challenges they are facing (concept adapted from the role of toolkit in IT management in organizations from (Ashurst, 2015)).

The scope of this WP has then been established: to develop an Engagement Framework and Toolkit understood as a collection of resources that can be used during each of the WeCount case studies

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[1] Available at: https://eu-citizen.science/

and when tackling common challenges associated with citizen science initiatives. In this sense, the WeCount EFT is not a mere recipe book but rather a lingua franca or a boundary object including structured resources to inspire and enable the different actions. As a consequence, success depends on the effective usage of tools which requires cumulative experience and a thorough understanding of the specific context by each of the case study leaders.

In summary, considering these reflections, the final objective of the WeCount EFT is then twofold:

1. Assist, inspire and enable all case study leaders in undertaking their local WeCount citizen science initiatives and act as a common language to increase consistency among the practice of different partners.

2. Act as an important legacy of WeCount and thus foster the sustainability of the project activities after the funding period is over. This means that this collection of resources will be proposed as an outcome for others to replicate one or more of the WeCount case studies, or to set up new interventions inspired by the results and the learning achieved within WeCount.

2.2   Developing the WeCount Engagement Framework and Toolkit

To develop the WeCount EFT we relied on two different, complementary, approaches: (1) an extensive review of the material available across relevant citizen science literature and other projects' documentation and reporting; (2) an empirical implementation and testing of the engagement methods and tools during a short sprint of the full WeCount case study cycle (i.e. the five WP4 tasks outlined above) with a reduced number of participants. This second approach was named "beta-pilot" and was undertaken by IFC in Barcelona.

The activities conducted within each are described separately below.

2.2.1   Review of existing sources

The first step was about investigating, at different levels, what material is publicly available to address the objectives of this WP. During the first half of 2020, we conducted an extensive review among both scientific and practitioners-oriented material with respect to three main topics.

1. Existing or previous citizen science projects focusing on mobility-related issues; this first phase allowed ensuring that we capture any possible opportunity for collaboration across initiatives and we learn from previous projects and approaches. The results show that, besides several initiatives within the broader domain of (sustainable) mobility, traffic counting is a novelty for the discipline.

2. Existing traffic counting techniques as well as challenges and benefits of each approach. We identified existing technologies allowing for traffic counting, both those designed in theory and those used in practice. For each, we investigated benefits and challenges. A particular focus was placed to compare the image recognition approach of the Telraam[2] traffic counting sensor used in WeCount and traffic counting based on mobile application and Bluetooth technology. The former was found to be more suitable for the overall scope and characteristics of the WeCount citizen science intervention.

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[2] https://telraam.net/

3. Existing tools, methods, best practices, and approaches in mobility related participatory projects and in citizen science more broadly. This constituted the core activity of Task 2.1 ("Aggregation of best practice in citizen science and traffic counting") as the associated results were key in informing the main outcome of this work package, i.e. the WeCount EFT.

In summary, the novelty of WeCount, i.e. targeting the intersection between traffic counting and citizen science, led us to take a broader perspective when building the foundation of the WeCount EFT. This specific domain does not lend itself to identifying and replicating specific best practices resulting from other experiences. Therefore, the main sources of information informing the development of the WeCount EFT were searched and considered from the overall citizen science discipline (i.e. beyond mobility-related citizen science projects and literature), and the toolkits and best practices available to-date.

This extensive review then focused on identifying existing approaches to share and transfer knowledge with respect to how to conduct effective engagement and action-oriented citizen science interventions. These types of resources are often offered as an outcome of publicly funded citizen science projects which, similarly to the overall objective of WP2, produce resources as legacy of the projects to foster their scalability. After a careful analysis of those efforts identified in the literature and through other publicly available materials, we clustered existing findings across three types of knowledge sharing and transfer resources: (1) inventories and catalogues; (2) best Practices, education, and training; and (3) tools, guidelines, and tutorials.

Inventories and Catalogues: the first level refers to knowledge resources made available as narratives and organised textual explanations of previous or existing projects. The key idea of these efforts is to provide listings or catalogues of existing and previous citizen science projects and their characteristics in terms of processes followed and general narratives and storytelling. The reasoning behind it is that, by doing so, these resources give access to some level of information which is meant to facilitate others to uptake existing citizen science practices and approaches.

Examples of resources identified within this first cluster include the Citizen Science Inventory and Explorer by the European Commission's Joint Research Centre (JRC) [3], the "Federal Crowdsourcing and Citizen Science Catalog" [4] developed by the U.S. General Service Administration. According to the latter's website, the Catalog "is designed to improve cross-agency collaboration, reveal opportunities for new and high-impact projects, and make it easier for volunteers to find projects in which they can participate". At the time of writing this deliverable (i.e. November 2020) the Catalog includes more than 400 projects. Each of these is populated with information about:

- the status of the project (i.e. active, planned/pending, complete);
- the (current) geographic scope;
- a brief description of the project and the intended outcomes;
- contact details and link to the project website;
- field of science (e.g. climate change, ecology, urban planning, earth science etc.);
- and the tasks required to participate.

Similar to this, several other inventories and catalogues have been developed and are currently available online, such as the SciStarter Project Finder [5], The National Geographic Citizen Science

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Project Resource Library [6], the New Zealand Citizen Science Inventory [7], and even a dedicated page on Wikipedia [8]. As exemplified by the Federal Crowdsourcing and Citizen Science Catalog described above, however, the level of information provided is often very limited to a three to five lines general description of the projects together with some general tags to facilitate navigability of the inventory. While such catalogues could serve as a good starting point for the scope of this deliverable, not much information is available on what specific tools and methods are used within these interventions. Rather, this review was useful for achieving a broader understanding of possible general engagement strategies designed and employed to guide citizen science actions. Data collection in this way was however somewhat problematic. In this respect, we argue that there is a lack of a centralised and consistent approach for the effective inventorying of citizen science projects. The availability of a plethora of these catalogues results in an information landscape that is often fragmented, rather than integrated and easily accessible.

Best Practices, education and training: the second level of knowledge sharing instruments and techniques analysed during our review refers to a more elaborated set of content such as best practices frameworks and actions in the space of education and training, i.e. aligned with the tasks of WP2.

With respect to the former, the last decade saw the emergence of a variety of frameworks and studies of best practices in the field of citizen science across different domains of application. These can be either in the form of academic studies, e.g. (Sachs et al., 2008; Gonsamo and D'Odorico, 2014; Johnston et al., 2019; Rambonnet et al., 2019), or the result of initiatives undertaken by other organizations, such as the Environmental Protection Agency (EPA) in the US [9] and in Scotland [10] or the more general ten principles of Citizen Science published by the European Citizen Science Association (ECSA) [11].

The second category within this space emphasises the importance of carrying out training and educational programs as the mechanisms to transfer knowledge to individuals (in our case the WeCount case study leaders and future communities) that want to either replicate a citizen science project or start a new one. An example of this is the Citizen Science Best Practices training program designed and delivered by the Northwest Environmental Training Center in the US [12]. The program consists of a two days "hands-on workshop" covering the following topics: (a) how to define project goals in Citizen Science; (b) recruit participants; (c) train citizen scientists; (d) manage and analyse data; (e) participant retention; and (f) evaluate and communicate results. A further example of training and education initiatives is the online course "Citizen Science Projects: How to Make a Difference" [13]. This course aims at transferring relevant capabilities to lead citizen science projects and focuses on the different important phases from creating a community to interpreting the data and undertaking action. The course is directed by the H2020 project WeObserve [14], which focuses on awareness, acceptability and sustainability within citizen observatories.

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[6] Available at: https://www.nationalgeographic.org/idea/citizen-science-projects

[7] Available at: https://www.landcare.org.nz/file/citizen-science-inventory-updated-may-2018-lr/open

[8] Available at: https://en.wikipedia.org/wiki/List_of_citizen_science_projects

[9] Available at: https://www.epa.gov/sciencematters/new-epa-citizen-science-quality-assurance-handbook-provides-best-practices-citizen-0

[10] Available at: https://www.ceh.ac.uk/citizen-science-best-practice-guide

[11] Available at: https://www.wilsoncenter.org/sites/default/files/ten_principles_of_citizen_science_english.pdf

[12] Available at: https://www.nwetc.org/course-catalog/citizen-science-best-practices

[13] Available at: https://afrialliance.org/knowledge-hub/online-learning/online-course-citizen-science-projects-how-make-difference

[14] See https://www.weobserve.eu/

Tools, Guidelines, and Tutorials: the most articulated examples of knowledge sharing and transfer resources refer to what is commonly known as toolkits. During the past decade, projects - including dedicated EU funded initiatives - have been increasingly looking at ways to document methods and learning in an attempt to aid project replicability or scalability by equipping others to perform Citizen Science activities. A plethora of toolkits, have emerged such as Citizen Sensing (Making Sense, 2018), the Citizenscience.gov toolkit [15], the citizensciencetoolkit.eu [16] developed as part of the Horizon 2020 funded project CitieS-Health [17], or the toolkit developed as part of CitiSense [18] and reported in (Fishbain et al., 2017). These resources typically go at a much deeper level of granularities compared to the previous categories, and provide access to tools and methods on how to: involve citizens in Citizen Science processes; collectively plan and design research studies; and even assemble environmental sensors and interpret complex data. These toolkits were considered as the most prominent sources of insights for the development of the WeCount EFT as these are ultimately meant to act as a common language to increase consistency among the practice of different partners, i.e. fully aligned with the scope of WP2.

2.2.2 Beta Pilot for development and testing

Another important, and concurrent, stage we undertook to develop the WeCount EFT referred to a WeCount-specific empirical effort to develop and test tools tailored to the project, and specifically to traffic counting using the Telraam sensor and its impact on sustainable mobility. Inspired by the findings of the review conducted, this phase was undertaken through the implementation of a beta-pilot in Barcelona, Spain. This referred to an early sprint across all phases of a case study (i.e. across all tasks of WP4: Scoping and Community Building, Co-Design the Use Case, Data Collection, Data Analysis and Awareness, Legacy and Reflection) with a limited number of participants. This effort was conducted in Barcelona by IFC during a 30-day sprint involving a total of 12 participants (May-June 2020).

It is noted that, in addition to acting as a development and testing environment for tools and methods (i.e. contributing to WP2), this was also a critical part of the local case study. Indeed, participants at this stage were selected as potential community champions. Experiencing the full process was an important component of the knowledge transfer and experience gaining exercise to enable the so-called train the trainer approach. In other words, by involving community leaders across all stages of the case study, we instrumented them with the necessary knowledge about the technology as well as of the engagement and citizen science process, so they could disseminate the project and involve their own communities in a more informed way.

Overall, the beta pilot allowed for three fundamental outcomes:

1. Gather preliminary feedback about the technology (and related processes) and subsequently inform its re-design. Specifically, feedback was collected about the: instalment process, user registration, user experience while hosting the sensor, visualisation of data and related user experience. This feedback was aggregated and shared with the partners contributing to the tasks of WP3.

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[15] Available at: https://www.citizenscience.gov/toolkit/#
[16] See https://www.citizenscience.gov/toolkit/#
[17] See https://citieshealth.eu/
[18] See http://www.citi-sense.eu/

2. Test, learn, and adapt accordingly: engagement methods and techniques, and the case study's contextually embedded narrative. This included developing new, or adapting existing (e.g. translate), support resources, e.g.: video tutorials, step-by-step guidebooks, ongoing support.

3. Meaningful exploration of traffic and mobility related matters of concern as experienced by different communities. While doing so, this process served to engage, nurture, and transfer knowledge to community champions thus enabling the train the trainer approach ultimately enabling an infrastructuring of WeCount across the different communities involved or interested in being part of the case study.

Clearly, objective (2) above was central with respect to WP2 and the development of the WeCount EFT.

In terms of process and engagement with participants, after the first exploratory research stage, the beta-pilot in Spain was built upon four main interactions with the group of participants (three virtual workshops and one online ongoing activity during data collection). A summary of these activities and their outputs is provided in Table 1 below. It is noted that a more extended description of this process will be provided within the case study reports deliverable (WP4) due in February 2021.

Table 1: Summary of beta-pilot experience

Time	Stage	Event	Activity Description	Outcome(s)
May 19th 2020	Scoping and Community Building / Case study co-design	Workshop 1. Participatory Problem Formulation and Co-Design	• Presentation of the WeCount project and planning agenda • Frame the issue with a narrative and co-design of possible scenarios of use.	• Mapped issues about traffic • Possible scenarios of use • Testing of participatory problem formulation and co-design tools and methods
May 26th 2020	Data Collection (Sensor delivery and Installation)	Workshop 2. Telraam onboarding and installation	• Understanding of the technology and set up of the sensor.	• Testing of installation support resources and methods as well as logistics • Knowledge on how to set up Telraam sensors • Awareness about the technology
May 26th – June 9th 2020	Data Collection	Continuous Support and Interaction	• Participants have been collecting data autonomously • WhatsApp group for continuous interaction • Collect testimonies and info on usability, difficulties and achievements.	• Testing of remote support techniques • Usability notes & User testimonies • Data live on Telraam platform
June 9th 2020	Data Analysis and Output	Workshop 3. Findings and next steps	• Presentation of data analysis and visualisation • Discussion on potential uses of data • Discussion on state of application • Discussion on data collection experience • Plan for involvement of their communities in the wider case study.	• List of improvements • Results and lessons learnt • Testing methods and tools for participatory data analysis and reflections.

In addition to running the overall WeCount process, this phase has proven to be fundamental in the shift to online interactions forced by the COVID-19 crisis. The insights from the review, as well as the initial plans for WeCount, had initially led to planning actions across the phases of the case studies with a strong component of physical interactions and hands-on activities. For example, prior to the COVID-19-related restrictions, we dedicated significant effort in planning and developing resources to enable participants to install the sensor themselves during a workshop. This, together with several other planned face-to-face activities, was a crucial part of the engagement process (with respect to the example of assembly this would have enabled a much deeper understanding of the technology, a different learning curve, and an appreciation of what the technology can do as well as what its limitations are - i.e. a crucial part for the strongly advocated expectation management in citizen science) and could not be replaced by online activities. Other elements were adapted to the online interactions following a careful research of available applications (e.g. Miro, Slido) and the assessment of their viability to assist during the different stages of engagement within WeCount. A training provided to all partners by one representative from UWE on online options for engagement and workshop activities was very useful during this phase.

Furthermore, several other elements of the original WeCount process had to change significantly with the shift to online only interactions. First, ethical approval processes had to be detached from the sensor delivery and could not rely anymore on physical signatures (we tested the option of adding digital signatures for the informed consent form, but this has proven not effective especially for older adults and for those with low digital skills). Second, the actual delivery of sensors required a relatively fast re-planning stage where we tested different forms of "packaging" (finally established as the WeCount Toolbox - see section 3.3.1 below), different delivery options (e.g. through different local delivery partners) and new templates to allow participants to input the additional information needed for enabling these processes.

In summary, as the foundation to design and implement the WeCount EFT we conducted two concurrent phases. First, we undertook a review and analysis of existing methods and tools from the overall discipline of citizen science; subsequently, the learning from the review has been adapted to WeCount - i.e. informed the development and, sometimes, the adaptation of existing methods, approaches and tools tailored to the focus on traffic counting, citizen science and sustainable mobility of WeCount. Second, these were implemented and tested during the beta-pilot experience with a reduced number of participants. Collectively, these two phases systematically informed the main outcome of this WP which is presented next, i.e. the WeCount Engagement Framework and Toolkit. Furthermore, the EFT has been constantly updated from the experiences of the cases studies as they were progressing.

3   The WeCount Engagement Framework and Toolkit

This section represents the core of this deliverable and focuses on the detailed description of the WeCount Engagement Framework and Toolkit (EFT). This is understood as an embedded set of resources, methods and tools for effectively engaging participants in WeCount across all phases of each situated case study. Figure 1 below provides an overview of the WeCount EFT.

Figure 2: Overview of the WeCount EFT

The WeCount Engagement Framework and Toolkit

1 Scoping and community building	2 Co-Design	3 Data Collection	4 Data Analysis and Awareness	5 Reflection & Legacy
• Achieve a situated understanding traffic-related issues. • Explore perceived mobility-related matters of concern • Map the local WeCount Stakeholder Ecosystem • Community building	• Co-design of the data collection protocol • Co-design project (and data) governance	• Supply data collection tools • Complement data collected from sensors with qualitative data from participants • Provide Continuous Support (technical and non-technical)	• Analyse the data collected with participating citizens • Foster new uses of the data • Collective impact assessment	• Disseminate results among different audiences • Co-create citizens actions • Reflect and plan for the legacy of the project

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It is noted that the five phases are consistent with the tasks each case study is required to implement according to the work to be conducted within WP4. Each of these was broken down into several key objectives and iterative sub-phases to address the main stage. Within each sub-phase, several tools and methods are proposed to address them. These include both tools and methods that were inspired by those already available from previous citizen science interventions (i.e. from the findings of the review) and those that were designed from scratch by the WeCount partners. Each tool and method comprise a description, and, where applicable, a step-by-step guide on how to implement it as well as a downloadable and editable template to be adapted to the specific case study. Each phase, method and tool included in the framework is presented separately in this section.

At this point, three important reflections should be highlighted with respect to the framework:

1. Consistent with the findings of our review, this embedded resource is not meant to be a strict methodology that is superimposed to all case study leaders in WeCount. Rather, the framework acknowledges that each case study needs to be aligned with several elements, narratives, and specific focuses, that are context specific. Therefore, it acts as a repository of tools and methods which usage and adoption are totally voluntary and based on the needs and interests of the different localities. In other words, for each of the key tasks within each case study (from the DoA and reflected in the five phases of the WeCount EFT), it proposes possible tools and methods to address them, and thus is meant to inspire and facilitate local case study leaders to plan and implement a proactive engagement strategy.

2. The experience of the two experimental case studies (i.e. in Spain and Belgium) is also ingrained in the framework which is continuously updated as these two actions progress.

Tools and methods are being added by partners as they design/use/adapt them in their own case studies for others to benefit from it and to be inspired. The result is that the WeCount EFT has been proposed as a living document, shared among all partners and has been regularly updated when new tools and methods were designed and tested during the different cases.

3. Given that each phase also involves requirements with respect to other work packages (specifically WP5 monitoring and evaluation and ethics), those templates provided by the respective partners (e.g. the template for Stakeholder Mapping provided by WP5, the different information sheets and consent forms to be used depending on the type of interactions and data collection) were also included in the WeCount EFT. By doing so, we facilitated the work of partners by providing only one access point to all tools and resources needed to effectively plan engagement and implementation of the different case studies. However, while the adoption of the engagement tools and methods was voluntary, using those templates and resources to support monitoring and evaluation activities and ethics compliance was mandatory for all partners.

3.1 Phase 1: Scoping and Community Building

According to the work plan, this first phase was divided into two steps: (1) linking and engaging with communities of citizens potentially interested and involve them in WeCount at different levels; and (2) in a workshop format, build the actual communities led by their community champions to increase the sense of ownership of the citizen science activity. While these specifically refer to the community aspect of this phase, an additional effort is placed here in scoping the citizen science case study, i.e. formulate the (context-)specific issue to be tackled. Therefore, given its exploratory nature, this first phase also includes several heuristics for gradually narrowing down the focus of the intervention, i.e. for scoping the case study. As a consequence, the steps and tools within this phase must be adjusted also depending on the level of granularity of the understanding of a particular issue. In WeCount, each case study, at the proposal stage, established a key focus for their intervention (e.g. in Wales established at the intersection between traffic counting and air quality). Through this phase, partners have already broadened the key focus of their case studies based on response and uptake by local citizens. The focus here is therefore on specifically explore the issue, where it occurs, the public perception around it, as well as what has already been done (or is being done) to address it.

In summary, Scoping and Community Building was divided into 4 critical, iterative and interrelated, sub-phases which can also be seen as critical objectives to address the main phase. These are: (1) Achieve a situated understanding of traffic-related issues; (2) Explore perceived mobility-related matters of concern; (3) Map the Local WeCount Ecosystem; and (4) Community Building. Each of these sub-phases, together with its description and the methods and tools proposed to address it, is described separately below.

3.1.1 Achieve a situated understanding of traffic-related issues

Previous citizen science studies have shown that interventions that are designed to address a matter of concern (i.e. an issue that citizens perceive as relevant for them and/or are affected by) are more likely to promote the formation of communities because they galvanise around the problem at stake. As a result, individuals are willing to take their time and energy to address the issue (Le Dantec & DiSalvo, 2013; DiSalvo et al., 2014; Balestrini et al., 2017). This contributes to promoting a shared sense of purpose over the project's aim and foster the development of attachments, both of which

are considered key elements in preparing the base for the WeCount case studies (Teli et al., 2015). Therefore, as part of this first set of actions, three critical objectives were established:

1. Break down traffic issues into more specific matters of concerns experienced in the city; in this way the complex topic of mobility in the specific context can be unbundled into more specific problems faced. Traffic and traffic counting can have several implications, including (but not limited to): air quality, noise pollution, road safety, urban design, green routes, speed compliance, among others.

2. Further develop a consistent and shared project narrative: as a result of this initial learning, the case study narrative is adapted accordingly and is shaped in a way that is locally relevant (e.g. *from citizen scientists counting traffic, to traffic counting to understand impact on noise pollution in neighbourhood x targeting improving policy y*).

3. Gradual definition of a current and relevant issue as perceived by local citizens and stakeholders.

Given the exploratory nature of this sub-phase, codifying the types of activities was challenging. Therefore, as opposed to other (less open ended) phases, the focus here has been dedicated to proposing existing methods to undertake these tasks through a citizen science approach.

Method, citywide online survey: one avenue to initially investigate traffic-related issues in the target area refers to the design and massive distribution of an online survey. This was initially tested in the Spanish case and has proven to be an effective method to increase the understanding of the complex and multifaceted nature of mobility-related issues in urban environments. The tool suggests specific questions to be asked in the survey: level of concern about traffic in the city, neighbourhood, and street (Likert scale); ranking of mobility-related issues among health, contamination, road safety, energy consumption, time, urban design, and "other"; open question on how mobility affects the related concern selected at the previous question; an open question on what they would like to investigate within WeCount; an opportunity to sign up to the project. The link to the survey used in Spain was also provided as an example (https://ideasforchange1.typeform.com/to/ZfaP8a). Results can then be mapped based on where the respondents live thus achieving a more granular understanding of perceived issues by geographical area. Concluding, the distribution of the survey and the communication sustaining it, also strongly contributes towards raising awareness and interest about WeCount as well as to community building.

Method, desk research: subjective inputs received from the survey should be complemented with objective information about traffic related issues in the given local environment. While those concerns emerged as particularly critical from the survey (e.g. road safety) can guide the search for publicly available material, this method focuses on gathering and organising information about what incidences/problems occur/are present in the target urban location as well as a review of existing policies that can be potentially targeted as part of the case study.

Method, mapping of publicly available information on traffic issues and policies: based on the information gathered through desk research, this further step enables visualising in a comprehensive manner, all publicly available information in a map. Different software is proposed such as OpenStreetMap and Google Maps where those traffic-related news and policies encountered can be positioned in the area where these are relevant and can also be classified by type of information (e.g. accident reports, new policies etc.).

Method, interviews with local officials: another important source of information refers to the specific plans, principles, and understanding of those involved in mobility-related aspects from the relevant public sector agencies and departments. These could include (depending on the focus of each specific case study): Urban Planners, Road Safety Authority, Road and Transport Department (this varies depending on the city). This step can be also seen as a strategic phase for the overall intervention because by presenting the project to the relevant agent(s), the team can gather initial insights on the level of interest of those individuals, and if needed, change the focus of the case study in a way that facilitates uptake of the final results (i.e. by ensuring alignment with the needs of the public sector from the very beginning).

3.1.2 *Explore mobility-related perceived matters of concern*

The second sub-phase (it is reminded that these are interrelated and not necessarily sequential) focuses on narrowing down the specific focus of the intervention by achieving a great level of granularity on the understanding mobility-related issues in the target location. Most of the tools and methods included in this section require the organization of a participatory workshop as some of the activities proposed require a certain extent of explanation and of facilitation. Specifically, four main objectives were outlined for this sub-phase. These are: (1) break down traffic issues into more specific matters of concern perceived by citizens and gather granular data about how individuals perceive the area and streets where they live and work from a mobility perspective; (2) further develop a more tailored case study-specific narrative; (3) community building; (4) promotion and dissemination of the local, context-specific, WeCount narrative.

Method, focus group conversations: focus groups are typically effective in stimulating group discussions. Participants should be targeted leveraging existing communities, and from those identified as part of previous steps (e.g. by inviting those that took part of the survey). These should be provided with a physical or virtual space to engage in focus group conversations. It is important to move from general statements to actual facts and matters of concern, as this phase aims at gradually establishing a specific, situated, issue to be tackled. Different focus groups may be organised in relation to specific geographical areas (e.g. by neighbourhood – like in the case of Leuven) or by topic (e.g. air quality, noise pollution, urban planning – like in the case of Spain). If conducted virtually, specific rooms should be organised and each requires facilitation from the WeCount research team.

Method, street chats and pop-up interventions: while the concept is similar to the previous, i.e. engage in conversations to narrow down the specific matter of concern to be targeted, its implementation happens in public spaces. These interactions also allow for a physical demonstration of what the sensor is and to engage with one-to-one discussions about the case study. In Spain, given the COVID-19-related restrictions, these were only promotional activities (the team was not allowed in any of the pop-up events to hand over material to the individuals). In Belgium, the team undertook a pop-up event for the delivery of the Telraam sensors (see below).

Figure 2: Pictures from WeCount pop-up interventions - Spanish case study

Furthermore, as mentioned above, a range of additional tools could be used in a workshop format to further narrow down the understanding of traffic and related issues as perceived and experienced by citizens, as well as how people would like their streets/neighbourhoods/urban environments to be in the context of sustainable mobility.

Tool, Interactive Map and Symptoms Cards: the tool consists of a printed map of the WeCount area of intervention (e.g. a neighbourhood or city) on an A0 / A1 poster and symptoms/issues cards that people can stick to the area where they experience them. The focus is on exploring perceived consequences on people's quality of life due to high volumes of traffic. In its current formulation, the symptoms cards proposed in the toolkit are only a sample mainly related to respiratory symptoms. This tool can be used both online and offline. If online, software like MIRO could be used to facilitate the activity.

This tool also included a detailed description table (see Table 2 below) as well as some examples of symptoms cards that can be downloaded, edited and adapted.

Table 2: Interactive Map and Symptoms Cards - detailed description

Description	The tool consists of a map of the city/neighbourhood, symptoms cards and pins. The map must clearly distinguish the different districts/neighbourhoods within the urban area. Symptoms cards include headache, itchy skin, respiratory difficulty, tiredness, nausea, itchy eyes, cough, congestion, and other (to ensure exhaustiveness).
Why am I doing it?	Investigate perceived symptoms of citizens due to traffic and contamination, by district of the city.
Which kind of issue can I tackle?	The tool was originally created for air pollution issues but can be adapted to other environmental concerns by outlining appropriate symptoms cards.
Resources needed	City map (A0); pins and symptoms cards; post-its; one facilitator to explain the task.
Time needed	20-30 minutes.

Skills needed (Not Required, Basic, Intermediate, Advanced)	**Subject-matter expertise:** Basic **IT skills:** Basic **Facilitation skills:** Intermediate **Event organization skills:** Intermediate **Project management skills:** Basic **Communication skills:** Intermediate
How to use the tool	• Either in conjunction with a public workshop or in other public places, create a separate space for engagement with a large map of the city and the symptoms cards. • Ask citizens and representatives of various institutions to map perceived symptoms when exposed to traffic related contamination across the city's districts. • Gather further unstructured inputs from citizens through post-its – i.e. any additional insight beyond the simple symptom card. • Analyse symptoms by district and derive insights.
Outcomes	Refinement of citizens' concerns.
Tips!	If the number of participants is high, it becomes practically difficult to keep the pins and the post-its ordered. Try to keep up with the conversation to gather additional annotations that can further explain the symptoms. While you won't require technical skills, you will have to empath!

Figure 3: Example of downloadable symptoms cards and example of application (Spain)
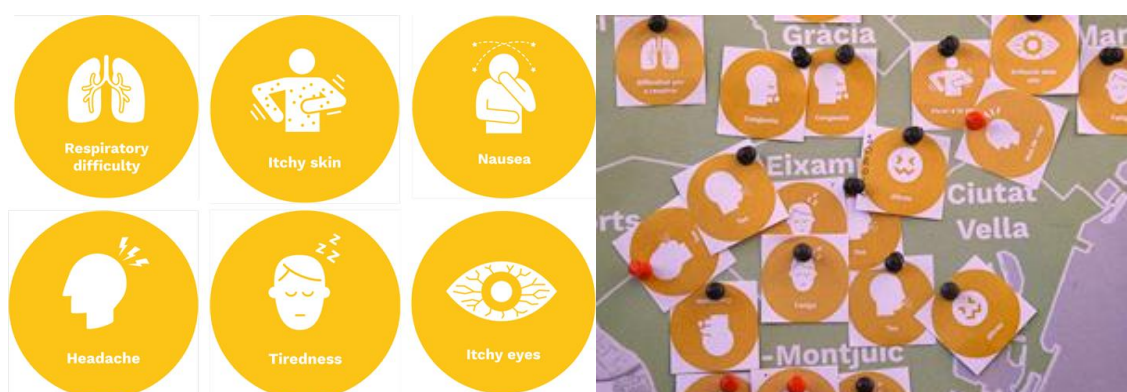
Tool, the WeCount Traffic Timeline: this tool consists of a printed canvas for brainstorming and stimulating discussions on traffic related benefits and issues during typical 24 hours days and by month during the year. By using this tool, the research team can investigate and establish how every single participant perceives and experiences traffic related issues in her or his own street. For example, some places may be experiencing high traffic loads only during certain hours within the day or periods within the year. In this way, insights from this participatory exercise can effectively inform also the design of the case study from a timing perspective. This can also be an important asset to be re-considered during the participatory analysis phase, whereby data collected from the Telraam sensors can be crossed with the perceptions of individuals, thus contributing substantially to their own understanding of traffic in the areas where they live. Once again, this tool can be used both in online and physical workshops. For online sessions, MIRO has proven to be well positioned to support the

delivery of this activity. The editable template is available to the WeCount partners and examples of its application are proposed in Figures 4 and 5 respectively.

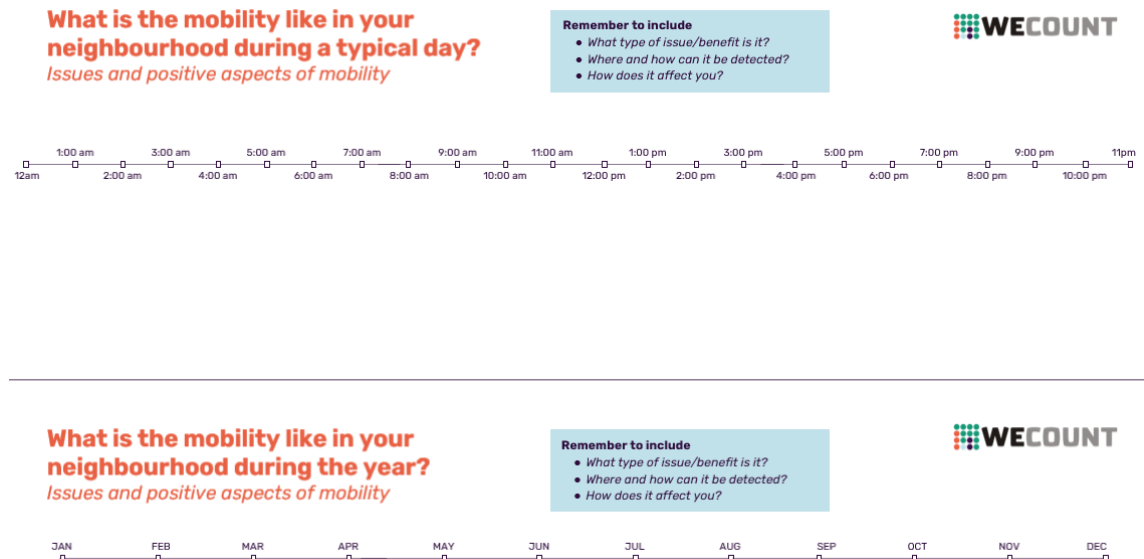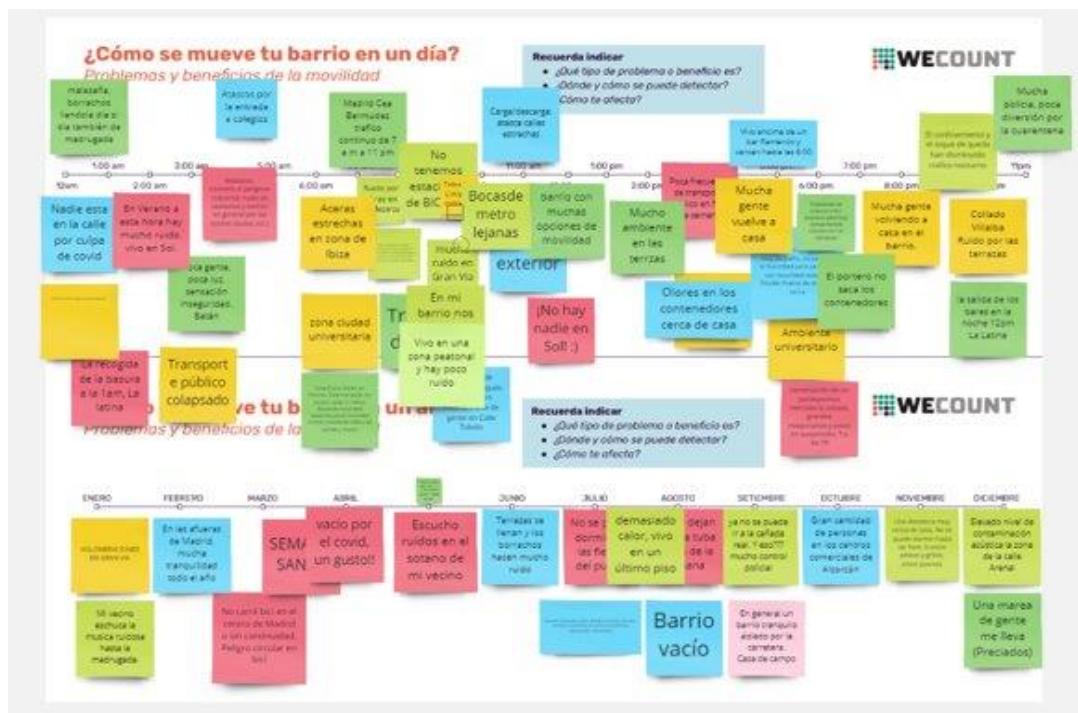*Figure 4: The WeCount Traffic Timeline - editable and downloadable template*

Figure 5: Example of application of the WeCount Traffic Timeline in Spain (MIRO software)

Tool, Ideal Mobility Canvas: like the previous tool, the Ideal Mobility Canvas can be used to stimulate individual and group reflections on how they would like future mobility in their streets and neighbourhoods to be. Like the previous it can be used both in online and offline workshops and consists of a printed Canvas for brainstorming ideas and stimulating collective conversations. In the example below (i.e. the one provided for download and editing in the actual EFT), mobility is broken down into four categories (i.e. the most relevant mobility-related concerns emerged until this stage in the Spanish case study) – Pollution and Health, Time, Road Safety, and Urban Design.

Figure 6: Ideal Mobility Canvas - editable and downloadable template

Presentation used for problem formulation (virtual) workshop: to inspire and facilitate other partners, an additional resource uploaded to the WeCount EFT was the actual presentation template used during the first workshops - i.e. those focusing on participatory problem formulation and co-design of the case study. Typically, these presentations include: (1) introduction on Citizen Science and examples of projects; (2) introductions of participants; (3) introduction on WeCount; (4) commonly used traffic counting techniques and tools and discussion about their limitations; (5) introduction and technical explanation of Telraam, and why it is different from other traffic counting technologies and approaches; (6) overview of survey results; (7) overview of sustainable mobility and concepts of urban feminism and Cities in 15 minutes; (8) the WeCount Traffic Timeline (facilitated by MIRO software); (9) Ideal Mobility Canvas (MIRO); (10) closing and Next Steps; (11) questions related to Monitoring and Evaluation informing WP5 (facilitated by SLIDO software).

Requirements: as mentioned above, one of the objectives of the WeCount EFT is to offer to the consortium a one-stop resource and solution to inspire and facilitate their context specific case studies. During its development, continuous conversations were undertaken with representatives of WP5 from UWE to ensure that the framework also includes the resources developed with respect to ethics and to gather data to inform Monitoring and Evaluation activities. It is noted that while the adoption of the different tools, methods and techniques is voluntary by each partner (i.e. acknowledging that tools may be more or less relevant depending on the context, the focus of the case study, and the type of participants and audiences), the templates to facilitate ethical approval and informed consent and to facilitate evaluation data gathering must be used in the relevant steps in all WeCount case studies. These include: a link to the overall WeCount Ethics Framework; links and descriptions of the information sheet and consent forms templates designed for the different possible situations (e.g. interviews, workshop participation, school workshops etc.); templates to record detailed information about each workshop and about participants; a Self Reflective Log to be

completed by those individuals within the partners' organisations that actually led the workshop; a template to record citizens that registered and their demographics; and focus group questions that should be asked during a participatory workshop. For each of these, also the process to be followed to effectively store the data collected and share it with those responsible for WP5 is explained.

Concluding, this phase offers a range of methods and tools that can be leveraged by the WeCount case study leaders to achieve a granular understanding of mobility related issues together with participating citizens.

3.1.3 Map the local WeCount stakeholders' ecosystem

At this point, a significant amount of information has been gathered about the mobility-related ecosystem in the focus area. This sub-phase should start with aggregating the information and insights gathered and ordered so far. The main scope is to identify and engage all possible stakeholders and investigate their potential role in the local case study.

A careful approach in this sub-phase is recommended as the findings from these actions will play a significant role in informing: (1) community building (see next subsection); (2) who the target audiences of WeCount are, what their interests and objectives are, and what communication channels should be used; and (3) to target relevant actors through, for example, snowballing techniques. With respect to tools and methods, based on the experiences in WeCount, most activities have been conducted through dedicated meetings with the stakeholders identified and engaged. These can vary from citizen communities (with different interests, e.g. mobility, air quality, urban sustainability), academic organizations, private companies, and public sector agencies and representatives. Clearly, each of these interactions is different and requires an ad-hoc planning. Notwithstanding this, three resources are proposed in the WeCount EFT to inspire partners on how to address this phase.

Tool, the WeCount Stakeholder Mapping Template (provided by WP5): this resource refers to an extensive excel file where partners can record the stakeholders identified, their type and likely involvement in WeCount. In addition, through this process potential community champions are identified and coherently targeted. While not all stakeholders mapped are or can potentially be community champions, their classification in the template allows for their identification and positioning within the local ecosystem. In particular, for each stakeholder the following is recorded: (1) level of influence (1. High influence + high interest - 2. High influence + low interest - 3. Low influence + high interest - 4. Low influence + low interest); and (2) stakeholder category (1. Stakeholders linked to citizens (neighbourhood workers) - 2. Stakeholders linked to policy (transport/sustainability) - 3. Stakeholders linked to (citizen) science - 4. Local influencers (interest groups, media, etc.) - 5. Other).

Tool, Digital Local Ecosystem Mapping: this second tool allows organising the findings of the stakeholder mapping exercise and visualising them in an interactive map. Using a free software (e.g. OpenStreetMap, Google Maps), partners can develop a comprehensive map of stakeholders in the city, as well as other points of interest (e.g. existing air quality monitoring stations, neighbourhood associations, specific areas in the city where mobility-related problems occur more frequently etc.). An example from the Spanish case study is proposed in Figure 7 below. In this example, purple pins refer to civic society stakeholders engaged in the WeCount case study, the red pins represent critical areas for an existing traffic policy in Madrid (i.e. Madrid Central), and green pins represent existing official air quality monitoring stations.

Figure 7: Example of Digital Ecosystem Mapping - Madrid
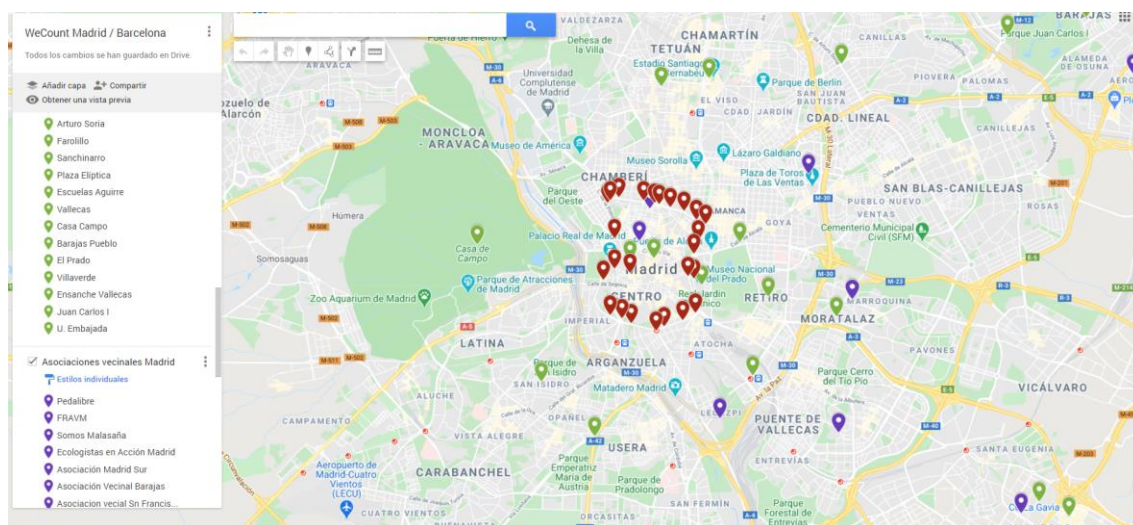
Method, additional interviews and/or desk research: at this point in time, the team will have: achieved a comprehensive understanding of the WeCount ecosystem; established a network of relevant actors to be involved (at different levels depending on their nature) in WeCount; and a granular understanding of traffic-related issues in the target area informed both by citizens and by publicly available information. It is possible that during these engagement actions new potential stakeholders that deserve consideration emerge (e.g. from snowballing from the initial interactions) and may require more in-depth investigation. Thus, if needed, additional interviews and/or focus groups should be undertaken to investigate these aspects. The aim should be twofold: (1) identify additional stakeholders; and (2) explore and understand how they are positioned in the overall ecosystem, their interest, and their potential involvement in WeCount. Given the granular understanding of the landscape achieved at this phase, interviews should be semi-structured with a specifically developed protocol based on the findings generated so far. In other words, this acts as a refinement step, once the more open-ended and unstructured phases of problem formulation and ecosystem mapping should be completed.

3.1.4   *Community building*

The process of community building can be considered as a set of actions and activities that are undertaken throughout the case study. This is thus an ongoing process driven by principles of inclusion, i.e. to keep it open to everyone to participate in WeCount. In this section of the WeCount EFT, the tools, methods and resources proposed are mainly oriented to facilitate communication and dissemination activities. However, two important considerations should be made at this stage: (1) those resources proposed across the other sub-phases presented above play an important role in identifying, nurturing, building, and establishing the actual local WeCount community of participants; (2) the actual, more formal, engagement process was covered by the redesign of the platform and specifically by the steps to be followed to: register as participant to the project; apply for a Telraam sensor; and general community engagement and management resources (this part was extensively covered within WP3).

One important aspect of the WeCount approach to community building and engagement refers to the so-called train-the-trainer approach, whereby community champions are identified and given the necessary knowledge and resources to be able to act as gatekeepers (or boundary spanners) and amplify community building within their own networks. As explained in detail in section 2 above, the

main proposed method to address this is conducting a local beta-pilot. In the Spanish case study, this approach allowed to involve community champions in a full cycle of the WeCount case study (i.e. through problem formulation, sensor deployment and installation, data analysis and reflection) to ensure that: they understand the technology as well as its limitations; we set the right expectation management approach for the wider deployment; we gather feedback on the tools designed and employed and address it accordingly; we collect feedback on the overall methodology and process. Undertaking a beta-pilot allowed to actually train community champions who by the end of this experience had acquired the necessary knowledge to understand the project, its potential, its limitations and the process being designed (and continuously improved together with them). We believe this knowledge is crucial to empower them to engage their own communities in WeCount.

It is noted that while the initial plan to adopt the train-the-trainer approach was still in place, the COVID-19 situation made it more challenging to ask community champions to run pilots almost autonomously. These individuals would require skills and expertise to move these processes online and the gaining of this experience (as well as the potential need to purchase additional online licenses to do so) is something we observed to be beyond what we can ask them as volunteers.

Another important aspect refers to the development of communication, dissemination, and diffusion templates to distribute to those identified and established as community champions in the different case studies. In this way, once the community champions have gone through the process once (e.g. in Madrid and Barcelona through the beta-pilot experience), they have consistent and useful resources to promote WeCount within or beyond their communities (e.g. through social media or other contacts they may have).

As underlined for the previous task, this approach is very context (i.e. case study) specific. For example, in Madrid and Barcelona, some community champions were linked to schools in the area where they live, whereas some others were representatives of neighbourhood associations (typically linked to protests around traffic, air quality, and/or noise pollution). Clearly, the strategy co-designed to reach the different local communities are expected to vary substantially not only based on the city, but also on the individuals (or organizations/entities) and their areas of influence/interest. For example, in Spain, the overall community participating in WeCount is being built leveraging multiple avenues in parallel. First, we initially identified, contacted, and listed community champions in both Madrid and Barcelona. Their role in WeCount varies and was negotiated with them. Some agreed to be "mini-pilot" leaders in their (existing or new) communities, whereas others' committed to "softer" involvement, through e.g. facilitating access to existing communities or helping to disseminate the WeCount communications. Second, a massive communication campaign was designed and deployed aiming at ordinary citizens and other potential stakeholders. Third, a recruitment face-to-face workshop has been conducted (prior to the COVID-19 restrictions), where around 50 citizens participated and were given information about WeCount together with a short paper-based survey to assess their suitability to be involved as counting citizens (i.e. to host a Telraam sensor) and specific information on how to get involved.

All in all, the team shared with the partners those learning outcomes achieved from their experiences and basic templates and resources that must be adapted to each partner's context (and language).

Methods and resources to facilitate massive communication campaigns: to facilitate and support local WeCount communication and recruitment campaigns, the resources being leveraged in Belgium and Spain are continuously uploaded in the WeCount EFT. In Spain, communication and engagement activities are also supported through the development of a case-specific WeCount website (in Spanish): https://www.wecountmovilidad.eu/. The website includes an "about" section,

links and explanation on how to be part of WeCount and the different steps to be followed, "news and histories", and a section where different supporting resources can be found and downloaded. Furthermore, several different resources supporting communication and dissemination activities have been designed and used so far in the experimental case studies in Belgium and Spain. These are also included in the framework for others to adopt and adapt them. These include various types of flyers (see some examples in Figures 8, 9, and 10 below), as well as other resources such as an integrated *Sign Up Text* document developed as part of WP5 and finally included in the WeCount EFT. Other, minor, communication-related resources are included such as the WeCount stickers used in Spain for promoting the project (see Figure 9 – right side).

Figure 8: Example of WeCount Flyer – Belgium case study
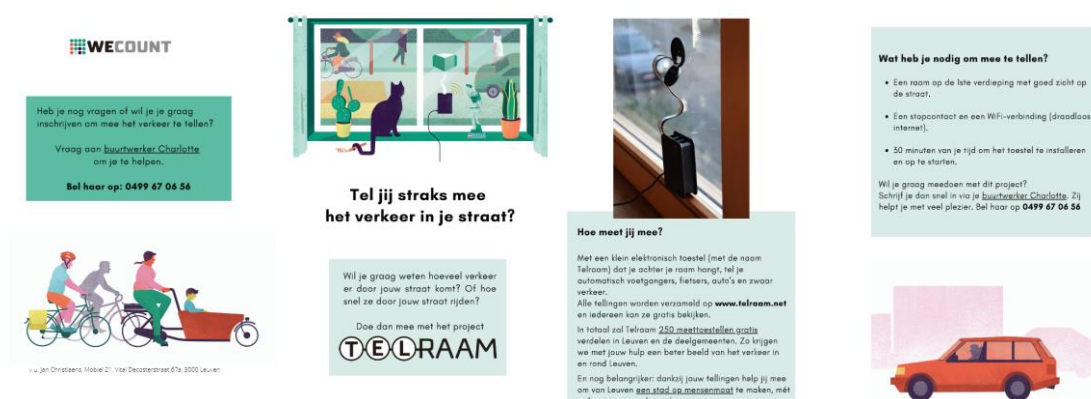
Figure 9: Example of poster (left) and WeCount Stickers (right) - Spanish case study

Figure 10: Example of flyer for targeted campaign – Belgium (above) and Slovenia (below) case studies

Tool, WeCount Recruitment Cards: one of the key initial lessons learned during the Spanish case study relates to the uncomfortable situation that participants face when discovering that their location is not suitable for hosting a Telraam sensor. To avoid this frustration, Recruitment Cards can be used to preliminarily investigate and assess whether interested citizens meet the requirements (i.e. have a

suitable view from their windows). Thus, in support of a "physical" engagement activity (e.g. a pop up event, street chats, other events), this resource helps to: (1) gather contact information of potential participants; (2) manage their expectations from the very beginning; and (3) identify suitable participants for installing a sensor and thus develop more focused communication with them. In Spain, the team availed of these recruitment cards (see example in Figure 11), during the only physical event organized to-date (i.e. prior to the COVID-19-related restrictions).

Figure 11: WeCount Recruitment Cards

Tool, introduction document to WeCount: this resource simply refers to a two-pages document that proposes a clear and understandable text explanation and graphical representations of the WeCount project. This resource has been developed by UWE for the Cardiff, Wales case study, proposed to the consortium and finally included in the WeCount ETF.

Finally, a further set of resources is included within this sub-phase to facilitate partners in the process of collecting, storing, and reporting important information regarding community-building processes and results. This includes a Local Dissemination Template (provided by WP5) to support the documentation and tracking of the local communication actions undertaken during the case study. It distinguishes activities by communication channel and highlights important data to be gathered and recorded (e.g. number of visits, number of views, etc.). Another example refers to a template to record all actions and activities implemented to target low socioeconomic level's participants. This consists of an excel file which allows recording what actions have been undertaken, when, what specific groups were targeted, the outcomes and the challenges experienced. This template was also provided by WP5.

All in all, the Scoping and Community Building phase encompasses several methods, resources and tools to address the four relevant objectives defined within it. While several of these activities

(especially those related to community-building and communication and dissemination) should continue throughout (and after) the actual case study, at this point the following outcomes should have been achieved:

- The WeCount local narrative has been consistently developed. From the general WeCount narrative at a project level, this is detailed and expanded taking into account the local context, the input received, and the learning acquired, the areas of the interventions and the specific issues to be addressed.

- Perceived matter of concerns explored, identified, and mapped across the city's districts. Different stakeholders, communities and areas might experience (and be therefore more interested in) different issues. As argued above, traffic counting can be related to several different matters of concern. At this point, these become evident and understood at a great level of granularity.

- Relevant stakeholders are identified and, if relevant, approached and involved.

- The community of participants and stakeholders are aware of expectations and initially agreed on commitments.

3.2   Phase 2: Co-Design

According to the WeCount work plan in WP4, this second task focuses on engaging participating citizens in the co-design of the case study. An important component of this task has been carried out within WP3, which focuses on adapting the technology, and specifically the data platform, the engagement process, and the overall user experience. In part, this was achieved in a co-creation format facilitated by the case study leaders. In other words, continuous feedback to those responsible for WP3 has been provided based on the experiences and suggestions observed and gathered with actual participants across both the Belgium and Spanish cases first, and then the remaining ones. Therefore, this phase in the WeCount EFT addresses the following: co-creating a suitable data collection protocol; and co-design of the project governance structure. At the end of this phase, the data collection campaign is set to start. It is noted that when entering the Co-Design phase, the following should have been established: (1) collaborative elaboration of a clear, narrow, and relevant problem statement; (2) a comprehensive understanding of the local mobility ecosystem and the relevant actors within it; and (3) an initial case study governance framework detailing different level of participation and commitment across citizens, scientific researchers, and other relevant actors / entities and stakeholders. In Spain, co-design activities were undertaken as part of the first workshop. Specifically, the last part of the online sessions with the different communities was dedicated to planning the case study with respect to establishing the specific focus, the timing, and, importantly in Spain, the logistics for the delivery of the Telraam sensors. Alternatively, a dedicated workshop with motivated participants could also be organised.

3.2.1   Co-design of the data collection protocol

The first set of activities within the Co-Design phase should address the following four objectives:

- To provide participants with the necessary resources to autonomously assemble the Telraam sensor and/or to assist partners during an assembly workshop.

- To design the data collection protocol.

- To design the case study according to the participants' availability, skills, and expectations.

- To initially establish participants' commitment.

The experience gained from the first two case studies had informed that a "one strategy fits all" principle is likely not to be applicable and this was confirmed when the other cases have been carried out. The involvement of different communities, with different interests and priorities, should entail an additional effort by the research team to try to accommodate everyone's needs and desires. For example, several schools wanted to participate with a dedicated "mini-pilot". However, the scope varied per school e.g. some were interested in assessing traffic around the school to make more informed decisions on where to place the access gate, whereas some others were more interested in deploying sensors to students that live around the school and to investigate "safe routes" for them. Clearly, these would require a dedicated approach. The approach can also vary for example with respect to timing (e.g. schools were not interested in traffic data during the summer), area of intervention, and specific focus of the analysis (e.g. combining traffic data with noise pollution data, or air quality etc.).

Tool, Collaborative Pilot Schedule: The Collaborative Pilot Schedule Tool can be used in a workshop format to plan the case study in a participatory manner. The tool consists of a simple A0 printed calendar of the case study (or if this is conducted online, an interactive calendar on MIRO) and allows to collectively decide on the actual schedule of activities and tasks during the local action. In addition to effectively involving participants in the co-design of the action, this tool has proven also helpful in somewhat initially formalising their actual commitment. This tool's detailed description is included in the WeCount EFT and proposed in Table 3 below.

Table 3: Collaborative Pilot Schedule - detailed description

|	
Description	The tool is simply an A0 printed calendar of the pilot and allows to collectively decide on the actual schedule of activities and tasks during the pilot, and to formalize the actual commitment of participants.
Why am I doing it?	To develop a detailed plan of actions across the remaining phases of the project (data collection, analysis, dissemination, and legacy) and assign people to specific tasks.
Which kind of issue can I tackle?	**Potentially applicable to all citizen science interventions.**
Resources needed	Public space (or virtual teleconference); A0 printed calendar canvas; one facilitator; pens, post-its and pins.
Time needed	1 - 3 hours depending on the number of participants
Skills needed (Not Required, Basic, Intermediate, Advanced)	**Subject-matter expertise:** Basic **IT skills:** Not Required **Facilitation skills:** Intermediate **Event organization skills:** Intermediate **Project management skills:** Intermediate **Communication skills:** Intermediate

How to use the tool	1. The extended team convenes in a public space in a workshop format. 2. Depending on the agreed data collection instruments (if any beyond Telraam), a set of action points are co-defined and mapped onto the calendar. 3. Hence, participants assign their names to the actions they are most interested in and competent about. 4. Specific tasks for everyone are outlined as a result of this step.
Outcomes	Established case study schedule and refined related governance framework. Engagement with each participant is formalized across the remaining phases of the case study.

Tool, Telraam Assembly Video: an important aspect originally included in the WeCount engagement strategy referred to engaging participating citizens in the assembly of the Telraam devices. This is considered as a significant contribution towards: (1) enabling them to learn about the components and the functioning of a Raspberry Pi - enabled internet of things device (i.e. Telraam); (2) transferring the required knowledge for them to be able to involve additional individuals or entities autonomously; (3) ensuring that people understand what the technology can do, as well as what it can't do. Regarding the latter, the experience in Spain (where a physical workshop for assembling the sensors was not possible) tells that it is of paramount importance for people to appreciate the value and limitations of technologies, to avoid false expectations and frustration at a later stage. Thus, a Telraam Assembly Video was originally conceived as a gif-based presentation to support a physical workshop and guide the assembly process step-by-step. This has been still the case in Ireland, where the case study leader has used it to facilitate an assembly workshop during interventions at local schools in Dublin. In other cases, such as the ones in Wales and Spain, however, sensors have been pre-assembled by the team, as remote, non-assisted, assembly was deemed too risky (i.e. we would have realised that a problem occurred only at the end of the following steps, i.e. the registration and installation process). Therefore, the initial video was adapted to be a standalone resource that can be used by anyone that wants to install a Telraam sensor at any time. So far, the text in the video has been translated to Dutch and English. The videos have been published openly both on the website and on YouTube[19]. Concluding, this video resource will be an important element of the legacy of WeCount, which will hopefully enable its scalability across communities and geographical areas.

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[19] https://www.youtube.com/watch?v=QiO4BJAXnSg&t=4s&ab_channel=IdeasforChange

Figure 12: Screenshot of WeCount Assembly Tutorial[20]

WeCount Assembly Tutorial (English)
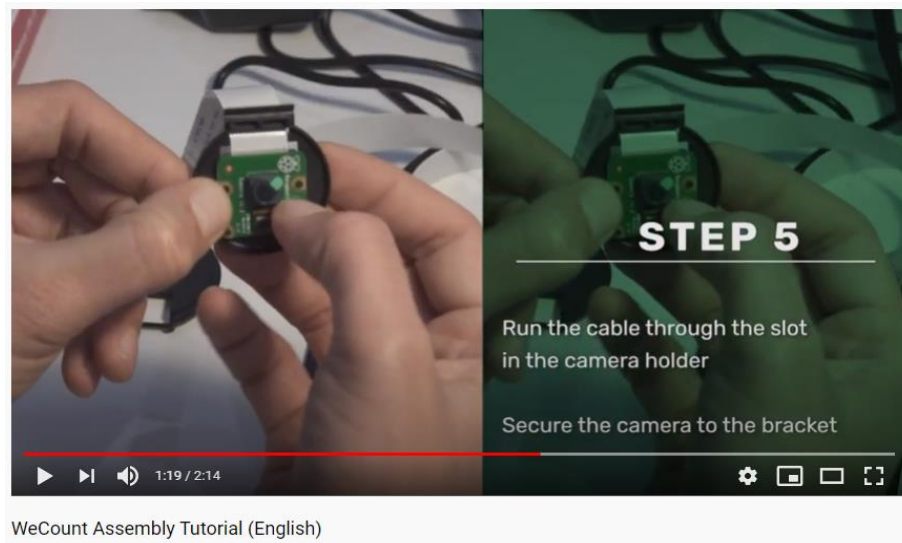
3.2.2 Co-design project (and data) governance

This second sub-phase specifically focuses on the project governance, i.e. what roles and responsibilities are assigned within the case study. It is noted that a key contribution to this stage is given, if used, by the Collaborative Pilot Schedule tool described above. Therefore, two key objectives were established for this phase: (1) establish a final case study governance framework in terms of roles, decision rights and accountabilities of each individual / entity involved; and (if case study leaders decide to include additional sensing technologies to Telraam) (2) make sure participants understand and agree upon what data they share and under what conditions. Regarding the latter, we believe that clarifying these aspects increases the level of trust between the partner and the participating citizens, besides underpinning a significant learning curve on data governance more generally from participating citizens.

Tool, Community Contribution Canvas: The Community Contribution Canvas tool is a large wall canvas which openly allows people to log contributions to the campaign, such as resources, sensor, meeting space, funds, time or even specific skills. Facilitators can fill out the fields in the chart according to the specific needs of WeCount. The tool is therefore designed to collectively explore, understand, and establish the level of commitment of each participant to the WeCount case study. It is also useful to identify expectations and commitments and to design different communication and engagement strategies tailored based on individuals' skills, interests, and availability.

Table 4: Community Contribution Canvas - detailed description

Description	While an ongoing communication plan contributes to this stage as a "continuous recruitment" instrument, a specific goal of this tool is to negotiate and establish the levels of contribution to WeCount across participating citizens and stakeholders. These generally vary with respect to: (1) level of participation; (2) time available to dedicate to the case study; (3) resources that can be brought into the case study; and (4) relevant skills. The tool offers three different levels

	of contribution to the pilot across these four dimensions. It is very simple to use and understand.
Why am I doing it?	Collectively understand and establish the level of commitment of each participant to the WeCount case study.
Which kind of issue can I tackle?	Potentially applicable to all citizen science projects
Resources needed	A3/A1/A0 printed canvas (depending on the number of participants), post-its, pins, pens, one facilitator
Time needed	Between 40 minutes and 1 hour, depending on the number of participants
Skills needed (Not Required, Basic, Intermediate, Advanced)	**Subject-matter expertise:** Basic **IT skills:** Not Required **Facilitation skills:** Intermediate **Event organisation skills:** Intermediate **Project management skills:** Intermediate **Communication skills:** Intermediate
How to use the tool	1. Organize a public workshop with the aim of establishing the extended research team, i.e. including citizens and all other relevant actors. As a result of this activity, those that participated so far and new members will officially become part of the case study. 2. One facilitator explains the different variables describing the level of contribution to the case study that each participating citizen can commit to. 3. Citizens position themselves onto the canvas by estimating and self-assessing the skills, resources, frequency of participation and time that each can bring into the case study.
Outcomes	Initial governance framework co-created and agreed across participants; commitment of citizens to the case study.
Tips!	Be empath!

Figure 13: Community Contribution Canvas - Downloadable and editable resource
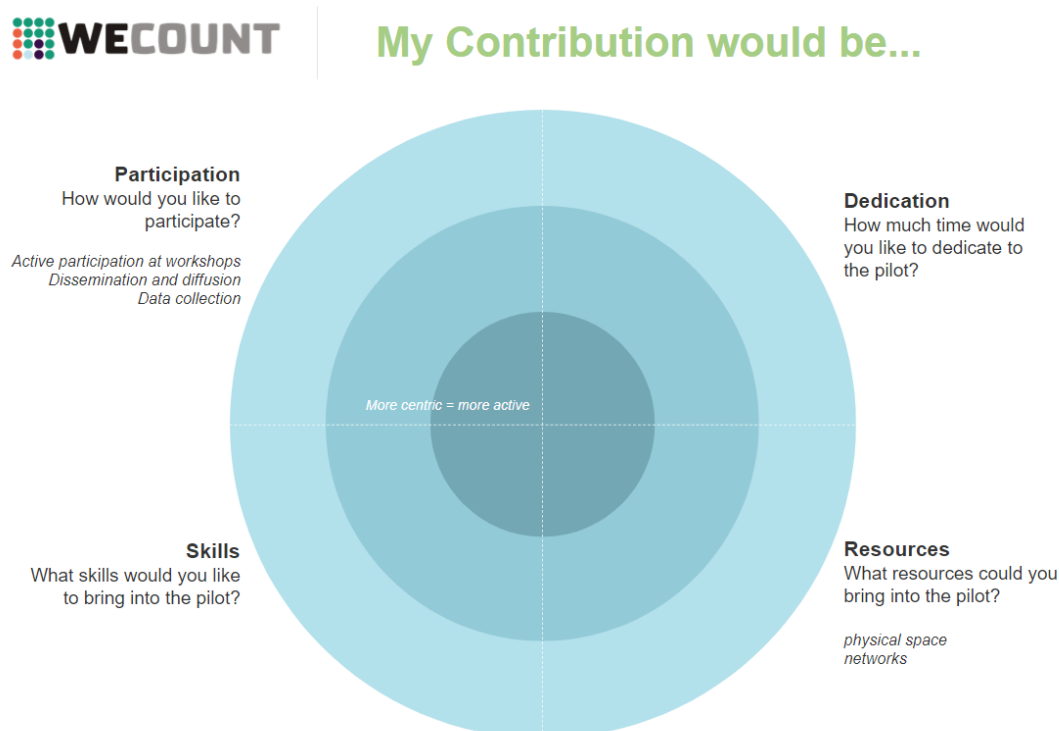
This tool has been originally designed, inspired by existing literature, by the team in Spain. So far, this has been adopted and adapted by the Belgium case study to support a more detailed understanding and establishment of the community of participants as part of an action whereby Telraam sensors were distributed to participants in public places. In particular, the tool has been adapted to the local situation where, with respect to project governance, the local team has adapted the original canvas with the specific roles that participants could take as part of the WeCount case study. Like its original version, the more central the role is in the canvas, the more commitment is established from participants. The adapted tool is shown in the figure below together with a brief explanation developed to support the action (left side of the figure).

Figure 14: Community Contribution Canvas adapted – Belgium case study

Tool, Risk / Benefits Matrix: this tool was introduced into the WeCount EFT to support partners and other future adopters in: (1) considering co-design of data governance aspects if additional technology is used to collect data beyond Telraam; or (2) enable discussions about risk and benefits of sharing Telraam data in an open format. Governance principles regarding Telraam data are clear, open, established, and ingrained in the Telraam Privacy Notice (as part of WP3). However, opportunities to co-create data governance principles together with participating citizens may be relevant if traffic data is combined with other forms of data from other sensors (e.g. air quality data, noise pollution data) - and if the newly introduced technology allows for flexibility in the management of the data it collects and visualises. The tool enables participants to understand the risks and the benefits of sharing their data and to discuss possible solutions in terms of what data to share, with whom, and under what conditions. Pragmatically, it consists of scenario cards to stimulate discussions and a matrix allowing to position perceived risks and benefits of sharing the data. A detailed description of the tool is provided in Table 5, followed by examples of templates for scenario cards taken from the repository of downloadable and editable resources (Figure 15), and the actual matrix template (Figure 16).

Table 5: Risk / Benefits Matrix - detailed description

Description	The tool consists of one or more (depending on the number of participants) A0 printed matrices of four quadrants displaying positive / negative combinations of risks and benefits. The matrix is populated through scenarios cards as data sharing scenarios are generated and discussed.
Why am I doing it?	Taking decisions about what data to share and in what format is often a matter of weighting personal and collective benefits against potential risks. The Risk / Benefits Matrix allows participants to collectively establish data sharing scenarios, evaluate benefits against ethical and other risks, and finally co-design a data sharing agreement.
Which kind of issue can I tackle?	Potentially applicable to all citizen science projects involving digital data collection and visualization.
Resources needed	One facilitator per table, scenarios cards, AO poster of Risk/Benefits matrix, public space, pens and pins.
Time needed	Approximately 1 hour
Skills needed (Not Required, Basic, Intermediate, Advanced)	**Subject-matter expertise:** Intermediate **IT skills:** Not Required **Facilitation skills:** Intermediate **Event organisation skills:** Basic **Project management skills:** Basic **Communication skills:** Intermediate
How to use the tool	1. The team convenes in a public space in a workshop format. Participants are divided across tables, with each group consisting of maximum 8-10 people. One facilitator per table must be assigned. 2. Participants are provided with previously developed scenario cards that describe different data sharing situations relevant to the specific data collected and analysed in WeCount and the associated devices and methods employed.

	3. Working in groups, participants collectively discuss their views on risks and benefits associated with sharing the different data collected and analysed in the study. 4. The resulting scenarios cards are mapped on the Risks / Benefits Matrix, thus creating an overview on the perceptions of the participants regarding data sharing.
Outcomes	Participating citizens will have gained collective awareness of potential benefits and risks deriving from sharing their data. In addition, the overall research team will have built the foundation for a data governance framework that accommodates the needs and concerns of all the citizens involved in the study.
Tips!	Potential risks and benefits of data sharing situations are not always obvious at the beginning. Try and provoke the generation of all possible scenarios through constructive conversations!

Figure 15: Risk/Benefits Matrix - Example of Scenario Card

Scenario Card

A Telraam sensor to measure traffic is installed on Maria's window.

The sensor has revealed high levels of traffic. Maria has to decide whether to share this data in an open format.

- If Maria decides to share this data, this will contribute towards better understanding the problem of mobility in the city and the appropriate design of solutions accordingly.

- However, María is currently selling her apartment and she is afraid that, if she shared this data, less people would be interested in buying it.

Figure 16: Risk/Benefits Matrix - Downloadable and editable matrix template

Risks / Benefits Matrix

⊕ Risks

⊖ Benefits   Benefits ⊕

⊖ Risks   WECOUNT

Concluding, the Co-Design phase is tackled in the WeCount EFT through two main steps concerning the co-design of the data collection protocol and of the project governance respectively. In WeCount, an important part of Co-Design was addressed through experimentation and feedback from the initial experiences in both Belgium and Spain. At the end of this phase, the community of participants has been positioned based on their willingness, capability, and availability to contribute to the local WeCount case study. The data collection protocol has been designed and agreed upon. Thus, data collection is set to start.

3.3 Phase 3: Data Collection

At this stage the data collection campaign begins. This phase, according to the DoA, also includes the crucial aspects concerning the assembly, preparation, and distribution of the Telraam sensors as well as their installation at the participants' homes. Once sensors have been deployed and installed, further actions to complement the quantitative data collected by the Telraam sensor with qualitative data are proposed in the WeCount EFT together with resources and methods to address the need of continuous support to participants during their experience of hosting a sensor.

3.3.1 Supply data collection tools

The first important step revolves around all those activities to procure, deploy, and install the Telraam technology. Ideally, this should be conducted as part of a physical workshop with participants (including hands-on activities as explained above) where, at the end of the event, people can take their sensors and will have experienced a demonstration of the registration and installation process, as well as a detailed technical explanation of how the sensor works and what its limitations are. However, this was not possible for all cases. For example, while in Belgium and Ireland a hybrid approach was taken (i.e. some activities online and some, including sensor delivery, physical), in Spain the local situation forced to adopt a full-online approach. This different approach was considered as an advantage within WeCount and specifically for the scope of the WP2 as learning outcomes, tools and methods were derived for both a full online and a hybrid approach. In terms of development, an important learning that guided the design of this sub-phase in WeCount came from the first beta-pilot experiences. While the Telraam hardware technology is not co-designed in WeCount, initial participants were involved in this phase in order to ensure that: (1) the registration and instalment processes are easy to understand and perform; (2) to test and inform changes in the support material provided to facilitate these processes; (3) to make sure that participants understand the technology, how to use it, and how to visualise the data; and (4) to test the logistics of the sensors' delivery (especially relevant in those countries were physical delivery was not possible due to COVID-19-related restrictions).

Method, pick up in public place process: the case study in Belgium has approached sensor delivery also as part of a public pop up intervention. A process, consistent with the detailed descriptions format used in this WeCount EFT, was derived and established for others to be inspired and facilitated. This is presented in Table 6. It is noted that as part of this intervention, the local team has also integrated the use of the adapted Community Contribution Canvas tool (see Figure 14 above and Figure 17 below).

Table 6: Telraam pick up in public place - detailed description of the process

Description	Pick-up in public space of the Telraam devices as a COVID-19 proof add-on to the technical workshop and start of community building.

Why am I doing it?	To meet the participants in a particular network in real life before the online technical workshop, which creates confidence and lowers the threshold to interact online during the process. To contribute to community building and create a COVID-19-proof opportunity for interaction among participants. To talk to participants individually and get an insight on motivations, level of participation and possibilities to contribute
Resources needed	● 1-2 people and a table ● Community contribution canvas page 1 and 2 (version M21) ● Map of the Telraam network: indication of the locations where citizens are counting already (on their own initiative), locations where the new participants will start counting in the framework of WeCount, the locations that we would like to count because it are strategically interesting locations ● Pens ● Telraam toolkits for participants ● Ethics document to sign.
Time needed	1 hour
Skills needed (Not Required, Basic, Intermediate, Advanced)	Communication skills: Intermediate
How to use the tool	● People come to your pick-up station. ● You hand over the Telraam toolkit and explain what is in the toolkit ● You show the map of the network and guide them through the community contribution canvas ● You let them sign the necessary documents ● You invite them again for the online workshop ● You let people interact with each other.
Outcomes	● All participants have their Telraam device to install after the workshop (that is following the pick-up) ● Participants met you in person which creates confidence ● Participants met each other and had an opportunity to exchange ideas. ● You have an overview of engagement and skills of participants
Tips!	● Useful to be with two colleagues to make sure you get the most out of this live moment with the participants! ● Organize yourself well at your pick-up station ● Make sure you choose a place in public space that is easy to find (visibility) and accessible for all participants. Communicate clearly to the participants about place and time (easily done through the dashboard) Make sure it is clear that you are the Telraam team! ● A drink or cake can foster interaction.

Figure 17: Telraam sensor delivery in Belgium combined with Community Contribution Canvas

Tool, Step-by-Step Installation Guide: this resource consists of a printed step-by-step installation guide. While a complete description is already available on the Telraam website, the learning from initial experiences informed that, especially in Spain, a printed and more detailed version of it would have facilitated the onboarding and registration process of participants. The guide consists of a 12 pages booklet comprising detailed descriptions supported by images about the actual process for each step to be followed during the installation. The process has been broken down into 16 basic steps. The case studies in Ireland and Wales have already adopted this guide (originally designed in Spanish and subsequently translated in English).

Figure 18: Downloadable Step-by-Step Installation Guide

Tool, the WeCount Toolbox: to support home delivery of the sensors (but also suitable for physical handover), a WeCount Toolbox has been designed and developed. It consists of cardboard box to be sent to participants (or handed over if done face to face) including: the sensor, the step-by-step installation guide; the Sensing Diary (see section 3.3.2); the charger and the additional equipment and manuals. The cardboard box is 22x15x9 cm and includes a paper wrap with WeCount logo and the following text: *Citizen Toolkit to Count Traffic and Mobility*. In terms of resources shared with the partners (and available for future potential adopters), the WeCount EFT includes: the description of the box (dimensions), a template to create a WeCount stamp, a template for the paper wrap (Figure 19) and pictures of the finished Toolbox (see Figure 20a). The idea was adopted by the case study leaders in Ljubljana who adapted the Toolbox (see Figure 20b).

Figure 19 Paper wrap design for WeCount Toolbox (in Spanish)
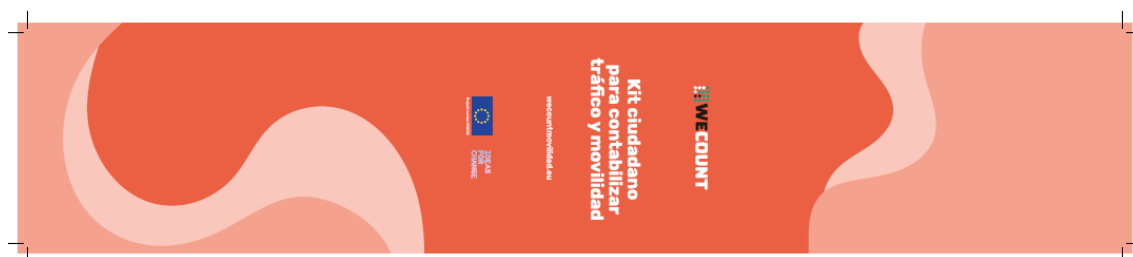

*Figure 20: Mounted WeCount Toolbox Spain (a) and Slovenia (b)*

Tool, Telraam Installation Tutorial Video: the registration and installation process are undertaken by participants at home. Therefore, one key objective for the WeCount local case studies is to make sure that all supporting resources possible are provided to them, also taking into account those

participants with low digital skills. Together with the tutorial embedded in the registration process on the Telraam website, and in addition to the printed Step-by-Step Installation Guide, two additional videos have been produced to further assist these important processes. First, a video has been created and embedded in the Telraam website and published on the WeCount YouTube channel (video available here: https://www.youtube.com/watch?v=PtWafiievfE&ab_channel=WeCount). Second, the initial experience in Spain has informed that, especially for older adults, a more detailed description and instructions guiding the process were needed (also considering that the images and screenshots of the first video are in English). To address this issue, a longer and spoken installation tutorial was also developed, and published online both on YouTube and on the local website (https://www.youtube.com/watch?v=l8XKh6BcJF8&feature=emb_title). The case study in Slovenia also developed three dedicated video tutorials to guide participants through the assembly, registration and installation processes respectively.

Figure 21: Screenshots of Installation Tutorial Video (in Spanish) and assembly video (Slovenian)
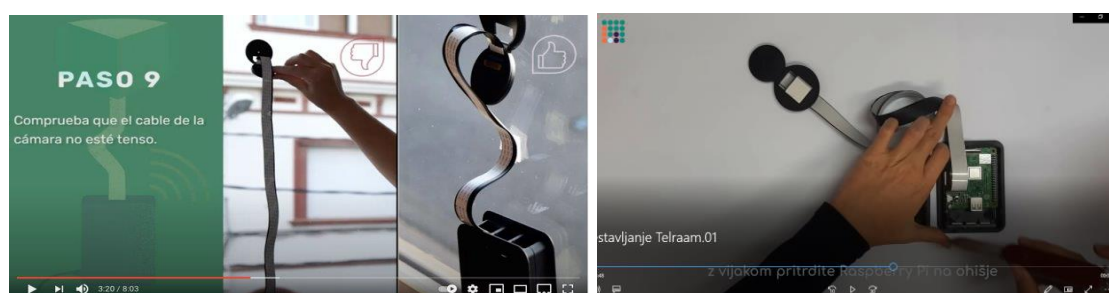
All in all, a suite of resources, tools and methods to accommodate both an online and hybrid approach has been collectively developed and, according to the initial experiences and feedback, has been found an appropriate guidance for installing the Telraam sensor by participants. In terms of further support to this process, the team in Spain has experimented conducting online workshops "installing the sensor together". This was conducted three times across Madrid and Barcelona with a limited number of participants. The format was as follows: a two- hour meeting was organised on Zoom; a member of the team installed one sensor using screen sharing functionality; participants followed the presenter across the different registration steps; those participants experiencing difficulties were moved to a separate online room (this is why Zoom software was chosen) for dedicated individual support from another member of the team.

As a result, two other options are proposed (both options can be also used within a given case study): (1) after delivering the sensors to participants, setting up so called "WeCount Online Help Clinics" as online meetings open for people experiencing issues or inconveniences to join, ask specific questions, and get personalised support; (2) conduct an actual technical workshop prior to the installation. With respect to the latter, the WeCount EFT also includes a template presentation used in the Spanish case study covering the following steps: (1) recap from previous workshop(s); (2) unboxing of WeCount Toolbox (to be received by post); (3) explanation of sensors' components; (4) registration guide; (5) how to see the data; (6) overview of how the classification algorithm works (to avoid surprises – e.g. heavy vehicles not counted at the beginning); (7) overview of Zendesk and how to use it; (8) feedback questions (feeding in WP5) using SLIDO software.

From the experience in Leuven, it is recommended to include a set of communication-related templates and a flyer (see Figure 22) to be included in the WeCount Toolbox with the objective of enabling participants in contributing to dissemination activities as well as extending the community building process by leveraging their networks, professional and personal.

Figure 22: WeCount Flyer to enable participants to contribute to communication (in Dutch)

As for the previous phase, also requirements with respect to both ethics, and monitoring and evaluation are also included here. The moment of supplying Telraam devices to participants entails crucial ethical considerations. This phase of the WeCount EFT thus includes links to relevant documentation such as the WeCount Privacy Notice and the Project Participation Information Sheet and Consent Form. With respect to the latter, some process-related considerations should be made. Specifically, due to different COVID-19-related restrictions across the different localities, Telraam sensors can be supplied either directly during a physical interaction (like in the case of Leuven) or through home delivery (like in the case of Barcelona and Madrid). In the second case, however, the process of collecting physically signed consent forms would have been challenging and would have resulted in the drop off of several participants (e.g. those that do not have a scanner at home). After we collectively explored the feasibility of adding digital signatures, but this was also discarded as we believed it would have negatively affected the participation from those with low digital skills. As a result, the following process was established: (1) send notification email that the participant has been selected to host a sensor, including the WeCount Information Sheet, and the Consent Form; (2) ask those selected to confirm their participation by replying to the same email copying and pasting the informed consent form. With respect to Monitoring and Evaluation (WP5), those templates to be used at this stage were also included.

3.3.2 *Complement data collected from sensors with qualitative data from participants*

The Telraam sensing technology and platform provide and visualise data about traffic in a given location. This includes how many cars, pedestrians, bicycles, and heavy vehicles pass in front of a given window and at what speed. However, some specific contingency factors (e.g. road closure for temporary works, events such as protests, marathons, among many others) may affect the analysis, interpretation, and ultimately the findings from the data collected. Thus, the main goal of this sub-phase is to propose an approach to enable effective interpretation of the data provided by the sensors, by including qualitative data from participants. The tool proposed to do this is named the WeCount Sensing Diary.

Tool, WeCount Sensing Diary: the tool is in the form of a notebook or notepad and can include a calendar. Participants are asked to input any possible information that in their opinion might have affected a specific measure from Telraam – e.g. road closed for works, festival etc. In Spain this was included at the end of the Step-by-Step installation guide. A table with a detailed description of the tool is provided below.

Table 7: WeCount Sensing Diaries - detailed description

|	
Description	WeCount Sensing Diaries can be used to complement quantitative data from Telraam with rich qualitative data from the citizens. Especially in the context of mobility-related data, it is important to gather as much contextual data as possible (e.g. regarding possible contingency factors that might better explain the hard-sensed data from the sensor). The tool is in the form of a notebook or notepad and can include a calendar. Participants are asked to input any possible information that in their opinion might have affected a specific measure from Telraam.
Why am I doing it?	Enable effective interpretation of the data provided by the sensors.
Resources needed	Notebook, pens - it can be done on paper or on digital device
Time needed	Ongoing throughout the duration of the data collection campaign
Skills needed (Not Required, Basic, Intermediate, Advanced)	**Subject-matter expertise:** Intermediate **IT skills:** Not Required **Facilitation skills:** Not Required **Event organisation skills:** Not Required **Project management skills:** Not Required **Communication skills:** Basic
How to use the tool	1. Citizens gain awareness from subject matter experts on potential events or other contingency factors that may influence the validity of measures from Telraam. 2. Citizens add annotations to the quantitative data as these contingency factors or other events occur. 3. The process is kept flexible and citizens can use the format (e.g. written form, pictures, videos etc) that suits them the most.

	4. The team collects the WeCount Sensing Diaries from each participating citizen to enable effective interpretation of the quantitative data.
Outcomes	Sensed data become richer to enable thick descriptions and more in-depth understanding of the phenomenon of interest.
Tips!	Keep reasonable expectations and avoid requesting complex data entries which might frustrate the participants.

3.3.3 Provide continuous support (technical and non-technical) to participants

An aspect of paramount importance during the months of data collection is to provide the right amount of technical and non-technical support to participants. While establishing communication channels (e.g. e-mails, WhatsApp groups with community champions etc.) is an important, and quite obvious, aspect of this sub-phase, a more structured, scalable, and embedded online resource has been developed as part of WP3. The system is called Zendesk. In WeCount, the Zendesk platform was available for all partners and complemented the very much needed one-to-one conversations with participants experiencing doubts and issues.

Tool, Zendesk: in terms of providing continuous support to participants, an embedded set of resources has been developed within Zendesk by Mobiel 21 and is now integrated in the Telraam website. The system includes several different elements. First, it includes organised and structured Frequently Asked Questions (FAQs) comprehensively covering technical, procedural, maintenance-related, and privacy and security elements (see Figure 23).

Figure 23: Zendesk Homepage[21]
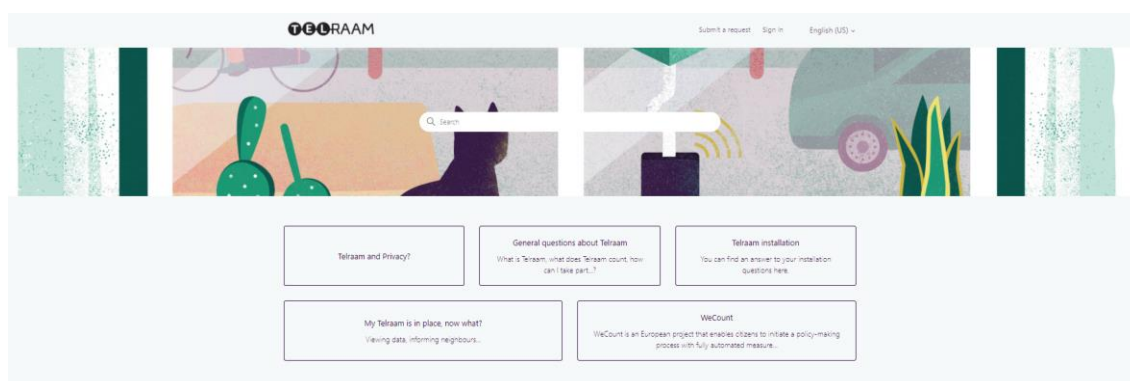
The website and all FAQs are available in all local languages and each case study leader provided the translated content (Zendesk is now available in English, French, Dutch, Slovenian, and Spanish).

When signed in, participants can also submit requests through the Zendesk system. The front-end system is visualised in an intuitive and easy-to-use format (see Figure 24).

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[21] Available at: - https://telraam.zendesk.com/hc/en-us

Figure 24: "Submit a Request" feature from Zendesk[22]

When a request from participants is submitted, the relevant case study leaders are notified and a ticket in the system is opened. The local leaders have access to the back-end side of the Zendesk platform and can effectively manage all requests either individually or, if needed, with the support of the technical team from Mobiel 21 and/or TML. Given the central and key role of this system throughout most of the WeCount local case studies, Mobiel 21 has carried out one-to-one training sessions with all case study leaders and is available for further dedicated support if needed. Finally, information about the sensor and to support the hosting experience is provided on the WeCount project website as well.

3.4   Phase 4: Data Analysis and Awareness

From the perspective of WP2, providing tools and resources to facilitate data analysis represents a challenge mostly because of the different research questions tackled within each case study. Therefore, the content within this sub-phase focuses mainly on approaches and resources to conduct data analysis processes together with participating citizens. In other words, while the nature of the research question dictates the appropriate methods for analysis, a cornerstone for this phase is to give an opportunity to proactively engage participants in this process. To achieve this, three main sets of activities are included in this sub-phase.

3.4.1   *Analyse the data collected with participating citizens*

Consistent with the citizen science nature of WeCount, and according to the workplan, analysing the data collected with citizens is a core element for all local case studies. The recommendation at a

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[22] Available at: https://telraam.zendesk.com/hc/en-us/requests/new.

project level is to conduct one or more workshops with participating citizens fully dedicated to data analysis. If more than one angle is to be taken during this phase (e.g. analysis focused on different geographical areas such as neighbourhoods, or analysis by theme such as mobility and air quality, mobility and urban design etc.) these can be organised as one unique workshop with several parallel sessions (e.g. tables if it is a physical workshop or online rooms if it is virtual) or as a series of dedicated workshops with the relevant communities.

Tool, Data Discussion Sheets: in general, the role of this tool is to offer relevant templates created for facilitating group discussions on the data collected and the overall WeCount case study experience. The data collected by Telraam gives an account of the amount of traffic in a specific place. However, the link between this data and how new knowledge informing change can be generated, can be hard to understand without specialist training. Developing an understanding can also be challenging when people have strong views on an issue. It is important to understand the measurements that have been collected and how these relate to impacts: for example, if you measure a high traffic at a certain place for a given amount of time, what does that mean in terms of informing more sustainable mobility policies? Relating measurements to action is a technique aimed at helping community members understand the broader implications of their measurements, and their options for action as a result. A template and a detailed description of the tool were also provided by M21 and TML to all partners. Part of these is dedicated also to comparing initial citizens' perceptions about mobility in their street (e.g. in Spain collected through the WeCount Timeline - see section 3.1.2).

Tool, Telraam Personalised Monthly Reports: another important tool for enabling (ongoing) analysis and interpretation of the data collected is the feature "Monthly Report" which is available on the Telraam platform (the tool is provided by WP3) for each sensor installed within a network. This can be downloaded from the platform and already incorporates some level of analysis and more detailed visualisation of the data collected until that point. The report includes: (1) an overview of the sensing activity as well as of the quality of the data collected (see example in Figure 25); (2) the average of objects per hour also compared with the previous month (see example in Figure 26); (3) an overview of the 10 busiest hours within the month by mode of mobility as well as an overview of speed ranges of cars during the same period (see example in Figure 27); and (4) trends in terms of daily volumes by mode of mobility (see example in Figure 28).

Figure 25: Example of Monthly Report Part 1

Figure 26: Example of Monthly Report Part 2

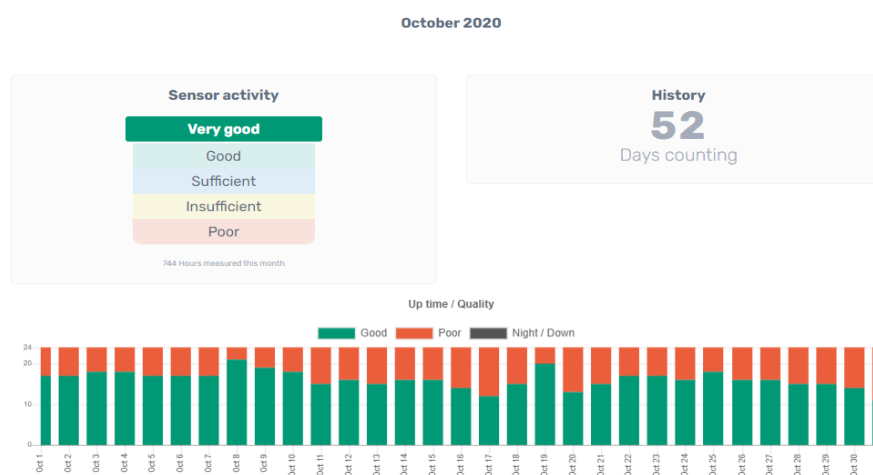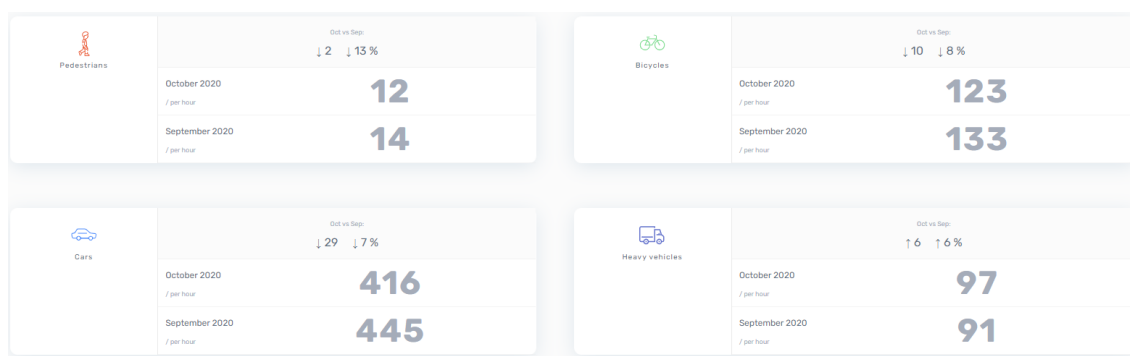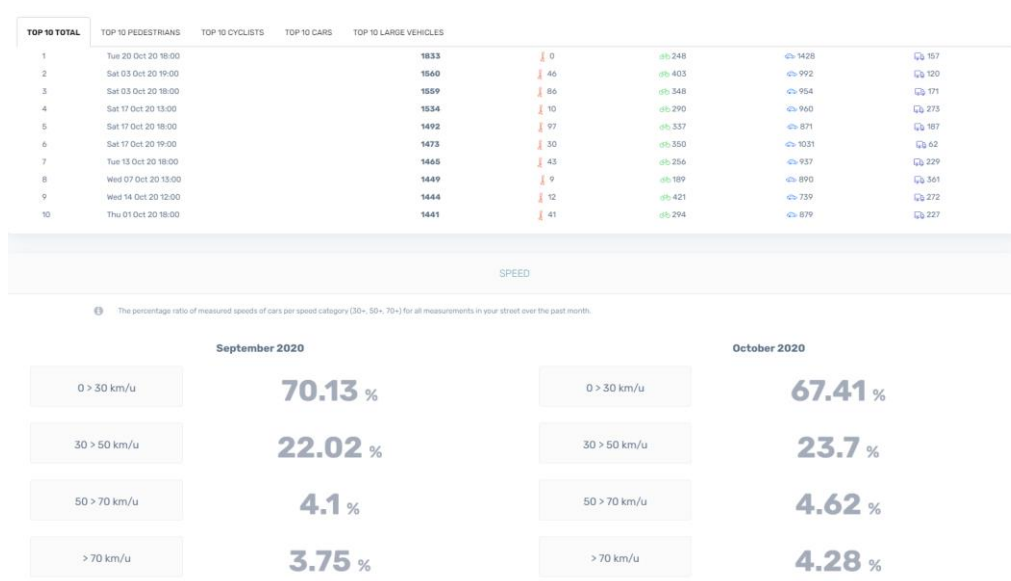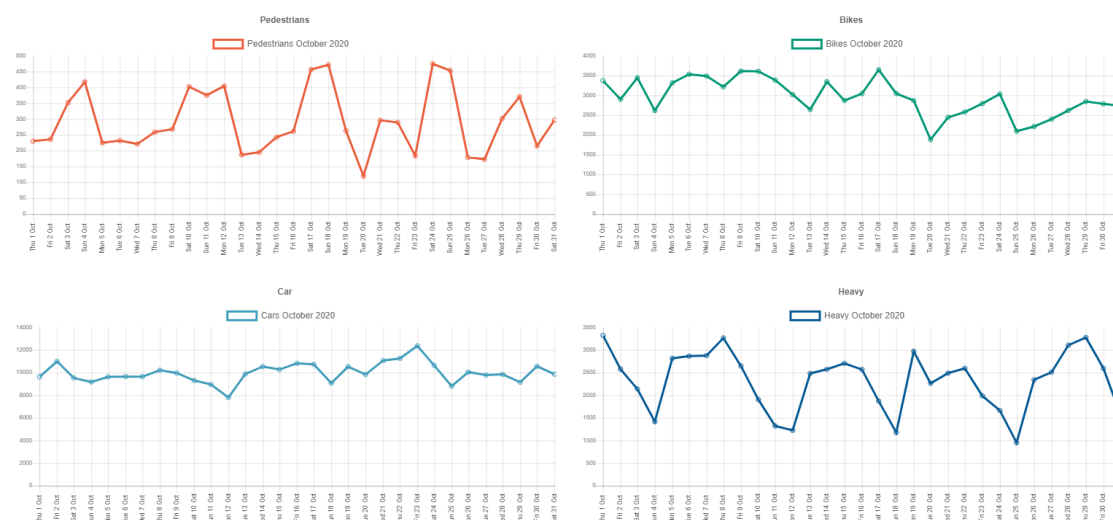*Figure 27: Example of Monthly Report Part 3*

Figure 28: Example of Monthly Report Part 4

Method, Participatory Analysis Workshop: one option through which participatory analysis of the data collected can be carried out is through a workshop. This was done in several cases and often was informed by a previous analysis conducted by the research team. The format proposed includes:

(1) a presentation of the overall results and some descriptive and more specific analyses (depending on the focus of the case study); (2) the opportunity for participants to comment and discuss the results presented, for example comparing these with their initial perceptions gathered at Phase 1 (e.g. through the WeCount Traffic Timeline); (3) pre-defined exercise for participants to conduct some independent and group based analysis starting from the data visualised onto the platform. In Spain, for instance, participants were assigned pre-defined tasks (e.g. find the day in which cars travelled fastest in your street) from their own sensor (or were assigned one in case they did not receive it).

3.4.2 *Foster new uses of the data*

A further central characteristic of WeCount refers to the development and implementation of the open data platform where the data collected by the citizen scientists through their Telraam sensors is visualised in near-real-time. As a consequence, this newly generated data can potentially open up opportunities for developers and other interested entities or communities. In other words, the objective of this sub-phase is to explore and experiment WeCount as an open data platform where developers can re-use the data generated as a core or marginal component of new (or enriching existing) services and applications. Clearly, this set of activities require significantly high levels of IT skills.

Tool, Telraam API: as a technical solution for enabling others to download the data in machine readable format, WP3 provided an Application Programming Interface (API) available online at https://telraam-api.net/. This online resource is defined as a "*collection of publicly available API call methods that can be used to access Telraam (https://telraam.net/) data*" and includes all documentation needed for anyone interested in downloading and reusing raw data collected from the sensors. Different features allow for several options for filtered download of the data (e.g. by segment ID, by MAC ID). A segment of the related webpage is proposed in Figure 29.

Figure 29: Screenshot of section of the Telraam API[23]

Importantly, complete information is also provided on the same page about the license associated with the Telraam data, that is Creative Commons Attribution 4.0 International Public License[24].

Method, hackathon / datathon on the results: an additional method that could be leveraged to stimulate, enable, and facilitate developers to reuse the data for application development is that of those so-called hackathons (also called datathons). These typically take the form of contests or competitions where developers are given a limited amount of time (e.g. a day, a weekend) to design

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[23] Available at: https://documenter.getpostman.com/view/8210376/TVeneTbe
[24] Available at: https://creativecommons.org/licenses/by/4.0/legalcode

and develop new applications on top of open data portals and platforms. In WeCount, no specific tools or resources were developed for facilitating these events. Rather the focus is currently on identifying potential institutions, civic tech communities, or other developers that could be potentially interested in taking part.

3.4.3   *Collective impact assessment*

Once the data has been collected and analysed, the focus shifts towards evaluating and assessing both the experience of participants during WeCount, and the impact of the case study. In other words, this sub-phase focuses on enabling a reflection on what goals have been achieved and to which extent, and any other expected or unexpected (positive and negative) outcomes of the case study.

This stage of the case studies is driven and informed by WP5, i.e. Monitoring and Evaluation. To do so, the team responsible for WP5 provided all case study leaders with a template and a process to collect relevant information from participants as well as from case study leaders. While these processes have been extensively described in Deliverable 5.1 and reported in Deliverables 5.2 and 5.3, these are now embedded in the WeCount EFT, consistent with the objective of providing case study leaders with a one-stop resource to facilitate their situated actions. Once again, it is underlined that while the engagement tools and methods are optional, and their adoption (and subsequent adaptation) depends on the specific context, those methods, templates and tools referring to ethics and monitoring and evaluation are mandatory for all partners.

Data collection and analysis at this stage is organised by WP5 and includes three key components: (1) data gathered from case study leaders through semi-structured interviews; (2) the aggregation of the data collected throughout the case study (e.g. the Self Reflective Log, the feedback to the different workshops from participants etc.); and (3) a systematically designed questionnaire to be distributed to participants after the local case study. Regarding the latter, it includes both multiple choice questions and open ones. These cover general topics such as the overall experience and learning curve during the action, as well as specific aspects revolving around the experience of hosting the Telraam sensor, the user interaction and interpretation of the data collected, the feedback about the installation process, and information about how WeCount has provoked actions from the individual or the community or the reasons why those actions could not be implemented.

3.5   Phase 5: Reflection and Legacy

Overall, the last phase of the WeCount case studies aims at implementing actions to ensure that: (1) the findings are effectively disseminated across different venues reaching appropriate audiences; (2) the impact of the case study is translated into policy making-oriented debates; (3) the learning from the action is captured and codified to foster both long-lasting impact and replicability of the pilot; (4) positive and negative experiences are captured, ordered, and disseminated to contribute to the advancement of the citizen science knowledge base as a whole. Planning for this stage should start at the beginning of the case study.

This phase includes three sub-phases that are tackled separately below together with a description of the tools and methods developed to address them.

3.5.1   *Disseminate results among different audiences*

A crucial part of ensuring legacy of WeCount refers to extensive communication and dissemination activities that should be conducted throughout the project lifecycle (as well as beyond the funding

period). These should focus on producing different types of materials to suit the different audiences of WeCount. These can include news media activities (including blogs, news articles, radio interviews, interventions on TV etc. - two examples among many outreach activities undertaken so far are proposed in Figure 30 below), academic publications and conference presentations, presence on other institutions' websites and blogs, social media communication, and communication oriented towards the public authority (see the Policy Brief Tool below). These activities are being undertaken by all partners. Typically, case study leaders focus more on local dissemination, whereas POLIS (i.e. the team responsible for WP6) is active on communication and dissemination, also, at the international level.

Figure 30: Examples of media outreach to-date - on the left BBC article on WeCount [25] - on the right extract of Spanish TV interview on WeCount [26]

Tool, 1st WeCount Policy Brief: as a tool specifically focused on targeting relevant governmental agencies and local authorities (both at the local and the international level), the first WeCount Policy Brief has been created and initially disseminated as part of WP6. It consists of a four-pages document written specifically for policy makers and/or others interested or involved in formulating or influencing mobility-related policies. It includes the summary of the issue being tackled in WeCount (i.e. "The value of citizen participation and science in transport is harnessing more recognition, however, the current ad-hoc engagement approaches can result in a lack of diversity and inclusivity. Can citizens directly contribute to achieving more sustainable transport systems? Can their actions and insights contribute to policy-making, allowing for a bottom-up, participatory approach, that reflects citizen expectations in urban mobility planning?" - extract of the Policy Brief); the approach and methodology employed in the project to address these issues, and a final section on "Policy Implications and Recommendations" which, in this first version, are articulated across four main points. To-date, the Policy Brief has been disseminated through several different channels and uploaded on the WeCount project website [27].

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[25] Available at: https://www.bbc.com/news/world-europe-51123760

[26] Available at: https://beteve.cat/ciencia-i-tecnologia/projecte-sensors-we-count-transit-carrers-secundaris-barcelona/

[27] Available here: https://we-count.net/_uploads/WeCount_Policy_Brief_1_final.pdf

Figure 31: Headline of the 1st WeCount Policy Brief

3.5.2   *Co-create citizens actions*

This sub-phase focuses on actions to empower citizens to propose courses of action. The aim is to co-create, plan and deliver actions that can generate recognition of the issue explored in the case study experiment and possibly make an impact.

One of the most obvious and straightforward ways to address these objectives would be to organise one or more public events where debates are conducted among participating citizens, the research team, and representatives from the relevant departments/agencies of the local or regional authority.

Method, Pop-Up Intervention: according to the experience, pop up interventions to showcase results and raise awareness about these have proven effective. These can take many forms, but we advocate for citizens to be at the core of the action, both its design and implementation. In Madrid and Barcelona, for example, a final event has been organised simultaneously in both cities in the form of pop-up interventions in those streets where sensors were placed and where citizens agreed to lead the action. It consisted of analogue-based visualisations of some of the results of the specific street (see Figure below). It also included interactions with local citizens that contributed to the data in addition to being presented the results of the case study. The action was the final event in the case study in both cities and all participants (as well as all key stakeholders engaged during the project were invited. The action was fully co-created with the participating citizens as they: (1) co-created three options for the final action and event; (2) democratically chose the one to implement; (3) actively participated in the co-design of the materials (i.e., magnetic boards, pins, graphics, locations etc.); and (4) in some cases assembled the kits (see examples in figure below) and led the action itself.

Figure 33: Example of Pop-Up Intervention Madrid and Barcelona

In addition, other tools and methods for effectively engaging participating citizens in this phase are proposed below.

Tool, Future Mobility Newspaper: An example of a dissemination tool that could also be used as a call for action to larger local communities (even beyond the end of WeCount funding period) is the Future Mobility Newspaper, i.e. a tool that consists of a canvas that gives a structured way to envision and effectively communicate future desirable scenarios that will ideally come true in the medium or long-term. The key aspect here is to stimulate participants' creativity in planning the journey from the WeCount intervention towards effective positive change in favour of a more sustainable mobility. Change here can be envisioned both from a behavioural perspective (both at the individual and collective level) and from a policy point of view. The detailed description of the tool is provided in Table 8, followed by the downloadable and editable template (see Figure 33).

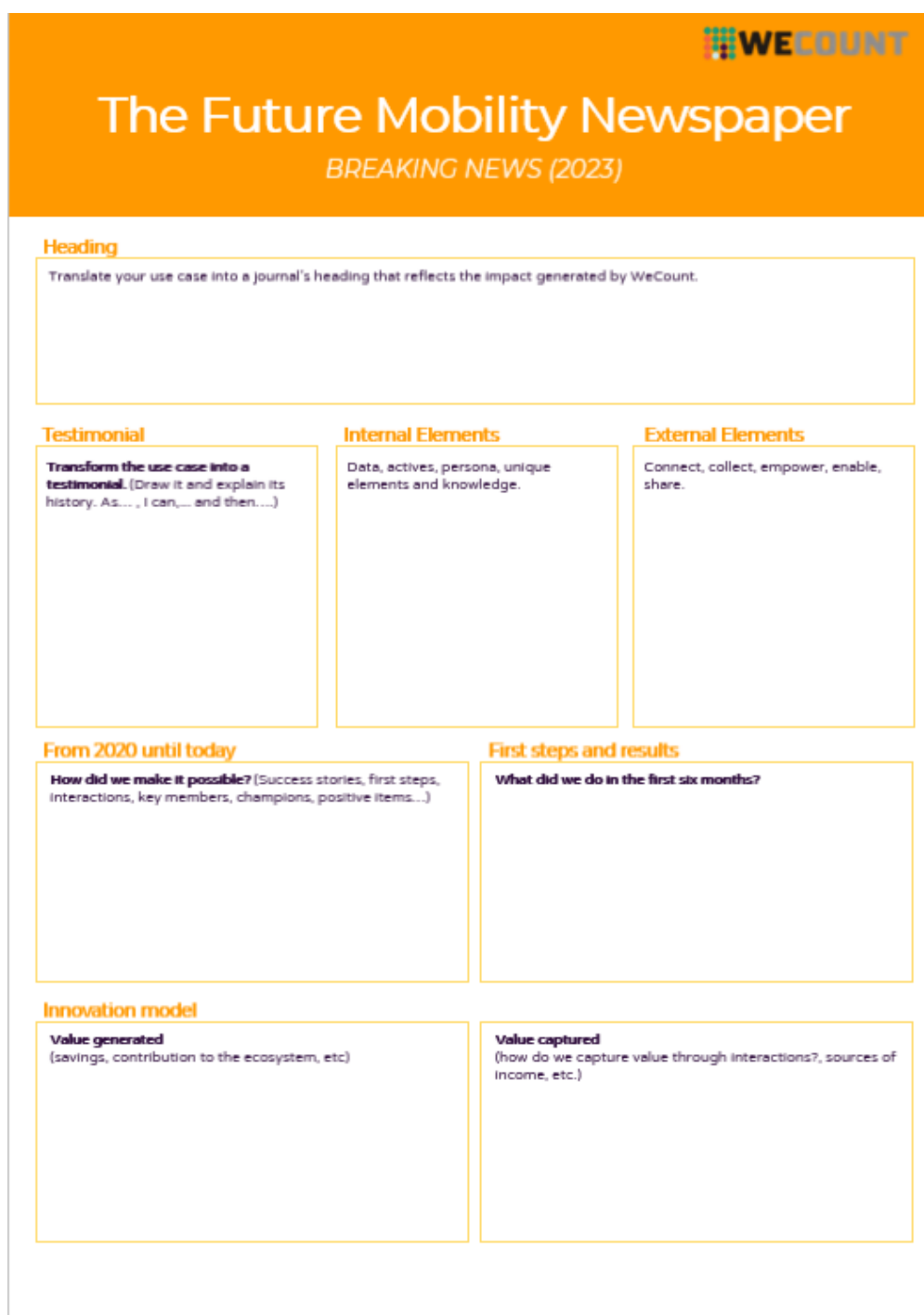*Table 8: The Future Mobility Newspaper - detailed description*

Description	The Future Mobility Newspaper represents one way to engage citizens in the production of dissemination material to reach both public authorities and the civic society as a whole. The tool consists of a canvas to facilitate the capturing of inputs when envisioning future sustainable mobility scenarios. The canvas gives a structured way to envision and effectively communicate future desirable scenarios. It includes: a headline and additional elements to describe the journey to the establishment of such scenarios (e.g. the enabling policies and other resources, a list and timeline of actions, stakeholders to be involved etc).
Why am I doing it?	Envisioning future scenarios to address mobility-related concerns emerging from the case study's findings. The tool is meant to stimulate the creativity of participants in designing new action - oriented solutions.
Which kind of issue can I tackle?	Potentially applicable to all citizen science projects
Resources needed	Printed Future Mobility Newspaper Canvas, markers and post-its; public space; one facilitator per group / table.
Time needed	1 to 2 hours

Skills needed (Not Required, Basic, Intermediate, Advanced)	Subject-matter expertise: Basic IT skills: Not Required Facilitation skills: Intermediate Event organisation skills: Intermediate Project management skills: Basic Communication skills: Intermediate
How to use the tool	• The team convenes in a public space. • Citizens and other participants are divided into groups of 4-7 people. • A facilitator guides the emergence of creative ideas about desirable future scenarios around sustainable mobility. • Collectively agree on a story title and populate the canvas. This is done through outlining the journey to be undertaken to make the future scenarios real. • Disseminate the Future Mobility Newspaper(s) through appropriate means.
Outcomes	Dissemination material targeting both the overall civic society and public authorities.
Tips!	Stimulate the group to be visionary and force them to envision the optimal situation in 3/5 years from now!

Figure 33: The Future Mobility Newspaper - Downloadable and editable template

Tool, Draw How You Would Like Your Street To Be, to be used during a workshop with children, this tool is meant to stimulate their creativity in envisioning the streets where they live in a world where sustainable mobility becomes the norm. The tool consists of a downloadable and editable canvas divided in two parts (see Figure 34 below). To be implemented, it requires a first explanation of what mobility is. Following this part, the team asks participating kids to draw on the left side of the canvas how their streets look like today; second, following an extensive explanation of the concept of sustainable mobility, the team can organise a funny and simple visualisation of the data collected through the Telraam devices in the area (in Spain this was conducted through a game). Based on the data and sustained by the concepts of sustainable mobility introduced to the children,

the team asks them to draw how they would like their streets to be in the future on the right side of the canvas. In Spain this was an effective tool to meaningfully engage 11-years old children during a WeCount school workshop undertaken online and dedicated to their class. Figure 35 below shows an example of this tool in action from one of the participating kids.

Figure 34: Draw How You Would Like Your Street To Be - editable and downloadable template
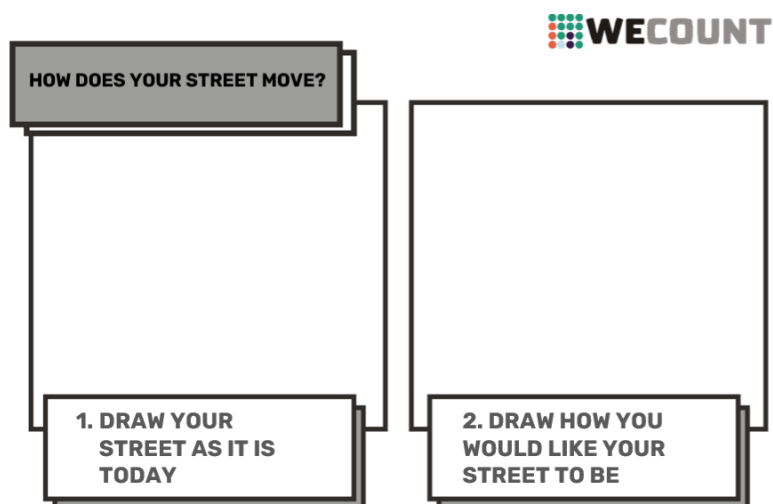
Figure 35: Draw How You Would Like Your Street To Be - example of application - Spain
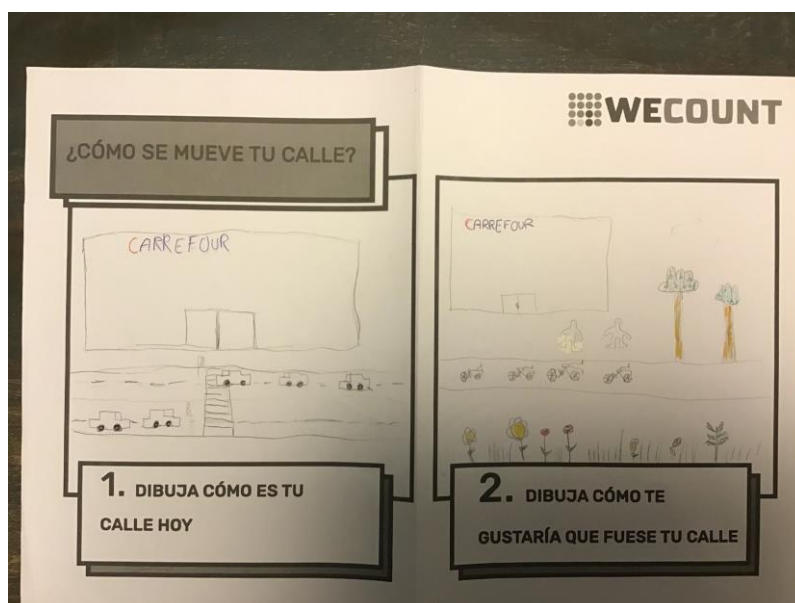
Finally, Mobiel 21 developed a more articulated set of tools named *Raambabbel* (in English: Window Chat) which objective is to enable and facilitate an open dialogue between neighbours on the local meaning of mobility data, on quality of life in their neighbourhood and on the impact of their own mobility behaviour. The ultimate goals are to stimulate the bottom-up co-creation of local solutions for local challenges on mobility and quality of life, and to foster the establishment of local sustainable WeCount/Telraam Communities.

Figure 36: Raambabbel Drawing - https://www.raambabbel.be/

3.5.3   *Reflect and plan for the legacy of the project*

In the last step within the WeCount EFT, the main objective is to codify and transfer the learning from the case studies and the overall project and to plan for scalability and sustainability beyond the end of the initiative. Therefore, citizens and researchers should collectively reflect on which kind of legacy the project aims to leave, and how.

The cornerstone for addressing this sub-phase has been tackled by the WeCount consortium through the development and establishment of a stable and transferable socio-technical infrastructure that will enable other groups of citizens to replicate the experiment and contribute with new sources of evidence to augment the knowledge base on traffic in our neighbourhoods, cities, and regions. The key elements of this infrastructure are the technology (the hardware, the platform, and the software side), and the WeCount EFT. Concerning the latter, i.e. the main scope of this WP, it includes a wide range of tools and methods that are meant to enable scaling of the WeCount case studies at two levels: first, from the experimental case studies (i.e.in Belgium and Spain) to the remaining cases in WeCount (i.e. in Wales, Republic of Ireland, and Slovenia); second from the WeCount project to other future communities or initiatives that will be interested in leveraging citizen science in the context of sustainable mobility. The way the WeCount project is articulated (i.e. across five case studies in different socio-cultural-technical contexts) fosters generalisability of the methods and resources leveraged. Currently, the project team is planning for how this toolkit and framework will be made available to others. As one action, this will be included in the project website. Furthermore, the team is currently engaging with other European initiatives that focus on aggregating tools and best practices across citizen science projects. The team is now discussing with representatives from the European Citizen Science Association (ECSA) for the inclusion of the WeCount EFT in their repository (specific webpage dedicated to WeCount in the platform is available at: https://eu-citizen.science/project/91#). This will include uploading the content to Zenodo and linking it as a resource to the platform.

In addition, the WeCount EFT includes two more resource to facilitate this sub-phase.

Tool, Graduation Certificate: with the objective of establishing ownership of the WeCount intervention, as well as of creating an attachment to the project and the citizen science discipline as a whole, this action focuses on graduating participants as members of WeCount and/or as a "graduation" as Citizen Scientists. This will be conducted through the delivery of a certificate that asserts that the person has been an active part of the WeCount case study. The development of the WeCount Graduation Certificate template is planned for the following months.

Tool, Pilot Videos: videos, in WeCount and beyond, were proven to be effective ways to disseminate the project's concepts, principles, experiences and findings. In WeCount every case study leaves videos showing and explaining each local intervention as an important legacy of the project. Videos for Leuven, Ljubljana and Madrid and Barcelona were produced to-date. The remaining two are forthcoming. The links to these can be found below:

- Leuven: https://www.youtube.com/watch?v=1WutQFBI9V8&ab_channel=WeCount

- Madrid&Barcelona:
  https://www.youtube.com/watch?v=zUGxNu0JuLM&ab_channel=WeCount

- Ljubljana: https://www.youtube.com/watch?v=4tTskieFrbw&ab_channel=WeCount

3.6 Support for Partners

As underlined several times in this document, one of the main objectives of this work package was to support, inspire, and facilitate case study leaders in engaging participating citizens across all phases of the WeCount case studies. As a consequence, one key objective of WP2 (formalised in the workplan as Task 2.2 - *Building a coordination and support network within pilots*), was to make sure that the WeCount EFT is effectively shared among all partners so that all can benefit from its insights, resources and tools. In other words, one important outcome of this WP is to provide a knowledge sharing resource (i.e. the WeCount EFT) to support all partners across all phases of the WeCount cases in their localities. To do so, we set up a knowledge sharing approach at multiple levels. The WeCount EFT has been shared with all partners in an easy-to-use and understand format. In particular, this consists of a master document whereby each critical sub-phase under each critical phase is presented in the following format: (1) a general description of the objective, why it is relevant and what actions it can include; (2) a table with proposed tools and methods to be used to address the objective at hand. Regarding the former, for each method and tool a description is provided and, where applicable, partners can also consult a detailed description and can download an editable template (as showcased across the previous sections in this chapter). These detailed descriptions include the following items: overall description, why is it relevant?, what type of issues can be tackled?, resources needed, skills needed (Subject matter expertise, IT skills, facilitation skills, event organization skills, project management skills, communication skills; each of these is described using the following scale: not required, basic, intermediate, advanced), Step by step guide on how to use the tool, outcomes, tips (i.e. tips from those partners that have already been leveraging the tool are also included). Also, to ensure that the WeCount EFT captures both adaptation of existing tools and new ones that may be designed as part of local case studies, partners had the opportunity to upload more tools to this knowledge sharing resource.

In addition to the format of this framework, three key considerations in addressing Task 2.2 should be remarked.

First, during the review and development phases, the team has had continuous interactions with those responsible for WP5 (Monitoring and Evaluation) and ethics. By doing so, the actual WeCount EFT embeds in one single resource, also the requirements in terms of data gathering (and related templates) for evaluation purposes and those with respect to ethics approval. This coordination across work packages has been crucial in ensuring a coherent approach for informing and supporting the case studies' implementations.

Second, the team, as part of the first consortium meeting (which was conducted in an online format) delivered a training session on the WeCount EFT, how to use it, and how to interpret and adapt its content. This internal training session was critical in gathering feedback from partners and improving the work accordingly.

Finally, like in WP5, the WP2 team has strengthened this coordination structure with (optional and on a as needed basis) one to one support, should the partners need any clarification, help during implementation, brainstorming potential solutions, or additional information.

4   Reflections on Engagement across Cases

This fourth chapter of this report provides reflections on engagement as well as on the usage and usefulness of the WeCount Engagement Framework and Toolkit (EFT) for each case study city. First, the method followed for this effort is provided and explained. Second, a sub-section for each case study is proposed to reflect on how it has been used (or not) in each city.

4.1   Method

The scope of this phase was about investigating both if and how the different case studies have leveraged the WeCount EFT as well as the engagement approach adopted and the results obtained.

In terms of reasoning, an inductive approach has been adopted for this phase. In particular, this bottom-up approach to knowledge, as opposed to a deductive approach from existing frameworks, has been seen as more suitable as:

- The WeCount case studies are diverse in nature and tackled a wide variety of situated mobility issues, actors, ecosystems, and operate in settings characterised by different policy landscapes. These differences make the strategy of "one framework fits all" impractical, given the objectives of this evaluation.
- The focus of this evaluation effort is not about comparing different case studies. Rather, its aim is to learn about the effectiveness of the WeCount EFT and the engagement approach more generally.
- We argue that the context of each case study has played an important role in influencing what has been achieved (and what has not). Adopting an existing framework (or a deductive approach more generally) would have entailed a risk of reducing complex cases to a few comparable variables, resulting in the loss of the idiosyncrasies of individual cases.

As a consequence of adopting inductive reasoning, a qualitative approach has been found more suitable (also complementing the overall evaluation effort presented in Deliverables 5.1, 5.2, and 5.3). First, this is consistent with the exploratory nature of this effort (as opposed to a confirmatory study from established theories/frameworks which would lead to a more quantitative approach). Second, Kaplan and Maxwell (2005) argue that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified. As the main source of evidence for this effort, we relied on semi-structured interviews. Qualitative "interviews are highly efficient ways to gather rich, empirical data" (Eisenhardt and Graebner, 2007), consistently with the objectives defined at this stage.

A semi-structured interview protocol has been developed and guided the data collection across the different case studies. The questions included as prompts for the discussion are listed in the box below.

> *Tell me about engagement in [your city], do you think it was successful or not? Why?*
>
> *Did you use the WeCount Engagement Framework and Toolkit we developed? If yes or no, why?*
>
> *What tools did you find to be the most useful? And what were the less useful? Why?*
>
> *If you used any tool, did they require adaptation to your context? Can you make an example?*
>
> *In [your city] there have been a mix of online and offline engagement. What were the differences? What was better and why?*

> *What phase (or phases) of the engagement methodology experienced the highest participation (problem formulation, co-design, data collection, data analysis, action)? And what phases experienced lowest engagement? Why?*
>
> *Back to the WeCount EFT, what was missing or overlooked? Was it presented in a useful and understandable manner? If not, can you explain why?*
>
> *Any other feedback positive or negative about WP2 you want us to include in the deliverable?*

All case study leaders have been interviewed. The details are provided in the table below[28].

Table 9: Semi-Structured Interviews

Case Study	Date of the interview	Duration of the interview
Leuven	July 22nd, 2021	65 minutes
Dublin	July 26th, 2021	30 minutes
Cardiff	July 27th, 2021	60 minutes
Ljubljana	August 3rd, 2021	55 minutes

Below we present the findings from this effort. These are structured consistently with the different topics investigated and outlined in the semi-structured interview protocol, and therefore include the following subsections: (1) a general reflection on engagement in the specific case study location; (2) reflections on the effects of the COVID19 pandemic and specifically on online versus offline engagement; and (3) reflections on the usage, usefulness, and adaptation of the WeCount EFT

4.2   Madrid and Barcelona

The engagement effort in Spain was carried out throughout and beyond the case study duration. Supported by a constant (more and more customised and targeted over time) communication plan, diverse communities have been engaged at different levels in different phases of the case study. The main issue experienced was related to the non-suitability of most participants to host the sensor.

The strategy initially followed was consistent with the train-the-trainer approach whereby community champions have been identified and targeted with the ultimate goal of transferring the knowledge required for them to act as gatekeepers with their own communities. To do so, a beta-pilot has been undertaken. As part for this process, the identified community champions were involved in a short cycle of WeCount (i.e. problem formulation, sensor delivery, data collection, and data analysis) for them to become familiar with the project's concepts, processes, and technologies. This has proven effective.

In parallel, city wide surveys were distributed in Barcelona and Madrid to promote the project and collectively shape the mobility related issues that affect local residents. These were complemented with dedicated problem formulation and co-designed workshops where participants were guided to narrow down the scope of the case study, consistent with the citizen science nature of this project.

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[28] It is noted that no interviews were taken for Spain as the case study leader was also the partner responsible for WP2.

Across the two cities, diverse communities of different stakeholders' types have been explored, targeted, and engaged at different levels. Formal partnerships have been established from the very beginning with the Citizen Science Office (within Barcelona City Council) and MediaLab Prado (within Madrid City Council) among several other entities (both private and public) and communities. Different schools were also engaged and dedicated workshops for them have been carried out.

With respect to the focus of the action, linking traffic data from Telraam with air quality data emerged as being the theme that interests and concerns citizens the most. To this end, and to extend the community building effort, the local team incorporated in WeCount an initiative whereby strawberry plants were leveraged as air quality bio sensors. Overall, the action consisted of distributing 1,000 strawberry plants that participants had to place on their balconies or windows for approximately 3.5 months.

Engagement during data collection has been mainly one-to-one, often following specific requests of individual participants. These ranged from issues with the sensor to more specific inputs, e.g. about the source code of the technology, or about other possible engagement avenues for the case study. This was followed by a series of participatory data analysis workshops. Attendance to these was lower than expected and only (some of) those that hosted a Telraam actively participated. Finally, fewer individuals manifested interest in co-designing, assembling, and leading a final action in the street where they live. This was somewhat expected as this phase required a much higher commitment and effort to be completed.

Figure 37: Final action in Madrid and Barcelona
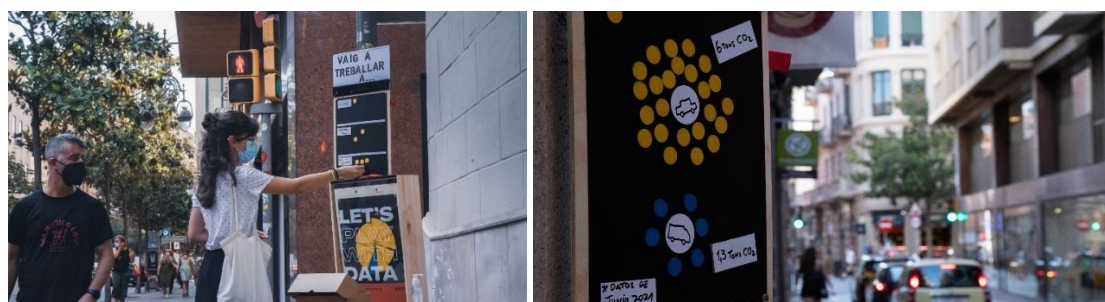
Further actions have been carried out independently by WeCount communities to pursue their own interests and, sometimes, existing agendas (see full details in Deliverable 4.1).

4.2.1 *Reflections on Engagement – Madrid and Barcelona*

Communication is found to be a crucial element for creating and sustaining engagement. The experience in Madrid and Barcelona shows, however, that one communication strategy for all is not a viable option. Participants differed in their level of interest, the topic of interest, their availability and commitment to the project, and their skills. Different participants needed therefore different approaches both in terms of the content to be communicated as well as the frequency of communication. This resulted impractical for the local partner as in most cases one-to-one communication channels were established (mainly through emails or phone calls) to address each individual's specific needs, interests, and issues. In other words, while mass communication has proven effective at the beginning of the case study to create awareness and raise interest in the project, as the case study progressed communication needs became more specific and required a targeted approach.

The main issue affecting engagement was related to the non-suitability of most participants in hosting the sensor (as their windows were not viable for generating valid and reliable data). In detail, only 100 participants were found to be suitable among the 575 people that requested the sensor.

Importantly, the air quality bio sensors campaign strategy strongly (positively) affected community building in the case study in four main ways. First, the delivery of plants has allowed the team to meet approximately 1,000 people, almost always individually, where they could explain and raise awareness about the WeCount narrative, physically show the Telraam sensor and conduct a brief demonstration, and manage their expectations from the beginning (i.e. people were explained the requirements upfront to avoid, like in previous cases, frustration at some point of the process when they realised they can't host one). However, the trends of most participants not meeting the requirements were confirmed and many people opted not for registering as members to the project. Second, several local private and public partners considerably endorsed the project and actively helped with communication, dissemination, and further recruitment. Third, the initiative, its narrative and originality were well received by the local and national media. Fourth, in addition to contributing to the objective of the case study co-designed with participants (i.e. to collect traffic data and air quality data and analyse these towards a more sustainable mobility), the team believed that by doing this campaign, people have been more encouraged to participate, follow the project progress and findings, even though they can't host a sensor. However, according to the feedback received by participants, receiving the traffic sensor was the main motivation for joining WeCount as members. This is reflected in the fact that the highest levels of participation were experienced during the first workshops and interactions. People that could not host a sensor tended to not engage in the project and generally did not attend the following workshop and meetings (e.g. data analysis workshops and action co-design).

4.2.2   Online versus Offline Engagement – Madrid and Barcelona

After the initial planning, due to COVID19-related restrictions, which have been enforced in Spain throughout the case study, all interactions have been conducted virtually with little to no face-to-face contact with participants and stakeholders.

The impossibility of organising face-to-face events and the need to move the entire process online, made community building more problematic. The full implementation of the methodology, the demonstration of the sensor, the actual promotion of the project, and, importantly, ensuring compliance with data privacy and ethics requirements, led to an engagement process that was not as straightforward as initially designed. The required task granularity of participants increased substantially, with several additional steps, emails, and forms that they need to read and fill. The local partner observed that this resulted in significant drop off between the different steps.

Also, one important aspect of the intervention was focused on hands-on activities in workshop format. These, apart from one initial event prior to the COVID19 crisis, have not been possible ever since. In this regard, having the opportunity to explain the project, its principles, and showing the sensor face-to-face during the delivery of the bio sensors have proven much more effective in recruiting members than sending newsletters and other digital communication materials.

A further impact of COVID19 pandemic at this stage related to people's participation in online workshops. According to the feedback received from participants, most of them have been spending most of their days working at their computers at home, spending significant time at their screens. We infer that this exceptional situation has negatively impacted people's willingness to spend more time at their computers during the evenings. Also, several participants noted that they have been

experiencing a skyrocketing number of invitations to online events, both new ones and as a substitute for their daily activities of all kinds, from physical exercises to their sessions with psychologists.

4.2.3 *The WeCount EFT – Madrid and Barcelona*

Since the case study leader in Spain was also responsible for WP2, i.e. for the design, development, and testing of the WeCount EFT, the evaluation of it from the Spanish case was not conducted to avoid bias. In addition, it has been developed within and from the case studies in Spain and Belgium (i.e. the first two cases that started). Still, the WeCount EFT has been the central embedded resource followed in the local intervention.

Most tools and methods included in the WeCount EFT were firstly developed for the local case in Spain (and in local language) and then generalised for the remaining cases. Because of this reason, these did not need adaptation.

In particular, the following tools and methods were primarily used: desk research and interviews; online city-wide survey; digital ecosystem mapping; pop-up intervention; the WeCount Traffic Timeline; stakeholder mapping; the Step-by-Step installation guide and the various tutorials developed locally and presented above; and the tools ingrained in the Telraam platform.

Despite a positive outcome from the beta pilot phase, the only tool used that did not produce significant outputs was the WeCount Sensing Diary. This was given to participants for them to highlight potential situations that might have affected the numbers provided by the sensor. This was included in the WeCount Toolbox, i.e. within the pack that they received with the sensor. However, very few participants returned it with very little inputs.

4.3 Leuven

Leuven's general approach to engagement was based on geographical areas. Different sub-cases have been established in different areas and each focused on a specific topic (resulting in specific objectives for counting traffic) and specific communities. For example, one case was created around monitoring the wider impact in the town from a road closure between two streets. Another one focused on monitoring the effects of a specific policy previously developed. A further one was based on speed compliance and a related challenge experienced recently with the local police who was not acknowledging the problem.

A cornerstone for the local strategy was based on reaching participants beyond the "usual suspects" (recognised to be "the 40 years old tech savvy male subjects"). This understanding of the "typical participants" came from a previous experience with Telraam in the area. The strategy has been subsequently to target civic centres as the gatekeepers for these communities.

The strategy was designed around the WeCount EFT (which development was also from Mobiel 21 - i.e. the Leuven's case study leaders). These centres were leveraged for promotion activities, whereby interactions were described as co-creation workshops. In another area (i.e. Kesselo) the initial strategy was to engage schools. This was later abandoned due to the COVID-19 crisis.

In total four cases were included in the (embedded) Leuven case study. Two were decided by the team previously and two were assigned among several communities that applied and submitted a proposal for setting these up.

4.3.1 Reflections on Engagement - Leuven

In general, the case study leaders considered the results of their engagement as a success in several aspects. Obviously, there is an acknowledgement of frustration emerged during the project because of the pandemic and the related restrictions that have affected the country and subsequently the initially thought engagement strategy in Leuven. This is believed to have seriously affected the ability to reach communities of vulnerable people (i.e. of low socio-economic status). The digital based effort to do so is believed not to be effective. As one of the strategies adopted, the team conducted face to face engagement through pop-up interventions. In here, participants were approached in public spaces and, after having a conversation on their perceived problems and opportunities as well as about a general introduction to the project and the sensor, the Community Contribution Canvas was adapted (renamed as Engagement Wheel) and leveraged (see Figure 14 in Section 3.2.2). This deviation from the original plan of conducting workshops has proven effective. Participants could pick up their sensors and learn about WeCount and sustainable mobility. After this pick-up moment, participants were invited to an online workshop focused on more technical explanation and instructions for registering to the platform and installing the sensor.

For engaging participants beyond the usual suspects, a considerable effort was made in communication and promotion with the design and distribution of several materials such as flyers, posters, social media posts etc. However, the results have not been as expected as, while 40% reached and engaged were females, the more general objective of reaching vulnerable groups was not fully met. Specifically, the engagement of people from other nationalities, ethnicities and low educated ones was not as high as expected.

The team acknowledges that the moment when sensor packages were distributed during the pop-up pick up event was the one characterised by higher shares of participation. Over 100 participants were engaged in this phase. Another phase that experienced high participation was the online workshop dedicated to technical explanation about the sensor and installation processes. This is inferred to be caused by the people's focus on the sensor, and of installing it right.

A challenge was experienced with respect to data analysis and specifically related to the objective of undertaking this phase in physical format. For this reason, this step was postponed several times. This was finally conducted in July 2021. To do so, the team leveraged the experience of the case study in Spain. As a consequence of the embedded approach (i.e. multiple mini case studies within the overarching Leuven case), to be meaningful, the analysis needed to be conducted separately for each case which has its own peculiarities, objectives, challenges, and focus points. These were organised through breakout rooms. Surprisingly to the team, while effective as a result, the data analysis phase saw the participation of 30 people, less than the number the team had hoped for. An interpretation on why this has happened leads to consider the name of the event used, i.e. WeCount Data Analysis Workshop. The team believes that this phrasing has "scared" some participants and that a more inclusive and less technical terminology may have increased the number of people who finally attended. According to the feedback received, a workshop based on "data" was perceived as being a technical one, rather than, as it was, focused on what the data can tell about sustainable mobility.

One observation was made with respect to the extent of engagement and commitment to the project. At the individual level, participants who are affected the most by a specific problem resulted to be the most engaged. For example, this was the case of an individual who has been vocal for some time about the non-compliance of cars in the street where the person lives with respect to speed. As a result, a dedicated sub-case was designed within Leuven around this.

An important lesson learned came from those who had a Telraam installed prior to WeCount. These participated in the analysis workshop and reported being impressed about the data being analysed and the format of these activities (i.e. face to face and divided by mini case). The lesson learned refers to the fact that these participants showcased the importance of continuous engagement actions to prevent them to fade away and lose interest.

Importantly, participants acknowledged that their role as champions and promoters of WeCount (e.g. through engaging in conversations with their own neighbours) was more effective when their claims were sustained by actual data and results, as opposed to project plans, goals, and descriptions.

With respect to action, the team is currently planning for an analogue-based intervention and is in close contact with the team in Spain, which has conducted this in both Madrid and Barcelona (see section 3.5.2).

4.3.2 Online versus Offline Engagement – Leuven

One main challenge of online engagement was the impossibility of creating and fostering social connections amongst participants. Creating a cohesive community was central to Leuven's approach to citizen engagement. The limitations of the online approach became evident during the physical data analysis workshop where participants reported its usefulness for creating a cohesive working group enriched with social ties created by the common purpose of improving sustainable mobility solutions for the area. This, however, went beyond creating connections among participants but also between them, the project team, and the City of Leuven. Having these relationships in place was found to substantially increase trust and, as a consequence, to have more productive and attached working groups.

Another challenge related to engaging people online relates to the difficulty of maintaining and sustaining the community over time. According to the case leaders, since this was done through email and social media, and without any personal contact due to the COVID-19 crisis, participants reported that this period was particularly rich for them in terms of emails conversations, online events etc., i.e. the so called online fatigue experienced during the crisis across sectors and domains.

One element that was found to be efficient in an online setting was the Q&A session organised for those that were experiencing issues either during the installation of the sensor or as part of hosting it. This format was found to be useful and was appreciated by participants.

For future projects, the most important element in terms of the phase in which physical interaction is of most importance is believed to be the kick-off. This is where the community is actually created, and the purpose is co-designed, agreed upon, and established.

4.3.3 The WeCount EFT – Leuven

The WeCount EFT was used in Leuven since the beginning (and was actually gradually built during the case study) and it was the basis for the overall engagement strategy. Its adaptation to the needed online approach was challenging. This, however, does not necessarily mean that online engagement is less effective. Rather, this entailed for the case leader a shift in the way they work in BAU conditions, and change is arguably hard in organizations generally.

The overall framework was used in several aspects and it was found to be an effective engagement framework. Effectiveness here is acknowledged to be in its ability to inform a coherent strategy and, simultaneously, to have a general set of engagement steps that could be adapted to every context,

thus ensuring a consistent approach across the WeCount case studies. All tools and resources were reviewed and those found to be useful were selected. It is noted that different areas required different specific approaches and, subsequently, different tools. Those that were found useful were leveraged in the case, and/or were used as inspirations for developing new, more specific and context-related ones. In terms of process, an evaluation of tools available was done through a first review and selection of candidates that were thought to be useful for the case. Those found to be not suitable were discarded at this stage. Still the team acknowledges that these weren't necessarily not relevant or badly designed, but simply not central to the scope of the case study.

In terms of adaptation and design of new tools, the team, to stimulate engagement among neighbours included in the material received by participants a recipe for a banana cake. This was thought to foster conversations among people living nearby, ultimately aimed at people learning about and engaging with WeCount. Another tool included was a marker for writing (and easily deleting) on windows (see Figure below).

Figure 38: example of markers for windows – from Leuven's WeCount Video

Furthermore, a sticker was produced for participants to showcase their participation in the project. Finally, a further tool was developed in the form of an information flyer including the specific steps, objectives, and timing of the case study in Leuven.

The Community Contribution Canvas was found to be one of the most useful tools (see Figure 14 in section 3.2.2). This was changed to accommodate the needs of Leuven as well as translated into local language. The team acknowledges that this would have been even more effective in face-to-face interactions as it is meant to stimulate a thoughtful discussion. The team assures that "we will definitely re-use this tool in future projects".

One challenge experienced in Leuven, as described above, was related to the shift to online engagement and interactions. The Leuven case started at the beginning, i.e. when the WeCount EFT was being developed and concurrently tested and improved. Initially, the resource was thought of as a support for physical activities and actions. The challenge was therefore related to the initial planning based on this initial version of this framework and the subsequent need to adapt the strategy to online activities.

The team's feedback is generally positive, and no major gaps were found in the WeCount EFT. As a suggestion, the case study leader advocates for more basic explanations about the specific processes to be undertaken to engage people in an online manner. This includes for example, tutorials on the usage of specific software solutions to foster brainstorming and focus groups activities (e.g. Slido, MIRO etc.) as well as the process to recruit, keep track and engage people online more generally.

It is noted that a member of Mobiel 21 was actively involved in the design of the toolkit and therefore the partner was very familiar with its structure, reasoning, and logical flow. The case leader believes that more training may have been needed if they had not been actively involved. Acknowledging the breadth of the scope of the framework, an actual citizen science coaching team, as a more constant dedicated support to engagement, is believed to be beneficial. The training sessions provided to the overall consortium are not believed to be enough. The team also highlights how these training would have been more effective in person, rather than online. However, no meeting in person could have been organised throughout the project.

Concluding, the team's feedback is consistent in saying that even at the consortium level, the impossibility of organising physical and face to face interactions affected the ability of the overall project to deliver a consistent engagement strategy across cases. As a positive feedback, the team in Leuven acknowledges the WeCount EFT as an important element representing the legacy of the project. In particular, they also recognize this qualitative evaluation to effectively complement the toolkit itself by providing richer qualitative lessons learned from the experiences across cases.

4.4   Cardiff

In Cardiff, the task of engagement was tackled assuming a broader perspective, i.e. not limited to citizen engagement. The starting point has been a stakeholder mapping exercise, consistent with the first phase of the WeCount EFT. The tool provided (developed as part of WP5 but included in the framework) was used to keep track of the stakeholders identified, their type and the type/extent of engagement and collaboration in the case study. This was done in parallel with a policy mapping exercise.

Stakeholder and policy mapping was followed by an extensive communication, promotion, and dissemination effort. This was also believed to be crucial and the previously defined strategy to leverage community champions as the boundary spanners and gatekeepers to their community was found to be relevant to enable the so-called snowballing effect.

The next phase was about onboarding and sensor delivery, which was conducted door-by-door by the case study leader on his bicycle. This was followed by a continuous effort in sustaining the community of participants and assisting them with sometimes very specific requests, issues, and doubts. Data analysis has been conducted through workshops (one has been conducted to-date and an additional workshop is planned for the end of the Summer). This is followed by a Citizen Advocacy Workshop, i.e. an event focused on moving from the results of the data analysis into action, e.g. addressing questions such as: what do we do now? How do we advocate for change? How can we collectively communicate the findings of the case study? These actions are planned for the Summer and Autumn 2021.

All in all, engagement was a continuous effort from the local team and while the strategy followed the framework and phases presented in this document, the need emerged to be resilient and accommodate the needs and requests of everyone. For example, even at the time of writing this report, new people are approaching the team as they heard about WeCount and apply for receiving

a sensor. This is mainly the result of stimulating local conversations through the community champions. However, the timing of this (and its effects) are out of total control by the case leaders.

It is noted that, given the focus of the case study was co-designed at the intersection between mobility and air quality, a small number of low-cost air quality sensors has been purchased and deployed alongside Telraam.

4.4.1   Reflections on Engagement – Cardiff

The majority of the local team at UWE lives and work in Bristol, England. The mapping exercise with respect to both policy and stakeholders was therefore found to be "essential" to achieve the required knowledge of the context and inform a meaningful engagement strategy.

The stakeholder mapping was found to be "invaluable" because even for the people living there, the presence of communities and other organizations may be often not known. These include networks and influencers. The strategy was then to stimulate snowballing from the initial influencers and networks identified. As demonstrated by their online activities in social media, this was effective in reaching potential participants and other stakeholders.

The local team then acknowledges the value of the policy mapping exercise, especially to have a meaningful and rich interaction with the community of citizen scientists and other stakeholders in Cardiff. This was specifically the case for some participants, but not for the more activist groups that were already well aware of the transport policy landscape. In both cases, however, knowing the policies in place was a cornerstone for effective engagement in terms of educating those that are not aware, and engaging those that know it well. In other words, this "baseline" knowledge was needed to have informative conversations. In summary, stakeholder and policy mapping went hand by hand, and one would have suffered without the other.

Overall, the highest participation was experienced in the first phases of community building. The reason is interpreted to revolve around the curiosity of people. In general, three types of citizens participated in this phase: (1) those that already knew they wanted a sensor; (2) those that could not host one, but still were motivated to contribute to the project; and (3) those that were simply curious and wanted to learn more about citizen science, sustainable mobility, and WeCount. Interestingly, one further reason for this is inferred to be related to the average level of knowledge of participants, which was (almost) the same for everyone at the beginning of the project as well as to their perceived ability to contribute. Indeed, the data analysis phase did not stimulate the same extent of engagement. People were generally less interested in "numbers" and felt that their contribution would not have been valuable unless they were experts in data analysis. In some cases, they developed the perception that they were collecting data only for the scientists/project, rather than also (and foremost) for themselves. In general, as in most citizen science projects, the level of participation decreased as the project progressed, e.g. with some of the "curious people" that followed up from the first community building effort.

4.4.2   Online versus Offline Engagement – Cardiff

Apart from the sensor delivery effort, the main activities with the communities have been conducted in an online environment. This had repercussions on the actual tools to be used. For example, the guiding material for building, registering on the platform, and installing the sensor would have been much simpler if it had been possible to organise hands-on sessions where participants could do these activities in a, face-to-face and supervised manner.

In total, four community building workshops have been organised, two of which are considered to have been successful by the case leader. These two workshops were organised with communities from two bounded geographical areas of the city. Participants often knew each other, and this facilitated the interactions and a productive environment. The other two were city-wide and, unlike the previous ones, were more general in nature. In other words, those considered successful also had a clear (geographical) focus. The debate and the level of engagement appeared to be much more valuable in the case where the focus of the intervention is more defined, participants are familiar with the issues, and the issue itself affects them directly. The city-wide community building workshops showed results more in terms of developing a citizen science community than one focused on particular transport problems. The data analysis workshop was also conducted in an online format.

The main element that was found to be missing was giving a human element to the case study. This is not only for participants that develop a stronger connection to the project but also in terms of the effectiveness of face-to-face informal conversations (e.g. during a coffee break at a physical workshop) beyond the more formal content delivery. The team acknowledged that, no matter how well done, the value of face-to-face interactions cannot be substituted by online actions. The delivery of the sensors with the bike at the participants' homes was a cornerstone in this way.

As a minor positive side of online meetings, some people, protected by a feeling of anonymity (e.g. they can set up a different name in the conference call and switch off their camera), were observed to be more vocal and participatory.

Finally, the fact that the overall consortium has always met online (apart from the kick-off meeting held in Leuven) is believed to have affected the overall effectiveness of WeCount as a whole.

4.4.3   The WeCount EFT - Cardiff

All in all, the WeCount EFT has been used by the case in Cardiff as: (1) a general methodology for engagement to be followed; (2) as an inspiration for designing and implementing local, context-specific, activities; and (3) as a repository of tools that were adapted to the local case.

The tools that were found to be the most valuable to the local context and case study were:
- Stakeholder mapping.
- The step-by-step assembly resources.
- The step-by-step installation guide: this was taken and adapted to the context in Cardiff and was found to be "vital". Even during the "helpdesk" phase, the team kept referring back to the steps and page numbers of the booklet.
- All the templates related to ethics and privacy, which were developed from a general template and adapted to each case study.

Also, other support resources for guiding the building, registration and installation of the sensor were leveraged and found to be effective. Some more details were added to the original format, beyond translations. These details were added based on previous experiences and common pitfalls experienced in other cases. To pre-empt those, some elements that caused confusion elsewhere were changed and clarified. Also, the impossibility of running face-to-face events forced the team to add more details to the booklet, i.e. details that were planned to be explained and showcased at these events. The challenge was to keep the resource as an informative material without overwhelming the users.

Interestingly, also compared to the case in Dublin (see section 4.5), the tone and language used in the Step-by-Step installation guide was a point of reflection for the team. In particular, two members were in charge of this adaptation: a scientist and a communication scientist. The former was arguing for a more formal tone and attitude (like in Dublin) while the latter pushed for a more friendly one (aligned with the tone used in Spain). The result was somewhat a balance, but there is an acknowledgement that the final tool went more in the direction of a more informal approach, mainly with the objective of "softening" the core concept of the project, thus making it more appealing for the more general public (i.e. beyond scientists and tech savvy people).

Figure 39: Step-by-step Installation Guide adapted to Cardiff, Wales
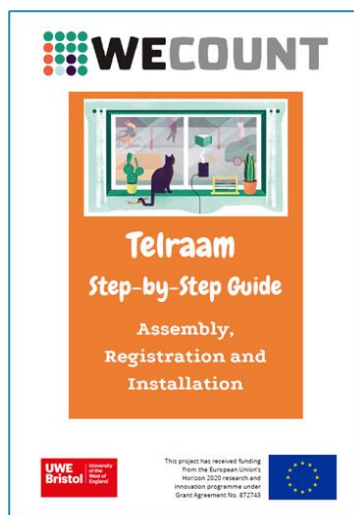
Other resources could not be used because of a logistic issue experienced in the case. In Cardiff, because of Brexit, the team had to use a different provider for the components of the sensors. This means that these came in slightly different versions (e.g. different boxes for the Raspberry Pi) than the remaining cases. These were not matching the images used for other sensor's related tutorials. In some cases (e.g. the printed step-by-step guide these could be adapted), in others (e.g. the assembly video tutorial) adaptation would have required a substantial effort.

The tools developed to support the distribution of the sensors were not used because of a different, peculiar, strategy adopted in Cardiff whereby the case study leader delivered the sensors to participants individually at their home through several cycling rounds in the city.

Figure 40: Contents of the WeCount Cardiff Sensor and Information Package

This strategy was found to be effective to:

- Give a human element to the project (thus partially addressing the issue of moving online described above).
- Have the opportunity to talk to participants individually to both explain the project further and assist with the registration and installation process (interviews were taken with some of them at their doorstep).
- The case study leader had the opportunity to experience being a cyclist in Cardiff, and to assess in first person how usable and effective the infrastructure is (it is noted that stimulating the usage of bicycles has been one focus of the case study).

All in all, this strategy allowed the case study leaders at UWE to: achieve a more granular understanding of the problem (both from a first person experience and from investigating how individuals perceive traffic in the city); "helpdesking" people; and gather material useful for the case study and communication. The case leader recognises that those new to citizen science projects and those that are not tech savvy, would have struggled to correctly complete the installation procedure without this face-to-face interaction.

Regarding the data analysis phase, the case study has taken a different strategy. Rather than undertaking an analysis of the data independently and discussing/enriching that with citizens, an extreme citizen science approach was adopted whereby citizens themselves took the lead of the analysis process. One of the reasons is the fact that the case leaders come from another city, and no one better than the locals can interpret the data from the sensor and propose new courses of action from it. This approach was found to be effective in terms of: (1) complementing the hard data from the sensor with data about the context; (2) demystify the idea that only experts and scientists can undertake data analysis, thus further developing the participants' sense of empowerment. In practical terms, no specific tools were developed. The data was presented by two participants together with their interpretation of it, thus making it possible to move from simple data to data interpreted and positioned within the participants' lived experiences. Beyond the effectiveness at the workshop, this strategy also helped in building the legacy of the project by leaving a sustainable socio-technical infrastructure and a community of citizens that can undertake a similar effort in the future independently. At this workshop, the policy mapping exercise conducted at the beginning was re-taken into account to provide a deeper and more meaningful understanding of the problems in the city as well as how they can potentially be addressed through policy making.

Figure 41: What other data would you like to see: feedback from Roath Data Workshop

The team in Cardiff had experience in EU and citizen engagement projects. From these past experiences, they have developed a number of resources and tools themselves that are now part of their way of working with citizens and communities. This was the case, for example, of advocacy and communication packages which were re-used and adapted to WeCount, rather than exploring, understanding, adapting, testing, and implementing those proposed in the WeCount EFT.

The main aspect that was found to be missing was a consistent approach to data analysis across the WeCount case studies. Such an approach should have been encapsulated in reusable tools and methods not only to inform and inspire the different case studies but also to enable a more consistent comparison. In this way, the analytics and visualisations provided in the Telraam platform are considered to be very useful (and at an enough level of detail for most participants). What was missing was an (offline) tool that allowed consulting and analysing data across different sensors. This was not a major problem in the case study, but it is believed that it would have increased the consistency across cases.

For the case study leader, it was the first experience in a fully citizen science project. The framework and the toolkit have contributed to their learning curve in this way. The steps are described as logical and naturally progressing. This learning curve could have been better if the toolkit could have been demonstrated in real life scenarios, and face-to-face. In other words, the fact that Spain and Belgium started before was a great learning for the UWE's team. However, the presentations and training online are believed not to be as effective as if these were conducted in person. This was actually the purpose of the first consortium meeting planned in Madrid where a significant portion of it was planned as a workshop with citizens where partners could have seen an example application of some of the tools. This was cancelled because of the pandemic. If this had been the case, however, a potential risk referred to the team not being pushed to actually reflect in-depth on the tools made available, making an effort to understand them and evaluate their suitability for the context, adapting

them etc. This gave a strong component of learning-by-doing, rather than following a strict methodology imposed by the training. All in all, "we found the right balance between the amount of guidance and the flexibility required to adapt to different contexts and communities" (Cardiff Case Study Leader).

Additional feedback is provided at the project level and relates to the effects of the pandemic and of the time constraints that all cases have experienced in WeCount. Because of this, some of the tools proposed were not considered, simply because there was not enough time to use them effectively. Some tools were found not to be relevant to the context, e.g. for cultural differences. Again, the fact that the usage of the tools proposed was not mandatory and these were inspirational, is believed to be a benefit.

Since WeCount (once again the first experience with a fully citizen science project for the local partner), UWE was granted two more citizen science projects. In both, the WeCount EFT has been adapted and proposed as the underlying citizen engagement methodology. This is a demonstration of how WeCount EFT represents an important legacy of the project, i.e. the fact that this is considered to be a valuable foundation for citizen (science) engagement even beyond the domain of sustainable mobility.

Concluding, it is noted that in Cardiff a specific focus on schools has also been established. Starting from the tools in the framework dedicated to these audiences, the local team has developed a separate embedded set of tools and resources to facilitate undertaking the steps of the methodology with schools. A dedicated working group led by UWE has been established and the first actions in this direction are planned for September 2021.

4.5   Dublin

The case study in Dublin was part of the WeCount second wave of cases, i.e. after the ones in Belgium and Spain. This started in 2021 and the engagement strategy was framed around three main interactions:

- An introductory workshop where participants could learn about the project, its concepts, aims and plans. In this first phase, the case leaders also gathered input about the traffic problem and how it is perceived by the people affected by it. This was leveraged also to gather inputs and to co-create the objectives for the case study (i.e. what data to focus on, what are the key elements to measure etc.).
- A data analysis workshop (planned towards the end of August /beginning of September 2021). This workshop has been slightly delayed due to the previous postponements and it is now scheduled for the end of the Summer to avoid doing it during Summer time, a particularly quiet period when schools are closed and families typically on holidays.
- A final workshop to co-create the final action upon the results of the data analysis phase. This final intervention is planned for September/October 2021.

Figure 42: WeCount Toolboxes adapted in Dublin, Ireland

The approach was driven by geographical areas. The partner in Dublin could undertake five series of workshops in parallel for five different areas of the city and the county. Attendance varied substantially with some that counted few participants ("three or four") and some with much more (quantitative details about each interaction are presented in Deliverable 5.3).

4.5.1   Reflections on Engagement – Dublin

When asked about engagement in Dublin the answer was: "it is going okay". The team is satisfied about the final results in terms of participants in WeCount. Over 100 sensors have been deployed in Dublin and, given the very strict restrictions resulting from the COVID-19 crisis, this is considered a success. Also, in Dublin, this process has been "slow" for several reasons, such as problems experienced with the installation and operation of the sensors, as well as delays of planned activities that had been constantly postponed until the restrictions would have been eased. This, at the time of writing this report, has not yet happened in the country of Ireland.

The initial steps were taken consistently with an infrastructuring approach whereby community champions and existing groups (e.g. the Dublin City Cycling Group) were approached and engaged. The strategy was to undertake the so-called train-the-trainer approach to leverage the networks of these groups and their champions, and, subsequently, substantially extend engagement in WeCount. These first interactions were then leveraged to conduct snowballing techniques and reach other potential individuals and groups - mainly those already established around transport and environmental sustainability topics. Several of these were activist groups.

An engagement effort was also conducted towards the councils. It is noted that Dublin City is divided into four city councils. These are acknowledged to be different from one another, and these reacted differently when contacted. Some have shared and given access to additional contacts, and some others have committed to take a number of sensors and to distribute these independently.

The peak in terms of successful engagement was experienced when the case study leader appeared on national television to promote the project, explain it, and recruit participants. As part of these communication and promotion actions, community champions were also interviewed and contributed. The team observed a "giant jump" in registrations following this mass communication events. Communication is then considered a cornerstone, "probably the most important one", for engagement.

From one perspective, in Dublin the engagement strategy has been different from Leuven and Spain in that an effort to recruit participants was made prior to the first workshop. A screening of suitability and a check on whether they met the requirements for effectively host a Telraam sensor was verified and established beforehand. In this way, all participants to the first interactions already had the sensor at home. This is interpreted as an action that has facilitated the process in terms of allowing the time to focus the workshop on sustainable mobility, co-design and collective problem exploration and formulation (rather than mostly on the technology and its requirements – which has been an issue in Spain). Nevertheless, this might have decreased the interest to participate from those that could not host the sensor.

According to the local partner at UCD, Data Collection is the phase that experienced the highest level of participation and extent of contribution. Surprisingly, several people that substantially contributed to the project (e.g. by providing data, feedback etc.) did not attend the online workshops. The result was that those that were already active in pursuing their own agenda (e.g. the civic groups and the community champions engaged) have been more present and active during the workshops, as opposed to those individual participants "that were basically interested in counting traffic in their own streets" (Dublin Case Study Leader).

4.5.2 *Online versus Offline Engagement – Dublin*

Apart from interventions in schools aimed at engaging children and students, all other interactions with adults have happened online. All in all, the partner's view on the differences between online and offline engagement sees some benefits and challenges of both approaches. In terms of benefits of online interactions, the fact that people did not have to travel to attend a workshop, and anyone could do so from their home is believed to be an advantage of online engagement. However, during the online interactions several people experienced difficulties, mainly technical related to poor connection and/or inability to use Zoom or the tools used for online interactions and participatory activities. This was mainly the case of older adults.

The team has benefitted from the UWE's training on online engagement and related solutions to undertake this. A variety of solutions have been used such as "MIRO and the Zoom canvases", but the team acknowledges that there was not one software or solution that was better than others, but all performed differently based on the specific scope of the interaction and the type of participants. However, the usefulness of these was observed to be lower in those cases where a limited number of people attended the events. In these, it was found to be more effective to have a person in the team taking notes to avoid losing some precious time in explaining how the different software work (i.e. not a central part of the project). Indeed, it is noted that online events could only last for a certain time and it was not realistic to ask people to attend half-day or full day workshops.

An interesting reflection emerges in terms of some experiences in which some more vocal people would take over some others that are in nature shyer. This minor issue was addressed by the local team calling out other participants, but it is believed that in offline and face-to-face settings these issues are easier to manage.

4.5.3   The WeCount EFT - Dublin

The WeCount EFT has been used by the case study team in Dublin. Several interactions with IFC were undertaken on an as-needed basis. The approach in this case was about explaining the target audience and the particular needs in a given phase of the case study and the subsequent reflection and proposal on what tools of the toolkit could have been leveraged for that specific purpose, type of participants, and the stage of the case study.

The team in Dublin has used several tools from the WeCount EFT. The vast majority referred to resources to help and inform dialogues and presentations (e.g. slides from other workshops, flyers etc.). In addition, the team at UCD has used:

- The Ideal Mobility Canvas (see Figure 6, section 3.1.2 – see adapted version for Dublin below): this tool was found effective in investigating the problem together with participants, taking into account their own experiences, perspectives, and concerns.
- Draw your Street (see Figure 34 section 3.5.2), which was used in schools' settings.
- The step by step printed guidelines: this is reported as the most useful tool to complement the manuals already published on the website as well as the video tutorial which was believed to be useful but only for a certain type of participants, i.e. those with some level of digital skills.

Figure 43: Ideal Mobility Canvas Tool used in workshop in Dublin, Ireland
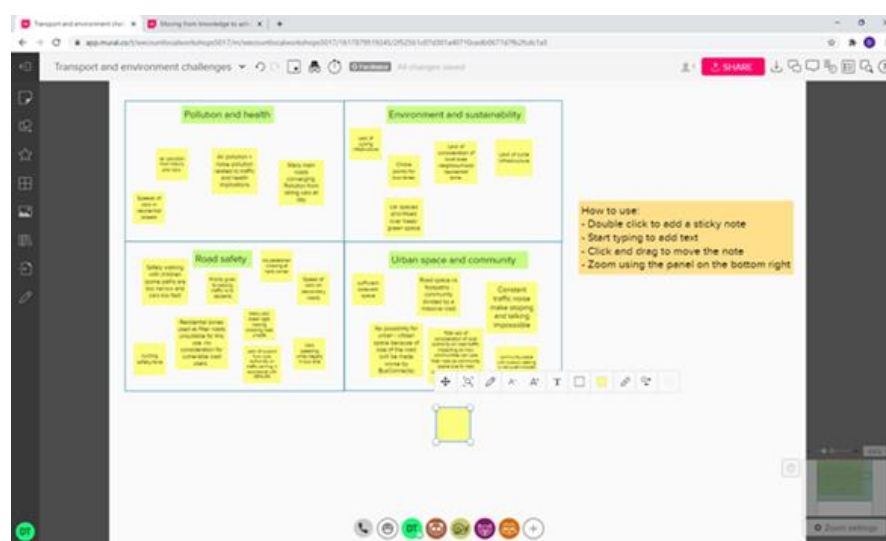
The team also found the longer step-by-step spoken installation tutorial to be useful. However, at the time of installing the sensors, this longer video was only available in Spanish (as it was specifically developed for older adults in Spain).

In general, no tools have been used as they were originally designed, and all required some adaptations. Most of these, however, referred to translation to English (and in some cases to Irish).

An interesting aspect emerges with respect to the step-by-step printed installation guide, and specifically in relation to the language and the tone used. While in Spain a more friendly tone has been used to phrase the different steps (e.g. "let's go, we are almost there!"), a more formal approach was believed to be more appropriate for the Irish context. This is believed to be the result of the cultural differences of the two countries.

When asked about tools that were found to be not useful, the response has been "I can't think of any". Rather than excluding those not used because these did not resonate with the context or the approach taken, the attitude was about selecting the most appropriate ones and then adapting these to the local language, focus, and context.

A point of confusion in accessing and using the WeCount EFT is reported being related to the software used for sharing the documents and resources at the project level, i.e. Microsoft SharePoint. This comes from two different reasons. First, the partner is not familiar with SharePoint and has traditionally been working with other solutions (e.g. Google Drive or Dropbox). Second, the partner argues about the need to have a consistent, and understandable structure of the overall shared folders and documents. According to their feedback, navigability of the shared WeCount resources could have been improved and this would have helped substantially in using the WeCount EFT and other resources more efficiently and effectively ("just finding the right things was very hard in there"). This difficulty was the main reason behind the Dublin team at UCD organising dedicated conference calls with IFC asking for support and advice on which tool and resource to use for what activity and brainstorm how. Since this type of support was considered effective, this approach was considered to be the most efficient by the team in Dublin. However, the team suggests, for future projects, a more formal public engagement coaching team established in the project governance framework to provide ongoing support to the local activities, as opposed to an as-needed-basis approach with more official training sessions for the overall consortium.

Another reason why the WeCount EFT could have been more useful is believed to be related to the COVID-19 crisis. The reason is twofold. On the one hand, the strategy needed to change continuously with the evolution for the overall situation. The WeCount EFT was firstly developed with a strong emphasis on face-to-face interactions, workshops, and hands-on sessions. On the other hand, the tools proposed complemented some other elements that needed to be used and delivered (e.g. project concepts and objectives, the sensor, the technical explanation, the timing of the case study etc.) and given the limited amount of time allowed in online interactions, there has been little time for other complementary activities (e.g. debating risks and benefits of sharing data).

In summary the WeCount EFT has been used consistently with its purpose, i.e. not as a mandatory set of resources to be used in a case study, but as an embedded set of tools to inspire local activities. The main barrier is perceived to be the way in which the EFT was presented and made available, which sometimes led to the perception that it was lost within countless project documents, deliverables, and other tools.

4.6   Ljubljana

Differently from Dublin and Cardiff, the case study in Ljubljana started almost in parallel with Leuven and Spain even though this was established as a follower case. This decision was made because of several reasons, such as: the need to match the strategy and the timing given that a core target audience referred to students; the acknowledgment that the COVID-19 related restrictions would have inevitably delayed several plans previously developed since the proposal stage. One of the consequences relevant to WP2 was that the WeCount EFT was being developed in parallel with the Slovenian's case study. The local team has therefore developed for most part their own tools and techniques, specific to their needs and priorities and to the peculiarities of the community targeted.

An extensive massive communication effort was conducted to promote WeCount and to start building the community. This has proven effective as the team could reach local newspapers and

several other networks connected to thousands of people. This was complemented by targeted campaigns and ongoing social media activities.

A first interaction then happened with the goal of explaining the project, its key concepts and objectives. Following this, the next step was about people independently registering to the platform and applying to receive one Telraam sensor. Those with suitable conditions were then given a sensor in another event. Once all sensors have been delivered, engagement was mainly conducted at the individual level. Follow ups with single participants were conducted frequently and periodically by the team. Other interactions happened with those experiencing problems during the installation process.

Like Barcelona and Madrid, a fundamental obstacle for the local team to engage local citizens in traffic counting was related to the urban design of the city's building. The vast majority of people interested in participating in WeCount was finally found to be not suitable to host a sensor as the window where Telraam should have been placed did not meet the requirements for ensuring a collection of accurate and valid data. This issue has severely affected the local's team strategy and often initial excitement of people and organizations (see example the cyclists network's NGO below) resulted in frustration of people and the team. The former could not install their sensors. The latter could not meet their expectations. It is however noted that the fact that the case started earlier positions it in the exploratory and testing phase of WeCount (also from a development perspective) and that issues were being reported to the WP3 team and the overall consortium and this contributed significantly to addressing some of these issues for later case studies.

This partial overlap with the development tasks also made the case study experience some technical issues, which are also believed to have affected the engagement (e.g. sensor not working because of wifi problems, the case leader had to change the power supplier in due course). In these cases, only strongly motivated people and those accessible (i.e. in Ljubljana) allowed one member of the team to go to their homes and fix the problem (when possible). Others just disengaged from the project. This has generated frustrations also from the team side as they had not had the chance to address some issues (e.g. the one related to encrypted wifi networks) even with the help of their IT department.

4.6.1 Reflections on Engagement – Ljubljana

Engagement at the beginning of the case study has been effective and met the team's objectives and expectations. An NGO, specifically a cyclists' network, was engaged as a local partner acting as a gatekeeper to their own community of people. Them, among others, showed interest and the willingness to commit to the project. However, from an initial testing, it became clear that most people did not have suitable locations and such an open engagement strategy would have struggled to take off.

To try and address the location suitability issues, the team conducted a door-to-door action for those places where windows looked suitable. This effort has proven effective. However, pursuing this strategy was time consuming (about 2 or 3 participants were engaged as users every day of work).

Interestingly, like in Spain, people tended not to engage fully in the project if they could not host a sensor. This suggests that having the sensor was the main motivation driving participation in these two case studies. The two main motivations triggering higher extents of participation were observed to be: (1) the chance to obtain a sensor, mainly for the tech savvy people; and (2) if an individual was seriously affected by a traffic related issue.

While the main motivation to participate came mainly from having the sensor, some participants showed interest also in contributing from the technical side, for example through giving continuous feedback and constructive suggestions to address some inconsistencies in the software and hardware. WeCount in Slovenia, consistent with the community champions - based approach, is also contributing to advance some communities' existing agendas. For instance, one community outside of Ljubljana was already conducting citizen (science) - led actions with respect to air quality and complemented their ongoing program with collecting and integrating traffic data through Telraam.

Other companies, shops and public entities showed interest in the project, but encrypted wifi issues have prevented them from actively participating. At the City Council of Ljubljana, ten sensors have been finally installed. However, to do so it required almost six months of debates and adaptations.

These experiences, together with the advent of the pandemic crisis, led to the decision of focusing also on students. Their response was mixed, as expected, in terms of extent of engagement and participation. Some students required an incentive or additional motivation to take part, and the local team decided to make this experience part of their coursework.

The interest and excitement initially shown by the cyclist network and other people interested makes the first phases of the project the ones that have experienced the highest level of participation and involvement. Different groups of work were established for participants based on their interest, skills, and concerns (e.g. one group working on speed compliance, a more technical group looking at the software development side etc.). A minor concern about perceived privacy issues for participants emerged. However, this was solved in most cases through explaining how WeCount complies with the most recent regulations and standards around people's privacy and security. Interestingly, the major impact came from three, independent, individuals. Based on the data collected, these participants acted by starting some debate with the public authority to finally get their local issue addressed.

Engagement with the project generally decreased at the time of analysing the data. However, some considerations should be made. It was observed that a necessary element fostering engagement is to have a clear purpose from the project. In general, those mentioned above who leveraged WeCount for their own agenda (e.g. to promote green infrastructure, in relation to air quality and noise pollution, to promote a more cycling friendly urban environment) reused the data independently for their own purposes. Other participants tended not to engage as a clear purpose for them was not prominent.

As a last effort to stimulate more engagement with the data collected, a public awareness campaign is planned for September in public spaces (e.g. banners on the external part of buses – see Figure 38) to showcase the findings and results of the case study.

Figure 44: example of banners for Ljubljana buses' awareness campaign

4.6.2   *Online versus Offline Engagement – Ljubljana*

Two initial physical workshops have been organised: one with students and one with the cycling network. The first went well and the second happened right at the start of the pandemic and even those registered did not attend.

All other workshops and meetings were conducted online, and this is seen as a further disadvantage experienced. Attendance has been low in general. The initial plan was to have pop up events and stands in public spaces to approach and engage people in person. This was believed to be more effective.

A challenge of online interactions came from the detached attitude of some people that typically turn off their cameras. In these environments it becomes hard to know whether people are understanding what they are being told and the level of interest in the topic.

4.6.3   *The WeCount EFT - Ljubljana*

Most of the tools included in the toolkit, as explained above, were still under development when the case study team at UL started their activities. Still, the main engagement stages and process have been followed. The tools used were mainly those that were somewhat mandatory, i.e. those related to ethics, privacy etc. Obviously, all tools ingrained in the Telraam platform have also been used and contributed to through the feedback from their experience and the one of the participants. Presentation templates were also used to some extent. Communication tools more generally are seen as critical and should be emphasised in these toolkits. Mainly because of the timing, the team in Slovenia developed their own communication tools and resources, e.g. flyers, posters etc. as well as a WeCount box where the sensor and other components were placed to be delivered to participants (see Figures 10 and 20b in sections 3.1.4 and 3.3.1 respectively – and see example in the figure below). In Ljubljana, Facebook's campaigns were effective in reaching people and in getting more members registered. Another project's tool that was used is the Zendesk helpdesk, which was translated in local language.

Figure 45: example of WeCount Postcard -Ljubljana Case Study

Importantly, the team in Slovenia states that the toolkit itself should have been promoted more strongly by WP2 leaders (IFC) and shares the opinion that having a very rich SharePoint shared drive for the consortium for all documents did not help.

The main feedback relates therefore to the promotion of the WeCount EFT towards the overall consortium. In the team's opinion, the usage of this embedded set of resources should have been pushed stronger for the partners, beyond the training provided. Also, in terms of presentation, it should have been more emphasised, rather than lost together with the other huge number of documents in the project's shared folders. It is noted, however, that forcing the usage of certain tools and methods was not the scope of the work conducted in WP2. Rather, it was to provide a shared repository of resources to inspire others to design their own intervention in their own socio-technical-cultural context.

As a general feedback, to fully engage a solid community for WeCount, the general timings in the project are believed to have been underestimated or at least severely impacted by the pandemic-related restrictions. More time would be needed to undertake citizen engagement more effectively.

It is believed that more formal and scheduled brainstorming sessions could have helped. Still, the case study leader acknowledges that different case studies required different approaches, and thus different tools and methods. The culture in Slovenia is also argued to be different. For example, according to the local team, several people have appeared to be "suspicious" about allowing a technology they do not know to be placed at their homes and connected to their networks.

5 Conclusions

This second version of Deliverable 2.1 presented the work conducted within WP2. In summary, all tasks have been addressed and converged in the development of the WeCount EFT which is extensively presented in this document. This knowledge sharing and transfer resource (to be used within and outside of the WeCount project) is the result of an extensive literature review on the topic as well as of the empirical experiences of the case studies in Spain, Belgium, Slovenia, Ireland, and Wales. More than thirty methods, tools and resources have been completed and shared with the partners across the different phases of the local case studies. These are complemented with those templates and tools developed by other WPs (mainly WP5 Monitoring and Evaluation).

The main addition from the first version of this document refers to the inclusion of specific reflections on the usage of the WeCount EFT as well as on engagement more generally. In addition, reflections on the need to move interactions and activities online is provided for each case study. The advent of COVID-19 related restrictions has had significant implications on the engagement approach in WeCount. While initially the team had strongly relied on face-to-face interactions and guided hands-on activities, for the vast majority of cases this was not possible. A significant effort has been therefore invested in adapting existing and designed tools and methods to other forms of virtual implementation in due course. Also, given the uncertainty related to these exceptional circumstances, the WeCount EFT had to take into account that different approaches have been (and could have been) taken by the different local partners (i.e. a fully virtual, a hybrid, or a traditional "physical" approach). As a consequence, the outcome of this WP had to be extended to accommodate all these possible situations. Conceiving the WeCount EFT as a living document ensured that all experiences of the case studies could be captured and shared.

Concluding, as a result of the current effort the team is undertaking in investigating suitable options for publishing this framework and toolkit as a legacy of the project, the goal is to have the WeCount EFT available online by the end of the WeCount project. This is believed to be a fundamental component enabling others to adapt the WeCount case studies into their own contexts tackling their own locally relevant issues.

References

Ashurst, C., 2015. Competing with IT: Leading a digital business. Macmillan International Higher Education.

Balestrini, M., Rogers, Y., Hassan, C., Creus, J., King, M., and Marshall, P. 2017. A City in Common: a Framework to Orchestrate Large-Scale Citizen Engagement around Urban Issues. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (pp.2282-2294), ACM.

Balestrini, M., Maccani, G., Righi, V., 2020. Tell me and I forget, teach me and I may remember, involve me and I learn: the role of toolkits in citizen science. *The European conference for citizen and participatory science 2020*, Trieste, Italy.

Craglia, M., and Granell, C. 2014. Citizen Science and smart cities—Report of summit, Ispra 5–7 February 2014. JRC Technical Report.

DiSalvo, C., Lukens, J., Lodato, T., Jenkins, T., and Kim, T. 2014. Making public things: how HCI design can express matters of concern. In Proceedings of the 32nd annual ACM conference on Human factors in computing systems (pp. 2397-2406). ACM.

Eisenhardt, K.M. and Graebner, M.E., 2007. Theory building from cases: Opportunities and challenges. Academy of management journal, 50(1), pp.25-32.

Fishbain, B., Lerner, U., Castell, N., Cole-Hunter, T., Popoola, O., Broday, D. M., & Jones, R. L., 2017. An evaluation tool kit of air quality micro-sensing units. Science of the Total Environment, 575, 639-648.

Gonsamo, A. and D'Odorico, P., 2014. Citizen science: best practices to remove observer bias in trend analysis. International journal of biometeorology, 58(10), pp.2159-2163.

Johnston, A., Hochachka, W.M., Strimas-Mackey, M.E., Gutierrez, V.R., Robinson, O.J., Miller, E.T., Auer, T., Kelling, S.T. and Fink, D., 2019. Best practices for making reliable inferences from citizen science data: case study using eBird to estimate species distributions. bioRxiv, p.574392.

Kaplan, B. and Maxwell, J.A., 2005. Qualitative research methods for evaluating computer information systems. In Evaluating the organizational impact of healthcare information systems (pp. 30-55). Springer New York.

Le Dantec, C.A. and DiSalvo, C., 2013. Infrastructuring and the formation of publics in participatory design. Social Studies of Science, 43(2): 241-264.

Maccani G., Goossensen M., Righi V., Creus J. and Balestrini M., Scaling up Citizen Science - What are the factors associated with increased reach and how to lever them to achieve impact, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-25157-6, doi:10.2760/00926, JRC122219.

Making Sense, 2018. Citizen sensing: a toolkit.

Manzoni, M., Vohland, K., Schade, S., Tsinaraki, C., Dusart, J., 2019. Citizens Science and Environmental Monitoring: Benefits and Challenges, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-09557-6.

Rambonnet, L., Vink, S.C., Land-Zandstra, A.M. and Bosker, T., 2019. Making citizen science count: Best practices and challenges of citizen science projects on plastics in aquatic environments. Marine Pollution Bulletin, 145, pp.271-277.

Sachs, S., Super, P.E. and Prysby, M., 2008. Citizen Science: A Best Practices Manual and How it Can be Applied. in Weber, Samantha, and David Harmon, eds. 2008. Rethinking Protected Areas in a Changing World: Proceedings of the 2007 GWS Biennial Conference on Parks, Protected Areas, and Cultural Sites. Hancock, Michigan: The George Wright Society.

Teli, M., Bordin, S., Blanco, M. M., Orabona, G., and De Angeli, A., 2015. Public design of digital commons in urban places: a case study. International Journal of Human-Computer Studies, 81, 17-30.