WECOUNT

WeCount: Citizens Observing UrbaN Transport

Deliverable 4.1: Summative Pilot Report – Leuven & Madrid

PART A: Introduction

Report for:
European Commission
Research Executive Agency (**REA)**

Date: February 2021

Authors: Lucija Ažman Momirski, Anja Bagon

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Document Details

Authors	Lucija Ažman Momirski, Anja Bagon
Contact	Lucija.azman@fa.uni-lj.si
Creation Date	December 2020
Date of Last Revision	10 March 2021
Description	Deliverable 4.1: Summative Pilot Report This document represents the first version of Deliverable 4.1. It summarizes the process of the realization of establishing the citizen science activity, the results of the citizen engagement in terms of participant involvement, data analysis on data generated in the citizen science activity and policy impact. The Summative Pilot Report builds on the experience of the two experimental WeCount case studies, i.e. the one in Belgium, Leuven, and Spain. Madrid and Barcelona

Version History

Version	Updated By	Date	Changes / Comments
1.0	Lucija Ažman Momirski	December 2020	Document draft
1.1	Anja Bagon	December 2020	Content/Layout
1.2	Lucija Ažman Momirski	February 2021	Review
1.3	Anja Bagon	February 2021	Full review
2.0	Lucija Ažman Momirski	March 2021	Final version

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Contents

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

1 Introduction

WeCount, Citizens Observing Urban Transport, is a Horizon 2020 funded project that is part of a Science with and for Society (SwafS) call (H2020-SwafS-2018-2020). WeCount is a Citizen Science project working in five cities in Europe to empower citizens to take a leading role in producing data, evidence, and knowledge around mobility in their own neighborhoods and at the street level. The project applies participatory Citizen Science methods to collaboratively develop and deploy innovative, low-cost, automated traffic counting sensors (e.g., Telraam) and multi-stakeholder engagement mechanisms in five case studies in Leuven (BE), Madrid and Barcelona (ES), Cardiff (UK), Dublin (IE) and Ljubljana (SI). The five cases will follow a similar execution path, with Leuven & Madrid (and Bacelona) leading off and serving as a test case for the remaining three cases. Following this approach, WeCount aims to quantify local road traffic (cars, trucks, active modes, and speed), produce scientific knowledge in the field of mobility and pollution, and co-design informed solutions to address a variety of road transport challenges. In addition, the project provides cost-effective data for local authorities on a much larger temporal and spatial scale than would be possible with traditional traffic counts, opening up new opportunities for transportation policy and research.

This deliverable represents the first version of the document reporting activities conducted as part of WeCount's Work Package 4 (WP4): Use Cases: 5 Citizen Science Activities. This WP is the central component of the WeCount project. The main goal of the WP is to implement citizen science activities (WP2) and sensor arrays (WP3) across five case studies and explore how they can contribute to solving a variety of societal problems related to transportation that are important to citizens. This WP builds on previous Citizen Science activities (e.g., the Telraam pilot in Leuven) and scales to other cases in terms of scope (e.g., linking with other low-cost sensors from iSCAPE), size (more sensors per case), and geographic location (five cities in Europe).

Because the processes of finding local communities and individual citizens (local champions), scanning local communities, community building and citizen science activities, communication techniques used, co-design processes with participating citizens, workshops, communication activities, customizations of the platform and sensors, assembly, distribution and installation of sensors, data collection, processing of raw data, data analysis and interpretation were so extensive in detail, this document is therefore organized as follows:

- Part A: Introduction;
- Part B: Leuven;
- Part C: Madrid and Barcelona.

The deliverable brings the summative pilot report for two case studies, Leuven and Madrid.

Part A summarizes the actions related to scoping, community building, and co-design throughout the case studies, data collection and analysis, the case studies outcome, and planned actions for the future.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2 Scoping, community building and co-designing the local citizen science activity

The most important step was to find local communities and individual citizens ("local champions") and their concerns about local transportation. This activity involved scanning the public realm, which led to direct meetings with community leaders and local champions able and willing to set up a citizen science activity. The activities were based on mapping existing citizen activities and groups (in collaboration with T 2.3) and identifying their needs, interests, and willingness to participate, as well as the type of support they need to effectively engage in citizen science.

The steps consisted of building the community around the citizen science activity using communication techniques common to any community (local Facebook groups, gatherings, community meetings, etc.). This led to a series of workshops with local citizens explaining the capabilities of WeCount. Once community leaders were identified, they were offered ongoing support to set up traffic count sensors.

The pilot reports present:

- Descriptions of the strategies used to build community management with the local champions;
- Description of how the community building evolved and what communication techniques were used.

2.1 Leuven

WeCount Leuven used 5 different sub-networks, for the 5 different city districts in Leuven. The community building process of WeCount was based on previous participatory processes, whether initiated by the local government or by the citizens themselves. Steps were taken to gain a good understanding of the local mobility context, supported by an existing rich participatory context organized by the city government and initiated by citizens (e.g. the platform "Maak het mee" (Help us build Leuven together)). A comprehensive stakeholder mapping was created for each city district. City officials who supported these active citizens and citizen networks were critical players in the community building phase. In addition to the press release, more in-depth communication channels and materials were used to engage local communities (e.g., announcements on Telraam social media (Twitter & Facebook)). Covid-19 restrictions worked against active enrolment of the local championship (e.g., for the Kessel-Lo Zone) according to communication plans. Recruitment, briefing, and motivation of the local champions had to be done entirely digitally, which is a difficult way to capture motivation and get a detailed briefing on engagement. Each participant for each of the networks received a welcome packet. Communication remains continuous.

Citizens have co-designed a Telraam platform where citizen scientists can find tools to analyze the data, tools to understand the data analysis, tools to build context around the data, tools to initiate a dialogue between citizens about the data, and tools to initiate action based on the data. Reaching socially vulnerable people is also an important focus in WeCount, especially in the scoping phase and in the data awareness and legacy phase.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2.2 Madrid and Barcelona

It was decided to expand the Spanish case study and extend the effort to the cities of Madrid and Barcelona. As a first step, a beta pilot was conducted with community champions through three online workshops and continuous engagement during the short data collection period performed. A summary of the lessons learned was generated in three different categories: (1) technical and user experiences; (2) strategic lessons for broader deployment; and (3) process-related lessons. In parallel with the beta pilot, the partner developed and deployed an online survey in the initial exploratory phase to meet the objectives. In all phases of the local case study in Spain, significant efforts were made to understand the stakeholder ecosystem, target relevant actors, and engage them at different levels. 66 community organizations in Madrid and Barcelona were identified. The public and private sectors were engaged. Schools and academic institutions (primary, secondary, university) were an important target group for the case study. Three face-to-face interactions were organized for the public. The core of scoping and co-design within the Madrid and Barcelona case study involved engaging citizens in participatory online workshops where participants gained awareness of citizen science, key issues, topics, and current trends related to urban (sustainable) mobility, as well as technical knowledge, low-cost environmental sensors, image processing techniques, data visualization, and more generally about low-cost computer hardware (Raspberry Pi) and data processing, taking into account the sometimes complex legal, regulatory, and ethical landscape. Community building and outreach have been expanded through the deployment of 1,000 air quality biosensors. A local communication and dissemination plan was designed and implemented. A highly diverse community of citizens, stakeholders, and institutions was built. Diversity was observed in several ways: through age groups, gender, interests, concerns, motivations, other demographic characteristics, previous digital skills and expertise. The inability to organize face-to-face events and the need to move the entire process online made community building difficult.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

3 Data Collection

This task is a series of workshops with all participants in the citizen science activity, explaining the approach to the activity in detail, developing the automatic sensor setup so that all participants can easily install the sensor, setting up a support/help desk structure led by people from the local community, with the project team's role focused on providing behind-the-scenes support to these local champions. This effort is gradually building toward data collection with automated sensors, which is the next task. The pilot reports present:

- Description of citizen engagement;
- Analysis of problematic and successful strategies.

3.1 Leuven

In Leuven, the partners decided to buy and distribute pre-assembled devices, i.e. to buy the sensors completely built from the supplier (Gotron), so that the users could focus on the installation of the device. The initial idea was to organize 5 face-to-face introductory workshops where the sensors were distributed and the participants were informed about the installation process. Due to Covid 19 limitations, the format was adapted to a hybrid online/pick-up format. Users were expected to install the sensor themselves. To this end, various instructional materials were created and the installation steps were explained. Data is automatically collected from the sensors and transmitted to the servers for front-end visualization in the platform without user intervention.

However, there were technical issues with the sensor that required constant attention from the project team to resolve. During the data collection, the project team both proactively accessed the struggling user to install the sensor or resolve issues with the sensor, and reactively responded to (technical) inquiries via the Zendesk support system. At the time of writing, the Leuven case study has 461 members on the Telraam platform and 272 users with still around 185 installed devices counting traffic (including devices from the pre-WeCount pilot in Kessel-lo).

3.2 Madrid and Barcelona

Throughout the various rounds of the case study, components for the assembly of 100 Telraam sensors were procured and received. The original plan before the COVID crisis was to involve citizens in assembling the sensors in a special face-to-face workshop. In the end, the partners assembled all the sensors themselves. It was also not possible to deliver the sensors in person. To adapt to this process, a WeCount Toolbox was designed and developed as an integrated resource to be sent to participants. In the plenary session, the Madrid and Barcelona team installed the sensor with the participants. Individuals who experienced problems during the process were moved to a separate virtual room where they received individual support from a member of the team. The most common problem revolved around the inability to connect the Telraam sensor when the wifi network it needs to connect to is encrypted. This was very common in public buildings and offices. A considerable amount of effort during this phase was devoted to ongoing technical and non-technical support for the participants. At the time of writing the Madrid and Barcelona case study, there are 750 members on the Telraam platform and 90 users with still about 34 installed devices counting traffic.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

4 Data Analysis and Awareness

The result of this task is a continuous flow of monitoring data that generates a growing dataset of traffic counts and other sensor data. The focus is on extracting useful information from the data beyond the simple dashboard in the platform. Processed raw data from autonomous sensors is used to create a validated dataset with metadata that can be shared with participants and the public. The WeCount dataset offers a wide range of analytics, using a variety of tools to achieve this goal. A mix of participant engagement techniques (surveys, workshops, etc.) help to learn what aggregate and detailed output indicators can be extracted from the autonomous sensor dataset. Organizers and citizens explore what information from the data is likely to be relevant/prioritized/sensitive to policy makers.

The pilot reports present:

- Analysis of the data generated during the citizen science activity;
- Description of how the raw data were processed and the role of the participants;
- Commentary on which analysis are actually relevant to citizens;
- Interpretation of the data;
- Information about interactions with policymakers.

4.1 Leuven

Due to Covid 19 pandemic, the schedule of city authorities in implementing changes to the traffic circulation plan has shifted and as a result, the analysis focus of Telraam data has been slightly adjusted, with the most important application pushed to the last months of the project and after the project, when most interventions will actually take place. WeCount is embedded in the Telraam ecosystem, which includes automated and generic data analysis via the platform. First, there is fully open data that is available in the public domain and accessible to everyone. Second, there is additional analysis at the individual device level, accessible only to the device owner and the project team. Each participant receives a personalized monthly report, every month. Through guided analysis of the data, the team gave participants tools for basic analysis to get a discussion going and generally to educate participants on how to interpret traffic count data. This type of analysis is low-threshold and aimed to engage a broad audience among participants. The unguided analysis is intended to allow participants inside and outside the project to interact with the data and conduct their own analyses without normative instructions or guidance from the project team. From the outset, the Leuven pilot case has been strongly embedded in the policy process of adapting traffic flow in the Leuven city center and districts. This has greatly facilitated the involvement of the local political level (both politicians and administration) and the use of the results of the activity in the policy development process. Concrete analyses and particular cases will be shared with local authorities and citizens.

4.2 Madrid and Barcelona

Starting from the visualizations and analysis capabilities integrated in the platform, the data analysis was carried out at different levels and with different means. A comparison was made between the data generated by Telraam and the official data on mobility in Madrid and Barcelona. The objective was to investigate if there is a positive correlation between the two measurements. This analysis provides important insights for understanding and conveying an approximate measure of the quality of the data supplied by the sensors. For the combination of traffic and air quality measurements, the formats, standard, and accessibility of the

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Telraam data and the existing data were different, so exporting these data required a special effort in each case. For the participatory data analysis, the team invited all members and counters of the two cities in two awareness workshops or online analysis workshops (one for Madrid and one for Barcelona). One of the key elements in this step, which also showed to some extent the will of the participants to act on the measurements generated, was questions for assurances that the data would be available beyond the end of the case study. A different approach to analyzing data and proposing future solutions was planned and conducted with children from the participating elementary school (the students were 11 and 12 years old). Also, valuable feedback was provided about the user experience. The team defined three types of actions to reach policy makers: Actions and future activities designed together with the participants; actions carried out to connect with the policy sphere and to share knowledge and results with relevant stakeholders; actions carried out independently from WeCount communities to pursue their own interests and sometimes existing agendas.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

5 Legacy and reflection – policy interaction

The ultimate goal of the use cases in this project is to achieve policy change as a direct result of the citizen science activity. This involves the continuous involvement of local authorities in the entire use case process, preparing city authorities to meet citizens' expectations, and likewise preparing citizens to engage in constructive dialogue with policymakers.

The pilot reports present:

- reflecting on the process, tools and methods;
- defining lasting impact.

5.1 Leuven

Covid-19 restrictions have been and remain a challenge to deploying a citizen science project with a stringent focus on community building and citizen participation. The goal of reaching the hard-to-reach and vulnerable groups was not met. But thanks to Covid 19 restrictions, we have learned and tried new tools and methods (e.g., engagement tools). More is needed to improve Telraam devices to work effectively on liveable streets. Technical improvements to the sensor, increasing the robustness and reliability of the data are needed to create a sustainable model and ensure continuation after the Horizon 2020 project. The Leuven pilot case shows that involving the policy level with intensive interaction with the city of Leuven is successful and sustainable. The legacy of WeCount in Leuven is secured as the city authority clearly expressed commitment to maintain the Telraam-network deployed in WeCount when the project is completed.

5.2 Madrid and Barcelona

In terms of legacy, the Barcelona and Madrid case study has left several contributions: A set of knowledge transfer resources, and research and innovation tools that allow others to replicate the case study in other places or to carry out similar citizen science actions in the future; creating new communities and expanding the activities and areas of existing communities in both Barcelona and Madrid so that they are sustainable after the end of the project; raising awareness about knowledge and cutting-edge approaches at the intersection of citizen science and sustainable mobility among thousands of people, including citizens, academics, industries, and the public sector; and developing academic related outcomes.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

6 Conclusion and next steps

The concrete next steps for the network in Leuven are: the rollout of the final subnetwork in Heverlee, further agreement with the city of Leuven on how Telraam becomes a permanent asset within the city of Leuven, supporting the counters and other stakeholders in analyzing the data (through guidelines and workshop), collecting data stories and further disseminating and communicating about Telraam, data stories, ... within Leuven. Several local authorities in Belgium have expressed their interest to implement similar activities in their own municipalities.

Both the Madrid and Barcelona city councils have supported WeCount project and included it in their list of active projects that promote the sustainability and replicability of the case study. The experiences and tools that are available after running the case study which was challenging for the continuous changes in the process, the software, the platform, and other related aspects of participation, can now be exploited across all Spanish cities, towns, and villages.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

WeCount: Citizens Observing UrbaN Transport

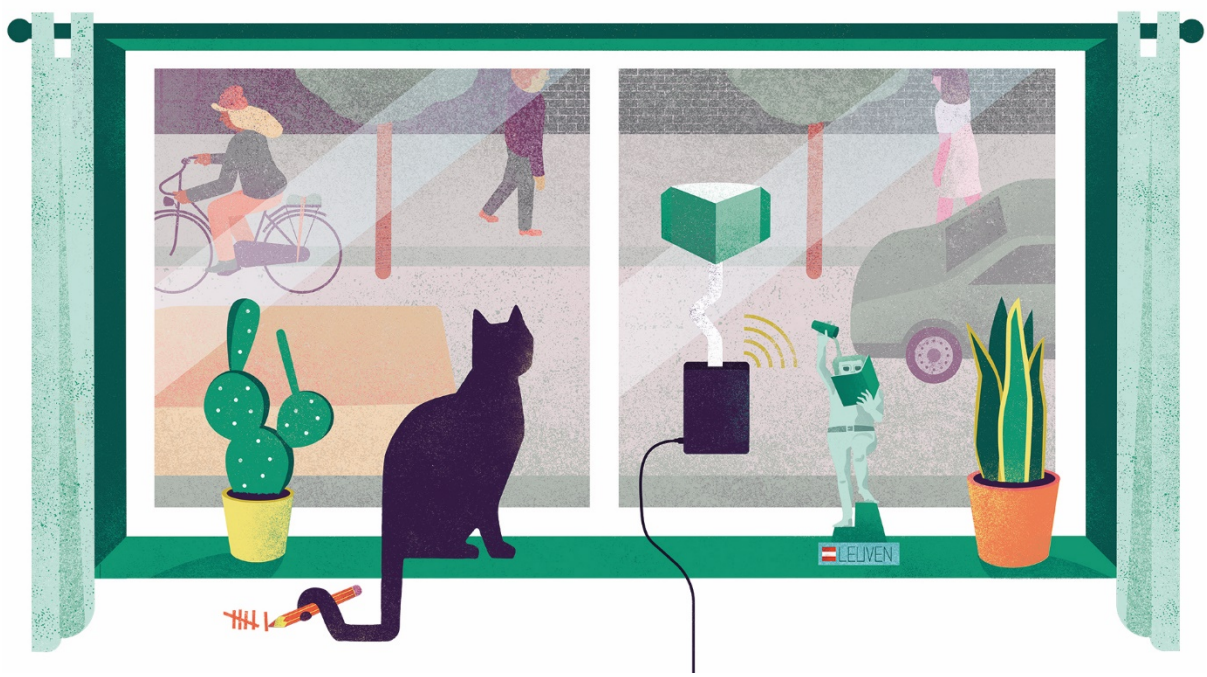
Deliverable 4.1: Summative Pilot Report – Leuven & Madrid

PART B: Leuven

Report for:
European Commission
Research Executive Agency (**REA)**

Date: March 2021

Authors: Elke Franchois, Laurens Vander Kuylen, Hannelore Depypere, Kris Vanherle



The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Document Details

Authors	Hannelore Depypere, Elke Franchois, Laurens Vander Kuylen, Kris Vanherle
Contact	Kris.vanherle@tmleuven.be
Creation Date	15 December 2020
Date of Last Revision	10 March 2021
Description	This report provides a detailed description and reflection on all activities and outcomes from the WeCount case study in Leuven. The report follows the structure of the tasks within the work package, i.e. scoping and community building, co-design, data collection, data analysis and awareness, and reflection and legacy.

Version History

Version	Updated By	Date	Changes / Comments
1.0	Elke Franchois	15/2/20	Outline
1.1	Hannelore Depypere, Elke Franchois, Laurens Vander Kuylen	15/2/21	Sections 1, 2, 3, 5 added
1.2	Kris Vanherle	28/2/21	Input to sections 3 & 4 added
2.0	Kris Vanherle	5/3/21	Lay-out & Language check – final draft
2.1	Kris Vanherle	10/3/21	Second proof reading

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Contents

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

1 Introduction

As one of the two experimental case studies in WeCount, the Belgian case in Leuven started in January 2020 and has been carried out for more than 12 months. Consistent with the citizen science approach in WeCount participating citizens had, have and will have a proactive role across all phases of the case study, from its problem formulation and co-design, through data collection and data analysis. The last phases are still ongoing while writing this report. But, also in the phase of data analysis and awareness, planning and implementing the co-created actions the participating citizens will be strongly involved, consistent with the WeCount Citizen Science approach and intended project legacy.

In Leuven, citizen science activities of WeCount are set up in the framework of two specific dynamics: at the one hand there are existing participation processes initiated by the local government to gather citizens input on urban planning and mobility to shape future mobility plans and take specific mobility measures in the different boroughs of Leuven (implemented as 5 different subcases in the case Leuven). Telraam is used as a monitoring tool to assess the impact of intervention in the local transport system and to gather input on local mobility. At the same time there are a lot of active and engaged citizens who are eager to objectify their gut feeling on mobility and road safety and feed the dialogue with the local government. Across the 5 boroughs, 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 City of Leuven and the departments of Mobility and Citizens' engagement and also among several other entities and communities in the city of Leuven (see stakeholder mapping).

The start of WeCount and Telraam in Leuven during WeCount is not the first experience for the city and its inhabitants with WeCount and Telraam. Telraam was launched as a pre pilot in the borough Kessel-Lo in March 2019. During this pre pilot an intensive contact was set up with the city administration, and also with important stakeholders, mainly in Kessel-Lo. This existing network and contact were of course used in developing this citizen science project in Leuven. WeCount was kicked off in Leuven with a series of meetings with different city departments and with a series of communication activities on WeCount in Leuven towards press and local communities.

At the time of writing this report, the case study in Leuven counts 461 members on the Telraam platform, and 272 users with still around 185 installed devices counting traffic (included the devices from the pre-WeCount pilot in Kessel-lo). Data have been collected during several months, with most devices deployed between May and November 2020. The upcoming months after this report will be used to further expand the data analysis: support the participants in doing the analysis and understand the data correctly, and to have a data analysis workshop in public space with all interested participants together, based on the tools that have been offered to them during the data collection process. The idea of this approach (giving the tools in hand to the users to analyse the data and understand this analysis in the local context) is to facilitate a handover of knowledge, resources, and capabilities to the community and its champions for these communities to be able to bring forward their own agenda. By doing this, WeCount is actively building self-sustaining communities of citizen scientists who become equal partners in mobility policy.

WeCount in Leuven leaves important legacies pointing towards several different directions that will be explained throughout this report. But for example, the connection that is emphasised within the development of the mobility plan in the borough Kessel-Lo, with a strong focus on public engagement and on data, is a strong legacy for WeCount in Leuven.

After the initial planning at the beginning of 2020, due to Covid19-related restrictions, which have been enforced in Belgium throughout the case study, most interactions have been conducted virtually with little

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

to no face-to-face contact with participants and stakeholders. Clearly, the timing of the Covid19-related restrictions has greatly impacted the Leuven pilot case, having to switch from a plan with face-to-face workshops to full online engagement almost overnight at a time the engagement activities were supposed to start. This has caused the timing to slip and stretch the deployment of (fewer than the objective of 200-250) over a longer period. Especially in reaching out to and engaging with vulnerable groups, which was an important focus in WeCount Leuven, Covid-19 has had an important negative impact.

Reflections on the impact of these restrictions and how we have addressed the resulting challenges are provided throughout the report.

This report provides an extensive description of activities undertaken in the Leuven case study across the key tasks upon which Work Package 4, i.e., Use Cases: 5 Citizen Science Activities, has been designed. This document is therefore structured as follows. Section 2 is dedicated to those actions related to Scoping, Community Building and Co-Design throughout the duration of the case study. Sections 3 and 4 focus on data collection and analysis respectively. In section 5, we reflect on the legacy of the case study and the actions planned looking forward. Lessons learned and reflections on expected and unexpected impact occurred during the case study are provided across these sections.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2 Scoping, community building and co-designing the local citizen science activity

This chapter provides a detailed description of actions and interactions carried out throughout the case study Leuven and its subcases about the scoping and co-designing the intervention, as well as the continuous effort in exploring, building, establishing, maintaining and leveraging diverse communities of different stakeholders in Leuven. In summary, actions started with defining 5 different use cases in line with 5 boroughs of Leuven (section 2.1) and the creating of the 5 narratives for these 5 different use cases (sections 2.2). In parallel to this, and related to the developed use cases and narratives, a lot of work was done on mapping the local WeCount ecosystem, resulting in an extensive stakeholder mapping for every borough (section 2.3). When the narrative was clear, a local communication and dissemination plan was developed and kicked off (section 2.4). Again, at the same time, the community building process was set up, and builds on earlier participative processes, whether initiated by the local government or initiated by citizens themselves (section 2.5). In this community building process, it was planned to put a strong emphasis on the vulnerable groups. In developing the engagement framework, a strategy to reach socially vulnerable groups was set up (section 2.6). Nevertheless, Covid-19 restrictions obstructed almost completely the strategy to reach the vulnerable groups (section 2.7). During the scoping and community building phase, the pre pilot testers in the borough of Kessel-Lo were asked to complete an online questionnaire about the Telraam Pre Pilot (section 2.8).

2.1 Developing the WeCount Story in Leuven part 1: defining 5 use cases

The WeCount project was not starting from scratch in Leuven, since it had been the pilot site of the Telraam technology back in spring 2019. This meant there was already some public record of the Telraam devices, and of the citizen engagement around it both on the level of the public as well as at the city administration. In the wake of the 2019 pilot site there were some open communication lines between the city administration and the Telraam partners on results, future and take up.

After the official start of the WeCount project in late 2019, communication with the city officials was taken up again. Meanwhile the city of Leuven started preparing the process for drafting mobility plans for all boroughs, stretching their full territory. While at the same time aiming for the inclusion of citizens and local stakeholders by participatory processes in each of them. It became apparent that the Leuven WeCount pilot (with M21/TML) was in a position where it was able to support these ambitions by deploying Telraam traffic counting devices. And it could be of clear mutual interest of piggy bagging the WeCount project in these incumbent spatial developments.

In this framework we had various meetings with several city departments from January 2020 onwards. Bilateral explorative meetings (in chronological order) with mobility department, the Vice-Mayor for Mobility and the citizen participation department. As well as several plenary meetings bringing together all different city-level stakeholders from the above departments. Followed by some in depth meeting with both the city's mobility department and citizen participation experts. Goals of these meetings was aligning the WeCount plans with those of the city, dealing with timing and practical agreements on the roll out of the counting networks, and agreeing on the communication and reach out towards citizens.

Apart from this practical conversation also more thematical an agreement was made to allow WeCount to fit in these different city-lead processes based on territory, timing and narrative. All of this, resulting in the case leading partners deciding to feature for the WeCount Leuven use case 5 different subnetworks, for the

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

5 different boroughs in Leuven. As a result of these meeting rounds, the following 5 counting network stories came out:

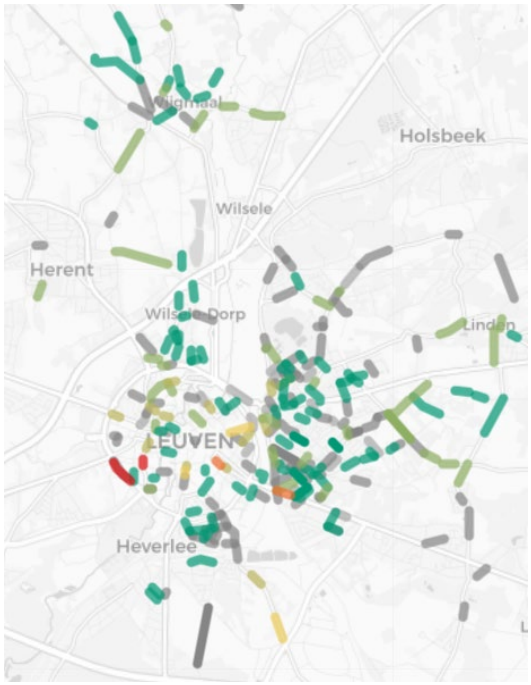


Figure 1: Map Case Leuven.

4 Telraam networks were planned to be set up in 4 boroughs of Leuven, in cooperation with the local administration. The initial ideas for the 4 subnetworks were the following:

Kessel-Lo: extension of the already existing Telraam network, reactivating non active Telraam devices with the aid of local champions to gather input, data, and engagement for the incumbent development of the Mobility Plan for this zone.

Wijgmaal: gather input for the drafting of the Mobility Plan for this borough, engage citizens to talk about mobility based on the data from Telraam with a special focus of the commitment of citizens in data interpretation and setting up actions.

Leuven inner city: monitoring of taken mobility measures (in the framework of mobility plan and Covid-19) with a strong focus of the commitment of vulnerable groups by working via local community centers.

Wilsele-Dorp: monitoring of the planned mobility measures (in the framework of mobility plan).

A 5th network was planned to start in late 2020, in **Heverlee**. For the Heverlee borough, there is not yet a concrete plan nor timing from city authority for the development of a mobility plan. Though there is a clear interest in the involvement of counter-citizens and the counting data coming from WeCount in (future) processes. Therefore, as WeCount-partners we decided that the Heverlee network will be a fully bottom-up network. This means there is not a concrete policy framework given by the local government for setting up this counting network.

Finetuning these different stories for each of the zones with a suitable timing, was and still is, a challenge. There was a high degree of involvement of the several city administrations services from the early project's beginnings. This was both a clear blessing in terms of legitimacy for the project to the outside world and as a way to use the expertise of the city to build our project. As it was also a barrier in having to agree and align with all different partners and services, who sometimes aren't on the same line themselves. In doing so sometimes risk losing sight of our own project goals.

2.2 Defining the WeCount story in Leuven part 2: Creating the narrative

Defining the cases in coordination with the city administration is one thing. Creating the local narrative with which citizens can identify, which motivates people to participate and which is shared and promoted by participating and involved citizens is another thing. A shared narrative has two components. The first component is the content component: what is the local mobility context? What are matters concern about mobility? The other – and equally important – is the component on participation: what do I as a citizen of Leuven want to reach by participating in this WeCount project? What does participation mean to me? In Leuven three steps were taken to create a narrative for the different cases. First of all, we had to understand

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

the local mobility context: what are the numbers? What are the plans? What is the history? What is ongoing? Secondly, we had to explore so-called matters of concern: what are people concerned about? What are perceived problems? But also, which ideas and dreams do citizens have to make Leuven a better place to live? Third, we explored the participation context of Leuven. Fourth, we focussed on the community of interested citizens by considering their motivations to participate in the WeCount project. Input from these three steps shape the narrative for each case, which is the starting point for the kick-off workshop and the common thread through the continuous engaging and community building process.

2.2.1 Achieve a situated understanding of the local mobility context

Before exploring matters of concern, it is important to get a good understanding of the local mobility context. The majority of members of the WeCount team in Leuven are inhabitants of one of the boroughs of Leuven and have a good insight in the local mobility context. To complement this knowledge, more profound research is valuable. Desk research, interviews with city officials and citizens in the different boroughs gave us a deeper insight in the local situation.

Interesting data to get a complete understanding on the local mobility context can be found in existing (and interactive) databases like 'Leuven in numbers' where we extracted specific data on commuting traffic, car ownership, …, with detailed information on difference based on gender, age, economic sector. Also, the citymonitor, an initiative of the Flemish government, is a very valuable source. For every city in Flanders, there is an extensive report available with data on road safety, car ownership, commuting, sustainable mobility behaviour, modal split in home-to-work and home-to-school-travel.

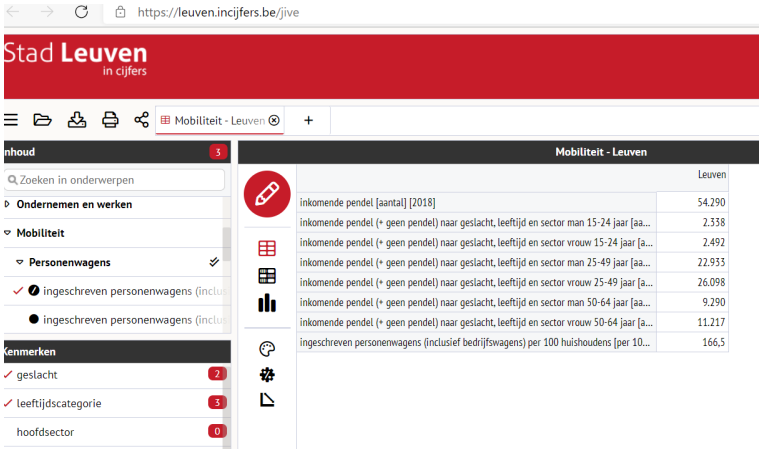


Figure 2: Screenshot Jive - Mobiliteit - Leuven (incijfers.be).

The city of Leuven puts a lot of effort in communicating with citizens. Therefore, the website of the city of Leuven was a good starting point to get an overview on mobility measures, mobility plans and future plans and ideas for every borough.

For Wijgmaal, all the information on the upcoming masterplan with reference to the use of Telraam is mentioned, for the inner city, detailed information on the circulation plan can be found there. But also, a detailed roadmap for a more sustainable transport of the city is available there. Other interesting sources to incorporate in the research phase are the policy plan on cycling, the spatial structure plan, the multi-annual plan. Last but not least and directly linked to the data collection and data analysing phase, the overview on ongoing and planned roadworks, which are important factors to take into account in the phase of data analysis.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 3: Map of the segmentation of the inner city of Leuven, in context for the traffic circulation plan - Source: Circulatieplan | Stad Leuven.

Figure 4: Short term and long-term planning in Wilsele Dorp. Source: Wilsele-dorp | Stad Leuven.

To get a complete understanding of the mobility issue, it is important to look beyond the city borders. The region of Flanders is known for its hyperconnectivity and - crucial in making the correct analysis – notorious for its complex political division of responsibilities. Not all the roads and public space on the geographical territory of Leuven are managed by the local government. Therefore, also information from regional governments has to be considered.

2.2.2 Exploring matters of concerns, needs and dreams of citizens

The city of Leuven has a rich participation context, organised by the city administration and initiated by citizens. Mobility and use of public space have always been thorny issues. Through desk research, interviews with city officials, intermediary workers and citizens and with our own experience and knowledge through participation projects carried out in Leuven, we could get a clear understanding of the local mobility context and get insight in matters of concern of citizens. We highlight a couple of interesting techniques/tools to explore the local context in order to create a shared narrative.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

In 2019 the city of Leuven launched the platform '[Maak het mee](https://leuvenmaakhetmee.be/nl-BE/projects/betrokken-en-participatieve-stad)' (Help us to build Leuven together) on which citizens could give their ideas to make Leuven a better place to live. 2331 ideas were gathered, in the 5 boroughs of Leuven. In the top 5 of all topics, mobility was on number 1, streets and plazas on number 2. This ranking reaffirms the importance of participation in local mobility issues. (Almost) everybody has an opinion on local mobility. Every road user is an experience expert. It is exactly that richness of experiences and insights the city of Leuven wanted to gather to shape future plans.

We analysed all the ideas on mobility and mobility-related matters and localised them in one of the 5 boroughs. Next to many abstract or vague ideas, also very concrete solutions were given. Shared mobility, cycling infrastructure, accessibility, road safety, access to public transport and modal shift were the most common. The answer of the city administration and the status of every idea is accessible for all citizens.

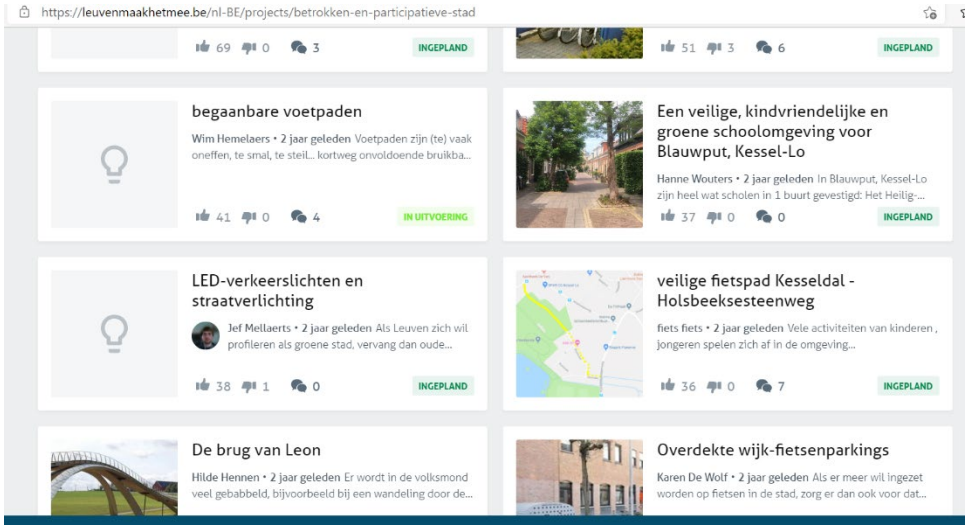


Figure 5: Screenshot 'Maak het mee' - ideas on mobility – source: Project - Leuven, maak het mee!

Interesting input to consider is local press and social media. Concerning the latter, it is worth to examine local Facebook groups to gather concerns about mobility, general issues as well as very specific and localizable problems. The Facebook group Leuven Fietsstad, with 2.400 members, for example is a rich source of concerns but also suggestions on mobility, from the perspective of the cyclist. But also, Facebook pages of community and neighbourhood organisations, local interest groups, … are very interesting sources to explore. Vivid discussions offer great insight in perceived matters of concern and are crucial input to create a local narrative, with which citizen scientists can identify.

Especially in times of Covid-19 restrictions these (social) and very dynamic media sources are indispensable to get a good insight. Often this is the way to encounter matters of debate but also to identify action groups, active citizens and other important stakeholders and key figures in the communities. Through exploring social media channels in Leuven, we bumped into an action group of citizens petitioning against one very specific mobility measure in Wilsele. The petition says 'we don't like PM. It is time for a traffic filter in the Burchtstraat'.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 6: Citizens petitioning Burchtstraat Wilsele Dorp.

2.2.3 Citizens as partners in policy making?

"Everything that is done for me but without me is against me."

These are Ghandi's words and still very relevant when we talk about participation. Citizens are often very eager to participate in policy making. And as said: mobility and public space are thorny matters. To shape the narrative to be a shared narrative of participating citizens, to be able to engage citizens in a sustainable and profound way and to manage expectations and define clear perspective, it is important to answer this question: do citizens get the opportunity to contribute and participate in local policy making?

In CIVITAS Prosperity three levels of participation are defined, connected to different types of policy.

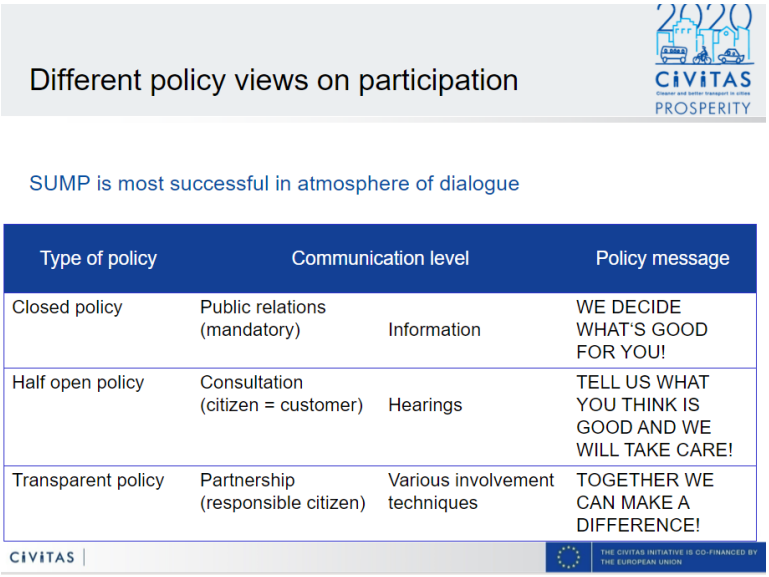


Figure 7: CIVITAS Prosperity three levels of participation.

Own experience, desk research on participation processes, and interviews with city officials point out that the city of Leuven is definitely willing and trying to partner up with her citizens. That does not mean that all citizens are happy with the state of affairs of course. But it is an important factor to take into account in creating a shared narrative together with participating citizens and to define realistic objectives for a certain case: how do we want to contribute? Are there existing channels we can use?

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Due to the cooperation with the city of Leuven and ongoing participation trajectories in the development of mobility plans in which data from Telraam will be considered, citizens have a clear perspective on the use of the Telraam data. Next to that, the WeCount team and participating citizens clearly know the ways to give input to the local policy making.

2.2.4 Monitoring motivations

When registering as a member for the Leuven case, or one of the subcases, people are asked about their motivation for participating in WeCount: why do you want to join this Telraam network? What do you want to learn from Telraam? Analysing motivations gives great insight in two aspects that shape the narrative. A share of the motivations tells us something about perceived matters of concern: sneak traffic, speed, traffic, … Another part tells us about what people want to do with the data and how they maybe want to contribute: getting insight in local mobility, give input to local policy making, …

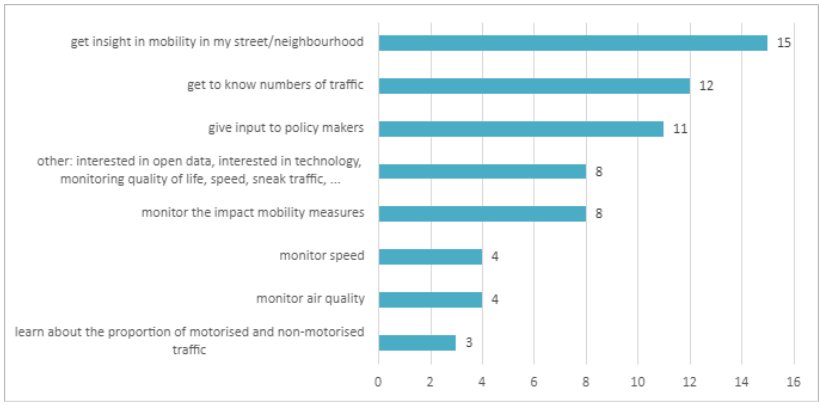


Figure 8: Motivation registering for a Telraam.

Figure 9: A wordcloud based on the motivations of all counters in WeCount networks in Leuven.

Motivations of the counters form an interesting and important part of the narrative. The citizen scientists are the ambassadors to bring the narrative to their neighbours and their communities. Their motivations therefore are a common thread for continuous engagement and crucial in expectation management during the project, from the very start.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2.3 Mapping the local WeCount Ecosystem

In the previous section, we explained the WeCount story and creating the narrative. At the same time a lot of work was done on mapping the local WeCount ecosystem. An extensive stakeholder mapping for every borough can be found in annex. Email addresses and other contact details are left out of this table. Mapping the local ecosystem was crucial as a base for community building, to define the target audience and to identify crucial partners and actors in communication and community building.

To rollout WeCount in Leuven feels a bit like a home game. First of all, several members of the WeCount team are active citizens in Leuven themselves. Secondly Mobiel 21 has great experience in participatory processes, campaigns and educational projects on sustainable mobility and public space. Leuven is the hometown of Mobiel 21 and has therefore always played a laboratory role for a diversity of projects. As a result, the WeCount team in Leuven has a good insight in existing networks, organisations and public sector. Therefore, the stakeholder mapping did not happen in a very structured way. Deploying WeCount in other cities would require a more structured approach. Still, we complemented our experience and knowledge with desk research and interviews to get a more complete overview of the WeCount ecosystem, also with the aim of reaching a diversity of people.

2.3.1 Citizen Communities and Civic Society

As mentioned before, Leuven has a community of active citizens who are strongly interested and often involved in local policy making.

The above-described citywide platform 'Maak het mee' is a very valuable source to identify citizens who are interested in mobility matters. More action focussed is the initiative 'Kom op voor je wijk' (stand up for your street - Inspiring booklet 'Kom op voor je wijk' - part 2 by Stad Leuven - issuu) which invites citizens to submit a proposal for action on street or neighbourhood level and to get funded and supported by the local government. Most of these ideas deal with the subject of public space (meeting space, vegetable garden run by the neighbourhood, …). Citizens submitting a proposal demonstrate their eagerness to take action and by doing this participate in shaping policy. 'The citizens submitting a proposal are important stakeholders and key figures in WeCount because of their interest in the subject of mobility and public space but also because these people often have a well-developed network in their neighbourhood and are not afraid to take action and talk to their neighbours. These people are not necessarily the citizen scientists who install a Telraam, but they are important actors to communicate about Telraam, to raise awareness on the output of data analysis, to take initiative for local actions and to build bridges with other citizens and with policy makers.

In Leuven there are many neighbourhood associations working on street or neighbourhood level. Often these organisations have a Facebook page on which they announce events like barbecues, flea markets or play streets. Screening these Facebook pages brings you to some key figures. In Kessel-Lo for example these neighbourhood associations are gathered in an umbrella organisation to cooperate on different topics. Mobility definitely is a hot topic for this organisation. Bringing the WeCount story to the key figures of these neighbourhood associations was a great way to recruit participants. These organisations play a key role in awareness on the Telraam data as well.

Next to active citizens and neighbourhood associations and initiatives working on street or neighbourhood level, Leuven also has a big number of organisations working on a city level. We focussed on organisations working on topics related to mobility like: Cyclist Federation, Natuurpunt (organisation of volunteers working on protection of the environment), Nature Advisory Board, …, organisations focussing on reaching vulnerable groups: Arktos, OKRA and organisations working on empowerment and education of

citizens on different topics like Vormingplus. But also, schools, repair cafes, initiatives on level of the different boroughs were listed.

2.3.2 Public Sector

'Stand up for your street' can be considered as a partnership between citizens and city officials. Next to these citizens, also the city officials supporting these active citizens and citizens networks are crucial stakeholders in the community building phase. We had a lot of contact with these city officials to identify and localize citizens, organisations on a local level. We also engaged these people actively in the communication and dissemination at the start of the project.

We worked intensively together with the city officials working in the department of citizen engagement and participation. This department has been extended over the last years and hosts great experts in participation with a priceless knowledge of the local context and communities. During the whole process we are in touch with these city officials who gave us insight in the participation context in the different boroughs. They are the direct line to local policy making. Considering past and running participation processes and development of mobility plans in several boroughs, they were very interested in WeCount, Telraam and tools and methodologies used for citizen engagement.

2.4 Local Communication and Dissemination

We hosted a press statement, early June 2020, together with the Vice-Mayor for Mobility for the regional TV and newspapers. Taken up by local media outlet this message officially announced the expansion of the existing Leuven Telraam network in the framework of WeCount. The expansion to all 5 city boroughs with a batch of fresh devices was announced, and candidates were invited to enroll for the contributing to the WeCount project.

Next to the press release the following targeted and in-depth communication channels and materials were used to convey the same message.

- Announcements on the Telraam social media Telraam (Twitter & Facebook).
- Direct mailing to active citizens (local champions), neighborhood organizations, other organizations (working on mobility, quality of life). This mailing was done by partners and by intermediaries (e.g. participation officers of the city).
- A letterbox flyer campaign in those streets that are of strategic importance to monitor traffic related to specific mobility measures.
- Mouth to mouth campaigning: citizens were stimulated to share information and to address their own network of peers and friends. Invited to share the message on their own social media profile or neighborhood groups or Hoplr.
- Info sessions in local community centers in the Leuven Inner city to inform vulnerable groups.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

With the start of the subnetwork in Kessel-Lo, there was a focus on the local champions and their network. The idea was initially that the 5 local champions in Kessel-Lo would recruit very locally in their neighboring streets and help with the installation of these Telraam sensors. We had 2 online meetings with the local champions to learn their expectations towards WeCount and being a local champion and to train them in helping people to install Telraam sensors or to resolve problems.

Figure 10: Flyer to recruit WeCount Leuven.

Covid-19 restrictions worked against the active enrollment of these local championship for the Kessel-Lo zone according to the above plans. The recruitment, briefing and motivation of these local champions needed to happen fully digitally. Which is a hard way for capturing motivation and having such in depth briefing on engagement. At the same because of the Covid-19 restrictions the intended house visits of were not allowed, and therefore we could not ask local champions to visit and install Telraam sensors at their fellow citizens'.

Figure 11: Presentation for local champions.

2.5 Community building

The community building process of WeCount builds on earlier participative processes, whether initiated by the local government or initiated by citizens themselves. Citizens in Leuven networks had to apply for a Telraam. TML made an assessment of all citizen-candidates for each network based on the suitability of the location. This was based on (a) the technical feasibility of installing a Telraam device at this location, (b) the suitability of the location according to the pre-determined locations (coordinated with the city administration) based and the added value of having traffic counting data at this particular location.

At the same time, and more importantly in this context, facultative to all citizen-candidates while applying was to write a short motivation on why they wanted to participate in this WeCount project, and dispose of a Telraam device. This was a great way for each of the sub-networks for gathering insight in the most important mobility-related issues and questions at citizens level for a certain neighborhood. This information could then be used in the project's later citizens engagement activities as a first step in the community building process and having a conversation with all candidates. Secondly, it was also a way of assessing, next to the technical feasibility, those persons who were also interested in the WeCount project in a broader sense. Since also several citizen-candidates left the answer to this motivational question open for the case leaders, this was a good way of filtering those citizen-candidates who were not solely interested in procuring a Telraam device for the sake of having one but had a stronger interest towards citizens engagement activities and as part of a community in the framework of the WeCount project out.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

From the feedback received throughout the whole process (from the response on the call for candidates to the engagement activities and workshop) it was clear that many citizens applying for a Telraam device were already engaged in the topics of mobility and quality of life.

Several of those citizens had already initiated, before the project, some form of dialogue on this topic with local policy makers or with their neighbors. Some of them were really eager of going the extra mile in terms of engagement in this newly formed counting community, these so-called local champions, already from the project beginnings described that they wanted to use their engagement in the WeCount project, and them having their Telraam device as a way to strengthen their voice in the local mobility debate, supported by the objective traffic data and visualizations.

Due to Covid-19 restrictions, there were limitations to carrying out the community building process as it way intended. Some activities had to be altered and adapted to be in line with the restrictions and rules. This meant of course limiting the amount of face-to-face contact, which is the usual way of getting engaged in community building activities. This meant a light, well-balanced and Covid-proof way of working on community building, consisting of the following aspects was developed for this Leuven network:

- Shared motivations – shared story
- Hosting a live pick-up moment.
- Community building kit
- Interaction
- Telraam Lab

Figure 12: Telraam Pick up Cargo Bike.

2.5.1 Shared motivation, shared story

Following the live pick-up, we welcome participants online for a kick-off workshop which focuses on community building and on installation.

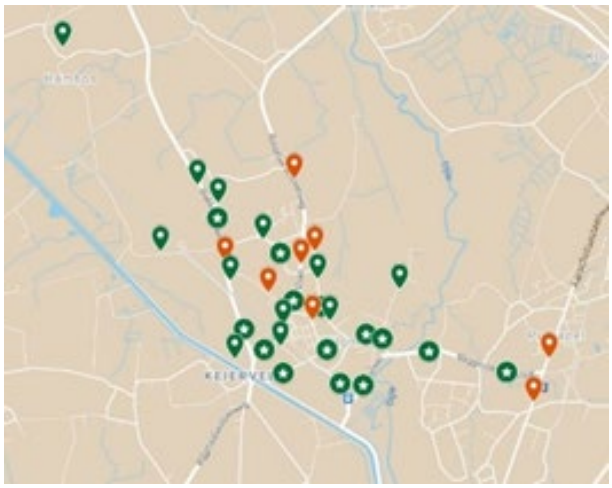


Figure 13: Map of selected and not selected.

Two important tools are the base of the community building aspect in the kick-off workshop: a map of the Telraam network on which every citizen with a device is pointed out and a graph with the motivations of all applicants of the network (selected and not-selected citizens). The graph tells the story of this Telraam community, the map gives these citizens the responsibility in this network. Other applicants are considered in later mailings and in this way become part of the community.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2.5.2 Live pick-ups

Figure 14: Engagement circle Leuven.

Bringing all citizens together at the same time was impossible, but for each network a location in public space was selected to host a pickup moment. At this neighborhood location citizens could come and pick-up their Telraam device and other materials (see community building kit) before the online workshop started. In most cases this was both on the same evening.

During that pick-up moment, mostly lasting around one hour, we exchanged ideas with the citizens and answered their practical questions and concerns. This also allowed fellow citizens to interact with each other: on their motivation, on quality of life and on mobility issues. We invited all citizens to put their name on the engagement circle (see picture). Citizens could rate their motivation in the project from 'just counting' over 'analyzing data', 'helping others to install the Telraam device', 'initiating dialogue based on the data', 'talking about Telraam' to 'initiating action based on the data'. With that list of names, and the corresponding level of engagement, we could connect fellow citizens with each other for reaching out or helping each other.

This whole pick-up moment, its interactions and its outcomes could altogether serve as a great basis for the further citizen engagement moments starting for the online workshop later the same evening, to solving some sensor issues months down the line.

2.5.3 Community building kit

On the pick-up moment, every participant for each of the networks received a welcome kit containing the following elements:

- An introductory letter with more information about their counting network and an invitation to talk about and about the Telraam data and visualized results.
- A cake and the recipe for this cake as part of a sweet incentive to invite counters to talk with their neighbors about the project., mobility or the Telraam traffic data, whilst sharing a cake.
- A poster citizens could put at their street side window to show neighbors and passersby that there is a Telraam device counting at that location.
- Some flyers for to inform the (direct) neighbors on the project. This featured an explanation about Telraam, the Telraam network and an invitation to talk and address the citizen-counter with questions and remarks.

Figure 15: Welcome kit Case Leuven.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2.5.4 Continuous communication

In February the city if Leuven kicked of www.vorm3010.be, the participation process in developing the new mobility plan for Kessel-Lo. Because of the strong connection with WeCount and Telraam, all counters in Kessel-Lo received from WeCount an extra mail to inform them about this process and to urge them to follow up on this.

In March 2021 all citizens in Leuven with a device and all applicants of the different networks will receive an e-mail with an update of the networks in Leuven. Citizens will be updated about the networks themselves, the relation with the plans of the city of Leuven and with an invitation to interact with the data and to write data stories and share them with neighbors, on social media, … This invite goes together with a guideline on how to analyze the data (see further section no data analysis) and templates to use. All data together shape the story of the network, so people are invited again to interact with each other.

2.5.5 Co-creation in the Telraam Lab

During the process of We Count in Leuven, right after the first lockdown (June 2020) and before the second lockdown (October 2020), Mobiel 21 initiated the Telraam Lab which brings citizen scientists in Belgium together to co-create a Telraam Platform on which citizen scientists will find tools to analyze data, tools to understand the analysis of the data, tools to build context around the data, tools to initiate dialogue between citizens about the data and tools to initiate action based on the data. Until February 2021, there were 3 Telraam Labs initiated.

Figure 16: Raambabbel | Window Chat.

The **first Lab** was set up in July 2020. This Lab was in real life, and only 12 participants showed up. It was clear that we had underestimated the concerns of the participants. Still, this was a very fruitful meeting. The purpose of this lab was to start creating *Raambabbel* as a method. A tool that could be offered to Telraam counters and their neighbors to talk in real life on the street about the Telraam data, what they mean, and how to act on this. It was interesting to learn, that we had to take a couple of steps back. Telraam counters are definitely not ready yet to get out and talk about the data, and to act upon. It was clear that they first need more context, more understanding, more guidance with the analysis, and a lot more interaction with Telraam and other counters. During this first lab, the **Telraam Platform** was born.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

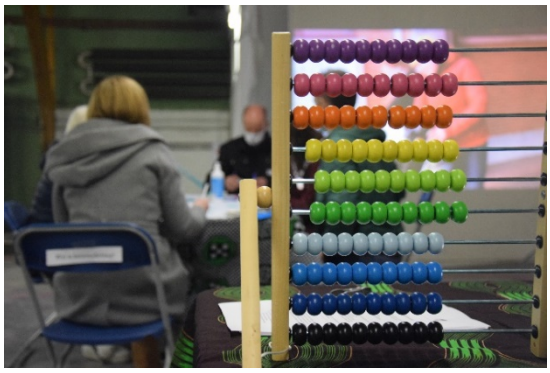


Figure 17: Second Telraam Lab.

The **second lab** could also take place physically, it was set up right before the second lockdown in Belgium (October 2020). Thanks to clear objectives and challenges communicated for this second lab, 28 counters participated in this lab. During this lab, we asked what counters themselves have done with the data on communication, action etc… We asked what could have helped them more.

Out of this co-creation lab for the Telraam platform, came very clearly the building blocks for this platform, with the Telraam community as the core for this platform:

- A place to meet (forum, chat sessions, calendars, ….)
- News and communication (media, best practices, testimonials…)
- Toolkit for action (Mobility for dummies, tips and tricks for action…)
- Technical toolkit (Open data, API, Github….)
- Data analysis toolkit (Guidelines for data analysis, street profile, …)
- Practical support (Support and FAQ)

Figure 18: Building Blocks Telraam Platform.

A video report of this second lab was made and can be found here: https://youtube.be/xM-TTPNqtkk

The **third Lab** was set up during the second lockdown, in February 2021 and it was an online version this time. Thanks to clear objectives, strong involvement of the counters and the fact that it was online, 62 people registered for this online lab. In a zoom meeting, using break out rooms and Miro, we all brainstormed about the building blocks of the platform, in order to validate and deepen the building blocks.

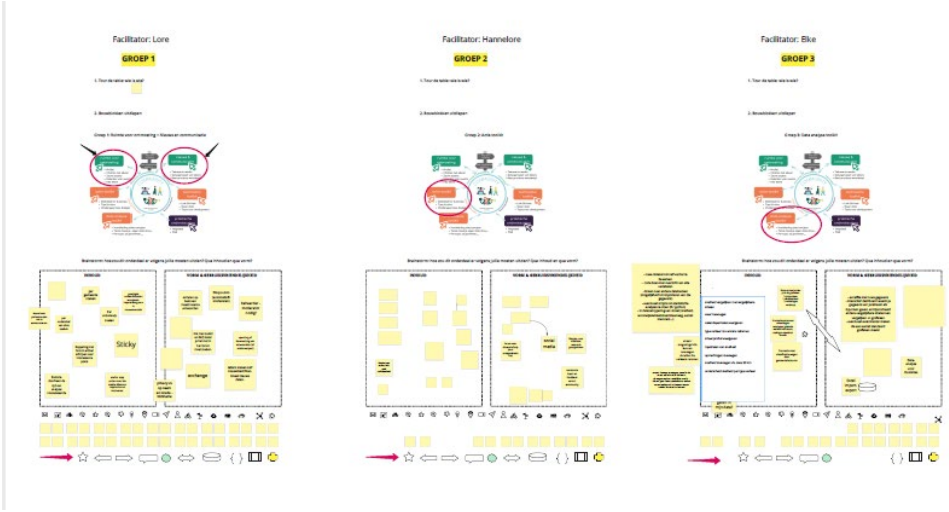


Figure 19: Third Telraam Lab | Deepening Telraam Platform building blocks.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

The platform itself is still under development. But a number of elements of the various building blocks are being developed in WeCount. Thanks to these labs, we learned for instance about the need for a basic analysis manual. This manual has been developed, and a first version is shared with the WeCount counters. These counters will also be asked for their input on whether this manual meets their needs.

2.6 Special effort to reach vulnerable groups

Very specific for Leuven is the reality of being a university city and also host for companies leading in research and innovation like the KULeuven university and spin-offs like IMEC. By consequence, the population in Leuven consists for a big part of highly educated people who know their way to policy making and who have the capacity of raising their voice.

But not every inhabitant belongs to this group of citizens. A little reductive maybe, but too often participation in mobility issues is a matter of highly educated white male citizens. Mobiel 21 has a tradition of involving and engaging the socially vulnerable people in the mobility debate. Reaching socially vulnerable people is also an important focus in WeCount.

In developing the engagement framework Mobiel 21 developed a strategy to reach socially vulnerable groups (appendix 5). Covid-19 restrictions obstructed almost all the plans and ideas to realize this: coffee bars on mobility matters, workshops and walks on a neighbourhood level to analyse matters of concern, streetchats, playing streets, … Still, starting in the scoping and community building phase, we did put some effort in organizing activities to hear the voice of vulnerable groups, to include their story into the narrative and to engage them in the WeCount process.

In the stakeholder mapping phase we had extra attention for socially vulnerable groups. We listed organisations, neighbourhood centres, community health centres working with vulnerable groups. We focussed on people in more challenging socio-economic situations, because the pilot in Kessel-Lo learnt that reaching a diversity in participants concerning gender and age was less a challenge. Out of the long-list we focussed on the community centres, organised by the city or by private organisations and identified people to interview.

2.6.1 Interviews and info moments

We started by sending an e-mail to several people, working in community centres to explain them about WeCount and Telraam and to ask if they would be willing to be interviewed. Because of Covid-19 restrictions, this project was of course not a priority for these workers, nor for the people they are working for. Still, we found four people from four community centres willing to engage in the project. In these interviews we focussed on the following questions:

- How to recruit people? (Why) would they install a Telraam? What would help them to install a Telraam?
- How to explain about Telraam in a accessible way?
- What are good ways to bring people together and discuss about mobility?
- How could we explain crucial issues on mobility (sneak traffic, road categorising, …) in an easy way?
- Would visualising the data of Telraam work for their target groups?
- What are your experiences with debate on different topics? How do you enable and empower people to participate in policy making?

These workers connected us with people in socially vulnerable situations. We interviewed them as well and asked them about their opinions about local mobility, about their eagerness to participate and earlier

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

experiences with participation processes. We identified matters of concern on local mobility and informed them about Telraam.

In one community centre we organised an info moment about Telraam. Before the info moment we installed the Telraam in the community centre in order to be able to show the device and to demonstrate how it works.

These interviews and the info moment provided us with valuable insights which are crucial as a base for a strategy to reach a diversity of people.

- I do have an opinion Too often, people in socially vulnerable situations are not heard in the debate. Not because they do not have an opinion. All interviewees confirmed the willingness of people to participate and the importance to give these people a voice to shape future cities for everybody
- But to do so, time and face-to-face contact is needed, time to really listen to people, to explain things. Patience is needed, to explain things again. Support is needed, for example to install a Telraam. And clear language is needed, not a jargon. At the info moment people challenged us to explain again and again. Face-to-face contact is needed.
- What's in it for me? To participate in a project, people need to feel an added value for themselves. Too often people are involved to check the box. That does not make sense. If you want people to participate, then make sure people get something in return. No money, but an added value. Fun could be an added value, social contact as well. That was made very clear by the info moment.

2.6.2 Targeted communication and working with intermediaries

Together with the community workers we designed a flyer to be distributed through the community centres, with the phone number of the community worker on. In two community centres a Telraam was installed before the start of the broad communication campaign, to demonstrate the device to the people and to raise awareness about the project. Due to Covid-19 restrictions and many other priorities this could not be realised in the other two community centres. The follow-up of this Telraam device and especially the communication about it to the people takes some time and effort which community workers did not have at that time. The community workers in the community centres where a Telraam was installed had all the information to explain about Telraam. One of the community workers installed a Telraam at her home as well and became a real ambassador for Telraam/WeCount. One Telraam was installed by the community worker and a WeCount-team member at the house of a visitor of a community centre.

Covid-19 restrictions did make things more difficult, that is sure. Community centres had to close their doors, people did have other concerns than mobility and installing a Telraam at their place, community workers were pushed to their limits to support their target group.

But also without Covid-19 restrictions, we did ask ourselves the question: do we have to reach socially vulnerable groups with the Telraam device? Is the effort to install a Telraam at people's houses worth the return?

Should everybody be able to be a citizen scientist?

We strongly believe in the importance of working inclusively on the issue of local mobility. It is of great importance that the narrative in each network is shaped with the voice of socially vulnerable people included. That is true for every participation process. It is crucial that everybody is aware of the existence of Telraam and gets the opportunity to participate. Installing a Telraam in a community centre was in that sense a good initiative. It is definitely crucial that the data and results of Telraam are made accessible to everybody, that all people have the chance to know about sneak traffic, speed, quality of life, air quality in

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

their street. It is important that people are supported and empowered to raise their voice. But that does not mean everybody should be a citizen scientist and able to install a Telraam and read a dashboard.

We think involving and engaging socially vulnerable groups is crucial in the scoping phase and in the phase of raising awareness on the data and in the legacy phase but of less importance in the data collection phase.

2.7 The impact of COVID-19 on community building and citizen engagement

It must be said that Covid-19 pandemic and the surrounding societal restrictions have been, and still are, a serious obstacle in the project's work around citizen engagement strategies. Both for recruitment as well for engagement during the whole process the limitations of what can be achieved with non-physical means have been reached.

The most challenging part was definitely in our ambition to reach and engage the vulnerable groups in the Leuven inner city in this project. As ambitious as this agenda of engaging vulnerable groups in a tech-heavy citizens science project was from the initial project beginnings, it became an even bigger challenge with the Covid-19 restrictions. In times of lockdown, medical emergency and scaling down of all kinds of social activities and interaction, engaging with these groups in a direct way became close to impossible. Especially since the alternative offer we had developed as project was heavily relying on digital literacy and resources.

Also the concept of the local champions as peer-to-peer assistance, local engagement activities and local data conversation in public space, would have definitely been much more fruitful, productive and rewarding without Covid-19 restrictions.

Nevertheless, so far we tried every possible digital way to engage with citizens and to co-create and co-design elements of this project. Though we can conclude that real live interaction moments are definitely needed to reach profound levels of citizen engagement to the project, as was demonstrated in throughout the Leuven case.

2.8 Evaluation of the pre-pilot in Kessel-Lo

Telraam started as a pre-pilot in Kessel-lo in March 2019. In 2019 Telraam looked for 100 candidates to have a Telraam installed. In no time, 250 residents applied to install a Telraam. At the start of WeCount and the Leuven case, these pre-pilot testers were asked to evaluate the pre-pilot in Kessel-Lo. In April 2020 an online survey (via Qualtrics) sent out to everyone who was ever active with a Telraam in Kessel-lo, i.e. to 98 e-mail addresses. 63 opened the mail, 35 started the survey, 22 completed the survey.

The responses to this survey helped to learn about and shape the needs and priorities for the rollout of new networks. The next figure shows the motivation of the counters to have a Telraam. We have learned that the inhabitants of Kessel-Lo want to have some clear interaction between the Telraam data and the plans of the city government. They want to be reassured that the Telraams are useful and the data will be used by the city of Leuven on further mobility policy making.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

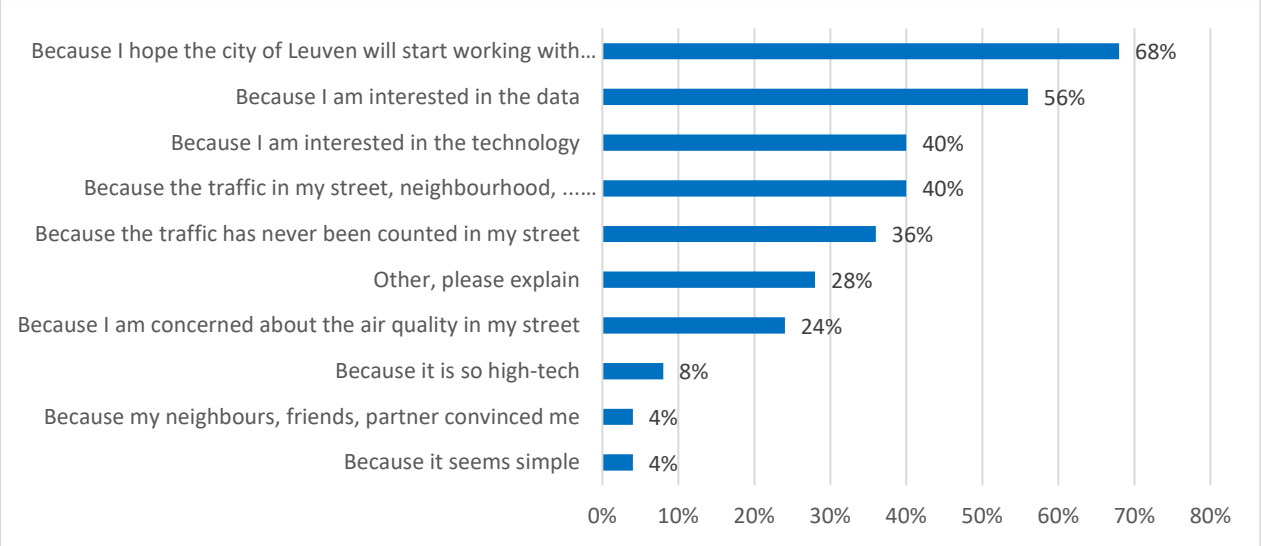


Figure 20: Pre Pilot Kessel-Lo: why did you register for a Telraam?

A lot of useful feedback was received about the sensor itself, the platform, the user-friendliness of the platform, but also about communication, the helpdesk, the FAQ, etc.

Table 1: Pre Pilot Kessel-Lo: easy to install a Telraam?

Did you find it easy to install your Telraam on the window and register it on the Telraam platform?	Percentage
Very easy	13.0%
Easy	52.2%
Neutral	21.7%
Difficult	8.7%
Very difficult	4.3%
Total	23

Thanks to this survey, we also found 5 interested people in Kessel-Lo to be registered as local champions for the extended Kessel-lo network. Thanks to the survey we were aware that counters need more support in increasing knowledge and understanding of the Telraam data in relation to mobility, as shown in the following figure.

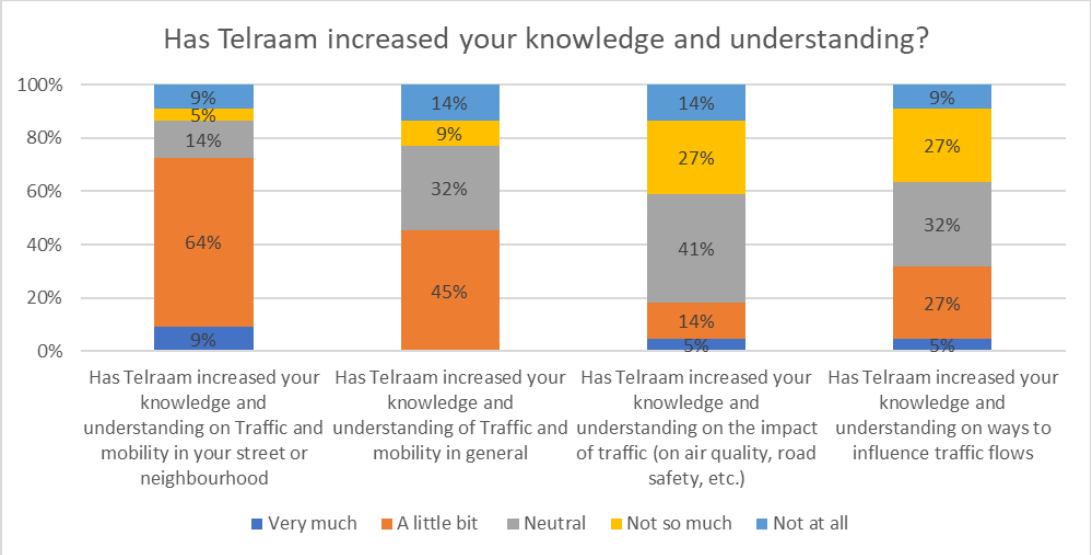


Figure 21: Pre Pilot Kessel-Lo: Has Telraam increased knowledge and understanding?

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

3 Data Collection

Figure 22: Window sticker.

3.1 The Procurement, Assembly, Preparation, and Distribution of the Sensor Hardware

For the Leuven case, we opted to buy and distribute pre-assembled devices, i.e. acquiring fully build sensors by our supplier (Gotron), so users can focus on the installation of the device. Devices were procured in bulk by M21 and stored in M21 offices. Prior to distribution, the individual sensors were supplemented to make a full "goody-bag". (see earlier)

As discussed earlier, the Leuven pilot was split into 5 sub-cases at borough-level. The initial idea was to organize 5 face-to-face initiating workshops, where sensors were distributed, and participants informed about the installation procedure. Due to the Covid-19 restrictions, the format was adapted, to a hybrid online/pick-up format, already described in the previous section on community building.

The central component of this sub-task is a set of workshops with all participants in the citizen science activity, in which the approach of the activity is explained in detail, the automated sensor setup is developed in such a way all participants can easily install the sensor, there is a support/helpdesk structure in place.

We adapted the citizen engagement activities due to the Covid-19 restrictions. This resulted in 4 online Technical workshops in the following 4 boroughs: Leuven city center, Wilsele Dorp, Wijgmaal and Kessel-Lo. (The 5th one in Heverlee still due). These workshops were organized with first a physical distribution moment in the neighborhood in open air (pick-up moment – see earlier). There people could come and pick up their devices and allowed for us to at the same time to have some bilateral chat on the citizens' motivations. At the same time, participants could ask some input and how they would contribute as a volunteer in this network. Feedback generally ranged from solely counting to planning for some concrete actions based on Telraam data. Later the same evening a digital session was hosted for the same group of citizens elaborating on the Telraam technology and data, and how to install the devices in their homes.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

3.2 The Sensor Installation

3.2.1 User onboarding

Before we describe the sensor installation specifically, we briefly described the technical onboarding steps of the users in the platform.

In order to apply for a device, users were to complete an online registration form in 2 steps, where candidates gave information on location, socio-economic information (used later in evaluation) and -most importantly- uploaded a picture of the view on the street to assess if the site itself was suitable to install a sensor device.

After screening by the project team for suitability, candidates were invited via bulk-mail via the Telraam management platform to register and attend the pick-up moment en the workshop with instructions on installation.

3.2.2 User sensor installation flow

Users are expected to install the sensor themselves. To this end, various instruction materials were created, among others:

1. First and foremost, an intuitive step-wise installation process in the platform.
2. Additional detailed installation instructions in the Telraam FAQ, using Zendesk[1] as the platform.
3. An installation video, in Dutch: https://www.youtube.com/watch?v=zqF8n21HFss

We briefly explain what the installation steps:

First, after an introduction and some guidelines to prepare for installation, the user selects the correct road segment where the sensor will be installed. Users are automatically guided to the address they have entered on registration. In a map-interface, nearby road segments are created and selectable; the user then selects the correct road segment, adds the camera position and confirms.

Figure 23: Interface in the registration when selecting road segement.

Secondly, the user connects to the Telraam device to link to the local Wi-Fi to allow for data communication, adjusts the camera-angle to make sure the field of view of the camera is correct and finally, enters the device serial number in the personal dashboard, to link the specific sensor to the account of the user. The device will attempt to connect to supplied Wi-Fi-network in a loop of 10 minutes. In case of success, the sensor is active and installation is complete. A green "heartbeat" icon is visible in the user's personal dashboard.

[1] https://www.zendesk.com/

The installation of the sensor is not trivial and has shown to be challenging for some users. For this reason, further support was given by the project team to participants via online Q&A sessions, the FAQ and remote helpdesk. The goal was also to work with "mobile teams" of tech-savvy local champions, to help struggling users. However, due to Covid-19 restrictions, this type of peer-to-peer activity from within the community itself did not materialize, thus increasing the load on the project team to help users fully remotely and also negatively impacting the installation of the users. An estimated 24% of registered uses was unable to install the sensor for all Leuven sub-networks combined.

Cumulative sensor installation in the pilot case of Leuven is summarized in graph below:

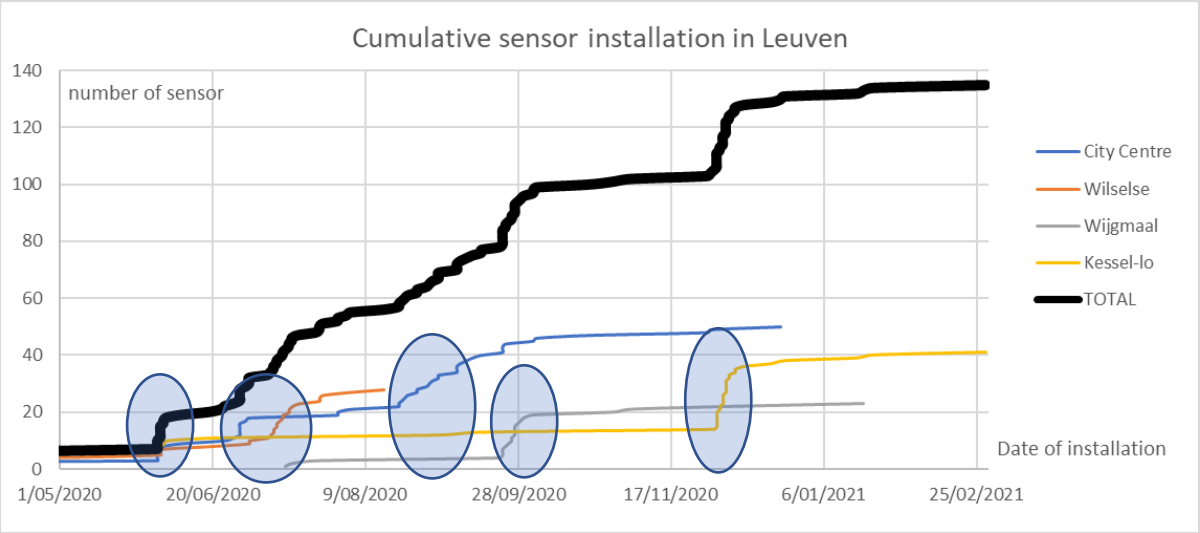


Figure 24: Cumulative sensor installation in the Leuven pilot.

4 waves of installation can be observed, linked to the timing of the installation instruction workshops:

1. Mid May, small but short spike of early adopters.
2. Early July, first workshop in borough Wilsele + additional early adopters in city center
3. End of August, 2nd workshop in city center
4. End of September, 3rd workshop in borough Wijgmaal
5. Early December, 4th workshop in borough Kessel-lo

Note that installations spike shortly after the workshop, but there is a gradual take-up over time, reflecting struggling users that needed further support installing the sensor. In total 135 sensors have been installed. About 170 have been distributed, with an estimated 35 non-installs. Also, about 10 devices have been replaced due to malfunction in hardware.

3.3 Data Collection Process

The data collection with the sensors is a passive process. Data is collected automatically from the sensors and without user intervention pushed to the servers for front-end visualization in the platform. However, there have been technical issues with the sensor, requiring constant attention of the project team to address. These technical issues include among other issues:

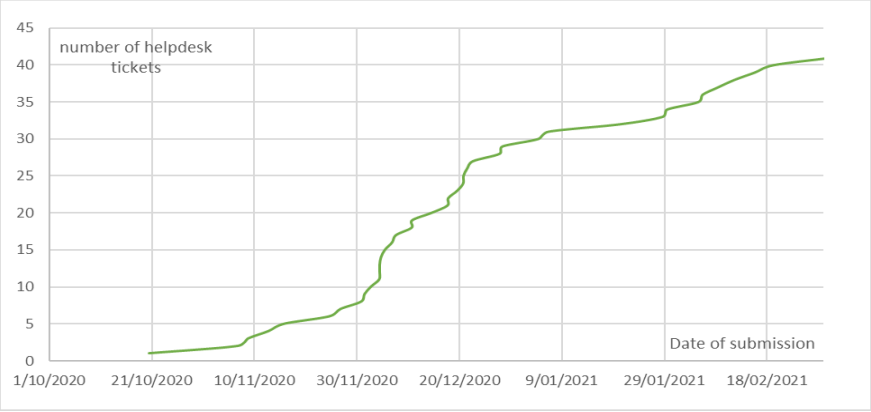
1. Unexpected outages due to sensor undervoltage: the Raspberry Pi-based Telraam system is prone to undervoltage and needs a manual reboot to restart (i.e. unplug & plug-in power supply). The initial power adapter that was supplied by our supplier Gotron wasn't rated for the 2.5V required for the sensor. About 20 new power suppliers have been distributed in Leuven to users who experience frequent outages.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2. Connectivity-issue's with the Wi-Fi: the Raspberry Pi-based Telraam system requires WPA2-PSK Wi-Fi-network, preferably on 2.4GhZ. Installation on public Wi-Fi's was not possible, causing inability install in schools & community centres (only the case with a few sensors). Wi-Fi-range or 5 GhZ-wifi did cause connectivity issues for some participants. To resolve the issue, either the sensor was removed or the network configuration was adapted (i.e. force on 2.4Ghz or add a repeater in case of range-issues)
3. About 10 devices have been replaced, either due to faulty SD-drives or a hardware malfunction in the camera-module or the Raspberry Pi itself. In about 10-20 cases, SD-drive re-installation was required to solve sensor outages. To this end, further instruction materials were developed and added to the Telraam FAQ-page. Specifically for the SD-drive: https://telraam.zendesk.com/hc/nl/articles/360028846211-Telraam-zelf-updaten

The continuous technical issues with the senor are definitely a low-light in the Leuven case. Over the course of the data collection, the project team has both pro-actively reached out to struggling user to install sensor or solve problems with the sensor, as well as reactively replied to (technical) queries via the support system of Zendesk.

The troubleshooting section of the FAQ was expanded[2], yet most of the effort fell on the project team to resolve technical issues.

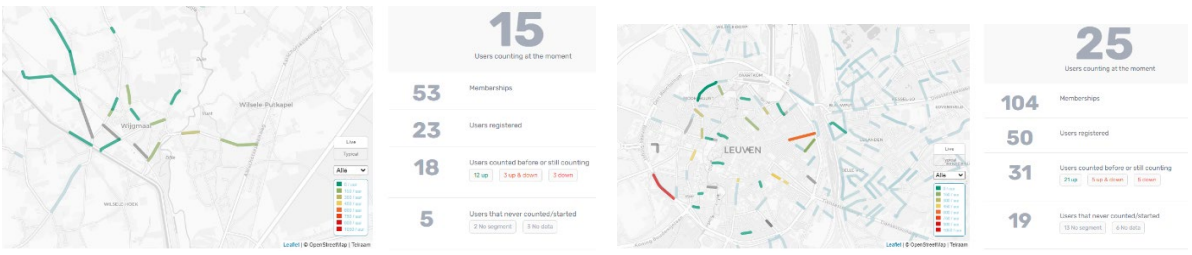


Helpdesk tickets were tracked from October 2020 onwards; figure below summarizes the cumulative number of technical questions received from user, indeed correlating with the sensor deployment.

Figure 25: Cumulative amount of helpdesk tickets from users in Leuven.

Screenshots of the management dashboard below summarize the sensor activity at the time of writing this report. 119 sensors are actively counting at this point in the 4 active networks (the small Heverlee sub-network will be added early March 2021). Note that this figure includes the sensors of the pre-pilot in Kessel-lo that were in part re-activated in scope of the Leuven pilot.

Data is broken down in the sub-networks, clockwise starting top left: Wijgmaal, Leuven city center, Kessel-lo, Wilsele:



[2] https://telraam.zendesk.com/hc/en-us/sections/360005128778-Troubleshooting

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

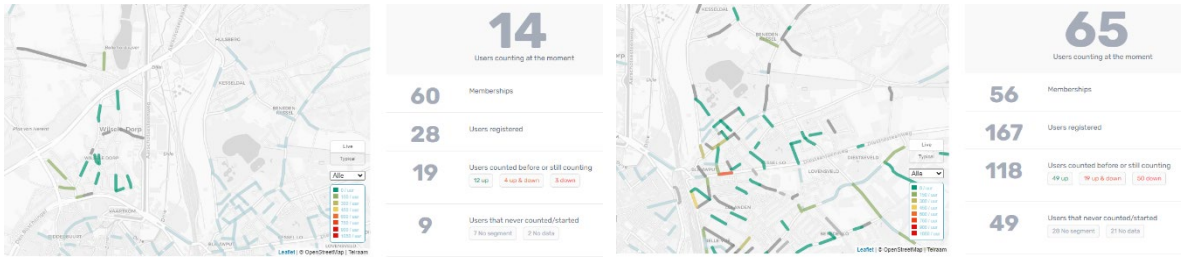


Figure 24: High-level user data in the Telraam dashboard, for the (currently) 4 sub-networks active in the Leuven pilot.

On average, about 70% of the installed sensors have consistently (at least 80% of the time) provided traffic counting data during a period of 4-8 months.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

4 Data Analysis and Awareness

The data analysis of the Telraam data in the Leuven case is heavily linked to the scope of the case on traffic circulation, to verify impact of interventions by local authorities in the local transport system. These include permanent or temporary road closures, introduction of one-way streets, redesign of the road infrastructure, typically favouring active travel at the expense of motorized traffic. The timeline of these intervention in principle coincided well with the deployment of the WeCount pilot case in Leuven, to generate a sufficiently large data set before the intervention and a dataset after the intervention, to allow for impact assessment.

Due to the Covid-19 pandemic, the timeline of the city authorities in implementing changes has slipped and as a consequence, the analysis focus of the Telraam data has been adjusted slightly, with the most important application pushed to the final months of the project and after the project, when indeed the most interventions will be in place. The local authorities of Leuven have expressed their continued interest to use the Telraam data in the WeCount project also after project completion for impact assessment of intervention. This section thus deals with the analysis done to date, with more analysis expected during in the later stages of and after the project.

The analysis is broadly building on 3 main blocks:

1. Generic analysis of the data from the WeCount platform
2. Participatory analysis by citizens, either "guided" or "unguided" in nature (more explanation further in this section)
3. Specific analysis of the data in the context of changing to the local circulation plan in Leuven

4.1 Generic analysis

WeCount is embedded in the Telraam ecosystem which includes automatic and generic data analysis via the platform. First, there is a fully open data, available in the public domain and accessible by anyone. Secondly, there is additional analysis at the level of the individual device, only accessible to the device-owner and the project team. We first explore the available option for analysis in the public interface.

4.1.1 Telraam public data

The detailed data analysis at link level is available through the Telraam-website (www.telraam.net) and includes a variety of comprehensive graphs reflecting the traffic in that specific street-segment. After selecting a specific time window , the following graphs are available:

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

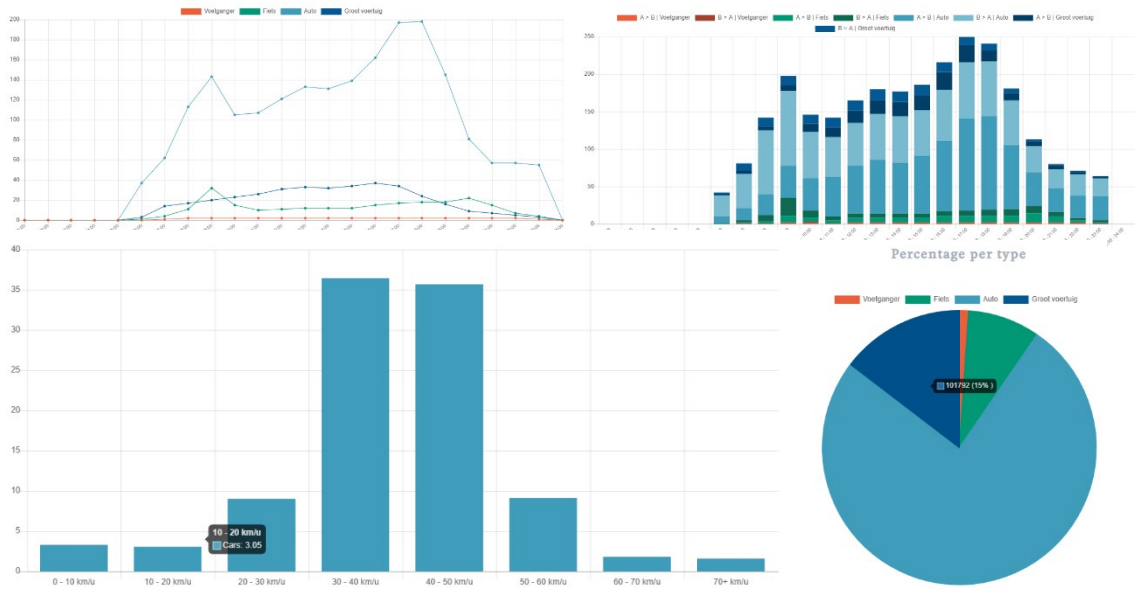


Figure 27: top left: average traffic volume per mode per hour of the day – top right: average traffic volume per type and per direction, stacked per hour of the day – bottom left: share of car speeds in bins of 10km/h, bottom right: overall share of traffic per type - Source: https://telraam.net/nl/location/349877/2020-04-06/2021-02-24.

Clearly, this is a very basic representation of the data the sensor generates and can only serve as the basis for analysis. This interface is the primary source for participating citizens to interact with the data and start analysing. Further in this chapter, we highlight a few examples.

4.1.2 User only data

Each participant receives a personalized monthly report, every month. These monthly reports include general statistics on the operations of the sensors itself and aggregated statistics for the last month on the counting data, comparing changes to the previous month.

These monthly reports offer an opportunity to the device-owner for and support in looking at the data more in depth compared to the public dataset. The monthly report includes the following components:

1. Sensor activity and quality of counting, aggregate per day and summarized for the past month in a qualitative assessment, grading from "poor" to "very good". These data reflect what share of the day the device was actively counting when light conditions were adequate to allow for counting and what days the sensor was not active.

Figure 28: Sensor activity and quality of counting.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2. Secondly, average traffic volumes are given for each type (car, bike, pedestrian and large vehicles) and compared to the previous month. In the example below, average traffic has been constant with (few) bikes and pedestrians dominating the traffic in this street.

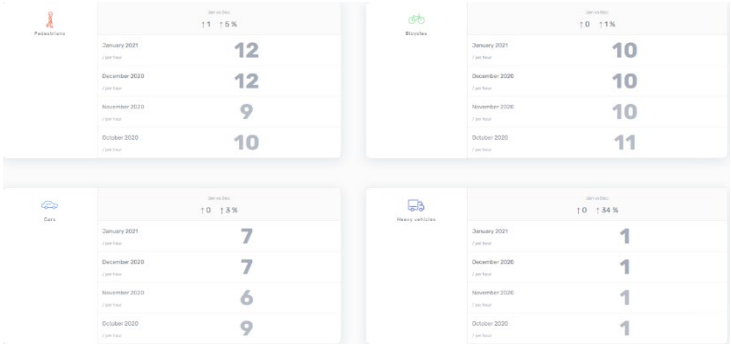
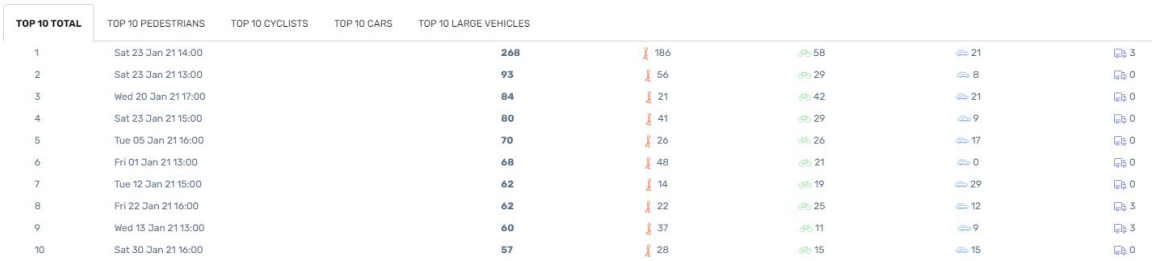


Figure 29: Average traffic volumes.

3. Further down, users can see what hours in the past month have been the busiest, both in terms of total traffic volumes as on a per traffic-type basis. This invites participants to think about the underlying drivers for traffic in their street (e.g. school run, commuting traffic,…)



TOP 10 TOTAL	TOP 10 PEDESTRIANS	TOP 10 CYCLISTS	TOP 10 CARS	TOP 10 LARGE VEHICLES
1	Sat 23 Jan 21 14:00	268	186	58	21	3
2	Sat 23 Jan 21 13:00	93	56	29	8	0
3	Wed 20 Jan 21 17:00	84	21	42	21	0
4	Sat 23 Jan 21 15:00	80	41	29	9	0
5	Tue 05 Jan 21 16:00	70	26	26	17	0
6	Fri 01 Jan 21 13:00	68	48	21	0	0
7	Tue 12 Jan 21 15:00	62	14	19	29	0
8	Fri 22 Jan 21 16:00	62	22	25	12	3
9	Wed 13 Jan 21 13:00	60	37	11	9	3
10	Sat 30 Jan 21 16:00	57	28	15	15	0

Figure 30: Past month averages.

4. The personal dashboard further includes estimates of speed compliance in the 4 main speed compliance categories: >30 km/h, 30-50 km/h, 50-70 km/h and <70km/h and again a comparison with the past month

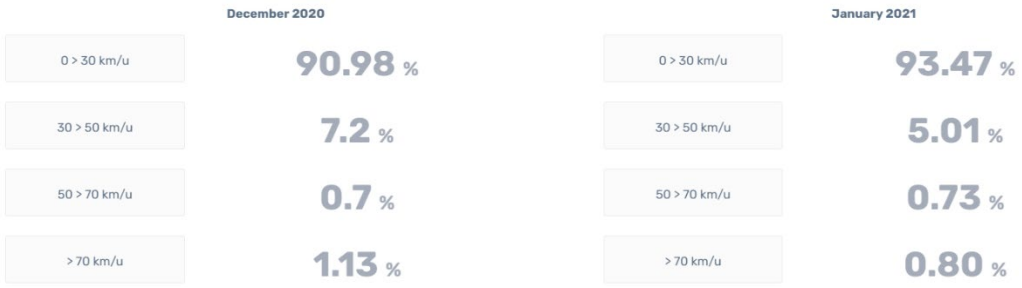


Figure 31: Estimates of speed.

While these interfaces are private to the user, participants are invited to share and add insights to explain observations in the data with the rest of the community, via social media (e.g. in the Telraam Facebook group or Twitter) or in a local community group like Hoplr. In most cases, these generic and automated analysis invite participants to a more specific analysis, example of those in the next section.

4.2 Participatory Data Analysis by citizens

This section includes both "guided" and "unguided" analysis on the data, performed by citizens. We distinguish explicitly between guided and unguided analysis. In the former, we give participants tools for basic analysis, to get a discussion going and generally educate participants on how to interpret traffic counting data. This type of analysis is low-threshold and aimed to involve a wide audience among the participants.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Apart from the "guided" analysis where the involvement of the project team is more apparent, one of the key objectives of WeCount, is to enable participants, inside and outside the project, to interact with the data and perform own analysis without any normative instructions or guidance from the project team. The data is available via the platform in various ways to accommodate various levels of complexity of the analysis:

- Simple: The online public dashboard as shown in the previous section
- Moderate: Excel/.csv data dumps for tailored analysis in a spreadsheet
- Hard: An API to extract large batches of data for integration in existing dashboard application or newly developed analysis/dashboards.

In this section, we first give a few examples (that we know of!) of data analysis performed by citizens, without intervention of the project team and secondly our approach for "guided" analysis, planned in the next few months.

4.2.1 *"Unguided" citizen analysis*

EXAMPLE 1

Some users have used Telraam data in a quite simple way and used simple means to share simple data analysis of their devices with their neighbourhood, for example using window markers or an outdoor marking board. A few examples of citizen initiatives in this sense below.

Figure 32: Examples of sharing Telraam data.

EXAMPLE 2

A more sophisticated example is the case of the Brusselsestraat in Leuven. The Brusselsestraat is an important approach road to the city centre. The speed limit has been lowered from 50 km/h to 30 km/h yet the street design and historical nature of the street as a 50 km/h speed limit, makes that speed limit compliance is very poor.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 33: Brusselsestraat in Leuven - source: Google Streetview.

There is a local citizen action group, pleading with the local authority for more enforcement of the speed limit and interventions in the road design to force lower speeds for several years now. One of the members received a Telraam-device to objectively show that non-compliance of the speed limit is indeed a problem. Telraam data indeed reveals that prior to any intervention **47.85%** of passing cars exceeds the 30km/h speed limit.

As a result of the activism of the local citizen group, the city authorities have done 2 interventions to improve speed limit compliance: first, in May 2020, the installation of a digital sign indicating speed to the passing car and second, in November, the installation of a temporary speed bump. As the Telraam device has been collecting data continuously, the impact of both interventions on speed limit compliance can be isolated.

With this perspective in mind, a second citizen with expertise in data analysis, also member of the local action group, exported the data from Telraam to perform analysis. His conclusions are captured in the graph he created, copied below (legend & title in Dutch only)

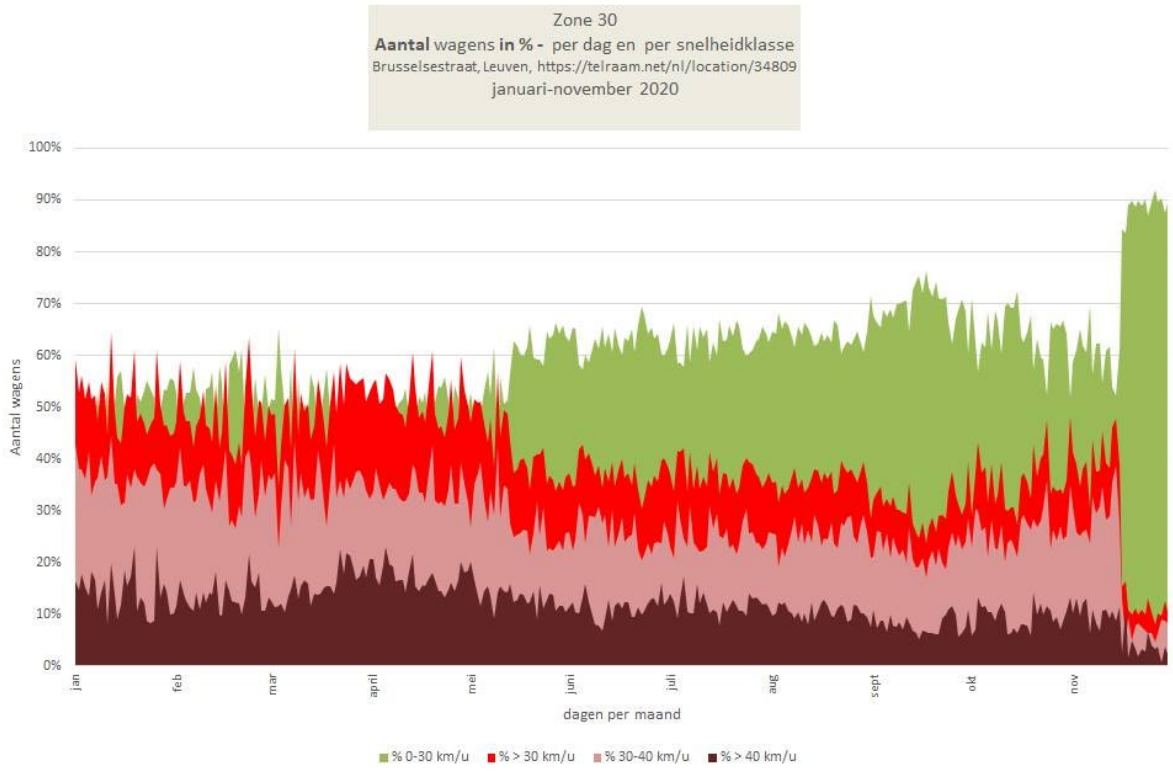


Figure 34: Speed compliance in Brusselsestraat, plotted over time - Credits Ludo Proost.

This analysis was performed without any guidance, unaware to the WeCount project team, and we only found out about it when the citizen action group contacted us to verify their findings. Indeed, the effect of both measures can be clearly seen with a decrease of speed limit non-compliance of the first intervention from 47.85% to 36.27%. The second intervention (speed bump) decreased non-compliance further to

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

8.02%. Figures below summarize the speeds histograms we produced as a verification for the first period up to 1/5/2020, without intervention (left), the second period with the digital sign installed, between 1/5/2020 and 15/11/2020 (mid) and finally to last period with the speeds bump installed as well, from 15/11/2020 until the writing of this report end February 2021 (right).

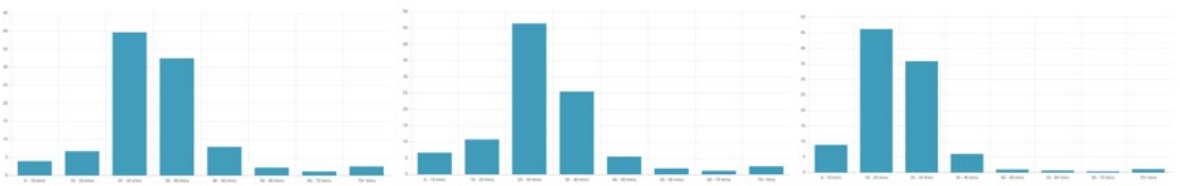


Figure 35: Summarize the speeds histograms.

This analysis reveals that citizens are able to perform own, more complex analysis with the available tools from WeCount and Telraam. All data for this specific road segment can be consulted via: https://telraam.net/nl/location/348095/2019-06-24/2020-05-01

EXAMPLE 3

As a third example, we focus on more complex analysis by data scientists, using the Telraam API that was developed in the WeCount project, to perform complex analysis on the full database of Telraam.

At the beginning of the Covid-19 Pandemic, the WeCount-project team produced an article for the Thinking Cities magazine, using Telraam data as a source to assess the impact of the lockdown on our mobility. The article was published in Think Cities: https://thinking-cities.h3bconnected.com/t-cities-july-2020/leuven-environment-health-in-transport/

We know of 2 cases of external users using the dataset to perform similar analysis. In a first case, a student at the VUB has used the API to test the hypothesis if mobility based on Telraam data can be used as a predictor to estimate Covid-19 hospitalizations. The analysis was published online as part of the Mistic research project: https://elucidata.be/mistic/blog/Is-traffic-volume-correlated-to-Covid-19-infections

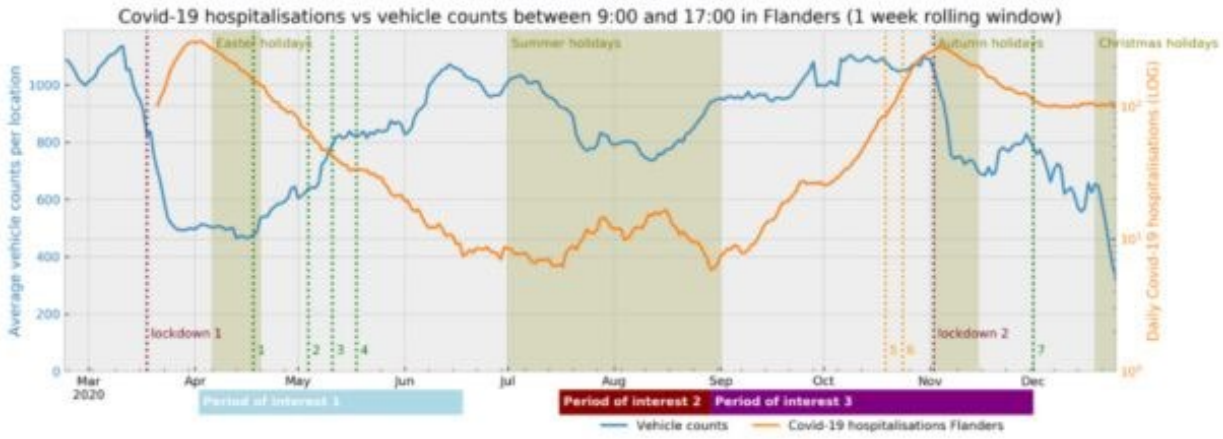


Figure 36: Correlating traffic data from Wecount sensors with Covid-19 hospitalizations, plotted in time - Credits Michiel Dhont (VUB).

In a second case, a team at VITO (a Belgian semi-public research institute) working on air quality modelling (https://vito.be/nl/luchtkwaliteit) has used the API of Telraam to estimate changes to traffic volumes as input for air quality models. The teams used a variety of sources for this, from the official counting data on the highway network (MOW) to Google workplaces report and complemented with Telraam for a finer spatial and temporal resolution.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

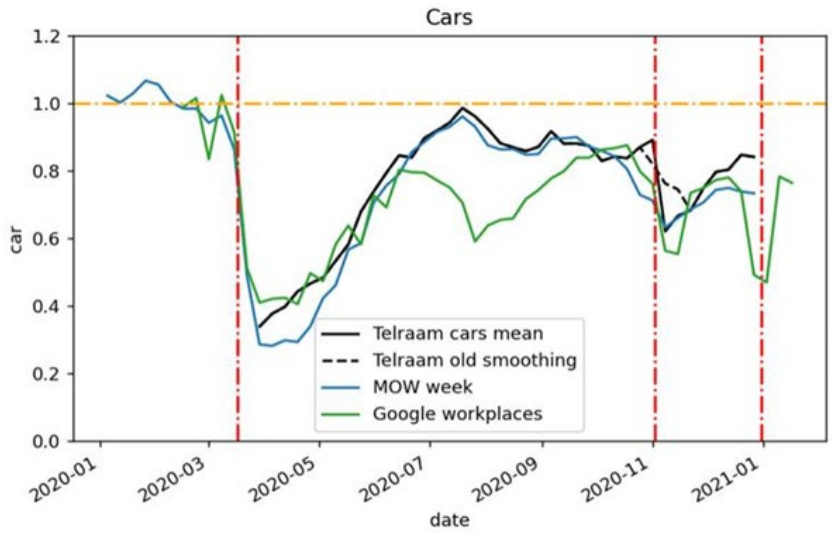


Figure 37: Relative decrease of mobility, using 3 sources - Credits Hans Hooyberghs (VITO).

There is a clear alignment between the 3 sources, apart from the holiday period with Google workplace data underestimating the mobility. For purpose of air quality modelling, obviously the true traffic volumes are required. The correspondence between official MOW-data and Telraam data gives confidence to the VITO research team to use sub-sets of the data from Telraam as MOW only provides an indication of total traffic.

These are just 3 examples of analysis performed by citizens and specialists, using WeCount generated data and tools. Given the nature of the objective to enable autonomous data analysis by citizens and researchers, it is likely that more examples of analysis performed by citizens or researchers exist that the project team is unaware of.

4.2.2 *"Guided" data analysis*

A second element of the data analysis in the Leuven pilot case, is a more structured and "guided" analysis with a more active role of the project team. The objective of this more hands-on analysis is to include a wider audience in the analysis effort. The examples in the previous section require at least some technical knowledge of data handling and interpretation, a skill not per se present with all participants.

This guided data analysis has a primary focus of educating and informing participants with limit understanding of interpreting traffic count data. There are 2 activities in this sub-task: a data-workshop and a low-threshold "street-profiler"

Data analysis workshop

The data workshop aim is to perform basic analysis with the Telraam data in a co-creation setting. Due to Covid-19 restrictions, we were not able to organize a physical workshop on data analysis early 2021 as it was intended. The workshop has been postponed several times, in the hope lockdown restrictions would be lifted. We have deliberately decided to further postpone this workshop as a physical workshop is crucial, facilitating the interaction between project team and citizens. We find this will be difficult in an online setting and have therefore pushed the date to a moment where this could be a possibility, even if this mean the data workshop will be performed after the Leuven-case in principle has ended.

The current expectation is that late Spring or early Summer 2021 should be a possibility. But still very much depending on the evolution in Covid-19 restrictions. Given the workshop has not been executed nor

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

prepared, we cannot report on the outcomes in this report. A brief additional report will be included in D4.3, at the end of the project.

"Street-profiler"

To start preparing the ground for this physical data analysis workshop before summer basic data analysis guidelines will be send out in March 2021 to all citizen-counters in the Leuven networks. It's a basic "fill-in" sheet that participants can complete for their own device, using the public and own dashboard. The guidelines add basic interpretation rules, specifically for traffic counting data (e.g. an indication of the amount of passing cars indicate a comparably quiet or busy street) and general in nature (e.g. working with mean values over a long time period increases robustness of analysis). With this guideline, the participant is both educated in understanding traffic data as well as data interpretation in general.

Figure 38: Street profiler (full example in annex).

By sending out guidelines focusing on how to look at the visualized data, participants are invited to look at the data of their own Telraam. These guidelines consist of different templates: street profile, modal share, impact of event, speed compliance, etc. By offering these guidelines and templates, participants are invited to develop and share their own Telraam data stories. Which can be the subject of the discussion on the physical data analysis workshop.

4.3 Bridge to the Policy Level

As described in the co-design section, from the onset the pilot case of Leuven is heavily embedded in the policy trajectory of adapting the traffic circulation in Leuven city centre and the boroughs. This has greatly facilitated the involvement of the local policy level (both politicians and the administration) and the use of the outputs of the activity in the policy development process. Also, because of the close working relation of both Leuven-based WeCount partners TML & M21 with the city of Leuven it was fairly easy to "attract the attention" of the local policy level. Finally, for a relatively small town with 100.000 inhabitants like Leuven, the generation of a rich traffic counting dataset and citizen community as provided by WeCount, is a welcome addition in a time of scarce public resources.

As such, no efforts were needed from the project team to establish this link with the policy level; on the contrary, as indicated earlier, the project team has guarded the independence and the bottom-up and citizen-driven nature of the WeCount Leuven case, to avoid the activities being "hijacked" by the city authorities in their own engagement initiatives. Though a challenging balancing act, this "problem" is still preferred over a lack of interest from the local authorities.

As indicated, Telraam data from WeCount was to be used to evaluate the impact of interventions in the traffic circulation and the community of participants is integrated in the engagement process of the city authorities itself. Again, due to the Covid-19 restrictions, the timeline of the city authority itself and the implementation of interventions has slipped. As such only a few interventions at this point can be truly tested with Telraam data generated in WeCount. On the positive side, this does open opportunities in terms of post-project legacy and the use of the outputs of the Leuven pilot case. Indeed, while we continue analysis work for the Leuven pilot case even as the case is formally concluding, the Leuven city authority has already indicated it is interested in further systematic collaboration with TML/M21/Telraam to perform

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

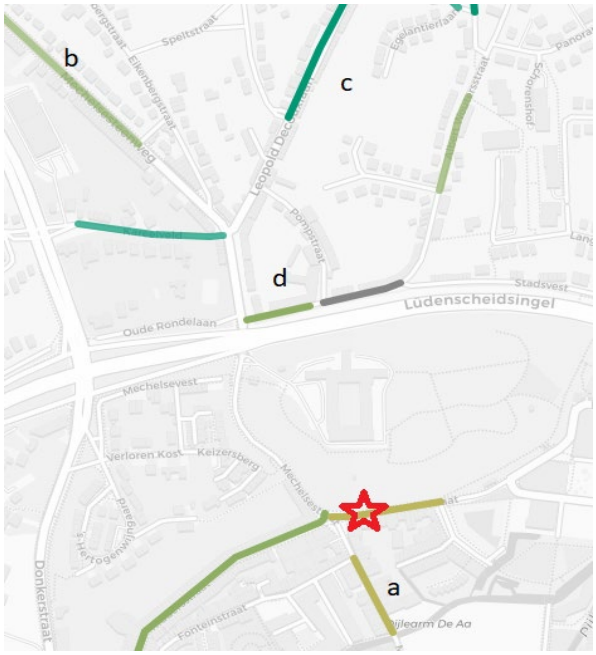
data analysis and community management for a longer period, as they gradually test and implement interventions.

In this section, we single out a single intervention: the installation of a "soft closure" of a key road in the city centre, which is expected to have a possible negative impact on neighbouring streets in the borough Wilsele. The intervention was done on 1st February 2021 and is enforced by an ANPR-camera, a camera detecting license plates of cars and automatically fining cars that do not have a permit to pass beyond this point. The intervention aims to ban all cut-through traffic, allowing only permit-holders (local residents) to use this road. The case is described in detail on the website of the city of Leuven: https://www.leuven.be/burchtstraat

In this brief analysis, we focus on the changes in traffic in 2 periods:

- 1 month before the intervention: 1st January to 1st February and
- 1 month after the intervention: 1st February to 1st March.

We then compare typical daily traffic profiles for these 2 periods, both for bike and car traffic and we plot a trend of traffic in time, again, both for bike and car traffic. We repeat this analysis for different street segments that are expected to be affected by the intervention. Figure below highlights the suspected affected road segments and the location of the intervention:



The relevant streets are, apart from the Burchtstraat where the intervention is done – signed with a red star:

a. Mechelsestraat
b. Mechelse Steenweg
c. Leopold Decouxlaan
d. Albert Woutersstraat

Figure 25: area of interest of the intervention in the Burchtstraat, Leuven.

We first assess the Burchtstraat itself, where the soft closure with ANPR-enforcement was implemented. After the intervention, only residents could use the Burchtstraat by car, effectively barring all cut-through traffic. A significant drop in car traffic is expected.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

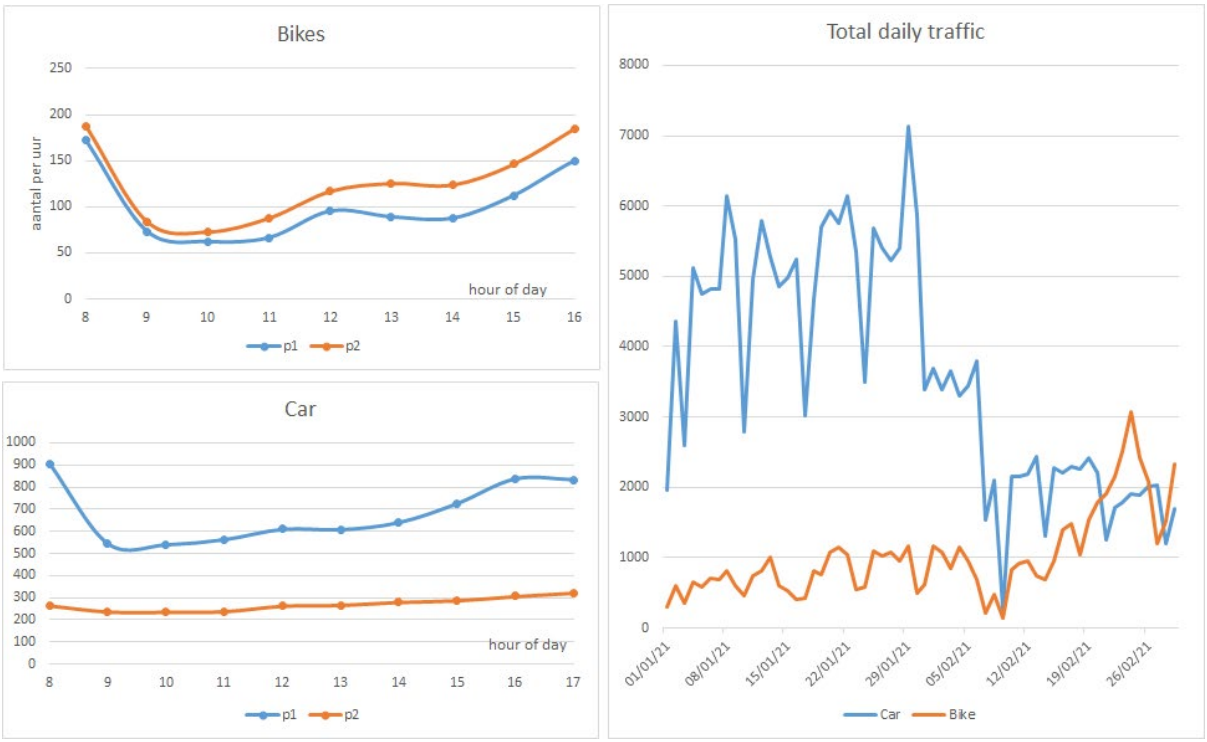


Figure 40: Traffic in Burchtstraat – on the left, typical daily traffic patterns pre-intervention (blue) and post-intervention (orange); top left for bikes, bottom left for cars. On the right, trend of absolute daily traffic volumes for car (blue) and bikes (orange).

It is immediately apparent typical car traffic volumes have reduced substantially, falling to levels of over half the volumes before the intervention. Total daily car traffic decreases from 5000-6000 to about 2000. In the peak periods, the reduction is the highest, so the intervention seems to affect peak traffic volumes that are associated with commuting more strongly. Interestingly, typical bike traffic volumes have increased, however, it is unclear if this increase can be attributed to the reduction of car traffic, as bike traffic is strongly correlated with weather conditions. The second part of February indeed had very favourable weather in Leuven, thus at least in part explaining the increase.

While the effect on car traffic volumes is near-immediate: after February 1st, there was a sharp drop leading to new constant baseline traffic around 2000 vehicles per day, the increase of bikes post-intervention seems to have occurred gradually as cars volumes dropped, potentially pointing to a learning-effect, attracting bike traffic to a now more bike-friendly street.

The intention of the soft-closure, is to push cut-through traffic to the ring road, designed to handle large volumes of traffic. However, it is possible the intervention will have unintended consequences, displacing car traffic locally, causing problems with rat-running elsewhere, specifically in the borough of Wilsele. The remainder of this analysis focuses on potential spill-over effects in nearby streets in Wilsele.

The first street for analysis of spill-over effect is the Mechelsestraat. The hypothesis for this street is that there may be an increase in traffic, as traffic from outside the city that would use the Burchtstraat, is now forced to use the Mechelsestraat. It is not clear if this is an attractive alternative and drivers may opt to choose an alternative route via the ring-road or rat-running through Wilselse instead.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

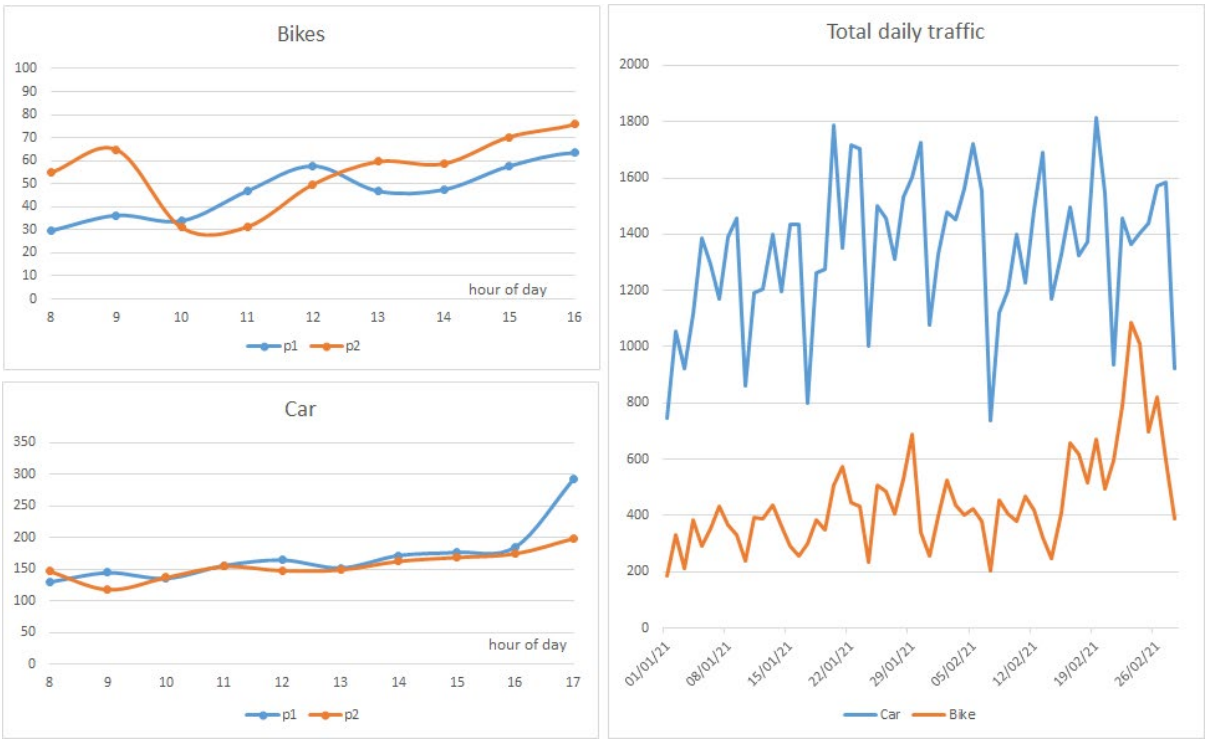


Figure 41: Traffic in Mechelsestraat – on the left, typical daily traffic patterns pre-intervention (blue) and post-intervention (orange); top left for bikes, bottom left for cars. On the right, trend of absolute daily traffic volumes for car (blue) and bikes (orange).

We find a negligible effect on car traffic of the intervention; the impact on bike traffic is ambiguous, again likely pointing to different weather conditions in both periods, though the increase of bike traffic is more explicit in de Burchtstraat compared to Mechelsestraat. Looking at the trend of total traffic volumes on the right, it is apparent that peak car traffic stays about the same before/after the intervention.

We thus continue further to the Mechelse Steenweg, north of the city, just outside the ring-road. The Mechelse Steenweg is an approach road for the northern part of the city centre of Leuven, but mostly serves the borough Wilsele. The hypothesis for the impact of the intervention on this road is not clear. If used as a systematic cut-through route, a drop in traffic is expected.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

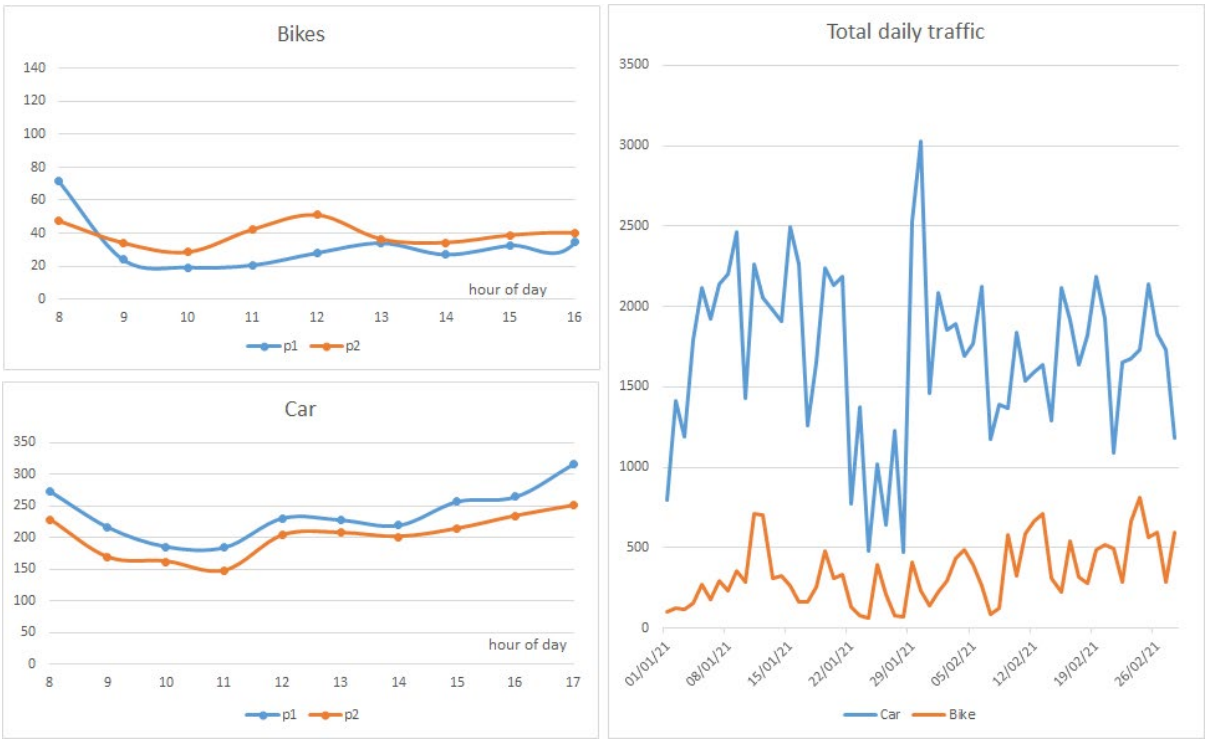


Figure 42: Traffic in Mechelse Steenweg – on the left, typical daily traffic patterns pre-intervention (blue) and post-intervention (orange); top left for bikes, bottom left for cars. On the right, trend of absolute daily traffic volumes for car (blue) and bikes (orange).

A small but significant drop in typical car volumes can be observed, systematic throughout the day. The trend-figure on the right with daily traffic volumes is less clear. It should be noted this sensor was not 100% active for the full period of this analysis. While working with mean values will solve issues for typical traffic volumes (left), this does not hold for absolute trend-analysis (right). Bike traffic increase moderately post-intervention but again it is unclear if this can be attributed to the intervention or to more favourable weather conditions in the post-intervention period.

A longer post-intervention measurement is advised to make any definite statements on the impact of the intervention on this road segment.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

We continue the analysis clockwise, now moving to the Leopold Decouxlaan. Hypothesis for this street is no impact expected with the intervention in the Burchtstraat. This is a small residential street that mostly serves residents in the street itself and adjacent streets.

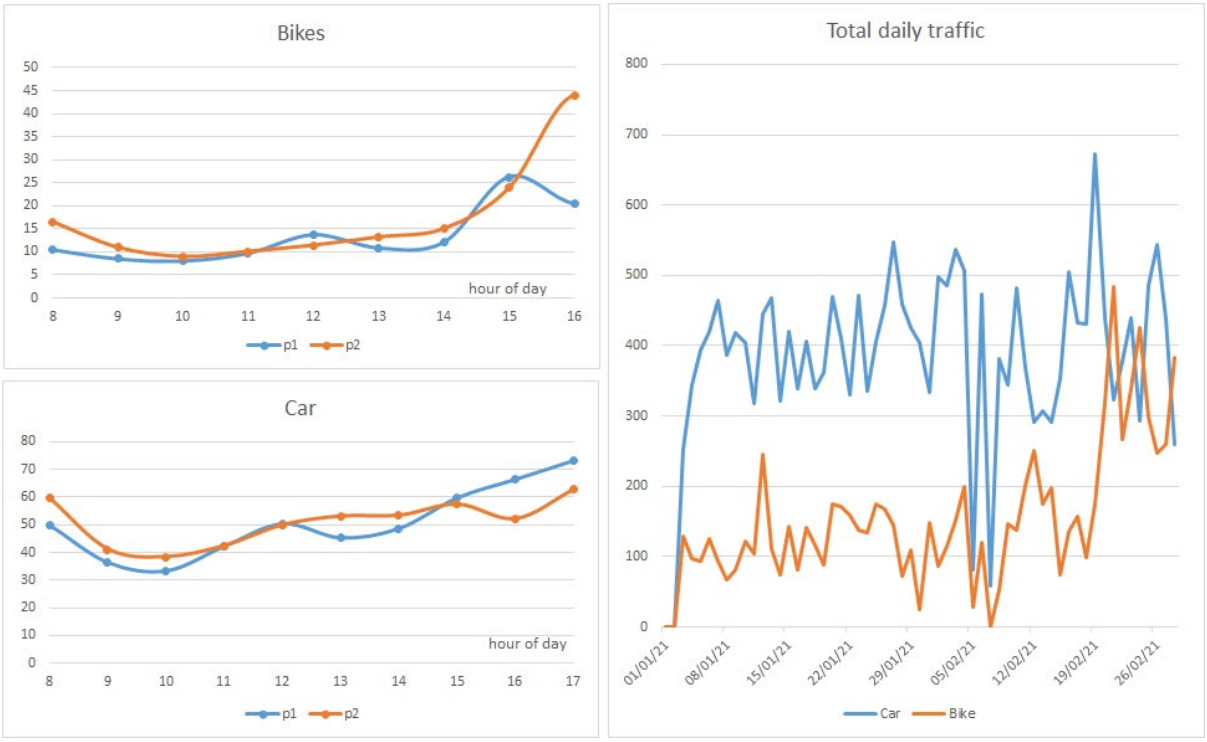


Figure 43: Traffic in Leopold Decouxlaan – on the left, typical daily traffic patterns pre-intervention (blue) and post-intervention (orange); top left for bikes, bottom left for cars. On the right, trend of absolute daily traffic volumes for car (blue) and bikes (orange).

Indeed, car traffic is quite low, averaging at about 50 cars per hours (less than 1 per minute), with no apparent effect of the intervention. Bike traffic increased substantially in the later part of February, when the weather was good.

One street expected to be at risk of rat running post-intervention is the Albert Woutersstraat; If a local displacement of passing-through traffic through the borough of Wilsele would occur, it would be via a route that would include this street segment.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

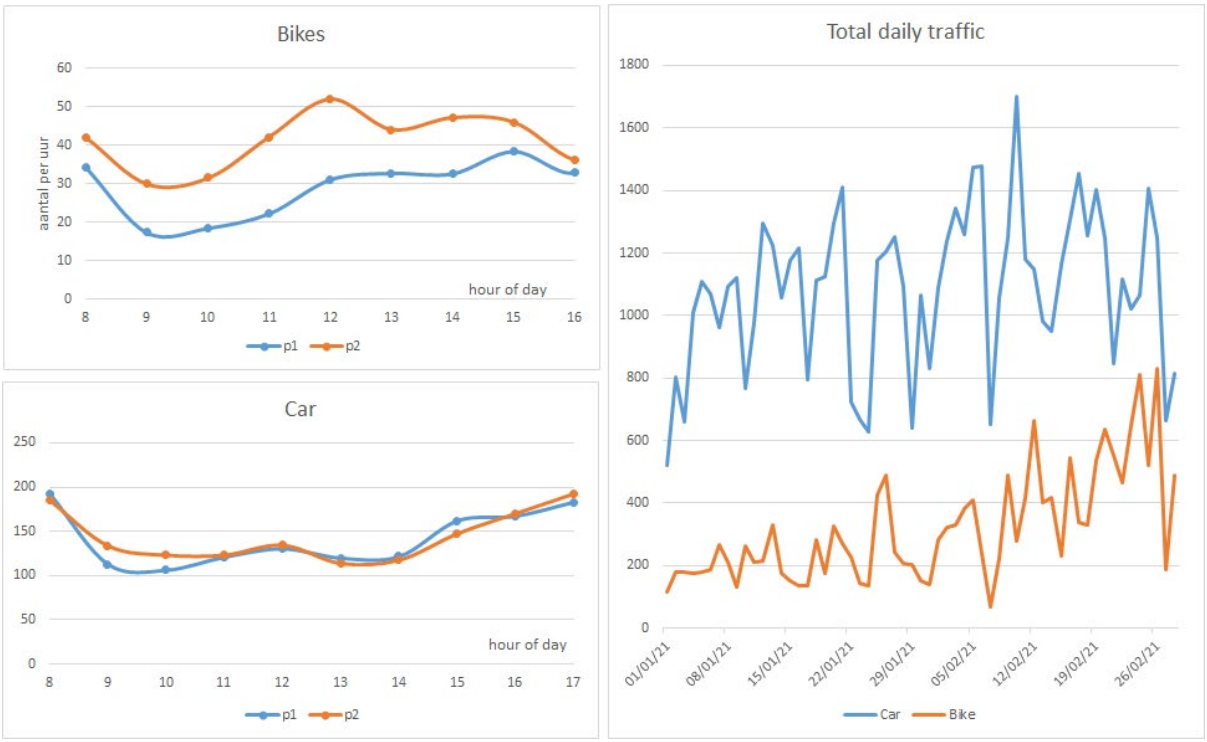


Figure 44: Traffic in Albert Woutersstraat – on the left, typical daily traffic patterns pre-intervention (blue) and post-intervention (orange); top left for bikes, bottom left for cars. On the right, trend of absolute daily traffic volumes for car (blue) and bikes.

We find little impact of the intervention on traffic levels in the Albert Woutersstraat. Daily traffic patterns are near-identical pre- and post-intervention. Also, the absolute trend data does not reveal an increase or decrease and remains constant to about 1300 cars per day. Bike traffic, as elsewhere, increased strongly in the second period of February.

Based on this analysis, it can be concluded that the intervention indeed achieved its objective of pushing cut-through traffic to the main arteries (i.e. ring road), while avoiding a negative spill-over effect, displacing rat running traffic to the borough of Wilsele.

This analysis will be shared with the local authorities and the citizens. Within the WeCount community in Wilsele, this is a lively topic, discussed frequently and monitored closely in the community Hoplr group. The Telraam data collected in scope of the WeCount pilot cases is a central component also among citizens.

This particular case confirms the value of the citizen-generated data for impact assessment of local traffic policy interventions. As indicated, the city of Leuven will use a similar approach to assess the impact of future interventions, in first instance in the borough of Kessel-lo.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

5 Reflection, Legacy, and Conclusions

The last phase of the case study was about **reflecting** on the overall process, as well as the outputs and outcomes of the intervention, and on planning for the legacy of the case study. Throughout its sections, this report provided several lessons learned from the case study, as well as reflections on what worked well and what did not across all the different phases. We have learned that Covid-19 restrictions were and remain a challenge for the deployment of a citizen science project with a string focus on community building and citizen engagement.

Especially, we did not meet our objective of reaching the difficult to reach and the vulnerable groups. Next to that, we have also learned that Covid-19 restrictions challenged us in thinking about other citizens engagement tools and working around or with the Covid-19 restrictions to set up those engagement tools and activities. Thanks to Covid-19 restrictions we have learned and tested out new tools and methodologies.

Despite Covid-19, we also learned that the Telraam enumerators are very eager to continue working on the data, with the data, on the liveability of the street, neighbourhood and city. We also learned that a lot more is needed to make the counters stronger to work effectively on liveable streets. Thanks to the Telraam Labs, we learned about those questions and needs, and also about the answers to those questions.

Deploying 200-250 sensors in Leuven proved to be too ambitious in light of Covid-19 restrictions, stranding at about 140 extra sensors deployed and about 45 reactivations of old sensors/users, to arrive to a total of 185 sensors. Moreover the -at least for non tech-savvy participants- technically challenging installation process and continuous technical challenges with the sensor, either during installation or later, have been a constant source of concern for the project team in the Leuven case. Technical improvements to the sensor, increasing robustness and reliability of data are required to make a sustainable model and ensure post-project continuation. TML has already taken the necessary steps to address these issues and a new sensor development process has been started, outside the scope of WeCount.

A clear positive element of the Leuven pilot case, is that the involvement of the policy level with intense interaction with the city of Leuven is successful and lasting. It was a lengthy process, but the city has already made it clear that it wants to continue working with the Telraam network we build in the WeCount project. This is not only from a mobility point of view but also from a citizen involvement point of view.

Telraam will continue to exist in Leuven, thanks to the strong commitment of the counters, thanks to the plans and the clear commitment of the city of Leuven. The **legacy** of WeCount in Leuven is assured. As mentioned earlier, the city of Leuven has indicated its intention to continue working with the Telraam network and data. In addition, a strong self-sustaining Telraam community has been built up in Leuven and beyond, which is only growing and flourishing, and which will only get stronger with the help of the Telraam platform.

Finally, due to nation-wide exposure and media attention the WeCount Leuven pilot enjoyed in Belgium, various local authorities in Belgium have expressed interest to perform similar activities in their own municipalities. Indeed, about 5-10 small Telraam-projects, using the same approach as in WeCount have started as a consequence (a.o. gemeente Halle, Moorsel, Turnhout, Bornem, Borsbeek,…) in the wake of the Leuven pilot. This clearly demonstrates the exploitation potential of Wecount, at least in Belgium.

The concrete **next steps** for the network in Leuven are: the roll out of the final subnetwork in Heverlee, further agreeing with the city of Leuven how Telraam will become a permanent value within the city of Leuven, supporting the enumerators and other parties involved in analysing the data (guidelines and

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

workshop), collecting data stories, and further spreading and communicating about Telraam, data stories, ... within Leuven.

Appendix 1: Local Communication and Dissemination Case Leuven

Name of event	Date (DD/MM/YYYY)	Location	Target audience	N° of participants	Presentation title (& number of slides on WeCount) or info on how the project was promoted (in case no presentation given)	Local event (x=YES)	Regional event (x=YES)
Pick up Wilsele dorp	8/07/2020	Wilsele Dorp	Counters	15	Welcome kit	x	
Workshop Wilsele dorp	8/07/2020	Online Zoom	Counters	15	Technical workshop training ppt	x	
Q&A Wilsele dorp	15/07/2020	Online Zoom	Counters	4	/	x	
Pick up Leuven Innercity	20/08/2020	Leuven	Counters	10	Welcome kit	x	
Workshop Leuven Innercity	20/08/2020	Online Zoom	Counters	10	Technical workshop training ppt	x	
Q&A Leuven Innercity	27/08/2020	Online Zoom	Counters	4	/	x	
Pick up Wijgmaal	22/09/2020	Wijgmaal	Counters	23	Welcome kit	x	
Workshop Wijgmaal	22/09/2020	Online Zoom	Counters	23	Technical workshop training ppt	x	
Q&A Wijgmaal	29/09/2020	Online Zoom	Counters	6	/	x	
Meeting local champions Kessel-Lo	14/07/2020	Online Zoom	local champions	4	PPT	x	
Training Local champions Kessel-lo	1/12/2020	Online Zoom	local champions	4	PPT	x	
Pick up Kessel-Lo	1/12/2020	Kessel-Lo	Counters	21	Welcome kit	x	
Workshop Kessel-Lo	1/12/2020	Online Zoom	Counters	21	Technical workshop training ppt	x	
Q&A Kessel-Lo	8/12/2020	Online Zoom	Counters	5	/	x	
Telraam Lab 1	25/06/2020	Leuven	Counters	12	Presentation, brainstorm tools		x
Telraam Lab 2	27/10/2020	Leuven	Counters	28	Presentation, brainstorm tools		x
Telraam Lab 3	1/02/2021	Online Zoom & Miro	Counters	56	Presentation, brainstorm tools		x

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 2: Dissemination and Outreach Activities

Media activity online

Title of publication	Title of the medium (e.g. name of the website/blog etc.)	Date of publication
Belgisch verkeersonderzoek gaat internationaal	Susanova	21/01/2020
Citizen science traffic monitoring with Raspberry Pi	FreeIO.org	22/01/2020
Leuvense product telraam wordt uitgerold in vier Europese steden	ROB TV	22/01/2020
Window-mounted sensors in homes to collect data for pioneering traffic study	Techspark	22/01/2020
Citizen Science Traffic Monitoring with Raspberry Pi	Blogdot.tv	22/01/2020
Europees verkeersonderzoek werft 'burgerwetenschappers'	Newsweek	29/01/2020
Belgisch verkeerstelraam duikt na Madrid en Dublin nu op in Alphen: landelijke primeur voor De Schans	AD news	14/02/2020
WeCount: Mit diesen Sensoren können sich Bürger*innen für eine bessere Luftqualität engagieren	reset.org	24/02/2020
A Collaborative Project for Installing Sensors and Monitoring Traffic from European Homes. A Collaborative Project for Installing Sensors and Monitoring Traffic from European Homes	bBlog.ferrovial.com	4/03/2020
Pandemic: Mobility In Cities Adapts To A New Way Of Life - Greg Lindsay chats with Ivo Cré	CoMotion	21/04/2020

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Telraam: actief in verschillende steden en gemeenten in Vlaanderen, Brussel, Wallonië en Europese steden	Fietsberaad	1/04/2020
Comptages automatiques au travers de sa fenêtre	GRACQ	29/05/2020
Europees project WeCount verdeelt 250 Telramen in Leuven en deelgemeenten	Leuven Actueel	2/06/2020
Telraam: 38% meer fietsverkeer tijdens autovrije zondag	Het Laatste Nieuws	30/09/2020
Telraam: Prenez part à l'analyse de la mobilité de votre ville!	City of Liège	4/12/2020
Prijzen voor Telraam en EPC-rekenmotor	De tijd	26/11/2020
API-awards voor TML en Vlaams Energieagentschap	Knack datanews	27/11/2020
API-awards voor TML en Vlaams Energieagentschap	Informatie Vlaanderen	26/11/2020
La ville de Liège peaufine le comptage de ses flux de circulation	RTBF	5/02/2021

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Third Party conferences

Name of event	Date (DD/MM/YYYY)	Location	Target audience	N° of participants	Presentation title (& number of slides on WeCount) or info on how the project was promoted (in case no presentation given)	Local event (x=YES)	Regional event (x=YES)	National event (x=YES)	European event (x=YES)
Civitas Forum Graz	2/10/2019	Graz (Austria)	professionals, local authorities	80	Telraam (WeCount was mentioned orally)				x
Smart Mobility Belgium	18/11/2019	Brussels (Belgium)	professionals	20	Voorstelling projecten (WeCount was mentioned orally)	x			
Workshop Telraam Schaarbeek	8/11/2019	Schaarbeek (Belgium)	citizens	30		x			
Workshop Telraam Aalst	19/11/2019	Aalst (Belgium)	citizens	15		x			
POLIS Congress presentation	27/11/2019	Brussels (Belgium)	professionals, local authorities	60	Telraam (2 slides)				x
Telraam Brussels meeting	17/12/2019	Brussels (Belgium)	regional government	5	Telraam & Good Move: partners in modal split (1 slide)	x			
Flemish Cycling Association presentation	18/12/2019	Brussels (Belgium)	cyclist federation, local departments	20	Workshop Telraam en Flitsfiets (1 slide)			x	
Telraam Tervuren meeting	20/12/2019	Tervuren (Belgium)	local authority	3	Telraam (1 slide)	x			
KBC bank meeting	13/01/2020	Leuven (Belgium)	professionals	40		x			
Brussels-Capital Region meeting	29/01/2020	Brussels (Belgium)	regional government	5	Telraam & Good Move: partners in modal split (1 slide)		x		
VERA + Province of Flemish-Brabant meeting	18/02/2020	Leuven (Belgium)	regional government	4	Telraam & Vera: partners in modal split (4 slides)		x		
Workshop Telraam Kortrijk	19/02/2020	Kortrijk (Belgium)	citizens	20		x			
Telraam Lubbeek meeting	27/02/2020	Leuven (Belgium)	local authority	2	Telraam & gemeente Lubbeek: partners in modal split (4 slides)	x			
Cycling Congress meeting	28/02/2020	Utrecht (Netherlands)	professionals, local authorities	15	Telraam (3 slides)				x

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Network evening City of Mechelen Congress presentation	3/03/2020	Mechelen (Belgium)	citizens	15	Telraam & Stad Mechelen: partners in modal split (4 slides)	x			
VCV Congress Turnhout presentation	10/03/2020	Turnhout (Belgium)	professionals, local authorities	85	Telraam: wat als burgers opkomen voor verkeersveiligheid? (3 slides)	x			
City of Blankenberge virtual meeting	12/03/2020	Leuven (Belgium)	local authority	5	Telraam & Blankenberge: partners in modal split (4 slides)	x			
Workshop Telraam Mechelen	30/04/2020	Mechelen (Belgium)	citizens	80		x			
Post-Lockdown Mobility webinar report: WeCount and insights from the POLIS members' survey	11/05/2020	Online (Belgium)	local authorities	85	Presentation on COVID related traffic counting and WeCount				x
SOLVA regionetwerk mobiliteit	11/06/2020	Sint-Lievens-Houtem (Belgium)	local authorities	30	Telraam - SOLVA regionetwerk mobiliteit		x		
Telraam Maasmechelen virtual meeting	2/07/2020	Maasmechelen (Belgium)	local authorities	2	Telraam - gemeente Maasmechelen	x			
Telraam Gulpen-Wittem virtual meeting	3/08/2020	Gulpen-Wittem (Netherlands)	local authorities	2	Telraam - gemeente Gulpen-Wittem	x			
Telraam Wetteren virtual meeting	24/09/2020	Online (Wetteren)	local authorities	2	Telraam- gemeente Wetteren	x			
Telraam Bornem virtual meeting	24/09/2020	Online (Bornem)	local authorities	2	Telraam- gemeente Bornem	x			
Telraam Hoeilaart virtual meeting	7/10/2020	Online (Hoeilaart)	local authorities	2	Telraam- gemeente Hoeilaart	x			
Citizen Science Conference (CSSDG)	14/10/2020	Online (Berlin)	Citizens science practitioners, policy makers and research community	200	Introducing: H2020 WeCount				x
Telraam S-LIM virtual meeting	20/10/2020	Online (S-LIM)	local authorities	2	Telraam- S-LIM		x		
Telraam Groen Geel virtual meeting	20/10/2020	Online (Geel)	local authorities	2	Telraam - gemeente Geel	x			
Telraam Mexico Zuid Derive Lab virtual meeting	9/11/2020	Online (Mexico)	professionals	2	Telraam - Derive Lab Mexico			International	
Telraam Lokeren Zuid virtual meeting	29/10/2020	Online (Lokeren)	local authorities	2	Telraam - gemeente Lokeren	x			
Telraam Wervik virtual meeting	13/11/2020	Online (Wervik)	local authorities	2	Telraam- gemeente Wervik	x			
Telraam Tielt virtual meeting	20/11/2020	Online (Tielt)	local authorities	2	Telraam- gemeente Tielt	x			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Telraam Veilig Verkeer Nederland virtual meeting	20/11/2020	Online (the Netherlands)	local authorities	2	Telraam- Veilig Verkeer Nederland		x		
Telraam MIVB virtual meeting	20/11/2020	Online (MIVB, Belgium)	regional authorities	2	Telraam- MIVB Belgium		x		
Telraam Torhout virtual meeting	10/12/2020	Online (Torhout)	local authorities	2	Telraam- gemeente Torhout	x			
Telraam Pepingen virtual meeting	11/12/2020	Online (Pepingen)	local authorities	2	Telraam- gemeente Pepingen	x			
SWAFS Cluster Event	21/01/2020	Online (Brussels)	EC & project partners		Introducing: H2020 WeCount				x
Telraam Lochristi virtual meeting	12/01/2021	Online (Lochristi)	local authorities	2	Telraam- gemeente Lochristi	x			
Telraam Merelbeke virtual meeting	27/01/2021	Online (Merelbeke)	local authorities	2	Telraam - gemeente Merelbeke	x			
Telraam Overijse virtual meeting	3/02/2021	Online (Overijse)	local authorities	2	Telraam - gemeente Overijse	x			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 3: Stakeholder mapping

LOCATION:	GREAT LOUVAIN					
First name	**Name**	**Working for**	**What**	**Function**	**Case**	**Vulnerable**
Geert	Baro	The city	Area-oriented working	Coordinator	Great Louvain	
Nora	Deschryver	The city	Area-oriented working	Area-manager	Kessel-Lo	
Ann	Coolen	The city	Area-oriented working	Area-manager	Wijgmaal	
Menn	Ernst	The city	Area-oriented working	Area-manager	Wilsele dorp	
Walter	Op de Beeck	The city	Area-oriented working	Area-manager	Heverlee	
Dries	Wierckx	The city	Community work	Coordinator		
Kristof	Steeno	The city	Community work	Policy officer		
Charlotte	Broodcorens	The city	Community work	Responsable for mobility + community worker Mannenstraat		
Kato		The city	Community work	Responsable for participation + community worker Casablanca		
Ann-Catherine	Metz	The city	Communication			
Sara	Claeys	The city	Mobility			
Eli	Lommes	The city	Mobility			
		The city	Community center Mannenstraat		city center	yes
Kristof	Steeno	The city	Community center Hoogland		Heverlee	yes
		The city	Community center Wilsele Dorp		Wilsele dorp	yes
		The city	Community center Sint-Maartensdal		city center	yes

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

		Organization	Community work 't Lampeke		city center	yes
Lieven	Verlinden	Organization	Community work 't Lampeke	Coordinator	city center	yes
Karin	Nelissen	Organization	Community work 't Lampeke	Coordinator	city center	yes
Stan	Hennes	Organization	Community work 't Lampeke	Sustainability	city center	yes
Nadja	SChils	Organization	RISO	Talk to each other'	Great Louvain	yes
martina	Bagaric	Organization	RISO	Talk to each other'		
Johan	Fobelets	Organization	RISO			
		Organization	Vormingplus Oost-Brabant		Great Louvain	
		Organization	Vormingplus		Great Louvain	
		Citizen group	Community committee Kessel-Lo		Kessel-Lo	
		Citizen group	Community committee K.V. Lotharingen		Wilsele dorp	
		Citizen group	Community committee Ridderstraat		city center	
Corine	Van Kelecom	Citizen group	Community committee Michotte		Kessel-Lo	
		Citizen group	Community committee Tussenlo		Kessel-Lo	
		Citizen group	OBK			
		Organization	Meer Mobiel Leuven vzw			
		Organization	velo vzw			yes
		Organization	Arktos			yes
		Organization	Milieu Advies Raad Leuven			
		Organization	OKRA Leuven			yes

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

		Citizen group	Residents Ridderstraat		city center	
		Citizens	Godmother and -father of streets to play			
		Citizens	Godmother and -father of streets to play			
		Citizens	Godmother and -father of streets to play			
		Citizens	Godmother and -father of streets to play			
		Citizens	Godmother and -father of streets to play			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizen group	Submitters 'Kom op voor je wijk'			
		Citizens	Counter/teller pilot Kessel-Lo			
		Citizens	Counter/teller pilot Kessel-Lo			
		Citizens	Counter/teller pilot Kessel-Lo			
		Citizens	Counter/teller pilot Kessel-Lo			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

LOCATION:	WILSELE DORP					
First name	**Name**	**Working for**	**What**	**Function**	**Case**	**Vulnerable**
Menno	Ernst	The city	Area-manager			
Eef	Delhaye	Citizen	(en TML)			
		Organization	vzw 3012WD			
		Citizen	Pro 'Cut Burchtstraat'			
		Citizen	Contra 'Cut Burchtstraat'			

LOCATION:	BINNENSTAD					
First name	**Name**	**Working for**	**What**	**Function**	**Case**	**Vulnerable**
Karolien	Meeuwissen		Area-manager North			
Kaat	Wynants		Area-manager city center South			
		Organization	Seniorama			
		The city	OCMW			
		Organization	Vereniging waar armen het woord nemen			
		Organization	CAW			
		The city	Zorg Leuven			
		Organization	Dijledal			
		Organization	Wijkgezondheidscentrum			
		Organization	wijkgezondheidscentrum			
Dirk	Delvaux	Entrepreneur	Bicycle courier			
		Community committee	Leuven Bewoners PLatform			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Bie	Daems	Community committee	Community committee Bruul			
Albert	Jacobs	Community committee	Community committee Bruul			
		Community committee	Community committe Ridderstraat			
		Citizen	Liesbet Ridderstraat			

LOCATION:	**WIJGMAAL**					
First name	**Name**	**Working for**	**What**	**Function**	**Case**	**Vulnerable**
Wiet	Vandaele	The city	Public space planner			
Katrien	Coremans	The city	Public space planner			
Jan	Polfliet?	Organization	Knalselder vzw	Overkoepelende vzw van alle verenigingen, jaarlijks Wijgmaalse feesten		
		Organization	Vrije basisschool De Twijg	verkeersouders? werkgroep verkeer?	Wijgmaal	
		Organization	Steinerschool De Zonnewijzer	verkeersouders? werkgroep verkeer?	Wijgmaal	
		Organization	Woonzorgcentrum Wijgmaalbroek	er is 1 actieve bewoner (naam?)	Wijgmaal	
Danny	Theuwis	Citizen	Dorpsklap, doremi, boekentil, ...		Wijgmaal	
Marnix	Beyen	Citizen	Cafeetje station, gastvrij Wijgmaal,			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Geert	Geboes	Citizen	Cafeetje station, gastvrij Wijgmaal,			
Thomas	Vandenhaute	Citizen	Repaircafe			
Joppe	Frateur	Citizen	Repaircafe			
Hilde	Vanwichelen	Citizen	Homework class new comers			
Martine	Eloy	Citizen	Volkstuintjes			
Ivo	Cré	Organization	POLIS	Involved in stationsplein		
		Citizen	Godmother and -father of streets to play			
			Organization of 'breakfast on the street'			
Erik	Daems	Organization	Fietsersbond			
LOCATION:	KESSEL-LO					
First name	Name	Working for	What	Function	Case	Vulnerable
Nora	Deschryver	The city	Area-manager			
		Citizen group	OBK			
		Citizen	Counter/teller pilot			
		Citizen	Counter/teller pilot			
		The city	Community center Casablanca		Kessel-Lo	yes
		The city	Community police officer			
Johan	Fobelets	Organization	RISO		Kessel-Lo	yes
Peter	Terryn	Organization	RISO		Kessel-Lo	yes
Kirsten	Saenen	Organization	RISO			

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 4: Inclusive Approach

To answer the question: 'How to reach a diversity of people throughout the whole We Count process?' you have to search for an answer to this question:

What's in it for me?

Possible answers

- Getting to know your neighbours
- Conversations with your neighbours
- More knowledge about local mobility
- More knowledge about how local policy on mobility works
- Possibility to contribute data to inform local politicians
- Possibility to give your ideas about how you neighbourhood should look like
- Possibility to create solutions together with your neighbours

0	Preparing the case	**meetings with officials, community workers, key figures who know the area and work with diversity of people (community workers, organisations working with elderly people, …) to (1) inform them (2) identify possible local champions (3) gather input to prepare participation process** **Inform and train local champions (citizens, community workers, …)** **Crucial role of local champions: people who can be trusted and who have the social skills to work with everybody.**

Phase 1: SCOPING AND COMMUNITY BUILDING	
Objective	**How?**
Collecting matters of concern on mobility	CITIZENS: Neighbours talking to each other. While drinking a coffee/tea/beer While looking at their children who are playing together With support of small tools: e.g. postcards with questions, a quiz to organise in the street, chalking on the street, ...

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

	Through INTERMEDIARIES (community workers, organisations, WeCount partner, …) In general to reach specific target groups: youth, elderly people, newcomers, ... Use intermediaries to collect matters of concern Quiz Focus group conversation in community centre Workshop analysing matters of concern in community centre (based on indicators liveability and from perspective of 4 modi) Mobility market/event/party (information on car and bicycle sharing, testing electric bikes, bouncy castle and balance bikes for children, food and drinks, … Physical mailbox to drop postcards (distributed through community centre, community police officers, …) Subjects: Air quality, road safety, public space, infrastructure pedestrians and cyclists, noise, accessibility, parking, … The telraam mobile coffee bar (and endless variations): go to the people to ask questions, .. with a cup of coffee
	THROUGH SCHOOLS Children/youngsters talk about difficulties on their route to school, to youth work … Maptionnaire as tool?
Informing about Telraam	CITIZENS Neighbours talking to each other. While drinking a coffee/tea/beer While looking at their children who are playing together With support of tools that foster dialogue: e.g. flyers and posters, visualisation of the questions on the windows, a park to park, chalk spray drawings on the street, …
	Through INTERMEDIARIES (community workers, organisations, WeCount partner, …) In general to reach specific target groups: youth, elderly people, newcomers, ... Flyers and posters Telraam at the window of community centres Storytelling Mobility market/event/party The telraam mobile coffee bar (and endless variations): go to the people to explain .. with a cup of coffee (if possible already):Visualisation in the community centres of the 'research questions' of Telraam!! (if possible already)Visualisation in public space of the 'research questions' of Telraam: posters, panels chalk, park to park, …

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

	THROUGH SCHOOLS Explanation in classroom/school Telraam in the school: learning living mathematics Letter to parents
Recruiting and building community around Telraam	CITIZENS Tools for citizens to inform their neighbours
	Through INTERMEDIARIES (community workers, organisations, WeCount partner, …) In general to reach specific target groups: youth, elderly people, newcomers, ... Use intermediaries! Searching and training local champions who are willing to put extra effort in reaching and supporting more vulnerable groups Telraam at window of community centres ASK QUESTIONS: what would you want to do with Telraam? Why do you want to participate? How would you want your street to look like?
	THROUGH SCHOOLS

Phase 2: CO-DESIGNING THE CASE

RB	Objective	How?
2	Establish commitment	Visualisation in the community centres of the 'research questions' of Telraam!! Visualisation in public space of the 'research questions' of Telraam: posters, panels chalk, park to park, … Timeline of the case in the community centre Overview of tasks: distribution of flyers and posters, helping in practical organisation of event, several ways to collect qualitative data!
	Informing about data protocol of Telraam	Workshop with clear explanation of the basics of Telraam: live demonstration of Telraam (people passing by, showing on the screen, showing dashboard) - based on active Telraam in the community centre!
	Registration	Registration office for Telraam in the community centre
	Installation of Telraam	Organise the technical Workshop in the community centre! Make sure people are mixed so they get to know each other and they can help each other Live helpdesk in community centre

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

		Helpdesk through whatsapp/sms (number of local champion per neighbourhood?) Local champion supporting installation in the houses of people

Phase 3: DATA COLLECTION		
RB	**Objective**	**How?**
	Complement data from sensors with qualitative data	Involve the community centre in this!! (counting and observing, perception on noise on several moments of the day, …)
	Provide continuous support	Live helpdesk in community centre Helpdesk through whatsapp/sms (number of local champion per neighbourhood?) Intermediate workshop or coffee bar with results: showing the dashboards of some streets

Phase 4:DATA ANALYSIS AND AWARENESS		
RB	**Objective**	**How?**
	Making the local meaning of data visible and clear to everybody and raise awareness on local mobility through data	Mobility for dummies Mobility market Interactive map Installations Tactical urbanism Drawings on windows Infographics in the streets
	Stimulate an open dialogue on data And stimulate reflection on own mobility behaviour	Postcards with questions Picture search Drawing on the streets Speeddating with cake Empathy timeline Interviews Panels with visualisations, quotes, … Storytelling Talks with experts Conversation tables

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

		…
	Stimulate co-creation on local mobility challenges	VR Plexiglas dreaming Templates for action plans Inspiration box with tips and tricks for local actions

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 5: Street Profile Fill in Sheet

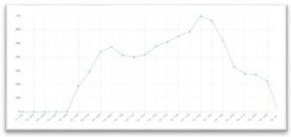
WECOUNT

STRAATPROFIEL GIDS

Leer de basiskneepjes van data-analyse. & Bepaal in een mum van tijd jouw straatprofiel!

JE STRAAT ONDER DE LOEP

Ga naar je **persoonlijk dashboard** en selecteer de langst mogelijke periode, ten minste 2 maanden gegevens, bij voorkeur over meerdere seizoenen[1]. De derde grafiek toont de typische verkeersintensiteit per uur voor deze periode. Bekijk de grafiek voor de autovolumes. Bekijk dit voorbeeld.



1. Is er veel autoverkeer in je straat?

We hanteren algemene richtlijnen uit literatuur die aangeven wat 'veel verkeer' is. Selecteer de optie die van toepassing is voor jouw straat:

☐ **0-30** minder dan één auto om de 2 minuten = een zeer rustige straat, rustig zelfs voor een woonstraat, typisch "woonerf", doodlopende weg.
☐ **30-60** één auto per 1-2 minuten = rustige straat, typische woonstraat.
☐ **60-120** 1 tot 2 auto's per minuut = enig verkeer, woonstraat ook gebruikt als verbinding voor een groter gebied, genereert enig verkeer.
☐ **120-300** 2-5 auto's per minuut = Veel verkeer, de weg wordt gebruikt als verbindingsweg.
☐ **>300:** meer dan 5 auto's per minuut = zwaar verkeer, hoofdverbinding voor langere afstanden.

WECOUNT

STRAATPROFIEL GIDS

Leer de basiskneepjes van data-analyse. & Bepaal in een mum van tijd jouw straatprofiel!

2. Kan je een duidelijk patroon herkennen in het dagelijks verkeer?

Het verkeer kent doorgaans vaste piekperioden, algemeen is dit tussen 7u en 9u 's morgens en tussen 16u en 19u 's avonds. De avondpiek is typisch wat langer in de tijd.

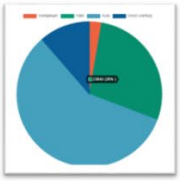
Dit klassiek patroon kan sterk verschillen in jouw straat. Kan je een duidelijk patroon herkennen? Bijvoorbeeld:

- Een uitgesproken ochtendpiek zoals een eenrichtingsstraat met een grote woon-werkverkeersstroom in één richting in de ochtend (voorbeeld).
- Hoge verkeersvolumes gedurende de hele dag met een haast onmerkbare piek. Een zeer drukke straat dicht bij "verzadiging", vatbaar voor congestie (voorbeeld).
- Geen duidelijke pieken in de ochtend of avond: je straat ondervindt geen hinder door woon-werk verkeer (voorbeeld).

Er zijn verschillende verklaringen voor een atypisch patroon in autoverkeer. Hoe zou je het patroon in jouw straat beschrijven en kan je er een verklaring voor bedenken?

Klik of tik om tekst in te voeren.

3. Zijn er veel fietsers in je straat?



De pi-grafiek onderaan in je dashboard toont het aandeel van verkeer per vervoerswijze (of 'modus' zoals verkeersexperten dit noemen).

Welke categorie is van toepassing voor jouw straat? Selecteer of voeg een eigen categorie toe.

☐ Veel auto's (>250 per uur), weinig fietsen (<50 per uur): typisch voor hoofdwegen (voorbeeld).
☐ Weinig verkeer (<150 per uur) maar bijna uitsluitend auto's: typisch voor plattelandswegen (voorbeeld).
☐ Meer fietsen dan auto's, maar weinig verkeer in het algemeen (voorbeeld).
☐ Fietsers 'domineren' de straat: veel meer fietsers dan auto's (voorbeeld).
☐ Andere: Klik of tik om tekst in te voeren.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

STRAATPROFIEL
GIDS

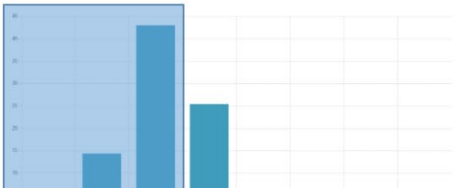
Leer de basiskneepjes van data-analyse.
& Bepaal in een mum van tijd jouw straatprofiel!

4. Houdt het verkeer zich aan de snelheidslimiet?

Telraam maakt een snelheidsinschatting van passerende auto's. Deze worden gerapporteerd in groepen van 10 km/u. Een auto die bijvoorbeeld 55 km/u rijdt zal worden opgenomen in de 50-60km/u balk.

Het aandeel van auto's dat zich niet aan de snelheidslimiet kan je grosso modo uit de snelheidsgrafiek berekenen.

Als de snelheidslimiet 30 km/u is, houdt de som van de eerste drie balken zich aan de juiste snelheid. In dit voorbeeld krijgen we de volgende berekening: 6,2% 0-10km/u, 14,37% 10-20km/u en 42,98% 20-30km/u. In totaal houdt 63,55% zich aan de snelheidslimiet, wat betekent dat meer dan 1 op de 3 auto's hier te hard rijdt.



U Let op!

Telraam is niet 100% accuraat in het bepalen van snelheden. De snelheidsgrafiek is dus altijd een benadering. Auto's waarvan wordt gemeld dat ze 70 km/u of harder rijden kunnen zogenaamde 'uitschieters' zijn, metingen waarbij iets is misgelopen. Deze fouten worden niet gefilterd! Daarom kan je enkel een ruwe schatting maken van de naleving van de snelheidslimiet.

Welk deel van de auto's houdt zich (ongeveer) aan de snelheidslimiet in jouw straat?

Klik of tik om tekst in te voeren.

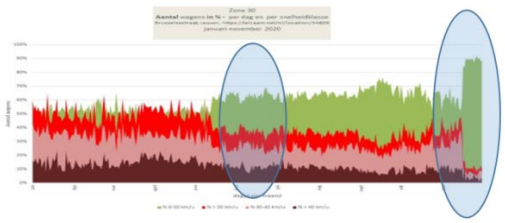
STRAATPROFIEL
GIDS

Leer de basiskneepjes van data-analyse.
& Bepaal in een mum van tijd jouw straatprofiel!

VERGELIJK EN ANALYSEER

Je kan onregelmatigheden opsporen door een lange tijdreeks te gebruiken en visueel na te gaan of er ergens abnormale verkeersniveaus zijn.

In het eerste voorbeeld waren er wegwerkzaamheden, eerst in de straat die werd gemeten en later in een nabijgelegen straat. De impact van de omleiding op de totale verkeersvolumes is duidelijk zichtbaar.



Het tweede voorbeeld toont een ingrijpende verandering in de opvolging van de snelheidslimiet in een straat. Deze verandering was te danken aan een teller die op basis van zijn data het lokaal bestuur zover kreeg om de snelheid te verlagen met een interventie.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 6: List of figures

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

WECOUNT

WeCount: Citizens Observing UrbaN Transport

Deliverable 4.1: Summative Pilot Report – Leuven & Madrid

PART C: Madrid and Barcelona Pilot

Report for:
European Commission
Research Executive Agency (**REA)**

Date: February 2021

Authors: Giovanni Maccani, Lucía Paz Errandonea, Ana Ramirez, Martín Balestrini, Javier Creus

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Document Details

Authors	Giovanni Maccani, Lucía Paz Errandonea, Ana Ramirez, Javier Creus
Contact	giovannimaccani@ideasforchange.com
Creation Date	December 2020
Date of Last Revision	February 2020
Description	This report provides a detailed description and reflection on all activities and outcomes from the WeCount case study in Madrid and Barcelona. The report follows the structure of the tasks within the work package, i.e. scoping and community building, co-design, data collection, data analysis and awareness, and reflection and legacy.

Version History

Version	Updated By	Date	Changes / Comments
1.0	Giovanni Maccani	February 2021	First version
1.1	Ana Ramirez	February 2021	Local Communication and Dissemination Plan and Outcomes
1.2	Lucía Errandonea	February 2021	Full review and graphics
1.3	Javier Creus	February 2021	Full review
2.0	Giovanni Maccani	February 2021	Final version

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Contents

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

1 Introduction

As one of the two experimental case studies in WeCount, the Spanish case started in February 2020 and has been carried out for more than 12 months. Consistent with the citizen science approach adopted, participating citizens have assumed a proactive role across all phases of the case study, from its problem formulation and co-design, through data collection and analysis, until planning and implementing the resulting actions informed by the case study's outcomes and experiences.

Following an initial investigation of the policy and socio-infrastructure-cultural environment in Madrid, the initial decision has been made to extend the intervention to Barcelona as well. This was due to two main reasons: (1) a substantial change in the policy context in Madrid since the proposal was written; and (2) an early learning whereby we realised the difficulty of finding suitable locations for installing the Telraam sensors due to the peculiar urban and building designs in Spain.

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 and communities.

Traffic counting and sustainable mobility issues have been gradually narrowed down through a series of actions (e.g. an online survey, interactions among stakeholders, and other events), culminating in a series of 8 problem formulation and co-design workshops conducted across different rounds in the two cities where more than 200 people participated and contributed to achieving a situated understanding of traffic and mobility – related issues as experienced and perceived by citizens. As part of these and complementing the findings of the other scoping and community building-oriented actions, the case study has been co-designed with a specific focus on traffic counting and air quality. To comply with this focus, and to partially address the problem in finding participants that met the conditions to host a Telraam sensor, WeCount in Spain has incorporated an action whereby we distributed approximately 1,000 strawberry plants acting as bio sensors for collecting air pollution data at the participants' places. Besides taking on board the new objective of the case study co-created with participants, and besides contributing to the local research and impact towards sustainable mobility, this initiative was key in involving participants even though these could not host the traffic sensor.

At the time of writing this report, the case study in Madrid and Barcelona counts 735 members on the Telraam platform, and 90 users (those found to be suitable to host a Telraam sensor that finally received it). Data has been collected during several months and has been analysed, together with participants, across several different elements, including: general descriptive analysis, comparison with official mobility data, cross and combine Telraam-based traffic counting data and air quality data. Participatory data analysis and awareness workshops were undertaken and resulted in the co-creation of three proposals for future actions based on the participants' experience and informed by the data collected. These are currently being disseminated and an online voting campaign has started to decide on what action to prioritize in the coming months.

The Train-the-Trainer and infrastructuring approach we have adopted entailed, by nature, a handover of knowledge, resources, and capabilities to community champions for these communities to be able to bring forward their own agenda. This was the case of WeCount in Spain, where impact also occurred because of independent actions carried out by these communities to address their very situated (sometimes at the street level) issues. Several other actions for bridging to the policy level have been undertaken, mainly leveraging the strong relationships established with both councils.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

WeCount in Barcelona and Madrid leaves important legacies pointing towards several different directions. For example, a complete set of knowledge sharing and transfer resources and tools is made available for enabling and fostering scalability of the case study across other neighbourhoods and cities in the country. Currently, three initiatives promoted by three different city councils in Spain are planning to replicate WeCount in their own locations, addressing their own socio-policy-behavioural situated issues. In addition, WeCount is now included as an active citizen science project in several platforms, to further foster sustainability and scalability of the case study.

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. Reflections on the impact of these restrictions and how we have addressed the resulting challenges are provided throughout the sections of this document.

Overall, the case study in Barcelona and Madrid has contributed to the overall project by enabling and enacting learning and improvements across all project's work packages. In terms of local impact, awareness has been raised among a few million people (estimated – see Appendix 2) through effective dissemination and communication actions; local communities have been empowered and, some acted upon this empowerment to tackle mobility-related issues to address the very local issues they experience and the concerns they perceive. New communities and existing ones have gain theoretical and applied knowledge about citizen science, sustainable mobility, and technology, leaving a new, improved, socio technical infrastructure as a fertile ground for future mobility-related (and not) citizen science actions and interventions. All resources (e.g. all workshops, tools, tutorials etc.) and analysis results are published on the local WeCount website and the team at IFC is currently disseminating these outcomes among all stakeholders identified throughout the process, and leveraging the networks of those finally engaged in the case study.

This report provides an extensive description of activities undertaken in the Spanish case study across the key tasks upon which Work Package 4, i.e. *Use Cases: 5 Citizen Science Activities*, has been designed. This document is therefore structured as follows. Section 2 is dedicated to those actions related to Scoping, Community Building and Co-Design throughout the duration of the case study. Sections 3 and 4 focus on data collection and analysis respectively. In section 5, we reflect on the legacy of the case study and the actions planned looking forward. Lessons learned and reflections on expected and unexpected impact occurred during the case study are provided across these sections.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

2 Scoping, community building and co-designing the local citizen science activity

This chapter provides a detailed description of actions and interactions carried out throughout the case study with respect to scoping and co-designing the intervention, as well as the continuous effort in exploring, building, establishing, maintaining and leveraging diverse communities of different stakeholders in WeCount in Spain. In summary, actions started with both an exploratory phase (section 2.1) and the implementation of a Beta Pilot with community champions (sections 2.2 and 2.3). In parallel to this, to achieve a situated understanding of traffic related issues in Barcelona and Madrid, we deployed a city-wide online survey (section 2.4), coupled with an extensive desk research and mapping of publicly available information around mobility, related policies, and potential stakeholders. These served as input for a more thorough stakeholder mapping and engagement strategy (section 2.5). The next step was undertaken through a series of online workshops devoted to investigate and establish how citizens experience mobility related issues in their streets and neighbourhoods as well as what are the key mobility-related matters of concerns that they perceive (section 2.7). These were supported by an ongoing effort on communication and dissemination which is still ongoing (section 2.10). According to the input received by participants, the relationship between traffic data and air quality has been established as a key focus of the case study. This entailed launching a campaign to empower participants to measure air quality at their location (section 2.9). This was done through the distribution and analysis (currently ongoing) of approximately 1,000 strawberry plants acting as bio sensors for air pollution monitoring (indicated as the bio sensor campaign in this document). It is noted that the actions presented across the sections below were not necessarily sequential. Rather these were conducted through several iterations with results from one activity informing other actions.

2.1 First exploratory phase: extending the Spanish pilot to include Barcelona and Madrid

As a first step prior to starting community building, we investigated two critical aspects of the intervention in Spain: the relevancy to existing policy and the suitability of the socio-technical-infrastructural context to the Telraam sensor technology employed in WeCount.

With respect to the first, the case study was initially focused on the city of Madrid targeting, according to the proposal, the Madrid Central policy[1] and specifically speed compliance in a predetermined area of Madrid (i.e. on the A5 Highway). However, since the proposal was written the policy situation in Madrid has changed dramatically. First, the overall citywide policy Madrid Central has been put in "stand by"[2] due to extensive political debates and controversies. Second, the focus area on the A5 Highway has seen the installation of several speed radars, making the proposed intervention less suitable for the current situation.

Second, more importantly, we thoroughly investigated the suitability of the Telraam technology to the Spanish infrastructural context, where the urban design is substantially different if compared to Belgium, where the it has been designed, tested, and previously deployed. It was soon clear that the locations that meet the requirements to conduct reliable and effective data collection are much fewer than we expected. This is mainly due to the peculiar urban design of Spanish cities that in the vast majority of cases do not offer suitable locations for installing a Telraam sensor (i.e. suitable views from the windows). In Spain, buildings are typically higher (the sensor can provide reliable data only if placed between the first and third

[1] https://www.madrid.es/portales/munimadrid/es/Inicio/Movilidad-y-transportes/Madrid-Central-Zona-de-Bajas-Emisiones
[2] https://www.madridiario.es/469756/sube-trafico-contaminacion-primer-dia-moratoria-multas-madrid-central

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

floor), the vast majority of windows facing the streets have balconies, most streets have trees that impede the view of the sensor, the grid pattern in the design of Barcelona's roads makes it very common for people to have windows facing a crossroad, a roundabout or a traffic light, among others. To a lesser extent, we also found several people that have internal window shutters, that do not have a plug in close to the window (and therefore that need to fix the sensor with an extension cable sellotaped on the window itself thus negatively affecting the experience of hosting a sensor).

Figure 1: Example of speed radar recently installed at the A5.

Figure 2: Examples of streets and window views.

As attempts to address these issues, the team first explored with 3 technical experts (an academic from Computer Science, a local Maker Space, and an independent citizen scientist and technologist that has been investigating this field for a period of time) opportunities for technology re-design to augment its suitability to the Spanish context. Through a series of meetings with them, we initially explored opportunities to place sensors outside (i.e. on balconies). However, the two potential solutions identified were found to be impractical to implement. First, building a cage for the sensor was possible, but the problem was the fact that the sensor always needs to be plugged in. Second, we explored the opportunity to place a battery and thus to overcome this requirement. This, however, would result in the need of changing the battery twice a day (thus further increasing task granularity which we believe would have negatively affected people's engagement), as well as in a substantial increase in the cost of the sensor. This is mainly due to the sensor's characteristic that, to preserve privacy and to comply with existing public cameras-related regulations, need to process all images inside the Raspberry Pi, causing relatively high energy consumption levels. Therefore, the decision was taken to extend to Spanish case study, duplicating the effort across the cities of Madrid

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

and Barcelona. From a theoretical perspective choosing Barcelona resonates with the existing criteria for case study selection as outlined in the extant literature on the topic (Stake, 2013)[3]. According to Stake's (2013) selection criteria in multiple case studies, these should ensure: (1) Relevance to the phenomenon of interest: urban mobility in Barcelona has been acknowledged as a key issue and the local government has released an ambitious set of objectives to achieve a safe, healthy, sustainable, equitable, and smart mobility by 2024[4]; (2) Accessibility of information and people: from an initial investigation several champions of existing communities have been contacted and have committed to be part of the project and to facilitate access to their local people and networks; and (3) Diversity across cases: diversity with all other WeCount case studies is still present for the socio-cultural-infrastructure and mobility differences with all other countries involved (i.e. Belgium, Republic of Ireland, Wales, and Slovenia).

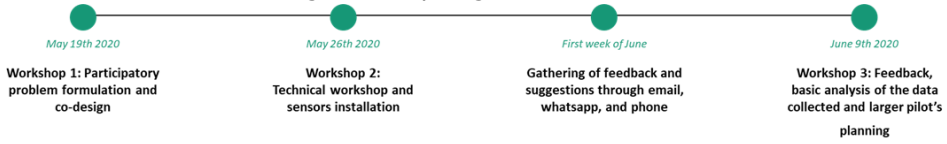
2.2 Beta Pilot

Consistent with the methodology and the Train-the-Trainer approach adopted in this case study, a Beta-Pilot initiative was undertaken whereby the full methodology has been trialled through the engagement of a limited amount of people in Barcelona (May-June 2020). Participants were mainly representatives of the citizens communities and associations previously identified (i.e. potential community champions) as well as other citizens that showed particular interest, and one representative from the Road and Safety Department within Barcelona City Council. Overall, the beta pilot, in addition to giving us the early opportunity to experience the full process, allowed for three fundamental outcomes:

1. Engage with community champions and give them the opportunity of experiencing the full WeCount citizen science cycle (i.e. from scoping, through co-design, data collection and analysis) so they could acquire all the necessary knowledge to effectively engage their communities in an informed way for the wider deployment.
2. Gather feedback about the technology (and related processes) and subsequently inform its re-design (WP3). Feedback was collected about the: instalment process, user registration, user experience while hosting the sensor, visualization of data and related user experience, overall engagement approach, communication of consistent narratives, alignment with their interests, needs and priorities.
3. Develop new, or adapt existing (i.e. translate), support resources, e.g.: video tutorials, step-by-step guidebooks, ongoing support, among several other engagement tools.

It is noted that the following have not been included as key focuses of the beta pilot: an in-depth investigation of the problem (conducted in parallel); an in-depth analysis of the data collected; the execution of citizen-driven actions based on the data collected and analyzed. The Beta Pilot was carried out through three online workshops and a continuous ongoing engagement during the short data collection performed.

Figure 3: Key stages of Beta Pilot.



The first interaction was dedicated to exploring the perceived traffic-related issues together with participants, and specifically how they perceive and experience them in their own situated context (e.g. street where they live, neighborhood). As part of this interaction, we also provided a detailed introduction to the project, to the discipline of citizen science, and to the core concepts revolving around the current debates on sustainable mobility and traffic counting. After this first workshop, participants were instructed on how to conduct the process of requesting a Telraam sensor (i.e. the forms on the Telraam website and

[3] Stake, R.E., 2013. Multiple case study analysis. Guilford press.

[4] https://www.barcelona.cat/mobilitat/ca/qui-som/regidoria-de-mobilitat

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

the submission of the picture showing the view from their windows). In the following week, sensors were distributed to people's homes through bike delivery. The sensors came in a WeCount Toolbox (see Deliverable 2.1) which also included a step-by-step printed installation guide, a sensing diary, and other equipment and WeCount design products. The second workshop was dedicated to a technical explanation of the sensor and its components, the data processing techniques and the algorithm, and the data platform. The focus of this second workshop was to conduct a guided installation with participants. This second workshop could not be finalized because of a bug in the system whereby admin rights were not correctly assigned. Although the issue was resolved quickly by the team at TML, participants could only install their sensors individually following a demonstration given in the workshop. The next phase was about establishing a continuous contact with those hosting a sensor to: (1) assist with problems; (2) help interpreting the data; (3) gather feedback from their experiences; (4) stimulate knowledge and ideas exchange among participants. This was done through creating a WhatsApp group including all participants. Once again, this was found to be impractical and has been replaced by the more structured WeCount Zendesk Help Desk which was being developed by TML and M21 in parallel. The final step refereed to a virtual workshop where we presented a preliminary analysis of the data collected and a planning for the next steps. The table below summarizes the key stages, events, and outcomes of the Beta Pilot in Spain.

Table 1: Beta Pilot: an overview.

Stage	**Event**	**Activity Description**	**Output**	**Participants**
Scoping and 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 based on times and volumes •Possible scenarios of use	11 9 males / 2 females
Beta Pilot Co-design	**Workshop 2. Tech onboarding**	• Understanding of the technology and set up of the sensor	• Set up sensors • Awareness about the technology	5 3 males /2 females
Data Collection	**Ongoing support and feedback gathering**	• Participants have been collecting data autonomously for 3-4 weeks • Q&A session • Collect testimonies and feedback	• Usability notes • User testimonies • Data live on Telraam platform • Feedback from participants	9 people included in WhatsApp group 5 males / 4 females
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 next steps.	• List of improvements • Results and lessons learnt • Insights for the for wider deployment and other case studies in WeCount	7 5 males / 2 females

In terms of participants, a diverse community of citizens took part in these efforts. In total, 13 people attended at least one of the three online workshops. A total of 11 participants installed the Telraam sensor and collected data. In summary, at the end of the Beta Pilot (i.e. June 2020) the following have joined the Telraam / WeCount platform at the different levels.

Table 2: Beta Pilot participants.

	#	male	female	NA	Age group					
					16-24	25-34	35-49	50-64	65+	NA
members	24	17	7		0	10	6	2	2	4
users	19	11	8	0	0	10	7	1	1	0
sensors installed	11	5	6	0	0	3	7	0	1	0

This process has proven very valuable for all the three objectives previously defined for this first action. Counting on the experience of several, diverse, participants that undertook all phases of the case study was crucial to enable early learning to inform: (1) WP3, i.e. to inform re-design of the technology, the processes, and the user experiences; (2) WP2, i.e. to develop and test new engagement tools (see Deliverable 2.1) (3) to enable the Train-the-Trainer approach in the Barcelona case study; (4) to provide insights to the other case studies in WeCount. A session to share these learning experiences has been delivered to all partners as part of the first, online, consortium meeting, as well as in an ongoing manner during the monthly meetings.

2.3 Beta Pilot: Lessons Learned

A summary of lessons learned (beyond considerations outlined in section 2.1) is provided below across three different categories: (1) technical and user experience; (2) strategic lessons for wider deployment; and (3) process-related learnings.

Technical and User Experience related lesson learned

- Often the Telraam sensors fall from the windows, especially if they are facing south. To address this issue, the participants that followed received two extra double-sided tapes.
- Placing the sensor in the upper side of the window (e.g. to overcome obstacles such as a balcony or an air conditioning external unit - as exemplified in the figure below) has been problematic. The suggestion was made for longer power cables needed to avoid using impractical extensions.
- The camera keeps moving, and this has been observed as particularly critical when windows have curtains. The left side of the figure below shows how one participant has (independently) addressed this issue. TML has addressed this issue for future participants by adding a new feature on the platform where they can check the positioning of their cameras daily.
- The sensor doesn't work when wifi networks are encrypted or need additional access credentials. This inhibits schools, other public or private institutions, and those relying on public wi-fi to host a sensor.
- Some participants manifested the perception that their wi-fi speed has been significantly lower since they installed the sensor (due to COVID, most participants were working from home).
- The installation process has been found mainly straightforward for those with some English and technical knowledge. The steps whereby the sensor needs to be connected to the wifi from the participants' smartphones has been observed as a potential pitfall in the process (mainly since this was only available in Dutch at that time).
- Before the sensor starts to count heavy vehicles, it could pass a period of several weeks.
- Participants manifested the interest in also distinguishing between bicycles, scooters, and motorbikes. Participants were interested also in electric scooters, which in their opinion, are causing several safety-related issues in the city following their rapid diffusion in Spain.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 4: Example of visual feedback from Beta Pilot participants.

Strategic-related lessons learned

- Unlike Leuven, engagement by theme (e.g. mobility and noise, mobility and air quality, mobility and speed compliance, mobility, and road safety etc.) seemed to be more effective in Barcelona than engaging people by neighbourhood or geographical area. Different community champions perceive different mobility-related issues and some existing communities are already active in specific domains (e.g. air quality, working with schools and interested in road safety around it).
- "One strategy fits all" is not likely to be suitable. This was particularly relevant with respect to timing. For example, some participants work with schools, and manifested interest to start the measurements in the area from September / October 2020.
- Given some data quality issues, we learned that it is of paramount importance to manage expectations of participating citizens. We advocate for a considerable amount of time to be spent with them as the more people understand the technology (e.g. that is low cost, under development etc.), the more they appreciate the value of being engaged in its experimentation.
- While some communication and engagement effort was dedicated at this stage to include participants from low socio-economic backgrounds, we observed that most of them could not participate because of different reasons such as: do not own a smartphone and a laptop; use their mobile connection as their "home internet"; often live on ground floors or in very tall buildings.

Process-related lessons learned

- Conducting an online workshop to install the sensor with participants has been found impractical. However, the resources provided, specifically the step-by-step printed installation guide, were found to be useful and enough for most participants to be able to install the sensor independently.
- Connected to the previous point, we observed that some participants experienced issues in installing their sensors. These were mainly older adults (one person required a visit at his home for installing the sensor) and those that do not speak or understand English (at this stage, most steps in the registration process and during the installation were either in Dutch or in English). Therefore, we developed a longer, spoken, step-by-step installation video tutorial in Spanish to assist these participants.
- Providing more informal channels of communication between participants and with the WeCount team has proven to be overwhelming for both parties. Therefore, we decided not to use social networks for this, grounded and detailed, continuous engagement.
- The positive feedback of the community champions in terms of their desire to be involved in the wider case study was surprising as their experience, given the continuous change in the technology and the process, has not been optimal. Interestingly, almost all community champions attended the final data analysis workshops conducted in January 2021 (i.e. almost 10 months after the Beta Pilot).

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

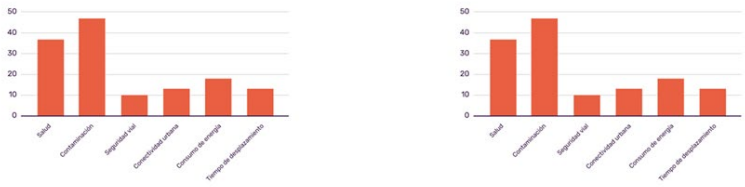
2.4 Online city-wide survey

In parallel with the Beta Pilot, during the first exploratory phase, we designed and deployed an online survey[5] to accomplish the following initial objectives: (1) Break down traffic-related issues into more specific matters of concern experienced in the city to achieve a narrower focus for the case study; (2) Shape the case study narrative, i.e. start shaping what the scope of the intervention is, why it is relevant, and what potential benefits of the citizen science action are expected to be. The survey was articulated in different sections including: (1) a brief introduction to WeCount, its objectives and citizen science; (2) general question on how much traffic is perceived as a problem in the city - Likert Scale; (3) and (4) what mobility-related impacts concern people the most in their cities and streets respectively; options given: health; air pollution; road safety, urban connectivity; energy consumption; time; other; (5) an open question to elaborate on the previous; (6) an open question: "what would you like to change around mobility in your city?"; (7) demographic data; (8) opportunity to register in WeCount.

Figure 5: Survey landing page.

Despite an initial dissemination effort (it is noted that at this stage the local communication backbone - i.e. the website, the partnerships with other stakeholders etc - was not fully in place yet), we received 103 valid responses. Results showed that in both Madrid and Barcelona people perceive traffic as an important issue. In Madrid, 92.9% of respondents indicated a level of either 4 or 5 (i.e. the maximum concern - 42.9% and 50% for 4 and 5 respectively). In Barcelona, this percentage was similar (i.e. 84.3%) - with 25.5% and 58.8% indicating levels 4 and 5 respectively. With respect to perceived mobility-related matters of concern in both Madrid and Barcelona the categories around air pollution and health were the most chosen (the two columns on the left in the histograms below).

Figure 6: Perceived mobility-related matters of concern – Barcelona (left) and Madrid (right).



Also, results show medium levels of concerns with respect to time and energy consumption. As for the category "other" several people indicated noise as one of the key traffic-related issues affecting their quality of life. With respect to the open question, in both Barcelona and Madrid people advocate for similar items such as a more efficient public transport network, fostering the diffusion of electric vehicles, policies to

[5] https://ideasforchange1.typeform.com/to/ZfaP8a

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

reduce noise and air pollution, and, especially in Madrid, a more widespread and effective infrastructure for fostering use of bicycles.

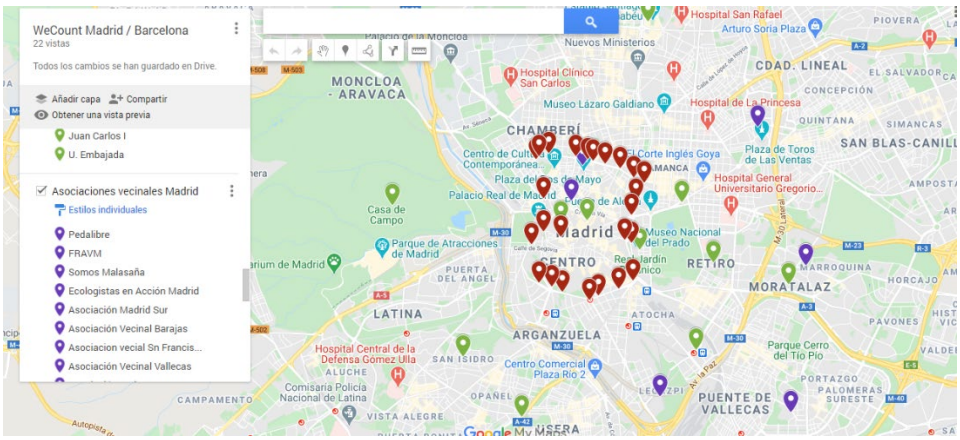
Figure 7: Word cloud from open question – Barcelona (left) and Madrid (right).

While we acknowledge that the low response rate does not allow for scientifically robust conclusions to be reached in this direction, this survey was found to be useful as an input for discussion with both the stakeholders approached and during the workshops with citizens.

2.5 Stakeholders Mapping and Engagement

Considerable effort has been placed throughout all phases of the local case study in Spain in understanding the stakeholder ecosystem, targeting relevant actors, and engaging those at different levels. These activities were crucial in informing community building as well as in involving critical actors and institutions across the quadruple helix collaboration model. The first step was about conducting desk research and snowballing techniques from initial engagement activities to map potential stakeholders in both Barcelona and Madrid. A Stakeholder Mapping Template was provided by WP5 (results on this will be included in the evaluation report) to facilitate tracking of stakeholders approached and engaged. In Spain this was complemented by the development of a digital interactive map where we positioned the findings of the desk research in terms of: stakeholders in the city, neighbourhood associations, which were mapped together with ping on where mobility issues occur more frequently (achieved through a review of publicly available mobility-related news and policy documents) as well as other relevant infrastructures (e.g. official air quality monitoring stations). The figure below proposes this digital interactive map created for the city of Madrid. In particular, purple pings indicate existing active citizen communities and neighbourhood associations, red pings indicate critical areas in Madrid from a traffic perspective, green pings indicate official air quality monitoring stations.

Figure 8: Digital interactive map – Madrid example.



The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Informed by this mapping exercise, an extensive effort has been placed in presenting the project to several entities. In summary, this strategy entailed two different approaches: (1) Massive online communication; and (2) targeted communication and, when successful, subsequent series of meetings with those identified in the stakeholder mapping from whom positive response had been received. Depending on the nature of the stakeholder, these were proposed to be either partners/supporters of the project, or community champions. These two strategies combined led to the identification and involvement of several actors in WeCount at different levels. These are detailed below based on the stakeholder type.

2.5.1 Citizen Communities and Civic Society

Clearly, according to the Train-the-Trainer approach, this stakeholder category was central to the case study. The objective was clear: engage community champions, position WeCount within their existing interests and domains, and involve them in the case study. While doing so, an important component was about transferring tools and templates so they can act as boundary spanners in their communities (and beyond through their own networks) and in turn involve more participants in an informed way. Importantly, tools and templates included specific communication material to be reused (specifically developed for each community) as well as general knowledge about the project, the process, the sensor, and the ways through which citizens can participate. In total, we identified and contacted 66 community organizations across Madrid and Barcelona. These ranged in nature from very localised communities interested in advocacy actions in favour of a more sustainable environment (e.g. *Eixample Respira, Sarriá Respira, Comunidad Ros de Olano*), other communities involved in citizen science activities (e.g. *Olot citizen community, Tienes Sal*), civic associations (e.g. *Asociación el Carmel, Associació Catalunya Camina*), and broader initiatives and associations already involved in nature based solutions and other actions against climate change (e.g. *Huertos in the Sky, Biodiversia, Red de Huertos Comunitarios Madrid*). In addition, local influencers identified through the previous engagement actions were targeted too. The approach has been similar for all and entailed contacting them first by email. Of the 66 organizations and communities contacted, 40 did not respond or did not follow up after an initial response. For the remaining 26 different interactions have been performed and different levels of commitment to the case study have been established. Appendix 1.1 gives an overview of those that have been involved and presents: names (individuals have been anonymised as *influencer_x*), nature, the interactions we had, their initially agreed involvement and commitment and their actual, final, involvement. As shown in Appendix 1.1, and as expected, the level of involvement across these actors and entities varied substantially. In general, all have (to different extents) helped with dissemination and recruitment activities through communication actions in their own networks. While we could keep track of some of these efforts, we believe we were not able to capture all the communication activities that they have conducted independently. With respect to existing and active citizen science communities, several participants took part of the Beta Pilot and subsequently helped with recruitment from their own networks. Concluding, most people we talked to in this cluster have shown interest and enthusiasm in the project. The typical scenario has been an initial meeting where we could introduce the project and the ways for participating, which usually ended with the handover of communication templates for them to help with dissemination and recruitment. Learning from the Beta Pilot, we have always been clear upfront about the requirements for installing a sensor and in most cases, they commented as follows: "very interesting and valuable, but unfortunately I can't participate. We will help to find suitable participants". At this point we emphasised that having a sensor is not a necessary condition for people to be part of WeCount, but workshops, data analysis and related actions are open to everyone. However, we have observed that without the possibility of obtaining a sensor, the motivation to actively participate decreased substantially.

2.5.2 Public Sector

Together with citizen communities, targeting relevant public sector agencies has been one of the key engagement objectives for several reasons, including: (1) ensure from the very beginning positioning of

WeCount within existing activities, interests, and policies; (2) make sure that results are up-taken and used. Both Barcelona and Madrid are fertile grounds for sustainable citizen science activities and projects. In Barcelona, the Citizen Science Office[6], i.e. an entity institutionalised within Barcelona City Council, is the formal body responsible for fostering integration between citizen science projects and actions and the relevant departments in the municipality. After several interactions, this entity incorporated WeCount as one of the local projects supported by Barcelona City Council (see figure below). This strong interaction allowed for several policy-related debates, culminating in a 90 minutes session with the local authority to handover WeCount results and foster uptake (more details in section 4.5, "bridge to the policy level" below).

Figure 9: WeCount on Barcelona City Council's website.

Concerning Madrid, a strong and formal partnership has been established from the beginning with MediaLab Prado[7], i.e. an entity dedicated to cultural, social innovation, and citizens-led projects within Madrid City Council. Besides contributing to communication and dissemination, and in addition to being active participants in the Madrid case study as counters, MediaLab Prado has been crucial in managing participation, engagement, and logistics in Madrid. Indeed, their central position in the city, and our impossibility to reach it because of strong restrictions during the deployment of both sensors and the biosensors (see below), has been of paramount importance. During the sensor and biosensor deployment phase, a WeCount stand has been mounted in their location (see figures below) where people, after taking an appointment, could go and collect their biosensor, experience a live demonstration of the Telraam sensor, and being explained the process to participate in WeCount. During these days the membership list grew substantially and approximately 270 people picked up their WeCount air quality biosensor from there.

Figure 10: WeCount Stand in Madrid City Council.

Finally, they offered the space for the WeCount consortium meeting in Madrid and to host a citizen workshop so to allow case study leaders from Wales, Ireland and Slovenia (i.e. those that had not started yet) to experience WeCount workshop and learn early in the process. Due to COVID both were cancelled.

[6] https://www.barcelona.cat/barcelonaciencia/es/ciencia-ciudadana
[7] https://www.medialab-prado.es/

Another important relationship was established with Ibercivis and the FECYT within the Spanish Ministry of Science and Technology. This resulted in the incorporation of the initiative Vigilantes Del Aire within WeCount, through which we complemented traffic measuring with air quality monitoring with biosensors - i.e. strawberry plants (see dedicated section below). Besides these partnerships formally established, other relevant public sector actors had been identified, have been approached, and, some, engaged. At the beginning we set ambitious objectives and we targeted high level governmental agencies such as the Spanish Ministry of Ecological Transition, the *Dirección General de Sostenibilidad y Cambio Climático*. However, probably because of different priorities from their side during these exceptional COVID-related circumstances, we were not able to establish a relationship with these.

In terms of other interactions, at a very early stage (i.e. February 2020), we engaged with one representative from the road safety department at Barcelona City Council. This person was interviewed to explore the potential value of Telraam-generated data for their work. Besides enabling a deeper understanding from our side, the subject committed to help raising awareness about the project within the department.

Concluding, at a later stage of the case study, we engaged with two more municipalities, specifically with Rubi and Sabadell city councils. They manifested interest in setting up a local citizen science case study leveraging our support, knowledge, and resources. At the time of writing this report, a quote to buy 80 and 200 Telraam sensors respectively is being developed (more details are provided in the Reflections and Legacy section of this report). An overall picture of public bodies finally engaged in the case study is provided in Appendix 1.2 following the same format used for the previous cluster.

2.5.3 Private Sector

With respect to private companies, we initially identified and subsequently targeted businesses that either operate in the context of sustainable mobility or in the broader field of social innovation (list available in the same format in Appendix 1.3). The strategy has been similar to the previous categories whereby the stakeholders identified were contacted through dedicated emails. For those that responded we organised a virtual online meeting where we presented, for each stakeholder, the WeCount project, the sensor, and the ways to become involved at different levels. This was usually followed by a brainstorming session to make sure that their potential participation is aligned and contribute to the general objectives of these companies. In total, of all stakeholders identified across Madrid and Barcelona, 13 private companies agreed to support and engage with WeCount at different levels. Although the number was low (it does not include those with which we had a contact and never followed up), their contribution to the case study has been significant. In particular, Adigital[8] and Smart Mobility[9], respectively a business cluster fostering digital transformation and one including companies operating in the field of sustainable mobility, became formal partners of the Madrid case study. Their communication channels' outreach has helped in growing substantially the member's base. Their help and support, however, was meant to be beyond communication, dissemination, and active involvement in the case study as partners. A plan was made to organise an event on site whereby they would have invited a panel of experts in the field to exchange knowledge and opinions with participating citizens. Due to COVID-related restrictions, this did not finally happen.

Several others actively participated in the case study. Exceptional support was given by co-working spaces which, in addition to actively participating in the case study and the workshops as counters, have also helped with promoting WeCount and to distribute the biosensors for measuring air quality (see below). WeCount stands, like the one exemplified in the picture below were mounted across 9 locations of 4 different stakeholders (see Appendix 1.5 for details).

[8] https://www.adigital.org/
[9] https://www.smobility.es/

Figure 11: WeCount stand at Impact Hub co-working space.

To some extent, the same pattern of other clusters was observed here in terms of stakeholders showing enthusiasm and interest, but then stating their inability to find suitable locations in both their offices (due to both encrypted networks and building design) and their homes. One company, i.e. *Sentilo*, has shown particular interest in integrating WeCount data into a city-wide open data platform being developed for Barcelona. We, during an online meeting, transferred the documentation, license information and access to the Telraam API to empower them to do so.

As a reflection, we observed that, once again, the level of contribution varies and so does each stakeholder's interest. This meant the need of devising dedicated approaches for each type. The Train-the-Trainer principle adopted for citizen communities was translated here in empowering established businesses to: gain knowledge about the project, the sensor, and its potential; instrument them with communication material to involve individuals and other businesses in their networks. While significant (aggregated) outreach was seen as a result of these efforts (e.g. growing number of members immediately after their communication efforts), keeping control of the actual impact of engaging them has proven difficult.

As another lesson learned in this space, we observed that companies, especially those that do not operate in the field of social innovation, strongly valued the narrative of "empowering citizens for sustainable mobility". This, sometimes, happened to a point in which they aimed at gaining a level of ownership of the project to legitimise claims about their company being active in social, open, and responsible innovation. In some cases, these offered to host WeCount events (at their expenditures) without being clear on who was driving the agenda. These, however, did not happen in the end because of COVID-related restrictions.

2.5.4 Schools and Academia

Following the input from other consortium members, schools and academic institutions (primary, secondary, university) were an important target for the case study. In general two types of stakeholders in this cluster were approached and, some, ultimately engaged: (1) academics with technical knowledge to seek support for both adapting the hardware to the infrastructural context in Spain (mainly exploring ways to place the sensor outdoors) and for data analysis and creative visualisations; (2) schools and students to be part of the overall case study and/or to set up independent pilots.

Regarding the former, we engaged with four individuals through one or more online meetings each, at a very early stage, to discuss:

- The possibility of placing sensors outside. This, as explained above, was not found to be suitable.
- The possibility of replacing the Telraam camera-based sensor, with a traffic counting Bluetooth based technology being prototyped by the individual engaged; again the decision not to move forward was collectively made given the low maturity of the technology and the substantially increased task

granularity required for conducting effective measurements (for counting smartphones need to be held and oriented towards the street at all times).

- General UX and registration processes and generate early feedback to inform WP3.

With respect to involving actual schools, these were seen as strategic partnerships as they could act as gatekeepers to younger generations to get involved with participatory traffic and air quality sensing activities and citizen science processes more generally. In particular, we started dedicated mini case studies with three different schools: a primary school (students between 11 and 12 years old and staff members), a high school (students between 16 and 17 years old and staff members), and a university (students all 18+ of all ages and staff members). Each of these involved a series of online meetings to transfer the knowledge to the staff members, a handover of promotion material and communication templates for them to promote the initiative with students (and their parents), and the dedicated development and adaptation of the required information sheets and consent forms from those developed at the consortium level to adapt to the needs and requirements of each institution.

With respect to the primary and high schools, the plan developed through the initial meetings was to place sensors around all sides of schools and surrounding areas to achieve conclusions about safety in school proximity and, if a high enough number of sensors and a granular distribution was going to be achieved, study green and safe routes for children for their way to school. Dedicated workshops were conducted with staff, students and their parents for both the primary school (19 students attended and one teacher) and the high school (17 people connected to the workshop with most connections being taken by a student and one parent). However, because of encrypted networks within the schools, installing sensors in their buildings has not been feasible. In one case, the teacher coordinating the relationship with the class and other staff members independently bought a new router for establishing a new, dedicated, and non-encrypted wifi network for the sensor. At the time of writing this report, they are experiencing challenges in this process, and the team at TML is helping to explore what the issue might be and how to solve it. Regarding installing sensors at the student homes again the trends of suitability of their location was confirmed. As shown in the figure below, only 6 sensors could be placed around the primary school (left side) and 9 in the proximity of the high school (right side).

Figure 12: WeCount sensors around primary and secondary schools.

These low numbers did not allow achieving a granular understanding of traffic and road safety in the area. Therefore, the decision was taken to re-adjust the objectives of both involvements. For the primary school, a dedicated analysis workshop for kids whereby they could create proposals for urban designs of the future was conducted (see section 4.4). Concerning the high school, the data analysis is conducted at two levels: (1) in conjunction with the overall Data Analysis and Awareness Workshop in Madrid (January 2020); (2) at the school level as part of technical related subjects they are undertaking. At the university level, the process required less previous interactions and followed the more general approach. An official hybrid

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

event (i.e. approximately 50% of participants attended from the university classroom and 50% from remote) has been promoted and conducted with 79 participants. As for the other problem formulation and co-design workshops conducted (see section below), participants gained knowledge about WeCount, citizen science, sustainable mobility, the Telraam sensor, and were given instructions on how to become counters.

Figure 13: Webpage of the WeCount workshop at Complutense - Madrid[10].

Finally, WeCount is being integrated in the ongoing project *Protegim Les Escoles* (i.e. we protect the schools) (see section 4.5) as a result of continuous interactions with schools involved Barcelona City Council. A summary of the key stakeholders engaged in this cluster, is provided in Appendix 1.4 following the same structure as other clusters (it is noted that names of individuals have been anonymised as "*technologist_x*").

2.6 Face to Face Engagement: Other Physical Interactions

In addition to the multiple meetings, emails conversations undertaken to establish relationships, and dedicated actions with the different stakeholders described in the previous section, we were able to conduct three physical interactions for the general public: (1) An initial event at our offices prior to the COVID-restrictions (February 2020); (2) the presence at an organised citizen activism event for sustainable mobility (*Stop Contaminació Barcelona*[11]); (3) a (restricted) pop-up action as part of the Barcelona's Parking Day Event[12].

The first event for citizens was organised to launch WeCount and give a live demonstration of the Telraam sensor as well as of the registration and engagement process to be followed. More than 50 inhabitants of Barcelona attended, gave input into the project and, for those interested in hosting a sensor, we asked to compile a WeCount Recruitment Card (see figure below - right side), i.e. small paper based questionnaires asking whether they met the required conditions for hosting a Telraam sensor (it is noted that the Forms on the platform were not ready at this stage). Besides gathering important inputs for initiating co-design of the case study, this event gave us a better understanding of the ratio of suitable locations. Unfortunately, only three participants were found to meet the requirements and were subsequently invited to join the Beta Pilot phase. Others still manifested the will to join the project as volunteers and committed to contribute through word-of-mouth diffusion. Also, awareness about WeCount, sustainable mobility, and citizen science was raised among these people at this stage.

The second physical event we leveraged for raising awareness and promoting engagement and recruitment, was a big activist outdoor protest where established neighbourhood communities and other citizens were protesting for the high concentration of private vehicles in Barcelona and the resulting very high levels of

[10] https://www.ucm.es/masterciudadesinteligentesysostenibles/noticias/41748
[11] http://www.stopcontaminaciobcn.org/
[12] https://parkingdaybcn.org/parking-day-2020/

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

pollution in the city. At this event, we actively engaged in conversations with at least 30 groups (of on average 2-3 people each) and we distributed flyers and other materials to allow people to register afterwards. The same day of the event, 8 more people registered as members to the platform. We believe more have done so in the following days, but it is hard to trace exactly how many came from this pop-up intervention.

Figure 14: Resources designed and leveraged for the first WeCount event.

Figure 15: Pop-up intervention Stop Contaminació BCN - June 2020.

The last physical pop-up event happened on September 18th, 2020, as part of the Parking Day initiative where we were given a parking slot for a full day. We took the opportunity to extend the community building and to raise awareness about the project. A WeCount stand has been mounted and we have approached people passing by (and those that came from the previous communication effort to promote the event) and introduced WeCount and give a live demonstration of the sensor and the platform. Unfortunately, because of COVID-related restrictions we were not allowed to hand over any material and thus the promotion has been verbal. QR codes were made available for people to register on site.

Figure 16: Images from Parking Day WeCount Stand - September 2020.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

As a general reflection on pop-up events, we observed that having a face-to-face physical interaction with potential participants is much more effective. Mobility and traffic counting are complex topics to understand and appreciate. In other words, we realised that in order for people to become highly motivated in participating they would need to get an understanding of: what citizen science is and its potential contribution to policy making; what Telraam is, how it works and how the data is visualised onto the open platform; and what can be done through traffic counting. These interactions gave the opportunity to engage in conversations with people individually (or in small groups of 2 or 3) and the reactions were found to be almost all supportive and positive. Alternatively, communicating these information through newsletters and other digital means required people spending time in reading and understanding the different components to appreciate the value and understand the meaning of being involved. These insights have been confirmed during the deployment of the biosensors, when we had an opportunity to have these face to face conversations. As shown in the dedicated section below, this large-scale engagement (almost 1,000 people participated) has had a significant impact on registration on the WeCount platform.

2.7 Problem Formulation and Co-Design Workshops

The core of scoping and co-design within the Spanish case study entailed, according to its citizen science nature, involving citizens in participatory online workshops. The focus of these has been generally on meeting participants, introducing them to the project and the key topics and procedures involved, and to conduct participatory exercises for both achieving a granular understanding of the traffic and mobility-related issues in participants' streets and neighbourhoods as they perceive and experience them and for co-designing the intervention. Regarding those workshops carried out for the overall WeCount communities in Madrid and Barcelona, three main rounds for each city have been conducted. The first, as explained in above involved the participants of the Beta Pilot. The second was carried out in July 2020. Participation has been low (i.e. 13 people) which has forced us to re-think the communication strategy, the channels to invite people at workshops and the general recruitment strategy. These improvements were put in place in the following months and, helped by the contribution of the biosensor's campaign (see section 2.9), another round of workshops was organised in both cities in October 2020 (56 people attended). Three additional workshops were carried out specifically dedicated to the three schools involved mentioned above. In total, over 200 people attended the different events, and much more that could not join at those particular dates and times could access the video recording of the workshops which were promptly shared with the members and uploaded onto the local website. The table below provides an overview of these workshops.

Table 3: Problem Formulation and Co-Design Workshops.

Date	Community	Participants	Duration ca.	Focus
19/5/2020	Beta Pilot Barcelona	11 - 18% females	120 minutes	Problem formulation and co-design
8/7/2020	Community Madrid	9 - 33% females	100 minutes	Problem formulation and co-design
9/7/2020	Community Barcelona	4 - 50% females	120 minutes	Problem formulation and co-design
14/10/2020	Community Madrid	23 - 48% females	90 minutes	Problem formulation and co-design
15/10/2020	Community Barcelona	33 - 48% females	90 minutes	Problem formulation and co-design
4/11/2020	School Vicalvaro	17 students	90 minutes	Problem formulation and co-design
5/11/2020	Univ. Complutense	79 students &staff	120 minutes	Problem formulation and co-design
6/11/2020	School in Getafe	20 kids	60 minutes	Problem explore and data analysis

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Even though the presentations, language, and some minor details on the participatory activities were developed and delivered taking into account the different audiences of these workshops (e.g. workshops in Barcelona and Madrid were positioning WeCount within the relevant local policies; the three workshops with the three different school levels were adapted accordingly), all workshops were structured as follows:

1. Introduction about citizen science; this first part aimed at explaining the potential of engaging citizens across all phases of scientific research endeavours together with successful examples of change enabled by citizen science actions. This was useful for raising awareness about what is possible if communities gather and scope, design, undertake actions, and reflect on environmental and other related issues.
2. Introduction of participants, brief focus group and exchange of opinions on the motivation and the objectives for their participation in WeCount. Notes, transcriptions, and other entries are being transferred to those responsible for the WeCount Monitoring and Evaluation (WP5) for analysis.
3. Introduction and discussion about sustainable mobility; this part included a description of what mobility is, the current key issues and the need to change towards more sustainable plans, policies, and behaviours. As part of this section emerging sustainable mobility fields like Urban Feminism and *Cities in 15 minutes* were introduced and discussed.
4. Introduction to the WeCount project including an explication of the sensor, the algorithm, the data platform, and a deeper presentation on why WeCount is different from the usual traffic counting techniques and tools and what the values of these differences are.
5. Overview of online survey results; as highlighted above, the low number of responses did not allow for solid conclusions to be made. However, this was found to be useful to stimulate participants to share opinions and to gather rich data on how they agreed/disagreed on several elements of the results.
6. Traffic Timeline; at least 20 minutes have been dedicated to the main participatory exercise through the WeCount Traffic Timeline, i.e. a tool developed as part of WP2 for brainstorming and stimulating discussions on traffic related benefits and issues during daytime and by month of the year. When the number of participants was higher than 15, we decided to divide them into two virtual rooms for ensuring a smoother and more productive discussion. Using this tool allowed single participants to share their perceptions and experiences of issues and other mobility-related factors. To do this, we used the MIRO software, that allows multiple people to be connected to the same online file and to collectively place digital post-its within the relevant points of the canvas (i.e. the Traffic Timeline). The figure below shows one example from one of the workshops. As shown, participants provided multiple entries and were given a chance to comment and discuss them with others. Beyond stimulating constructive discussion and insights from participants, this exercise allowed further narrowing down the matter of concern (traffic) across six axes: safety, speed compliance, air quality, noise pollution, livability of the area, and other traffic-related policies.

Figure 17: WeCount Traffic Timeline from Workshop at Complutense University.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

On the one hand, as expected, the inputs about traffic during the day varied substantially and most times were very specific (e.g. noise in one street given a standard schedule of waste collection from the council; a specific bike sharing station being empty at a certain time of the morning precluding people to go to work with public bikes). For this reason, participants were asked to note down their entries so these perceptions and experiences could have been compared at the individual participant and her/his street levels with the data collected by the sensors at a later stage, i.e. during the data analysis and awareness workshops. On the other hand, some more general findings could be achieved from these exercises. These strengthened the findings of the survey as the main perceived and experienced traffic-related matters of concern were found to be air and noise pollution. With respect to the entries around traffic issues experienced during the year, results have been more standard, e.g. most people confirmed very low traffic levels during Summertime. All in all, these exercises were critical in co-exploring traffic related issues at a great level of granularity. These findings represented an important input to co-designing the case study as well as for enabling participants to better interpret the data collected by the sensor, i.e. to relate them to their perceptions and experiences.

7. Closing and Next Steps: this last phase, as learned from the Beta Pilot experience, was crucial as participants needed to be explained all the different steps in the process for: (1) requesting a Telraam sensor through filling in Form 2 on the platform which included the delicate task of submitting a picture of the view from their windows; (2) completing the ethical approval process (which inevitably had to move online); (3) the delivery of sensors and the additional information needed from our side (e.g. mobile numbers) to facilitate this process; and (4) the next steps for the case study, i.e. an intervention calendar, tasks to undertake, and additional supporting material such as the resources on the local website and the Zendesk Help Desk. Finally, general feedback about the workshop was collected. Answers were collected using the SLIDO software, recorded and transferred to WP5 for analysis.

In summary, at the end of these first participatory problem formulation and co-design workshops, the most important outcomes with respect to scoping the case studies in Barcelona and Madrid were:

- The WeCount local narrative has been articulated further for both cities and specific narratives were co-developed with the different participants.
- Traffic-related matters of concern experienced and perceived by local citizens have been explored, identified, and mapped across the city's districts, time of the day, and month in the year.
- Participants have gained awareness about citizen science, key issues, topics, and current trends related to urban (sustainable) mobility, and technical knowledge about Internet of Things paradigm, low cost environmental sensors, image processing techniques, data visualization, and more generally about low cost computing hardware (Raspberry Pi) and data processing complying with the sometimes complex legal, regulatory, and ethical landscape.
- The various communities of participants are aware of expectations and commitments required for the successful implementation of the case study.
- Establishment of air pollution as the main traffic and mobility-related issue to be investigated and tackled during the case study, according with participants' inputs.

In addition, we propose below some reflections and lessons learned from these processes and activities. These were shared with the overall consortium during the monthly meetings.

- Participatory workshops are very useful for participants to feel part of the WeCount community. Leaving the complex and multi-faceted domain of mobility open and allowing them to discuss and input those issues that concern them the most strongly contributed for participants to feel ownership of the intervention, that is considered as a critical success factor in citizen science.
- Explaining upfront the limitations of the technology and explaining the novelty of the approach proposed helped in moving from a general deterministic understanding of technology itself. Rather,

participants were made aware of the experimentation phase in which the sensor technology is at. Gaining this awareness helped with managing expectations and for people to feel their contribution goes beyond producing new data, by also including the improvement of the technology itself.

- Several people stated that the most critical issues experienced refer to noise levels, especially during nighttime. However, this could not be taken on board as the sensor does not count during dark hours.
- One further learning for the Beta Pilot came from some participants' frustration once they realized that they could not host a Telraam sensor. The strategy at that point was to invite all members to participate so to have a higher number of participants. To avoid this frustration and to improve expectation management, the requirements for hosting a sensor were made clear in the invitation to the workshop.
- Attending dense and rich workshops and keeping a good level of attention throughout should not be taken for granted. Most concepts (i.e. citizen science, sustainable mobility, IoT) were new to some people which required a relatively high level of attention throughout the workshop. Given that the most demanding part (for them) was inevitably towards the end of the workshop, sometimes we observed people were tired or loosing concentration. Therefore, while at the beginning we were running these workshops for approximately 2 hours, we tried to reduce them to 90 minutes maximum.
- A challenge remains in that the diverse profile of participants (in terms of technical and domain-specific knowledge) would probably require dedicated workshops. In our workshops, explanations were brought back to the basics to ensure that the content was understandable to all. However, some more technically skilled people felt this was a waste of time for them. To address these, separate conversations were initiated with these people based on their interests and motivations.

2.8 Reflections on Co-Designing the Case Study

The fact that the case study in Madrid and Barcelona has been co-designed is demonstrated by the fact that this was articulated through an overall process of gathering, analysing, ranking, testing, and implementing inputs from citizens and a wide range of stakeholders involved across the different activities conducted and presented in this chapter. An important part of co-design of the case study with citizens happened through the interactions with the community champions across the different workshops of the Beta Pilot. These allowed to co-design the overall intervention with them in terms of: (1) timing (e.g. some communities already work with schools and manifested their interest to start in October 2020 rather than in the Summer as we initially proposed); (2) specific focus of the intervention. With respect to the former, the decision has been taken to launch the wider case studies in Madrid and Barcelona in two different rounds: the first in July 2020 and the second in mid-October 2020 to accommodate the needs of most participants.

Another important element ingrained in the experimental nature of this case study, was about a continuous gathering of feedback from all participants especially to improve: the software side of the sensor, the overall user experience, the data platform and visualisation, and the registration and installation processes. From one perspective, engaging participants in these phases, allows them to express their opinions from their previous knowledge and their experience in WeCount, and taking these on board for improving these elements, are considered as contributing to the co-design (i.e. proactively engaging participants in the design) of the overall technical architecture. Unfortunately, the impossibility of running physical workshops whereby participants could get hands-on experience with the hardware components and their assembly, limited the possibility of co-designing with them hardware-related improvements.

A further implication of running the overall case study online referred to the need of planning together with participants the actual logistics required for sending the sensors at their homes. Moreover, different participants offered to undertake different roles based on their skills, interest, and availability. For example, as extensively shown across the different tables in Appendix 1, some individuals, mainly those with technical expertise, assumed a more specific role around providing feedback on the technology, hardware and

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

software, and the overall process. Others committed more to communication, recruitment, and diffusion tasks. Enabling them to conduct these activities and facilitating them to do so, entailed establishing dedicated bilateral communications (either through email conversations or, in some cases, through online meetings) and dedicated support resources (e.g. a communication template to support *participant x* in engaging a specific school, entity, or public department). In general, understanding and appreciating differences in people's motivations, skills, and resources to be brought to the case study, and time availability, have helped to design the case study in a way that accommodates their needs and interests.

As another important element, the complex and multifaceted domain of mobility has been broken down into more specific traffic-related matters of concerns. By doing so, the case study does not only address the mobility related investigation, but also advances the citizens' research agenda by including what they appeared to be concerned the most about, i.e.: the relationship between traffic and air quality. Therefore, to take on board these inputs as well as to address the problematic recruitment (i.e. related to the fact that most people interested could not be active counters in the case study), the sensing activities have been extended to air quality as well, through the integration of 1,000 biosensors as explained next.

2.9 Extending Community Building and the Scope through Deploying 1,000 Air Quality Bio Sensors

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 during both the problem formulation workshops as well as from the other actions explained above. While adding an additional sensing element to the intervention was part of the initial plan indicated in the proposal, the mean through which this was conducted has changed. In the proposal we stated that we were going to deploy diffusion tubes to measure air pollution. However, due to COVID restrictions this was not found to be suitable. Diffusion tubes need to be stored in a refrigerator before and after their use. Being forced to deliver all WeCount equipment online did not ensure these conditions and would have substantially affected the reliability and quality of the measurements. After one trial, we opted leveraging strawberry plants as air quality biosensors.

Strawberry plants have been recently investigated and established in the literature as "valid tools for estimating the concentration of ambient particulate matter (PM)" (Van Dyck et al., 2019, p.1)[13] through the magnetic monitoring of strawberry leaves, based on Saturation Isothermal Remnant Magnetization (SIRM) techniques and processes. To achieve this aim, we incorporated within the Spanish WeCount intervention the initiative Vigilante del Aire[14], promoted by *Ibercivis* Foundation, the Spanish ministry of Science and Innovation, and the *Instituto Pirenaico de Ecologia*. The latter is currently responsible to analyse and publish the results. This was found as an effective strategy to accomplish two critical objectives emerged during the local intervention: (1) to take on board, consistently with the citizen science approach adopted, the will of citizens to combine traffic data with air quality data; and (2) substantially expand the WeCount citizen community to those people that manifested interest but could not host a Telraam sensors as their location did not comply with the requirements. The latter was found a winning strategy as these actions represented a non-invasive, original, and low-effort way to actively participate in and contribute to WeCount.

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 (i.e. from the beginning of October until mid-December). During this period, contaminating particles deposited on the plant's leaves. At the end,

[13] Van Dyck, L., Bentouhami, H., Koch, K., Samson, R. and Weyler, J., 2019. Exposure to Indoor Ferromagnetic Particulate Matter Monitored by Strawberry Plants and the Occurrence of Acute Respiratory Events in Adults. International journal of environmental research and public health, 16(23), p.4823.

[14] https://vigilantesdelaire.ibercivis.es/

participants needed to cut three leaves from their plant and send them to the lab that is currently conducting the bio-magnetic measurements.

Figure 18: 700 Strawberry Plants received at our offices in Barcelona.

Participants, together with their strawberry plant, were given an additional flyer including information about WeCount, the sensors, the way through which everyone can participate, and the relevant QR codes. Importantly, the pack also included an information sheet and questionnaire that participants had to fill and send together with the leaves to the lab. These included:

- Technical information about the plant and its position (dates, floor in the building, orientation - north, south, west, east - and other useful information such as wind exposure, walls around the plant, and whether the plant has been somehow protected in any way) to ensure a more reliable data analysis.
- Informed consent form.
- Instructions on how to take care of the plant (positioning and watering) as well as how to undertake the process including aspects such as instructions of which and how many leaves to cut and how, how to send them to the lab (participants were given a pre-stamped envelope with the relevant address).

Figure 19: Additional resources handed over together with the bio sensors.

Because of COVID-related restrictions, the distribution of the 1,000 strawberry plants has proven difficult and required an additional effort. The impossibility of delivering them as part of public events or pop-up interventions (initially considered as the most effective ways), forced us to organise in both cities a distributed delivery infrastructure. This consisted of establishing relationships with several actors that were given a variable number of plants, together with the WeCount Bag, and were assisted and trained to run a WeCount stand at their locations where, depending on the place, people could subscribe and take an

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

appointment or simply pass by and be offered the opportunity to participate. The actors finally engaged for this process are presented in Appendix 1.5.

Figure 20: Pictures of delivery of bio sensors – Madrid (left) and Barcelona (right).

Importantly, this strategy strongly (positively) affected community building in the case study in four main ways. First, the delivery of plants has allowed us to meet approximately 1,000 people, almost always individually, where we could explain and raise awareness about the WeCount narrative, physically show the Telraam sensor and conduct a brief demonstration, and to 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, the partners mentioned above 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 (including both TV and Newspapers – see next section and Appendix 2). 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), we 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 Telraam sensor.

Results are still pending and will be released to all participants in an open format, through an interactive digital map where spots are shown in correspondence to those places where the plants were placed. These will have different colours based on the pollution level and everyone will be able to click on each of these measurement points and access the specific pollution data.

2.10 Local Communication and Dissemination

A considerable effort in the case study was placed on communication and dissemination activities. Given the specificities of the Spanish context, and to foster a granular outreach in both Barcelona and Madrid, a local communication and dissemination plan has been designed and implemented.

First, leveraging the ongoing effort in mapping and engaging stakeholders (see section 2.5), a local communication plan was developed. The plan included: (1) Definition of the main communication actions, target areas and groups of interest; (2) Definition of the key messages for local activities tailored for different audiences; and (3) Definition of the channels to be used for the dissemination of the project. With respect to the latter, we have established:

- Local website: https://www.wecountmovilidad.eu/. A local WeCount website was created in Spanish, with all information, resources and news related to the case study. As of the 11th of February 2021, the pilot website has reached over 3,600 unique visitors.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 21: Local website: landing page.

- Social Media: we decided to rely on the existing IFC social media networks to reach the citizen communities that already followed these channels, while increasing the notoriety of WeCount.
- Dedicated Email and WhatsApp channels were created and used to interact with participants and have a fluent communication with them.
- A dedicated Mailchimp account was also created for the distribution of newsletters and email campaigns from a dedicated WeCount email account which was also created.

In parallel, we focused on the creation of creative graphic materials to reinforce the identity and branding of the project. Some examples can be found below.

Figure 22: Creativities, some examples.

In addition, before starting the mass and targeted communication campaigns, two surgical actions were carried out to facilitate the dissemination of the project. First, several alliances were built with active communities of citizens interested in exploring the links between mobility and pollution in both Madrid and Barcelona. These groups were offered to participate in the Beta Pilot and were given communication resources for contributing to raise awareness of the case study. Second, communication alliances were also established with some key stakeholders who endorsed the project. Specifically, the most effective alliances were established with: (1) Adigital[15] (the association of companies that represents the Digital Economy in Spain formed by more than 500 entities); (2) SmartMobility[16] (an association that brings together sustainable mobility companies); (3) Medialab Prado[17]; (4) ¿Tienes sal?[18] (an association focused on neighbourhoods and citizen communities, with more than 100,000 members); and (5) The Barcelona Citizen Science Office. To ensure that the messages were distributed among the third-party communities in the clearest and most effective way, a dedicated communication kit was developed tailored for each stakeholder.

[15] https://www.adigital.org/
[16] https://www.smobility.es/
[17] https://www.medialab-prado.es/
[18] https://tienes-sal.es/

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

The launch of the communication campaign had two components. First, a dissemination campaign was launched aimed at groups and communities potentially interested in sustainable mobility and citizen science.

Figure 23: Examples of images and contents created for the social media campaign.

Second, a mass communication campaign was carried out targeting both the general and specialised media. A press release was sent out and specific engagement efforts were made with key journalists. More than 19 appearances on national media were achieved at this stage, including a broadcast on the local TV station Betevé. Other examples of national and region-wide media and news agencies include EFE Verde, LaVanguardia, Betevé(article and TV news), TeleMadrid, Yahoo Noticias, COPE Radio, ElDiario.es, La Sexta Television, Independent, TimeOut. The full list and the related links can be found in Appendix 2.

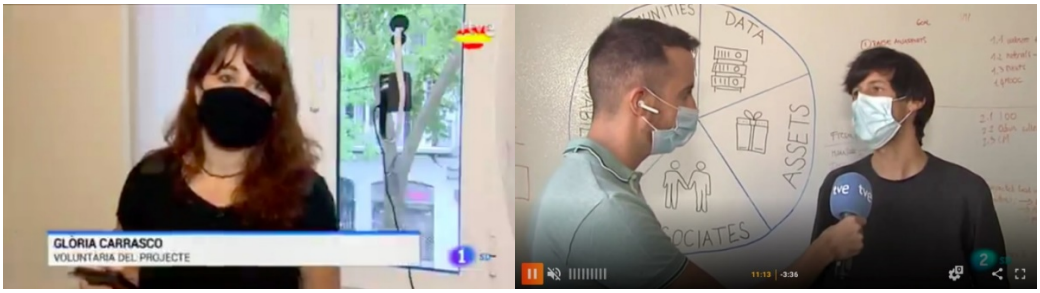
Figure 24: Examples of media uptake and diffusion.

The contribution of the stakeholders with whom alliances were established was also essential for dissemination. Some of the most effective examples of this coverage are provided in Appendix 2.2.

A second communication effort was carried out starting in September 2020 to foster an increase of participants. The main actions developed in this period were a mix between restricted physical events and presence (see section 2.6) and a, second massive communication campaign following the integration of the biosensor campaign into WeCount (see section 2.9). With respect to the latter, a second press release was issued highlighting the expansion of the scope of the project through the integration of air quality measurement. Additionally, one-to-one contacts were made with the main communication media, both locally and nationally, to ensure coverage of the action. As a result, there were more than 29 appearances in the press, including an article at La Vanguardia (a Spanish national daily newspaper), three televisions reports that were broadcasted by La 1 de Televisión Española (the national state-owned public-service television broadcaster in Spain), La 2 de Televisión Española (the second channel of Televisión Española)

and Telemadrid (the public television in the Community of Madrid) and an interview at Radio Nacional España - RNE (Spain's national public radio station). A full list of these is provided in Appendix 2.1.

Figure 25: Image captures of the pieces broadcasted by La 1 and La2 de Televisión Española.



Throughout the data collection process, additional, and continuous, communication actions were developed to ensure proper monitoring of the project as well as an ongoing community building and sustainability. The main activities at this stage (beyond those described above and continuously implemented) were: (1) uploading the recordings of the workshops for those who could not attend the sessions. The videos are available on the resources section of the project's local website[19]; (2) Newsletters and other online communication efforts with the participants were strengthened to keep them engaged. During this time, three newsletters were produced and sent (see Appendix 2.3). The data base has reached a total of 638 subscribers since the beginning of the project.

Figure 26: Image caption of the installation workshop recording.

In February 2021, a series of actions were carried out to disseminate the results of the case study (see section 4). Results were graphically published on the local website in a clear and accessible way[20] [21].

Figure 27: Image caption of extracts of the result section on the website (left) and on social media (right).

[19] https://www.wecountmovilidad.eu/recursos
[20] https://www.wecountmovilidad.eu/es/resultados-madrid
[21] https://www.wecountmovilidad.eu/es/resultados-barcelona

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

A newsletter containing a summary of the main results was also sent to the communities and stakeholders involved (see Appendix 2.3). The email contained also a link to a short survey so that people involved in the project could choose which impact action they would like to take as the final activity of the case study: This action is further described and elaborated across sections 4 and 5 of this report. The results were also published through social media[22] to reach a wider audience and generate synergies with the communities of other citizen science projects and initiatives.

Furthermore, throughout the duration of the case study, several presentations and lectures were given to spread the word about the project and reach a wider audience from the academic, scientific, industry, and civic society fields. Due to the COVID restrictions, most of them were held in digital format, although some could take place face-to-face. Appendix 3 provides a list of the most relevant.

To provide an overview of the overall results and impact of the communication and dissemination effort, the table below is provided. Specific numbers estimated from each action are provided in Appendix 2.

Table 4: Communication and dissemination results.

Type of activity	**Number**	**Audience**
Social media posts	120	5,774 Followers at IFC Twitter account
Social media mentions	30+	
Website	1	3,600 unique visitors and 6,200 pageviews
Newsletters	4 newsletters	638 subscribers
Videos	5	267 views
Media appearances	48	More than 4,700,000 people (see Appendix 2).
Third-party conferences	6	550
Local activities / training / community and stakeholders' engagement	33	Estimated more than 1,300

2.11 Summary of Community Building

All in all, activities and actions towards community building were conducted throughout the duration of the case study and are still a key focus of our efforts. Consistent with the overall objectives of WeCount, in both Barcelona and Madrid we built a very diverse community of citizens, actors and entities from both the private and public realm, and academics. Diversity was observed in multiple ways: age groups, gender, interests, concerns, motivations, other demographics, previous digital skills and domain expertise. Overall, at the time of writing this report (i.e. February 2021) the Madrid and Barcelona WeCount network counts:

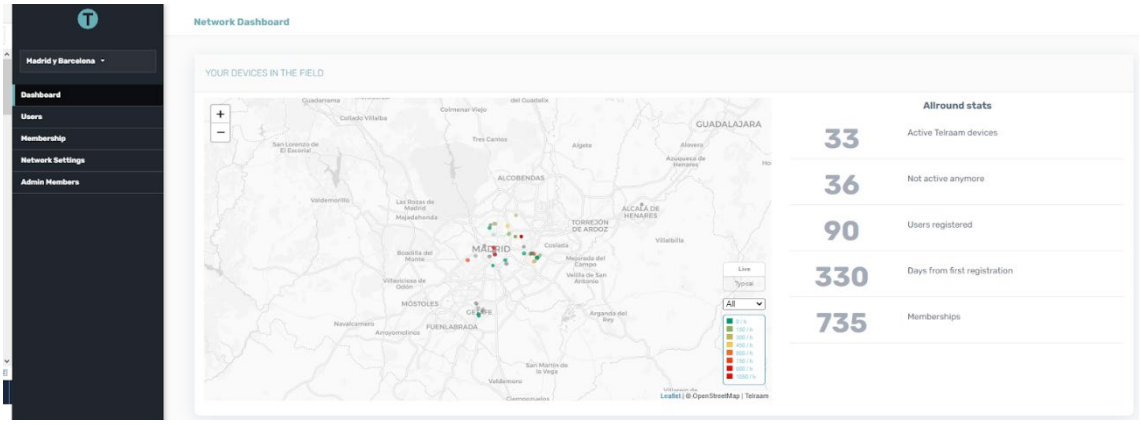
- 735 members.
- 90 users, i.e. members that host the Telraam sensor.
- Approximately 1,000 people that host the air quality biosensor[23].

[22] https://twitter.com/Ideas_4_Change/status/1360183021027151880?s=20

[23] it is noted that approximately 75% of people hosting a Telraam sensor also host the biosensor.

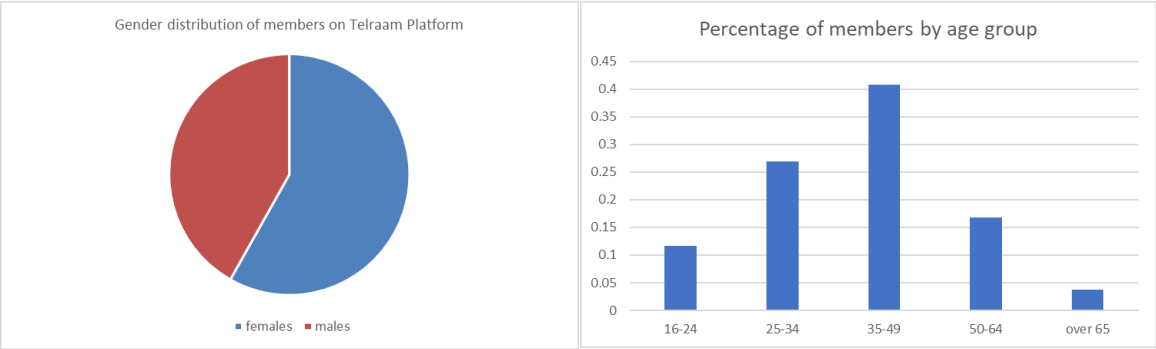
The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 28: Screenshot of Madrid and Barcelona Dashboard – Telraam website.



As shown in Figure 29 below, of all members that indicated their gender (it is noted that an option *prefer not to say* was available), 58.2% were female and 41.8% were males. These, as also shown on the right side of the same figure, were distributed across age groups, with the majority between the ages of 35 and 49.

Figure 29: Demographic information on members.

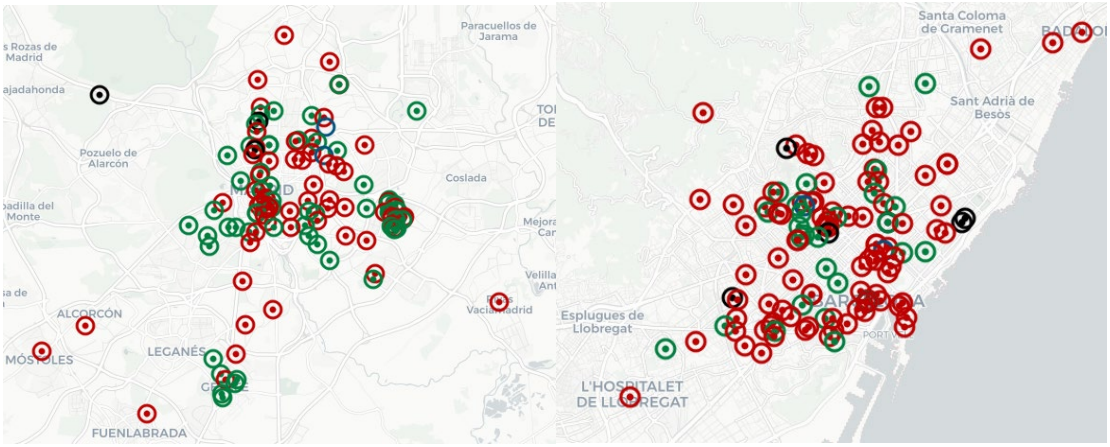


All these people have received all communication and dissemination material about WeCount, have gained knowledge about IoT, traffic sensing, citizen science and sustainable mobility (obviously to different extent, i.e. users could also experience the full participation, members directly received communication and dissemination material as well as progress updates and findings, and those hosting the biosensor could experience a one-to-one showcase of the sensor and description of these concept at the time they collected their plants across the various locations). The main challenge in the case study was to convert members into actual users (i.e. counters). According to the feedback received by participants, receiving the traffic sensor was the main motivation for joining WeCount as members. Once done so, these 735 participants had to submit a second, more detailed form including the picture of the view from their window. However, this process required time and, also according to the feedback received, people tended not to undertake it once they were shown in the form's introduction the requirements their location needed to meet in order for them to be selected as users. Clearly the main challenge in transferring members to users related to the urban design issues mentioned above. In detail, of these 735 members, 575 initially indicated that they were interested in being involved as counters (this was actually more as several members requested the sensor even though they initially subscribed "only" as occasional volunteers), i.e. hosting a Telraam sensor at their homes. However, after reviewing the suitability of their location (i.e. a suitable view from their windows), only 100 could be selected. This process was undertaken with additional iterations whereby interested people that could not be selected were given the opportunity to submit another picture for their location to be re-assessed. In some cases, this entailed a field visit from the research team to explore suitable windows. TML as the partner with most experience with assessing suitable locations was involved to this

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

review. Figure 30 provides a map of individuals that requested a sensor in Madrid (left) and Barcelona (right); those marked in red indicate people that could not be selected, those in green as those selected[24].

Figure 30: Map of selected and non-selected members – Madrid (left) and Barcelona (right).



Last but not least, it is noted that the case study in Spain is, by definition in the proposal, an exploratory case study which main objective is to capture and formalize learning to inform the other interventions in the Republic of Ireland, Wales and Slovenia. Therefore, the participants in Spain have been dealing with continuous changes in the technology, in the software, and in the overall process. While these are aligned with the timing of the activities related to WP3, we believe that it also affected the initial experience of the community champions in the Beta Pilot. Some of these, besides their very positive attitude, have not been as active as we hoped in promoting WeCount within their communities following their early experiences.

2.11.1 Reflection on COVID impact on community building, participation, and sustained engagement

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. We observed that this resulted in significant drop off between the different steps. As an example, as we moved online the process changed from signing a consent form on site when receiving the sensors to an exchange of 3 emails (once selected) -i.e. first notification email and confirmation of willingness to receive Telraam; second email following confirmation including information sheet and consent form to be sent back; third email once received the informed consent form with additional information to facilitate the delivery. These resulted as added required actions to the previous tasks undertaken (form 1, form 2, register to workshops etc).

Also, one important aspect of the intervention was focused on hands-on activities in workshop format. These, apart from the initial event prior to COVID, have not been possible. 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.

[24] It is noted that not all people who requested a sensor are mapped because of some bug in the system which is currently being addressed by the TML team.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

In alignment with the WeCount methodology, in parallel with exploring and defining together with citizens their mobility-related matters of concern, a substantial effort was conducted during the initial phases to engage the public authorities from the very beginning. While this resonates as we had expected that their involvement would have ensured relevancy of the intervention throughout its phases, the actual extent of (continuous and not episodic) engagement has been problematic. According to their feedback, the COVID crisis in Spain has dramatically changed their priorities since initial commitments had been established.

According to input from the overall consortium, as well as resonating with the interest of the initial community champions, WeCount activities were scheduled for September/October 2020 in schools. Several schools manifested their interest during and before the Summer and ensured commitment to participate. Now, schools are particularly under stress for several restrictive measures that are being imposed on them. The significant change in their priorities resulted in the impossibility of collaborating with many of them as of now. We hope the situation will evolve soon and that collaboration with schools could be restored before the end of the project.

A further impact of COVID 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. To address this issue, we could not find an alternative to videoconferencing to run the workshops and other interactions. To the best of our possibilities we tried to balance the more unilateral elements of presentation of the project and its key topic and principles and the participatory exercise whereby participants had more active roles than listening.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

3 Data Collection

This chapter provides a description of activities conducted as part of task 4.3. It covers how we have tackled procurement, distribution, installation and maintenance of the Telraam sensors to support data collection as well as how we have adapted to the exceptional circumstances of the COVID-related restrictions.

3.1 The Procurement, Assembly, Preparation, and Distribution of the Sensor Hardware

Across the different rounds of the case study, components for assembling 100 Telraam sensors have been sourced and received at our office. The choice was made to order a first set of 20 devices for the Beta Pilot phase and, allowing time for changes informed by the learning of this experience, the remaining ones were ordered and received over the Summer 2020. An important phase of the methodology originally planned revolved around organising hands-on activities to allow participants to assemble the sensors themselves. This wouldn't have had only an impact on their skills and knowledge development, but we also believe it would have increased their sense of ownership and involvement in WeCount as well as their understanding of their role, i.e. proactive researchers and experimenters, as opposed to passive data contributors. The initial plan, prior to the COVID crisis, was to involve citizens in the assembly of the sensors in a dedicated physical workshop. To do so, at the very beginning, we produced a gif-based video to guide the Telraam assembly step by step. Because of the restrictions, we then considered sending the components and let participants do the assembly of the sensor at home guided through an online workshop. However, in case people made any mistake, we would not have had the opportunity of figuring this out until the registration and installation phases. Therefore, it would have been too difficult to identify where the issue occurred and, since physical support could not be given, we opted for assembling all sensors ourselves. This also involved flashing the software onto the SD memory cards. This process was done twice for more than half of the sensors as a new release (incorporating improvements from the ongoing learning thus far from Leuven and Spain) was made by the TML team during the Summer of 2020. The original assembly gif-based video has been modified as an assembly tutorial video, which now represents an important legacy of the project[25].

Figure 31: Screenshot of the Telraam Assembly Video developed by IFC in Spain.

In addition, according to the learning from the Beta Pilot experience, the sensor in the following rounds of deployment have been sent with a stronger double-sided tape to ensure it stays fixed on the window. We also asked for a longer power cable as the current one (1 meter long) has created several issues for early participants, but there have been problems finding a suitable option. Therefore, we remained with the recommendation of having a power extension cable. Also because of COVID-related restrictions, the

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

delivery of sensors could not happen in person. To adapt to this process, we designed and developed a WeCount Toolbox, as one integrated resource to be sent to participants.

Figure 33: WeCount Toolbox.

The WeCount Toolbox included: the Telraam sensor assembled; the power cable; additional components coming together with the Raspberry Pi and the camera module that were not used for assembling the Telraam sensor; some promotional material, e.g. a WeCount sticker, flyer; a printed step by step installation guide (more information provided below); and a sensing diary.

Regarding the latter, one of the key learnings of the initial phases was about the presence of some contingency situations that might affect the correct interpretation of the data collected. Examples include, but are not limited to, roads being close to traffic for works or other events, protests and manifestations with groups of people, or any other exceptional circumstance. To address this issue, one of the tools designed as part of WP2, and adopted in Madrid and Barcelona, refers to this sensing diary. This is in the form of a notebook and includes a calendar. Participants were asked to input any possible information that in their opinion might have affected a specific measure from their Telraam sensors.

To send the WeCount Toolboxes to participants, we created partnerships in both Barcelona and Madrid with bike-delivering companies. This created two additional challenges to which we adapted as follows:

- Need to gather additional information to facilitate the delivery, e.g. mobile numbers, full address. To do so, participants were contacted one by one to provide this additional information.
- Ethical approval and signed informed consent forms could not be done in person. This process was re-designed as a full online process. While we brainstormed the most suitable option at the consortium level, this indubitably added several more steps that participants needed to complete to obtain the sensor. These were: (1) notify participants for suitability of the sensor and asked to confirm their commitment; (2) ask for the additional information described above to facilitate the delivery; (3) send the information sheet and consent form and ask to return the consent form in an email, signed.

3.2 The Sensor Installation

During the Beta Pilot, also according to the objectives of gathering feedback about the registration process, we organized one dedicated online workshop with those that received the sensors at their homes to conduct the installation together (details are provided in section 2.2). However, this process could not be completed. A bug in the system impeded our team to activate the participants' accounts, who could not complete the installation. The TML team was notified and addressed the issue promptly. The process was then to share the knowledge by installing one sensor, sharing the screen, to showcase the process and gather feedback.

This approach was repeated in July 2020, following the first round of Problem Formulation and Co-Design Workshops after the Beta Pilot. This entailed two dedicated workshops for Madrid and Barcelona

respectively. As shown in Table 5, only a few participants attended. We observed that some participants could complete the process independently with the support of the printed step-by-step installation guide. Finally, we shared the recording of the workshops with those that received the sensor and did not attend.

Table 5: Sensor Installation Workshops.

Date	Community	Participants	Duration	Focus
15/7/2020	Community Madrid	5 - 40% females	90 minutes approx.	Guided sensor installation
16/7/2020	Community Barcelona	6 - 33.3% females	90 minutes approx.	Guided sensor installation

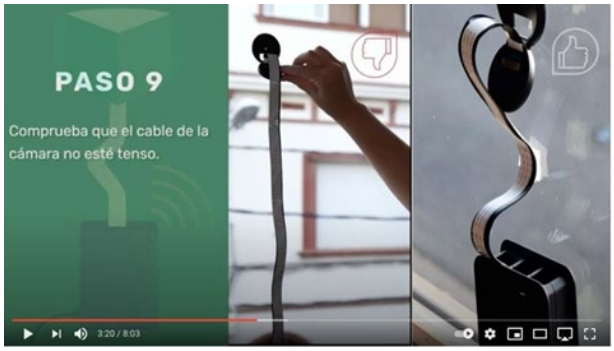
These workshops were also conducted on Zoom and we planned to have dedicated online rooms within the system to assist individually those experiencing issues. In other words, in the plenary session we were installing the sensor together with participants, and individuals that had issues during the process were transferred to a separate virtual room for individual support from one member of the team. The experience with a small number of participants was challenging mainly due to the different range of people involved (e.g. those that are tech savvy had to wait for those that took more time that in turn felt frustrated for this). This experience was useful in several directions, mainly: (1) significant feedback on the process was gathered (now improved by TML as part of WP3) also through our own observation; and (2) technical knowledge was transferred to participants that were provided with explanations of what each step of the installation means. However, the experience has been found impractical and challenging. Therefore, we changed the approach for the next rounds of sensors' delivery undertaken from October 2020. Whereby we organized a "help clinic", i.e. an online session where we were available for assistance to those experiencing issues. This was done by allocating a two hours slot (for all participants from both cities) where people could connect at any time to receive support. Only two people attended and were guided through the installation process. As part of this round of deployment, to further support independent installation, the team in IFC has produced two key resources: (1) a printed step-by-step installation guide that participants receive, together with the sensor, inside the WeCount Toolbox; in particular, we developed two versions of this, i.e. one per each version of the software. The guide consists of a 12 pages booklet comprising detailed descriptions supported by images about the actual installation process. The process has been broken down into 16 basic, elementary, steps.

Figure 33: Step-By-Step Installation Guide.

(2) An 8-minutes long spoken video (in Spanish) with a clear visual explanation of the overall process. While a video was produced as part of WP3, our experience showed that, especially for older adults, a spoken video in local language would have been more effective.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 34: Screenshot of the Spoken Installation Tutorial Video (in Spanish)[26].



The resulting ratio of participants that successfully installed a sensor, demonstrated the effectiveness of the resources produced and made available.

3.3 Data Collection Process

In total, 90 participants across Madrid and Barcelona have received the sensor and registered as Users on the Telraam platform. Of these, 69 could successfully complete the installation process and had their sensors active for a certain period. The 21 users that could not complete it were contacted individually and we explored what the issues might have been, with the fundamental help from the development team at TML. The most common issue revolved around the impossibility of connecting the Telraam sensor if the wifi network to which it needs to be linked is encrypted. This was very common in public buildings and offices. The problem, at the time of writing this report, could not be solved yet.

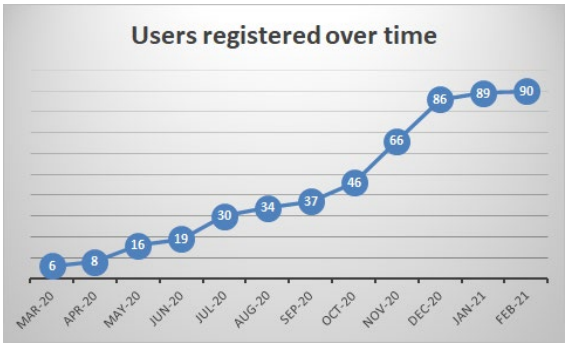
Figure 35: Screenshot of Madrid and Barcelona Network Dashboard - February 19th, 2021.

As shown in the summary figure above, 69 sensors have been active during the case study, and 34 are still active three weeks after the data analysis and awareness workshops. This demonstrates, as elaborated further below, the willingness of a significant proportion of participants (and their communities) to continue the measurements to pursue their own, situated agenda and activities, beyond the end of the project.

In terms of timing, the highest number of users registered following the workshops undertaken in October 2020. An overview of users registered over time is provided in the graph below. Data collection, therefore, lasted for different time frames prior to the data analysis workshops (conducted at the end of January). However, the objective of allowing at least two months of data collection for most sensors has been met.

[26] https://www.youtube.com/watch?v=l8XKh6BcJF8&ab_channel=IdeasforChange

Figure 36: Total number of users of Madrid and Barcelona Network over time.



With respect to the data collection process, two aspects must be considered:

1. According to the data generated by the system, of the 69 sensors installed, only 44 produced data of sufficient quality to be considered for the analysis step (i.e. 19 in Barcelona and 25 in Madrid).
2. Of these 44 sensors, not all were active at all times. Rather, sensing activities were disrupted in some cases for various reasons. These included, for example, the sensor falling from the window, the sensor disconnecting from the wifi network, the camera module has moved and thus do not point at the street anymore, among other problems currently being investigated at the WeCount consortium level across case studies. As an example of this sometimes discontinued sensing activity, the figure below proposes, for the month of January 2021, what sensors in the Madrid and Barcelona network have been active and producing good data quality (in green), active but with poor data quality (in red), and inactive (in grey). It is noted that the information in the graph below is reported for all 90 users registered to the network, and not only the 69 sensors that have been actively measuring.

Figure 37: Overview of sensors activity – January 2021.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

A considerable effort during this phase was dedicated to ongoing technical and non-technical support to participants. This effort has taken two forms: (1) we established an ongoing support resource and help desk and we were available at any time should any issue have occurred; (2) an active push to participants following a periodic (weekly) internal review of sensors' activities.

Regarding the former, during the Beta Pilot, a WhatsApp group has been set-up including all participants to gather experiences and issues. This, as reflected upon above, has been found to be overwhelming, despite the low number of participants. During the wider deployment, we relied on the Zendesk helpdesk, individual email exchange, and the FAQ section on the Telraam website, which had been previously translated into Spanish by the IFC team. In our experience, most requests and questions from participants came through emails. In addition to this help provided on an on-demand basis, we also provided help and support through being available in a virtual space for two hours following the delivery of the sensors. During this time, participants could connect and discuss their technical problems and other questions or doubts they may have had with the IFC team.

Regarding the latter, the team at IFC was involved in a periodic review of sensors 'activity in the network. As shown in the figure above, we were always aware on whether sensors were active or not, and the indication of the quality of data produced by each Telraam device. Following these reviews, we contacted those participants whose sensor either stopped sending data, or which quality changed from good to poor. During this process, we have assisted virtually more than 30 participants during the case study. In some cases, we had to go in person to investigate the situation, to try different options, or at least to understand the problem and subsequently ask help to the TML team. In total, we had to replace the sensors of 5 participants because they didn't work properly.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

4 Data Analysis and Awareness

The first and most immediate step of data processing and analysis is ingrained in the Telraam platform and is visualised onto it in an open and easy to use and understand way. While specific details on the capabilities developed within it are provided by the related WP3 deliverables, this was the foundation from which we started data analysis in both Barcelona and Madrid. It is noted that this section does not include the analysis of the data gathered through the biosensors as this is ongoing at the time of writing this report (the actual analysis process being implemented is described in section 2.9 above).

It is also noted that those levels of analysis for each sensor ingrained in the data platform were automatic in nature and included a visualization in each participant's profile. Each user (i.e. counter) could (and currently can) access her or his profile and visualise specific data of interest at any time. In their profiles, users have an option of selecting days' interval and be provided with related information about: number of sensed objects (by category); number of objects per day and per hour within the day (this is also represented in two different colour-scales to highlight whether the measure is of "good quality" or "poor quality"); speed ranges; the number of sensed objects per direction; and an overall summary of the percentage of distribution of these objects. In addition, a monthly report for each sensor is automatically generated and is downloadable by participants from their portals. This monthly report includes summary measures during the month, the differences observed with previous periods, the 10 busiest hours in the street for each mode of mobility, the percentage ratio of measured speeds of cars per speed category, and an overall evaluation of the sensor activity and quality (classified across: very good, good, sufficient, insufficient, and poor). In themselves, also according with the overall WeCount work structure, this information and analysis insights represents already a core component of this phase. It is indeed noted that this represents the analysis foundation for future communities of adopters of WeCount, which, according to the objectives of the project, should be able to carry out WeCount-like interventions in other streets, neighbourhoods, cities, or countries, independently and autonomously (supported by the open resources, like this analysis capability embedded in the platform, left as a legacy of WeCount).

Starting from these visualisations and analysis capabilities ingrained in the platform, data analysis has been carried out at different levels and through different means. These, in general, were conducted upon:

- Data generated by Telraam sensors from: the visualisations available on the platform and the monthly report from each sensor, accessing the Telraam API, and from the bulk download of the data collected.
- Crossing Telraam data with official traffic data from Madrid and Barcelona to compare the two measurements.
- Crossing Telraam data with other open datasets (with a specific focus on air pollution data to accommodate the focus of the case study as co-designed with participating citizens); in other words, an important aim of the data analysis process undertaken in Spain was about crossing the data collected in WeCount with other existing, open, datasets. While this was possible with respect to air quality data (sometimes), available open datasets in the field of mobility are substantially lacking and/or are not highly reusable. The most common instance was about the format and the standard through which these datasets are made publicly available. In general, a lack of an integrated API (most datasets are released in static/.csv versions), lack of metadata for navigating and effectively understanding the open data portals of both Barcelona and Madrid, and the different, non-homogeneous standards used, were the most problematic elements influencing an effective access and re-use of this open data.
- Analysing and interpreting data together with participants in dedicated online workshops; to this end two data analysis and awareness online workshops were carried out, for Madrid and Barcelona respectively.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Before explaining the approach we have undertaken towards the exploration and definition of analysis pathways from the data collected (and through the integration of other datasets) two main considerations must be highlighted: (1) according to the methodology, citizens themselves dictated the specific focuses of the analysis and particularly their desires of having terms of comparisons for effectively interpreting the data about their streets, integrate insights at the intersection between traffic and air pollution data; (2) the final distribution of sensors as shown above had an impact on what conclusions can be drawn from the data collected. Unfortunately, given the challenges in finding suitable locations, the distribution finally achieved (besides the low numbers) did not specifically relate to specific neighbourhoods and/or areas affected by specific policies. Therefore, the focus has been more on enabling participants to gain a solid understanding of what happens in their locations and more general conclusions on comparisons, validity, and potential future avenues for this data to be enriched to subsequently inform new (sustainable) mobility policies. Nevertheless, this is consistent with the objective of empowering people and communities in understanding and acting upon this data. The difference, as shown by some examples below, is that these actions were mainly informed by single sensors (i.e. focused on one single street) rather than a coherent ensemble of these. Overall results are published for both Madrid and Barcelona on the local WeCount website and will be actively disseminated for the remaining WeCount funded period and beyond.

Madrid analysis report: https://www.wecountmovilidad.eu/es/resultados-madrid
Barcelona analysis report: https://www.wecountmovilidad.eu/es/resultados-barcelona

4.1 Descriptive Analysis

The first phase entailed an analysis and overall reflections of the data collected and visualised in Barcelona and Madrid, beyond the information available in the platform. It is noted that for conducting this aggregated analysis, only sensors that showed a good quality of measurements (insight provided for each sensor by the Telraam platform and the monthly reports) were considered. These were 19 and 25 sensors for Barcelona and Madrid respectively. The table below shows an overview of the data collected and processed by mode of mobility in the two cities by these sensors.

Table 6: Overall Data Collected through Telraam sensors.

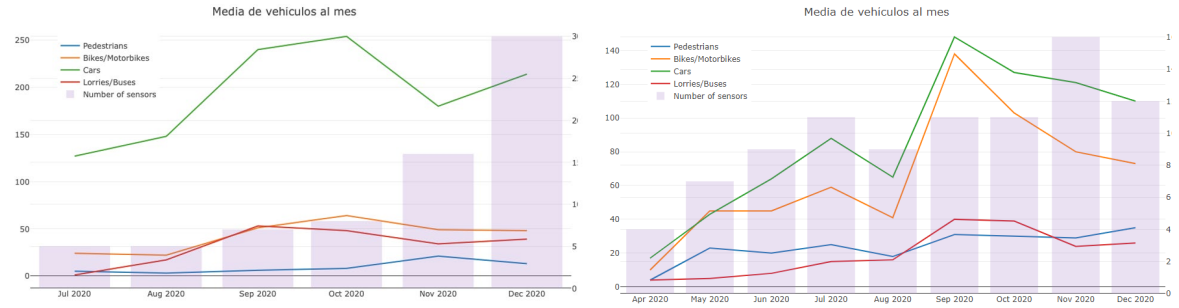
	Tot. pedestrians	Tot. bicycles	Tot. cars	Tot. heavy vehicles
Madrid	224.553	756.006	2.546.911	576.126
Barcelona	290.438	696.591	1.112.691	272.279

The next step was to outline, for each sensor, the overall data collected as well as some the monthly, daily and hourly average number of objects to provide participants with some general conclusions about average traffic in their streets. This information is also shared with the participants in different forms, as explained below.

The figure below provides the average of objects sensed (by more of mobility) over time in Madrid and Barcelona respectively. This phase of the analysis was useful to reflect (both internally and with participants) on the overall numbers related to mobility across different periods characterised by different COVID-related restrictions, peaks, and incidences.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

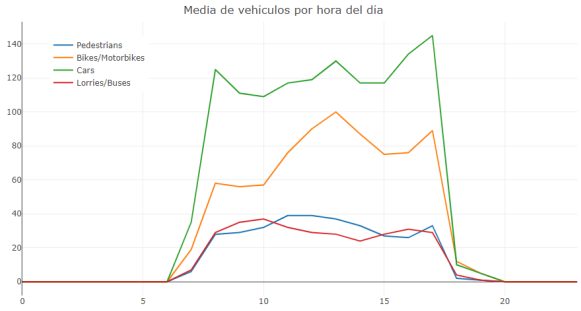
Figure 38: Average sensed objects over time – Madrid (left), Barcelona (right).



As shown, in Madrid, general data across the sensors has been observed to be constantly growing following the first full lockdown period happened in Spring with a drop down during the "second wave" of confinement established and enforced in the city in October (it is noted that this second strong mobility restrictions, unlike the firsts which were citywide, were specific by neighbourhood). In Barcelona, given the early stage experience of the Beta Pilot, this information was available starting from April 2020, and this represented a key reflection point during that experience. Likewise, Madrid's traffic levels were observed to experience peaks during those times when restrictions have been relaxed (i.e. July and September 2020), with these levels dropping when COVID-related restrictions were higher (i.e. April/May 2020 and October 2020). Interestingly, connecting to the problem formulation workshops where people emphasised the significant decrease of mobility during Summertime in both cities, this could be proven and quantified both for each and across sensors. In particular, in August (where most people commented traffic to be always very low as people usually leave the city because of holiday time and the heat in the urban area) the levels were lower or similar than those characterised by COVID restrictions.

Similarly, we realised visualisations on the number of objects sensed on average during the month and during the day. While the figure below of the average number of objects for Barcelona provides an example, obtaining these results was important to enable participants to do further comparisons, according to one of the analysis objectives outlined for this case study.

Figure 39: Average number of objects by time of the day – Barcelona.



On the one hand, this exercise was found to be useful to support individuals in interpreting the data coming from their sensors. On the other hand, the aggregated results themselves did not show many surprises and most of these were aligned with the general inputs from citizens during the various problem formulation workshops in the two cities. Indeed. in both Barcelona and Madrid, Thursdays and Fridays appear to be those days experiencing higher levels of traffic, whereas during weekends these numbers decrease substantially. With respect to the average traffic by hour of the day, once again both cities show similar results in which peaks are observed during lunchtime (1pm and between 1pm and 2pm in Barcelona and Madrid respectively) and between 5pm and 6pm. In addition, based on the limited locations considered,

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Barcelona shows a peak in traffic comparable to the other two during the day, at 8 am in the morning - it is noted, however, that the sensor does not work during dark hours.

The last step in providing more detailed descriptive analysis referred to outlining and visualising sensed objects in a diagram of boxplot components, including mean, median, quartiles and outliers. This analysis was useful to show the degree of dispersion and skewness of the data as well as to enable a more immediate comparison across sensors. These visualisations were created both for sensed objects and for speed levels. These graphs are interactive in the sense that by accessing the online page where these are visualised, actual values can be seen by hovering over the different points. These are shown for Madrid and Barcelona respectively in the figures below.

Figure 40: Boxplot diagram daily objects – Madrid.

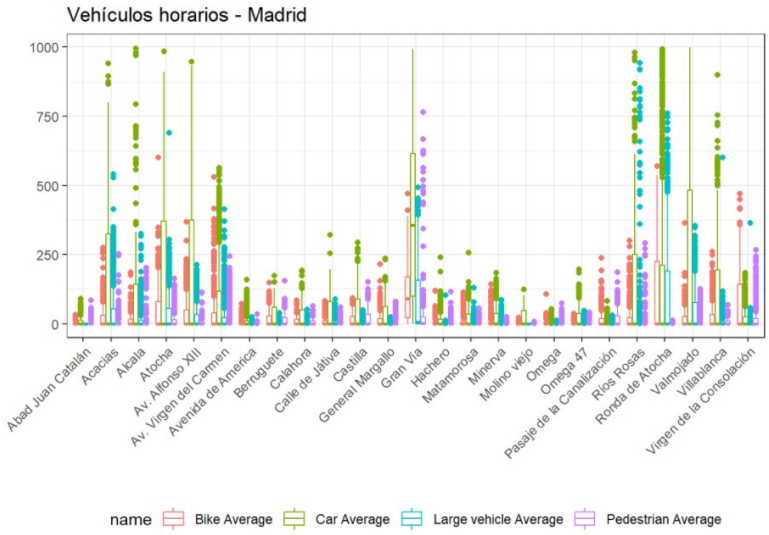
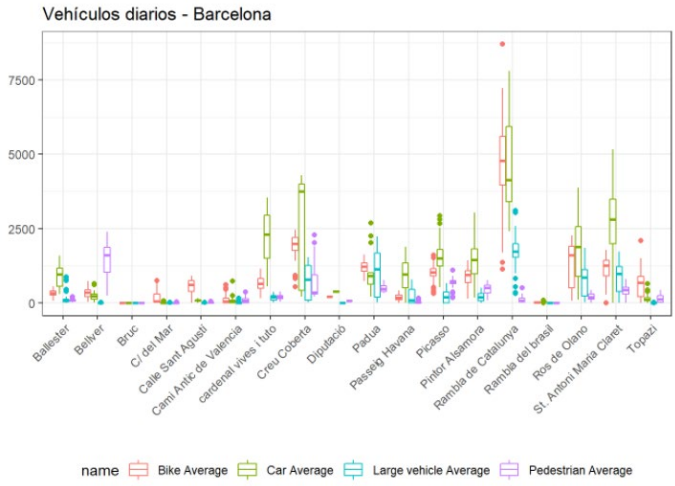


Figure 41: Boxplot diagram daily objects -Barcelona.



As shown in these figures, different objects (cars, pedestrians, bicycles, and heavy vehicles) are labelled with different colours. As some general conclusions from this analysis exercise, we observed that the degree of dispersion is higher in bigger streets (this is especially evident with respect to Gran Via in Madrid - i.e. one of the most central and most traffic dense streets in the city - if compared with other smaller streets). The same was done with respect to speed levels (see graphs below for Madrid and Barcelona respectively).

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 42: Boxplot diagram speed levels – Madrid.

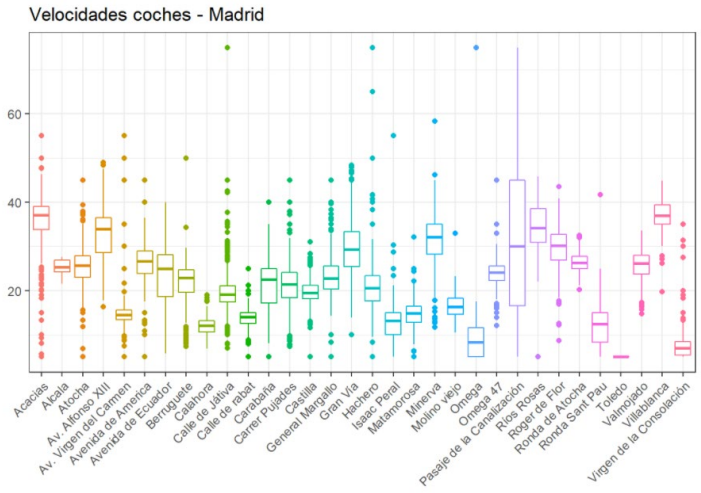
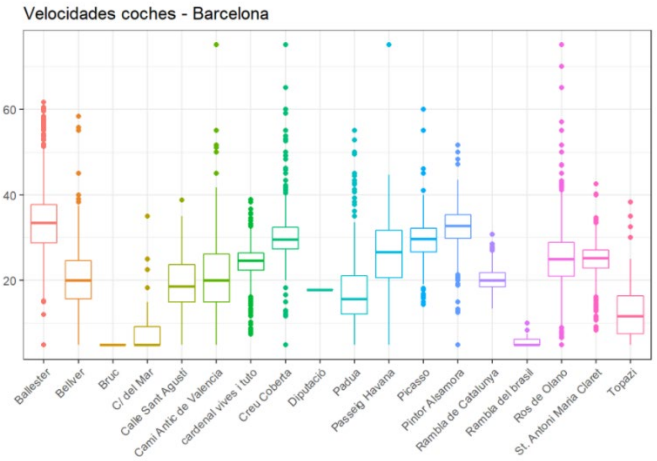


Figure 43: Boxplot diagram speed levels – Barcelona.



Finally, a ranking of streets for each object (i.e. average of pedestrians/cars/heavy vehicles/bicycles in each street) was created and shared with participants. This, together with the other outcomes of this descriptive analysis, was important as a means for people to enable comparisons and therefore to have terms of references when interpreting the data. For example, knowing that 5 cars per hour have passed in front of a home tells little if not compared with how many cars pass through other streets in the city. Sharing this information also involved some quick games during the workshops and other interactions to stimulate interpretation of the data - e.g. *guess what of these street experiences the highest number of cars? and considering only weekends?*

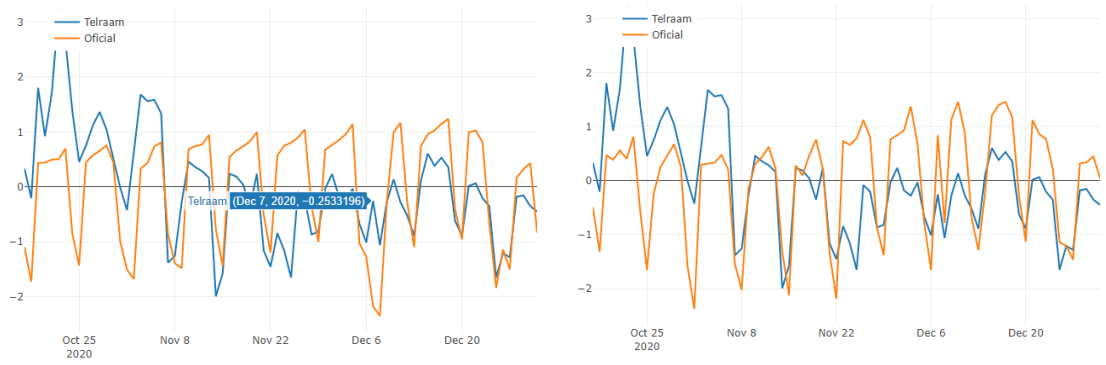
4.2 Comparing Telraam and Official Mobility Data

After we outlined some descriptive data across sensors about Telraam in WeCount, the next step was to look for comparison between the Telraam-generated data and the official data on mobility in Madrid and Barcelona. The objective was to explore whether a positive correlation exists between these two measurements and derive some conclusions in this direction. Clearly, the low number of sensors does not allow for particularly robust conclusions to be made. The approach has then been to first look for the official data about quantified mobility in the city (it is noted that the official data available does not distinguish between objects). Second, we mapped it together with Telraam data from both cities to explore

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

potential correlations. The figures below show this step for Madrid and Barcelona respectively. It is also noted that the graphs generated are interactive on the local webpage and each point in the graph is shown simply by hovering over it (see example in first figure - Madrid).

Figure 44: Matching official and Telraam data – Madrid (left) and Barcelona (right).



Already from simply looking at the graphs above, it can be seen that there is similarity. Being these continuous variables and given that the objective of this phase of the analysis was to explore and understand whether a correlation exists between Telraam and official data as well as the magnitude and direction of this relationship, the decision was made to use the Pearson correlation approach, based on covariance. As an example, the query for calculating the Pearson's correlation Coefficient for the data in Madrid is provided below.

Figure 45: Pearson Correlation Coefficient calculation – Madrid.

```
##
##  Pearson's product-moment correlation
##
## data:  vehicles and intensidad
## t = 4.3691, df = 74, p-value = 4.002e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.2532407 0.6154611
## sample estimates:
##       cor
## 0.4528415
```

The coefficient calculated for both cities were[27]:

- Madrid's correlation coefficient: 0.45 (conf. interval 95% between 0.25 and 0.61; p value < 0.0001).
- Barcelona's correlation coefficient: 0.48 (conf. interval 95% between 0.28 and 0.63; p value < 0.0001).

In both cases the correlation coefficients are similar and representative of a moderate correlation between the two variables. This analysis gives important insights in terms of understanding and communicating an approximate measure of quality of the data provided by the sensors (it is reminded that only sensors which quality was labelled at least as "good" by the system were considered). This was also useful for reflecting with participants about the potential value of this data as a valid and reliable contribution to future actions and policies, and as a means for convincing local authorities about the value of the intervention.

4.3 Telraam and Air Pollution Data

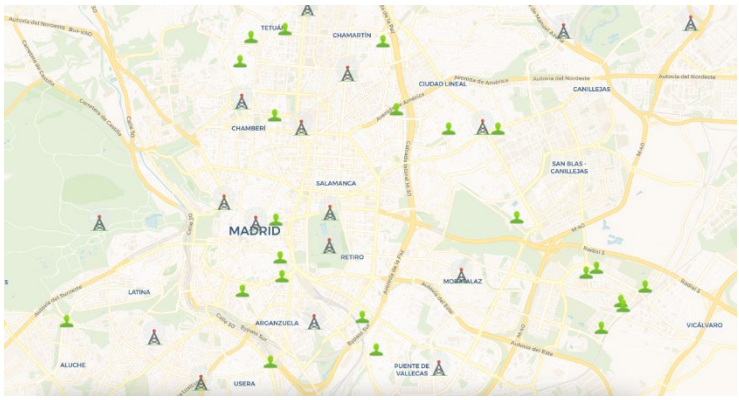
Consistent with the scope co-designed for this case study, i.e. on combining traffic and air quality measurements, an effort beyond the biosensors has been made to relate Telraam data with existing open

[27] It is reminded that the Pearson correlation coefficient ranges between -1 and 1, whereby -1 represents a situation of perfect anti-correlation, 1 of perfect correlation, and 0 of no association between the two variables.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

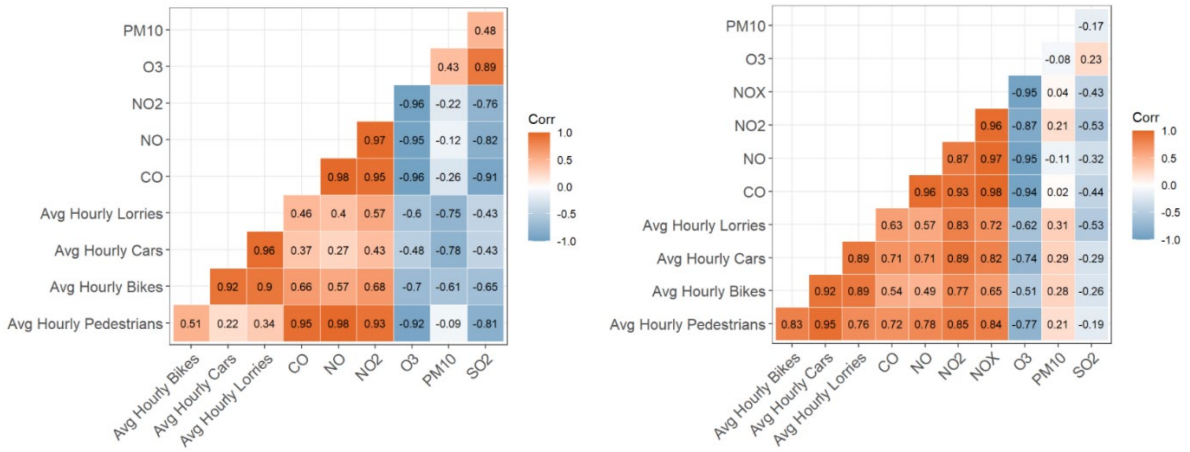
data available about air pollution levels. The first step was about searching available open data on air pollution in Barcelona and Madrid. These data sets were obtained from Barcelona and Madrid official open data portals. However, the formats, standard and accessibility were different, so it required a specific effort for each to export this data. For example, while in Barcelona an API is available for retrieving air quality data in near real time and in a dynamic way, this was not available in Madrid where data could only be downloaded in spreadsheets, i.e. in a more static format. The data was accessed/downloaded together with the geo-localisation of the different official air quality monitoring stations. The next step was about geo-localising the Telraam sensors and searching and establishing the closest air quality station for each sensor (see figure below with respect to Madrid).

Figure 46: Air quality monitoring stations (towers) and Telraam sensors – Madrid.



In both cities, data was available for each of these monitoring stations around the following: CO, NO, NO2, O3, PM10, and SO2 (and NOx for Barcelona only). From here, we have built a linear prediction model of the values recorded for each station according to the passing values of cars, motorcycles (which includes motorcycles and bikes), large vehicles (which includes buses and trucks) and the average speed of the cars. This model has been designed as a stratified one (i.e., there is a "sub-model") by sensor, pollutant, season, and date. The resulting correlation coefficients between these variables are shown in the figures below for Madrid and Barcelona respectively. These indicate whether a correlation exists between contamination (i.e. the pollutants measured by the air quality monitoring stations) and traffic measured by the Telraam sensors (i.e. the average hourly pedestrians, cars, bicycles, and heavy vehicles).

Figure 47: Correlation coefficients between traffic and air pollution – Madrid (left) and Barcelona (right).



Although approximate and affected by the low number of sensors as well as by the non-optimal positioning of the air quality monitoring stations (compared to the localization of participants), some interesting

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

findings emerged. Overall, with this correlation model, results show that 42.6% and 49.8% of the variability of air pollution levels is linked with the traffic counting vehicles from the Telraam sensors in Madrid and Barcelona respectively. In both cities, the significant variables in the model (that is, those that actually have an effect) are the number of cars and the number of large vehicles (with a stronger correlation with heavy vehicles than traditional cars in Madrid). According to this model and the open data available, the number of bicycles (and motorcycles) and the average speed do not have an effect on pollution. Interestingly, results show that the average number of pedestrians have a higher correlation coefficient with air pollution, and specifically with the concentration of carbon monoxide (CO), nitric oxide (NO), and nitrogen dioxide (NO2). Obviously, we do not interpret this result as indicating that pedestrians have a high impact on contamination. Rather, we believe that a high number of pedestrians is an indication of a higher overall mobility in the area, i.e. whereby more cars, bicycles, and heavy vehicles circulate.

Concluding, this exercise was useful to: (1) experiment possible data analysis solutions to inform the remaining WeCount case studies; (2) as an input for discussion during the workshops; (3) to create a methodological foundation and the linear model for further integrating other types of data and combining these with traffic data measured by the Telraam sensors.

Results from the biosensors analysis, i.e. the average air pollution levels in people's places measured between October and December 2020, will inform a more detailed analysis across sensors in addition to providing single participants with further data to interpret these relationships.

4.4 Participatory Data Analysis and Awareness Workshops

According to the citizen science methodology guiding this project and this case study, the core of the data analysis process was about conducting online workshops with participating citizens. Initially the plan was made to carry out dedicated workshops for specific communities and/or areas (e.g. neighbourhoods) to achieve more detailed and situated findings and conclusions. However, as underlined above, this was not considered as a strategic decision as the wide distribution of a low number of sensors wouldn't have allowed solid conclusions to be reached. We therefore organised two online analysis workshops (one for Madrid and one for Barcelona) where we invited all members and counters from the two cities.

The structure of the workshops was similar for both cities and the agenda included:

1. A recap of WeCount and what had been done until that point in time.
2. A presentation and discussion of the descriptive analysis conducted (and presented above): this phase tackled all steps of descriptive analysis and for each step included a brief moment of reflection where participants could share their opinions. This section was made more enjoyable by including games to keep participants active. These included for example questions such as: *what street experiences a higher average number of cars per hour? What day of the week is the most challenging from a traffic perspective?* (among others). As part of this phase, participants related the aggregated findings to their individual sensors. Interpretations were also conducted at the individual level within the workshops. In other words, participants had the opportunity to share additional opinions around interpretations of the data provided. Examples are very road and sensor specific and include aspects such as: "the number of pedestrians in my street is very low, but it should be considered that the sensor only covered one sidewalk". This phase also included reflecting on the impact of COVID-related restrictions (i.e. showcasing a comparison between before and after - as shown in the figure below for one specific street) and on speed compliance (see example in the second figure below).

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 48: Example of slide used for reflecting on COVID impact on mobility in one street.

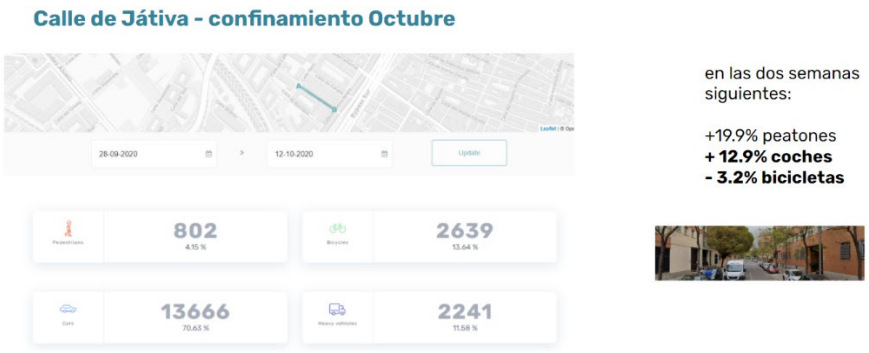


Figure 49: Example of slide used for reflecting on speed compliance.

3. A presentation of the results of crossing air pollution and traffic data.
4. A participatory session divided into two main parts:
    a. In the first part people were asked to work with their own sensor and to fill a template we have previously developed. Those participants that joined the workshop as WeCount members and/or volunteers (i.e. those that did not host a sensor) were assigned one. One exemplary template used in Madrid is proposed below (the specific template asks participants to access their portal and fill information on the percentage of heavy vehicles and the average speed).

Figure 50: Example of slide used for individual sensor-specific exercise.

This first participatory exercise had multiple objectives and benefits. First, participating citizens were trained and guided on how to explore and understand the data provided by the platform into each sensor's profile. Second, it allowed a debate among participants based on actual, and specific, numbers as opposed to the overarching descriptive diagrams presented earlier. Third, we went beyond simply reporting data immediately available in the platform (e.g. number of cars during the last month) by asking questions that required a minimum level of exploration

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

in the related profiles. In general, people were able to find the relevant information to fill the template, which consisted of a good result in terms of demonstrating their ability to read, understand, and interpret the data provided in the platform. This was an important objective of the overall project, i.e. transferring the required knowledge to participating citizens to interpret the sensed data independently. Further to this, another important, and more straightforward objective pursued in this step was about ensuring that participants gained knowledge about mobility in their streets. In this way, one of the most commented aspects across the two workshops was about speed compliance.

b. The second part of the participatory exercise revolved around proposing new courses of action informed by the overall intervention, the data collected, and the positioning of those proposed future actions based on the context as well as the actors involved. To guide the conversation, we proposed an activity articulated across three elements. First, we asked participants individually and we subsequently reflected collectively on the following question: *What other data do we need to complement the analysis?* In this sense, the reflection was on whether we should take actions towards developing a wider and enriched open dataset including additional data on e.g. noise and air pollution, urban design, time of commute, health, connectivity, safety, energy consumption, etc. The second element followed the same individual and group reflection process, and focused on the question: *What kind of action do we want to do with this data?* This was initially left as an open question. Inputs from participating citizens included: focus on influencing and enabling changes in current public policies and/or inform new ones, create communication campaigns, organize urban interventions, educational projects with schools, etc. Finally, we asked them: *What do we need to make it happen?* With respect to this last question, some highlights include: finding more traffic data (and deploying more sensors), integrating other types of data, inviting experts or politicians and organise policy-oriented debates and dialogues, getting financing or communication media's attention, etc. The overall outcome of this exercise referred to three possible courses of action, collectively agreed upon. These are presented and elaborated in section 4.5.1 below, together with a description on how we are currently acting upon these proposals looking forward.

5. Conclusions, general satisfaction survey (questions provided by the Monitoring and Evaluation team at UWE), and next steps. One of the key elements in this last step, also demonstrating to some extent the participants' will to act upon the measurements generated, they asked for reassurances for the data to be available beyond the end of the case study.

These workshops together with participants were very useful also to gather information and become aware about other independent actions undertaken by counters, informed by the data collected. A clear example of this came from one representative of the community *Fumuts Ros de Olano*. While we were completely unaware of this, the community has been active in engaging the local authority to propose and obtain a change in their street's speed limit (it is noted that the community was already established focusing on one street in Barcelona and was already active in citizen science and sensing activities in the street, although only with respect to air quality and noise pollution). More reflections on this and other actions from the case study are provided in the next section, "Bridge to the Policy Level".

In terms of participants to the online workshops, all members (i.e. counters and not counters) were invited to participate. A communication action has been planned and executed to reach as many potential participants as possible. In total, 35 participants attended the workshops (23 and 12 in Madrid and Barcelona respectively). As for the other workshops, and also according to the general feedback received, these were carried out during evening times. Some participants lamented not being able to attend. As done for previous workshops, the recordings have been shared on the local website. Feedback from their

experiences as well as inputs from their interpretation of the data collected by their sensors (as well as from the assertions made during the workshops) was gathered from them through emails.

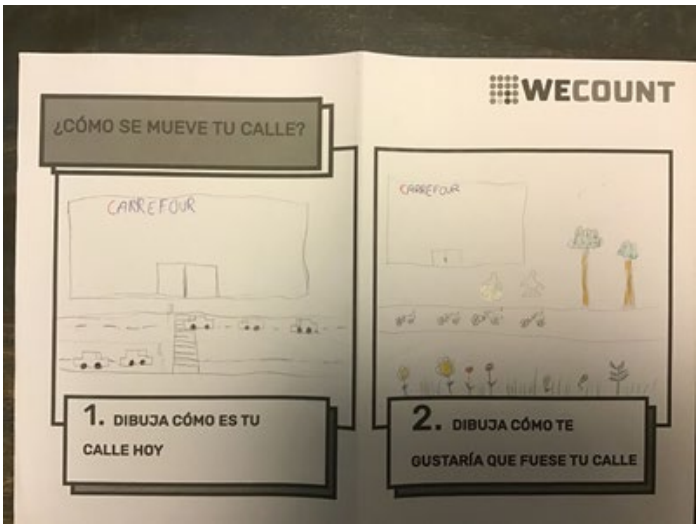
Table 7: Data Analysis and Awareness Workshops - participants overview.

Date	Community	Participants	Duration	Focus
27/1/2021	Community Madrid	23 - 52% female	90 minutes approx..	Data Analysis and Awareness
28/1/2021	Community Barcelona	12 - 25% female	90 minutes approx.	Data Analysis and Awareness

Further analyses will be conducted by the schools involved, at different levels. For example, the secondary school at Vicalvaro is planning to integrate activities for students to analyse the data from the Telraam API, as part of some technical modules. From the interaction at the University of Complutense in Madrid, one doctoral student is currently re-using the local Telraam generated data for his own scientific investigation, demonstrating how WeCount is also opening new avenues for academic research.

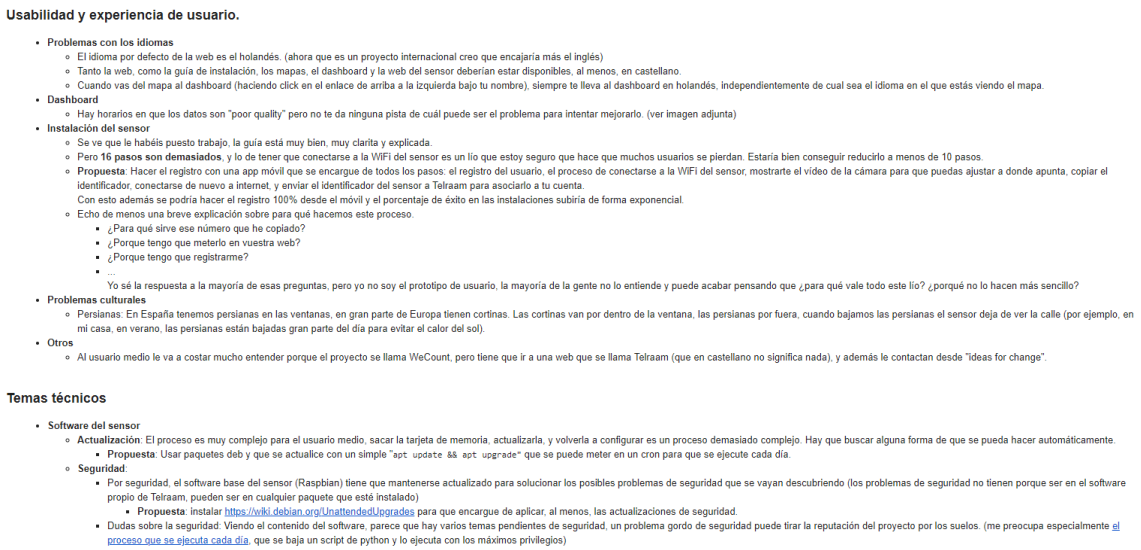
A different approach to data analysis and to propose future solutions was planned and executed with children from the primary school involved (students were 11 and 12 years old). During a dedicated workshop with them (20 participants), we did the following. We first started the workshop by explaining what mobility is. Following this part, we asked participating kids to draw on the left side of a canvas how their streets look like today. Second, following an extensive explanation of the concept of sustainable mobility, we organised a funny and simple visualisation of the data collected through the Telraam devices in the area, together with some simple games to stimulate their thinking and active engagement. Based on the data and sustained by the concepts of sustainable mobility introduced to the children, we asked them to draw how they would like their streets to be in the future on the right side of the canvas previously used. The figure below provides an example of this canvas drawn down by one of these kids.

Figure 51: Example of Draw Your Street WeCount Canvas – Getafe (Madrid).



Finally, other elements of data analysis were undertaken independently by users and some shared back their findings, feedback, and opinions through emails. These varied substantially from some general comments, to more detailed analysis and feedback around different topics. As an example, we received a very detailed document from one participant with high technical and digital skills. Without being asked explicitly to do so, he shared with us a detailed feedback (and proposed solutions) both from the user experience point of view and from the technical perspective. An extract from this document is provided in the figure below.

Figure 55: Document reporting independent technical analysis undertaken by one participant.



Usabilidad y experiencia de usuario.

- **Problemas con los idiomas**
  - El idioma por defecto de la web es el holandés. (ahora que es un proyecto internacional creo que encajaría más el inglés)
  - Tanto la web, como la guía de instalación, los mapas, el dashboard y la web del sensor deberían estar disponibles, al menos, en castellano.
  - Cuando vas del mapa al dashboard (haciendo click en el enlace de arriba a la izquierda bajo tu nombre), siempre te lleva al dashboard en holandés, independientemente de cual sea el idioma en el que estás viendo el mapa.
- **Dashboard**
  - Hay horarios en que los datos son "poor quality" pero no te da ninguna pista de cuál puede ser el problema para intentar mejorarlo. (ver imagen adjunta)
- **Instalación del sensor**
  - Se ve que le habéis puesto trabajo, la guía está muy bien, muy clarita y explicada.
  - Pero **16 pasos son demasiados**, y lo de tener que conectarse a la WiFi del sensor es un lío que estoy seguro que hace que muchos usuarios se pierdan. Estaría bien conseguir reducirlo a menos de 10 pasos.
  - **Propuesta**: Hacer el registro con una app móvil que se encargue de todos los pasos: el registro del usuario, el proceso de conectarse a la WiFi del sensor, mostrarte el vídeo de la cámara para que puedas ajustar a donde apunta, copiar el identificador, conectarse de nuevo a internet, y enviar el identificador del sensor a Telraam para asociarlo a tu cuenta.
    Con esto además se podría hacer el registro 100% desde el móvil y el porcentaje de éxito en las instalaciones subiría de forma exponencial.
  - Echo de menos una breve explicación sobre para qué hacemos este proceso.
    - ¿Para qué sirve ese número que he copiado?
    - ¿Porque tengo que meterlo en vuestra web?
    - ¿Porque tengo que registrarme?
    - ...
      Yo sé la respuesta a la mayoría de esas preguntas, pero yo no soy el prototipo de usuario, la mayoría de la gente no lo entiende y puede acabar pensando que ¿para qué vale todo este lío? ¿porqué no lo hacen más sencillo?
- **Problemas culturales**
  - Persianas: En España tenemos persianas en las ventanas, en gran parte de Europa tienen cortinas. Las cortinas van por dentro de la ventana, las persianas por fuera, cuando bajamos las persianas el sensor deja de ver la calle (por ejemplo, en mi casa, en verano, las persianas están bajadas gran parte del día para evitar el calor del sol).
- **Otros**
  - Al usuario medio le va a costar mucho entender porque el proyecto se llama WeCount, pero tiene que ir a una web que se llama Telraam (que en castellano no significa nada), y además le contactan desde "ideas for change".

Temas técnicos

- **Software del sensor**
  - **Actualización**: El proceso es muy complejo para el usuario medio, sacar la tarjeta de memoria, actualizarla, y volverla a configurar es un proceso demasiado complejo. Hay que buscar alguna forma de que se pueda hacer automáticamente.
    - **Propuesta**: Usar paquetes deb y que se actualice con un simple "`apt update && apt upgrade`" que se puede meter en un cron para que se ejecute cada día.
  - **Seguridad**:
    - Por seguridad, el software base del sensor (Raspbian) tiene que mantenerse actualizado para solucionar los posibles problemas de seguridad que se vayan descubriendo (los problemas de seguridad no tienen porque ser en el software propio de Telraam, pueden ser en cualquier paquete que esté instalado)
      - **Propuesta**: instalar https://wiki.debian.org/UnattendedUpgrades para que encargue de aplicar, al menos, las actualizaciones de seguridad.
    - Dudas sobre la seguridad: Viendo el contenido del software, parece que hay varios temas pendientes de seguridad, un problema gordo de seguridad puede tirar la reputación del proyecto por los suelos. (me preocupa especialmente el proceso que se ejecuta cada día, que se baja un script de python y lo ejecuta con los máximos privilegios)

In this case, feedback on the user experience was given about: inconsistent language on the website, data visualisation on the dashboard, installation process and supporting resources, cultural and urban design issues, and other. Technical feedback included: new version of the software, and security. This feedback was extremely valuable, and the participant has demonstrated to have spent significant time reviewing the software on GitHub and, most importantly, in providing ideas for solving the potential issues he identified. These were aggregated and transferred to the development team at TML, i.e. to inform activities in WP3. As another example, a participant has shared some feedback and desires for the future, including some observations and manual checks of the data gathered through the sensor. The participant shared his worry about the sensor not being fully able to classify objects in cases such as when "pedestrians go with a shopping cart", and also advocating for additional capabilities for distinguishing between motorcycles and bikes. Looking forward, he manifested the will to integrate noise pollution data and the desire to provoke debates to stimulate a stronger control of different regulations and subsequent enforcement of these.

4.5 Bridge to the Policy Level

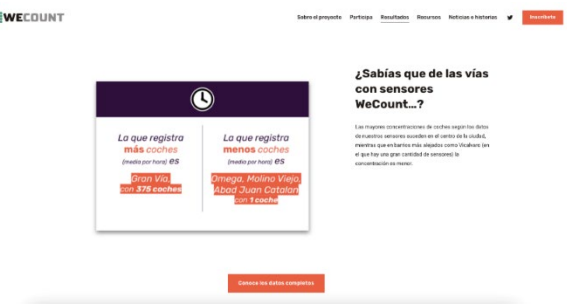
The last step within the Data Analysis and Awareness task of this WP, referred to facilitate and enable actions based on both the experience and the findings of the case study. In this way, we distinguish between three types of actions towards reaching policy makers, which are tackled separately below. These are:

- Actions and future activities co-designed together with participants at the participatory data analysis and awareness workshops.
- Actions we, as case study leaders, undertook and plan to carry out to connect with the policy domain and to transfer the knowledge and findings to relevant stakeholders.
- Actions carried out independently by WeCount communities to pursue their own interests and, sometimes, existing agendas.

More generally, from the results of the analysis conducted with participating citizens, we compiled a report for each city of insights informed by the data analyses described above. This includes an overview of the findings as well as a collection of ideas that citizens collectively believe to be useful in representing the current mobility situations in their streets and neighbourhoods, and that can therefore be relevant for local authorities. These reports are now available on the local website and were written using a format and language that is accessible and understandable by everyone, not only for those with technical and/or mobility-related domain expertise.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Figure 53: Example of extract of data analysis reports.



These are currently being actively disseminated leveraging the stakeholders engaged (see Appendix 1) and trying to reach as many as possible of those identified.

4.5.1 Actions and Future Activities Co-Designed with Participants

The first category of efforts to bridge to the policy level is the result of integrating the ideas emerged across the two participatory workshops described above. In particular, the participatory exercise conducted with participants to propose new courses of action from the results of and the experience in the case study (see point 5b in section 4.4). As an outcome of this exercise three categories of actions have been proposed by participant, discussed, and agreed upon:

- Create and maintain an education-oriented network to scale communities and the principles of WeCount beyond those that participated in the case study. Having schools involved in the workshop made it possible to start a debate on their potential role in maintaining a sustainable data infrastructure, and to make sure that the WeCount resources left as a legacy of the case study will be adopted for further, larger interventions. The idea emerged from participants here would be to establish community-based learning spaces and programs to foster behavioural change and a more effective transit to a more sustainable mobility in both cities.
- Design, plan, and implement a wide and creative communication and dissemination campaign to foster adoption and upscaling of WeCount principles and findings. This idea came from the acknowledgment of the power that today's social media channels and other platforms have in reaching large and diverse audiences, in different forms and formats, and, most importantly, in an interactive and participatory manner.
- Cross data comparison and integration: the overall process in the WeCount case studies focused primarily on collecting traffic data through Telraam sensors and relate it to air pollution data at two different levels: through the integration of open air pollution data from both the Madrid and Barcelona municipalities (it is again noted that the analysis was indicative and preliminary given the low amount of sensors); and, at the personal level, through the air quality data results provided by the biosensors. In addition, participants advocated their interest in seeing this initiative expanded towards also including noise pollution data as well as further data and information on road safety. According to participants' inputs, this should result in an integrated platform, where relevant citizen-generated data, open government data and other sources of data are visualised and made accessible to everyone.

These have been compiled, written and are being disseminated across all members of the case study as well as to other key stakeholders we have identified and engaged with throughout the process. Importantly, conscious that only a limited number of members actually attended the online workshops (it is once again noted that the recordings were made available online and we received additional inputs through email from those that could not attend but saw the recording afterwards, and this input has been taken into account) to give voice to everyone on how to prioritize and implement these three categories of actions emerged. To do so, when sharing the results, we promoted an online voting campaign so respondents can share their

opinion on which of these three categories of actions should be prioritised. This online voting campaign is currently ongoing - launched on February 11th - and is being conducted through a typeform survey[28]. In this survey we do not only ask for voting across these three proposed future actions, but also on explicitly mentioned whether respondents are willing to assume an active role in it, as well as what their proposed role would be.

The ones above, however, can be considered as overall actions from the case study. In addition, participants shared some street and location-specific proposals informed by their experience and the data collected. For example, some suggestions were made with respect to leveraging the Telraam data to provide a demonstration of speed compliance and put forward new policy proposals whereby specific limits are established for determined streets. For example, participants in Madrid proposed to establish within the urban area, limits of 30 km/h and 50km/h for urban streets with one way and one direction, and two ways respectively. Other people shared specific desires for fostering re-thinking and re-designing the space in their street with very specific suggestions. Since these were multiple and very specific, we opted for encouraging participants (with our support) to disseminate their inputs and proposals across social media, leveraging their networks and (when it was the case) their active communities, for achieving a wider reach.

It is reminded that these and all other related outcomes of the analysis processes undertaken are published on the local website separately for Barcelona and Madrid. The local team at IFC has now started a considerable dissemination and diffusion effort for these findings to reach the appropriate audiences, with a particular focus on the relevant city councils. Finally, in the coming weeks, we are planning to organise a local WeCount final event. This will represent an additional opportunity to disseminate the results of the local case study and, most of all, to ensure that citizens' proposals are clearly communicated and transferred to key stakeholders. We count on the partnership with MediaLab Prado in Madrid and with the Citizen Science Office in Barcelona to further foster the dissemination of these findings, thus ensuring that citizen voices will reach the relevant departments and stakeholders.

4.5.2 Actions for Bridging to the Policy Level

As shown above when describing our strategy to identify, target and engage stakeholders from the public sector domain, we undertook considerable effort throughout the case study in linking the local citizen science activity with policy makers. As also detailed in Appendix 1.3, we established key relationships with 8 public sector bodies. While two of these (i.e. city councils of Rubi and Sabadell) are currently planning to be "followers" of the WeCount project in their own locations (see section on Reflection and Legacy below), two formal partnerships have been established with entities within Barcelona and Madrid city council, i.e. The Citizen Science Office and MediaLab Prado respectively. As shown in the dedicated section above, in both cases the WeCount project has been published online on their webpages, which gives an important indication of their level of involvement and commitment in making sure that awareness about WeCount, its principles, and results is raised internally and, hopefully, followed up upon.

As said, in Barcelona, an important element in this way has been the strong involvement of the Citizen Science Office in the local case study. In general, these continuous interactions culminated in two main events:

- A brainstorming and participatory session in which WeCount was presented to representatives of the city council (event facilitated by the Citizen Science Office itself).

[28] https://ideasforchange1.typeform.com/to/oHagITzZ

- A Policy Masterclass to be delivered in September 2021 involving community champions, representatives of the local authority, and other stakeholders. This masterclass is established as part of linking to other EU citizen science projects, specifically with the Action H2020 project[29].

Regarding the former, this was conducted through a 90 minutes online event hosted by Barcelona City Council in which we discussed the process for translating data from the ongoing (and hopefully future) traffic measurements from citizens into contribution to mobility-related policies. The Citizen Science Office has committed to foster this uptake. In total, 22 people participated from the councils and other citizen science projects in the city. In addition, we discussed synergies with other citizen science and social innovation projects under their umbrella. For example, the ongoing ambitious project named *Protegim Les Escoles*[30] (i.e. we protect the schools) is currently planning for infrastructural interventions for ensuring a safer space for kids and students in the immediate proximity of 53 schools in the city. An example of intervention is about changing the entrance to the schools and creating a low traffic and/or green space around the new gate. Thanks to the effort of connecting WeCount to the local council, the project is currently planning to include WeCount resources and Telraam sensors to monitor the impact of these interventions in terms of traffic and speed reduction, and increased safety for kids. The implementation did not happen during the case study as the encrypted wifi problem persists and, so far, impeded installing sensors at their locations. At the time of writing this report, discussions are ongoing on whether they should install a new wifi network dedicated to the sensor or should wait until the problem is being addressed by the development team.

In Madrid, once again the strong and formal partnership with MediaLab Prado within Madrid City Council was the main aspect leveraged for bridging to the policy level. An online event called "From Citizen Data to Sustainable Mobility Policies" had been organised for December 19th, 2020 (registration for a maximum of 40 people was allowed by them). However, due to technical problems the event was cancelled at the time it was supposed to start. Still, we handed over the presentation to MediaLab Prado, but unfortunately the participatory exercises we planned with both policy makers and citizens were not undertaken.

Figure 54: WeCount Policy Event on MediaLab Prado's webpage.

Furthermore, in addition to these local actions and interactions, we engaged in other activities for fostering this bridging exercise beyond the case study in Spain. These were planned and conducted at the consortium level and were designed for a wider, European, audience of both practitioners and policy makers. Examples

[29] https://actionproject.eu/masterclass/

[30] https://ajuntament.barcelona.cat/ecologiaurbana/ca/que-fem-i-per-que/urbanisme-per-als-barris/protegim-escoles

include a presentation of the experience in Spain at the Urban Mobility Days, specifically within the parallel track entitled "Data-driven decision-making tools for small and medium-sized cities". In a similar conference format, a paper WeCount was also presented by IFC on the role of engagement toolkits at the ECSA conference in 2020 (a full list of these activities is provided in Appendix 3).

4.5.3 Actions Carried Out Independently by WeCount Participants

Finally, and of equal importance, we have become aware of some independent actions to translate the WeCount data into policy proposals by some of the participants involved. This is considered to be crucial evidence of the effectiveness of the Train-the-Trainer approach used in the case study. Indeed, following this method, we empowered individuals and groups of citizens to undertake these processes autonomously. As a lesson learned in this way, we observed that these actions were mainly conducted by communities that had some established presence and (citizen science) activities prior to the WeCount project. In this way, these represent important impacts of WeCount in Spain as, also according to the objectives outlined in the proposal, it demonstrates that communities have been empowered to address their own, situated and culturally-specific concerns, thus advancing their own agenda. However, the downside of this Train-the-Trainer approach (and of most open data-related initiatives) is the challenge in keeping track of these autonomous interventions. We were rarely notified of organised actions informed by the local case study, and we believe that there are more that we are not aware of. Two examples of these actions are provided below.

First, the community at *Ros de Olano* mentioned above is a very good example of this and of how WeCount in Spain, in addition to reaching objectives around raising awareness and developing skills, could contribute towards advancing existing citizen (scientists) agendas. This agenda may or may not be aligned with the participatory analysis process planned and undertaken for the overall WeCount communities in Madrid and Barcelona, but it is usually more situated and has a previous history of actions such as protests, activists-type of interventions and, in some rare cases, or participatory sensing. In their case (it is noted that this citizen community is focused on one street in Barcelona), they independently interacted with Barcelona City Council and, through showcasing the evidence collected in their street from the WeCount Telraam sensors, managed to have a change in the speed limit for this street, which was decreased to 10km/h (see related news published on the community's Twitter account in the figure below).

Figure 55: Community Fumuts Ros de Olano - evidence of change.

This, however, was not where they stopped. Actually, from the establishment of the new speed limit in late 2020, the participants hosting a Telraam in the street have been monitoring compliance to this new

regulation and have been very vocal in protesting about these limits not being respected by cars and motorcycles (see example of related post on the right side of the figure above).

As another example, we recently found an article in a local (neighbourhood-based) newspaper[31] describing some local citizens and WeCount participants, reporting data from their Telraam sensors. In the specific, the brief article reflects on the impact of closing two important streets for a short period of time on smaller surrounding streets. The article (which once again we were completely unaware of) compares measures obtained by the Telraam sensors before and during the closure, and lament that traffic has almost tripled in some specific smaller surrounding streets during that period.

Figure 56: newspaper extract on WeCount data used to address recent policies (p. 5)[32].

El tancament dels dies 4 i 5 va triplicar el trànsit als carrers secundaris

El comptador del projecte We Count del carrer Bellver va registrar en el tancament extra de carrers dels 4 i 5 de gener el triple de trànsit de cotxes, motos i bicicletes pels desviaments aplicats en aquest cas de Torrent de l'Olla. Dijous 7, per exemple, hi va haver uns 1500 vianants, 300 bicis o motos i 200 cotxes; en canvi, dimarts 5 van ser 1600 vianants, 800 bicis o motos i 600 cotxes.

While these two examples provide important evidence of actions implemented by participants to go beyond monitoring traffic to actually use this data to foster and enable change, some minor actions have been observed too. For example, a participant, through looking at the Telraam data, realised that several vehicles were travelling in the opposite direction. This motivated them to undertake a physical observation themselves and, besides realising that these vehicles were mainly those for road cleaning that needed to do a special manoeuvre, reported that several motorcycles were travelling in the opposite direction, sometimes on the sidewalk.

[31] available at https://www.independent.cat/noticia/42487/tancament-dies-4-5-transit-carrers-secundaris

[32] Full newspaper downloadable here: https://www.independent.cat/en-paper/655/numero-830

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

5 Reflection, Legacy, and Conclusions

The last phase of the case study was about reflecting on the overall process, as well as the outputs and outcomes of the intervention, and on planning for the legacy of the case study. Throughout its sections, this report provided several lessons learned from the case study, as well as reflections on what worked well and what did not across all the different phases. These lessons learned were shared with the overall WeCount consortium in an ongoing way, consistent with the need of this experimental case study to inform the remaining cases currently being carried out in Wales, Republic of Ireland, and Slovenia.

Overall, the case study was carried out consistently with the latest knowledge on citizen science. Participating citizens have been actively involved throughout the different phases, and it can be argued that the approach as a whole has been fully citizen centric. Citizens have guided and informed each phase of the research project, from problem formulation, through the co-design of the intervention and, in future, within the analysis, reflection and legacy phases. This ensures alignment with PE1, PE3, PE10 of the MORRI dimensions. Similarly, the main scope of our activities has not changed and thus is expected to contribute, directly or indirectly, to all the SDGs listed in the proposal.

In terms of legacy, it can be argued that the case study in Barcelona and Madrid has left several contributions which point towards different directions.

First, one of the main objectives of the project was to leave as a legacy a set of knowledge transfer resources as well as research and innovation tools to enable others to replicate the case study in other locations or to undertake other similar citizen science actions in the future. Together with the WeCount Citizen Engagement Toolkit, i.e. the outcome of WP2 which serves exactly this purpose, we have included in the case study website several tools and resources so others can conduct the same intervention autonomously. In particular, we leave as a legacy of this case study:

- All video and printed tutorials for: assembling the Telraam sensor, a printed step by step installation guide as well as a spoken video tutorial for this process.
- Engagement resources, adaptable and editable tools, and methods: these are the outcome of WP2 and include all resources designed and used for undertaking citizen engagement across all phases of the case study (a complete description is provided in Deliverable 2.1). As part of WP2, these resources will be uploaded online into existing citizen science platforms and will also be included in the local website, so it can become a one-stop place for future adopters where all information and resources needed to replicate WeCount can be found, accessed, downloaded, and adapted.
- Recording of both problem formulation and co-design and data analysis and awareness online workshops to provide actual instances and rich information about the overall citizen science actions and interactions and inspire future practitioners to undertake theirs.
- Editable and adaptable presentation templates as resources to minimise the effort for others to replicate the activities.
- Communication and dissemination templates designed specifically for the different stakeholders' groups.

Despite the urban design problem which will not be solved, we believe that this heritage can be exploited across all Spanish cities, towns, and villages. Given the fact that the Spanish case was exploratory in its nature, the starting point now is different and would allow for a more effective engagement and measurements. Indeed, it is once again underlined, that running the case study was challenging for the continuous changes in the process, the software, the platform, and other related aspects of participation. While this was aligned with objectives of this initial and experimental case study in WeCount, i.e. providing

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

feedback and improvement to enable and inform the cases in Slovenia, Wales, and the Republic of Ireland, this entailed continuous changes in the resources being developed. Participants were updated in due course about these new developments and we believe these changes have somewhat created confusions, especially for those community champions that have been involved throughout all stages, i.e. both in the Beta Pilot and the wider deployment. For example, a new, improved, version of the software was released by TML during Summer 2020. This entailed changes in the registration and installation processes as well as in the data platform. To accommodate these changes, we had to re-develop several resources (e.g. tutorial videos, step by step guides and manuals). Furthermore, those participants that had already received a sensor were asked to re-flash the SD Card with the new software. This was successfully done by those with digital skills, but others did not manage to do it. This created some challenges as we had to face participants with different versions of the software, therefore experiencing the overall process in slightly, but relevant, different ways. Now that both the cases in Leuven and Spain have informed re-development, a more coherent, stable, and enduring set of resources is available for others to independently start related actions. In addition, the demonstrated value of the intervention (see examples above of local impact) are expected to improve the scalability potential, according with the extant literature (Maccani et al., 2020)[33].

Moreover, the fact that both Madrid and Barcelona city council-related entities endorsed and integrated WeCount in their list of active projects fosters sustainability and replicability of the case study. In particular, an extensive effort has been made to transfer the knowledge to these bodies so they can promote and enact new actions in the near future. As a demonstration of the effectiveness of this approach some initial promising results are currently emerging. These are described next.

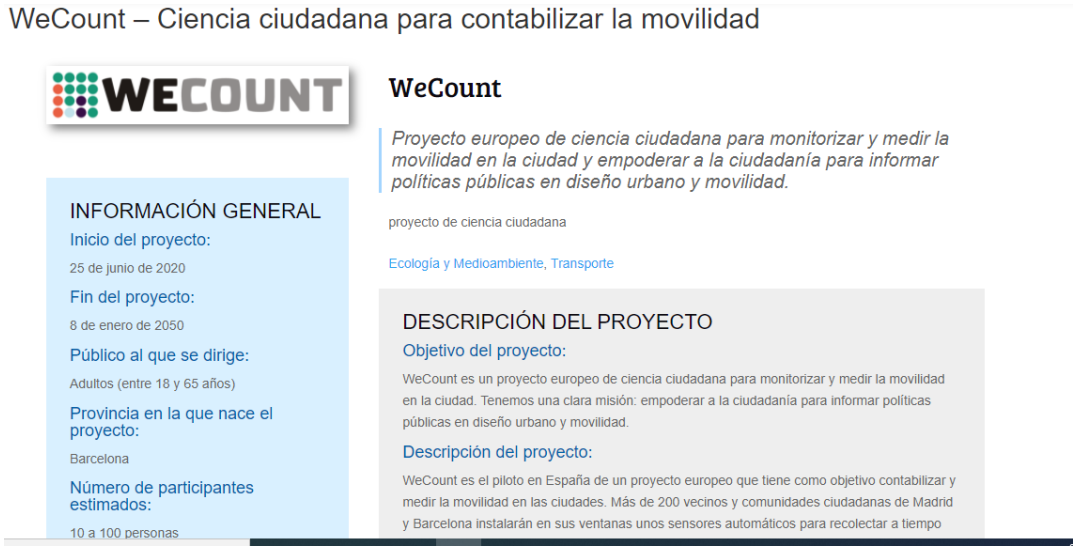
The city councils of Rubi, Sabadell, and Barcelona, based on the positive experiences during the WeCount pilot, have manifested their interest in leveraging the sensors and the knowledge environment we have created to run independent pilots in their municipalities. The City Council of Sabadell (small town in Catalonia) asked for a quote for 200 sensors, and acknowledged that no substantial support would be needed during their intervention as the available tutorials, toolkits, and digital, open, infrastructural architecture (i.e. the data platform in all its features), are self-explanatory and are seen as fully empowering. These have been introduced to TML, for a more consistent follow up on ordering and receiving the sensors. In a similar fashion, Rubi City Council has asked for a quote for a few dozens of sensors. The team at IFC is currently helping this entity in finding and assessing suitable locations to achieve a more accurate approximation of how many sensors can be consistently placed across the town. With respect to Barcelona, WeCount has inspired an existing ambitious local project to expand its scope. The project, officially called *Protegim les Escoles* (i.e. Protect the Schools), focuses on environmental monitoring and subsequent informed infrastructural interventions at school's places. The consortium, after learning about the WeCount project, after some representatives have been involved in it, and after sharing and discussing the details from our experiences and learning, are currently interested in installing a total of 80 sensors across the 53 schools involved in the project. Barcelona City Council has endorsed this proposal.

Concluding this first point, WeCount is now also present as part of the Citizen Science Observatory platform[34], an initiative seeking to enable continuity and a consistent link with practitioners beyond the end of given interventions. The webpage includes: general information (audience, how many participants can be included, dates etc.); description and objectives; process to be part of WeCount and resources needed; results; and impact to-date.

[33] 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.

[34] https://ciencia-ciudadana.es/proyecto-cc/wecount-ciencia-ciudadana-para-contabilizar-la-movilidad/

Figure 57: WeCount on the Citizen Science Observatory.



Second, the Train-the-Trainer approach has led to another legacy of the project referring to new communities that are actively involved in citizen science. WeCount in Spain has created new communities and extended the activities and scopes of existing ones in both Barcelona and Madrid in a way for these to be sustainable after the end of the project. The Train-the-Trainer approach taken through the implementation of a pre-pilot with community champions has allowed transferring the knowledge to those that can act as boundary spanner between research and citizens. According to the feedback received so far (in compliance with the requirements of WP5) by the members of the Madrid/Barcelona WeCount network, participants have acquired knowledge with respect to two general themes: (1) sustainable mobility (including but not limited to traffic counting techniques, traffic and urban design, the concept of "cities in 15 minutes", air quality). It is noted that the work conducted within WP2 is already contributing to the sub-objective of "WeCount will contribute new scientific knowledge in the field of citizen science concerning the methods to involve citizens in traffic counting interventions"; (2) internet of things and knowledge about low cost sensors, software and hardware, as well as data management and visualisation; (3) citizen science and specifically how to conduct research projects involving communities of citizens across all phases, from the participatory problem formulation, throughout co-design, data collection and analysis processes, until actions and reflections.

Third, indirectly, we raised awareness about knowledge and state-of-the art approaches at the intersection between citizen science and sustainable mobility among thousands of people, including citizens, academics, industries, and the public sector (see dissemination and awareness impact in section 2.10). The dissemination activities undertaken within Spain have been extremely effective with WeCount appearing on national and local newspapers, TV channels and in other media (see Appendix 2). The partnerships established with several entities such as MediaLab Prado, Adigital, Tienes Sal, The Citizen Science Office, and Smart Mobility are further contributing to a substantially increased outreach of the project communication and dissemination. Awareness is also being built through mapping several hundred points in both Barcelona and Madrid with information about air quality (the exact number is still pending - we expect that between 700 and 800 individuals have returned the leaves of their strawberry plants, i.e. the air quality bio sensor).

Fourth, at a broader level, IFC is actively contributing to the development of academic related outcomes (see Appendix 3). This is being done both through the provision of research data (not only from sensors, but also including qualitative and quantitative data from the different phases of the intervention), and

through contributing to the ideation, writing, and presentation of, so far, intermediate outcomes from the overall project across cases.

Fifth, we are confident that communities engaged in WeCount are continuing their sensing activities and keep pursuing their individual, often very localised, agenda. As underlined above, despite the evidence we found of actions and follow ups (e.g. from the community of *Ros de Olano*), we believe other communities are acting similarly. As an indication for this, we observed that several sensors are still active even after the data analysis and awareness workshops have been conducted - i.e. when data collection for the specific purpose of WeCount RIA has been completed.

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 1: Stakeholder Engagement

1.1 Civic Society and Citizen Communities

Stakeholder	Type	Interactions	agreed involvement	actual involvement
Red de Huertos Comunitarios de Madrid	Citizen community	Email and workshops	Active participants	Participated as counters
COFAPA Madrid	Association of parents of school kids	Email and online meeting	Helping with dissemination and recruitment	Little communication from their media
Huertos in the Sky	Citizen Community	Email and part of all Beta Pilot workshops	Active participants	A representative participated in the beta pilot. Her experience was not optimal as the data from the sensor was not reliable because of unsuitable view. Helped with dissemination.
Connecthort	Existing citizen (science) community	Email conversations and workshops	Agreed to act as community champion (only after having experienced it)	Actively part of the case study as counters.
Associació Catalunya Camina	NGO active across the region	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Unknown
Influencer A	Local influencer and potential community champion	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Little communication from her media channels
Influencer B	Local influencers and potential community champion	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Little communication from his media channels
Influencer C	Local influencers and potential community champion	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Little communication from her media channels
Influencer D	Local influencers and potential community champion	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Unknown
Influencer E	Local influencers and	Email conversations	Discussed wider involvement,	Unknown

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

	potential community champion		Helping with dissemination and recruitment	
Influencer F	Local influencers and potential community champion	Email conversations	Discussed wider involvement, Helping with dissemination and recruitment	Little Communication from his media channels
Comunidad Igualada	existing citizen (science) community	Email conversations and online meeting	Discussion about mini case in Igualada. Minimum requirement set to 10 suitable participants to have meaningful data. Agreed to investigate.	Could not find 10 suitable participants.
Biodiversia	existing citizen (science) community	Email conversations and workshops	Agreed to be part of the case study	Part of the case study as counters. Active participation at workshops
Influencer G	Community Champion technical skills	Email conversations and workshops	Agreed to be part of the case study. Propose to give technical feedback.	Part of the case study. provided extensive technical feedback on: the hardware, the software code and the overall installation and UX angles.
Stop Contaminació BCN	Local activists including several citizen groups	emails and face to face conversations at a public protest	Discussed active involvement, Helping with dissemination and recruitment.	Some communities' representatives joined the case study.
Asociacion el Carmel	Civic Association	Emails and meetings	Agreed to support strawberry plants delivery.	Mounted a stand, showcased the sensor, promoted WeCount, and distributed 120 plants.
Tienes Sal	NGO	Emails and meetings online	Agreed to help with dissemination and diffusion and to support workshop activities.	Strong help in diffusion from their networks. Formal partners of WeCount case study. Also, part of the case study as counters.
Comunidad Ros de Olano	Citizen community active in citizen science	Emails and part of workshops	Very interested and active.	Full involvement from beta Pilot until end of the case. Very active in dissemination. Interviewed at home by a TV program about WeCount. Independently run advocacy activities informed by WeCount data. Community champions.
Eixample Respira	citizen community interested in	Face to face and online meetings	Agreed to help disseminating the project in the	Helped with dissemination. Most people of the community did not meet the

	citizen science		community	requirements.
Influencer H	Local influencer and potential community champion	Meeting online	Agreed involvement	Active in communication and dissemination
Teamlabs	Citizen Community	Online meeting	Discussed active involvement, Helping with dissemination and recruitment.	Unknown
Tejeredes	Local influencers	Online meeting	Discussed active involvement, Helping with dissemination and recruitment.	Unknown
FAPAC	Federation of families of school kids	Meeting	Discussed active involvement, Helping with dissemination and recruitment.	No follow up.
Comunidad del Sol	citizen community interested in citizen science	Online meetings and workshops	Very interested. Agreed to fully endorse the project	Published 3 articles in the local newspaper, introduced and promoted WeCount to the overall community.
Sarriá Respira	Citizen community interested in environmental monitoring and citizen science	Series of meetings and workshops	Interested in setting up a dedicated pilot in the neighbourhood. Asked to start in September 2020 as interested in traffic during school time	Part of the Beta Pilot. Due to COVID (i.e. schools were closed) and not suitable windows in the community the data collection was integrated with the overall case study.
Olot Community	citizen community active in citizen science	series of online meetings	Very interested. Agreed to set up a mini case study in Olot.	Part of the beta pilot. Investigated suitability of participants but "only one out of 15 people initially interested met the requirements".

1.2 Public Sector

Stakeholder	Type	Interactions	agreed involvement	actual involvement
MediaLab Prado	Madrid City Council	Continuous interactions.	Full formal partners of case study.	Strong involvement across all actions and phases. Active counters in the case study.

Oficina de Ciencia Ciudadana	Barcelona City Council	Continuous interactions.	Partners and support in Barcelona for strawberry plants delivery, promotion of wecount and dissemination and disseminating results within the council	All support has been actually delivered (details in the text).
Road Safety representative	Road and Transport dept. in Barcelona City Council	semi-structured interview	Interested in seeing the data from WeCount experiment and agreed to help disseminating results within local authority	Strong help in dissemination. Did not participate as a counter as did not meet requirements.
UN Habitat Urban Resilience Hub	NGO	Email conversation	Discussed wider involvement, helping with dissemination and recruitment	Little communication from their network observed.
FECYT	Ministry of Science and Technology	facilitated by Ibercivis - next row.	their initiative incorporated within WeCount	Partners in the strawberry campaign
Vigilantes del Aire	Initiative by Ibercivis	Emails and meetings	Their initiative incorporated within WeCount	Partners in the strawberry campaign and responsible for the bio magnetic analysis.
Ayuntamiento de Rubi	Rubi City Council	Series of online meetings	Interested in setting up a suite of sensors in the town.	Asked for a quote to buy 80 Telraam sensors.
Ayuntamiento de Sabadell	Sabadell City Council	Series of online meetings.	Interested in setting up a suite of sensors in the town.	Asked for a quote to buy 200 Telraam sensors.

1.3 Private Sector

Stakeholder	**Type**	**Interactions**	**agreed involvement**	**actual involvement**
Innomads	Association of real estate companies	Online meeting	Interested at a personal level and said will help with dissemination. Not interested at work level.	Dropped interest when proposed to install sensors in their real estate locations to add info that may help in assessing value of a place.
FabLab Barcelona	Maker Space	Series of face to face and online meetings	Reviewed the sensor hardware and tried for adaptations to the context.	All potential solutions identified (see above) were found to be not feasible.

Adigital	Association of businesses - Director of Marketing and Communicatio n	Series of online meetings, workshops.	Agreed to become full partners in Madrid. Proposed to host an analysis workshop and to provide some expert speakers.	Active involvement in the case study, and strong help with communication and dissemination. Continuous interactions. Physical analysis workshop at their place was cancelled due to COVID.
Smart Mobility	Business cluster for sustainable mobility	Series of online meetings, workshops	Agreed to become full partners in Madrid	Active involvement in the pilot, and strong help with communication and dissemination
Raons Publiques	Architects	Online meeting	Agreed involvement mainly in dissemination	Active in communication and dissemination.
Mobility Commission at 22@	Panel of mobility companies within the 22@ Smart District in Barcelona	Online meeting, and WeCount industry focus group.	Interested in being part and setting up a pilot in their own area. Agreed to help in dissemination through their newsletter.	Followed up once communicating they could not find suitable locations. helped with dissemination through their newsletter. Interested in setting up a larger data platform for the area beyond Telraam.
Betevé	Regional TV Broadcasting company	online meetings and face to face interview and recording	Agreed to disseminate the project.	Interview to one member of IFC and to one participant in his home. Broadcasted on regional Catalan TV
Sentilo	Data Platform company	Online meeting	showed interest in the data and integrating the traffic data into their city wide platform. Discussion on potential other uses of the data.	Explored Telraam API and no further follow up. Unknown whether data have been used and/or downloaded.
Ana Villagordo Consulting company	Sustainable design	email conversations with the director	Discussed wider involvement, helping to disseminate the message and to recruit participants	Unknown
Abacus Shops	Shops	Emails and meeting	Agreed to support WeCount	Mounted WeCount stands for three days in 6 of their shops.

Impact Hub	Co-Working Space on social innovation	Emails, face to face meeting. workshops	Agreed to support WeCount and to be part of the case study.	Mounted WeCount stands for three days in their offices. Part of the pilot in BCN
Attico	Co-Working Space	Emails, face to face meeting, workshops.	Agreed to support WeCount and to be part of the case study.	Mounted WeCount stands for three days in their offices. Part of the pilot in BCN. Part of the case study as counters.
Kubik	Co-Working Space	Emails, face to face meeting	Agreed to support WeCount	Mounted WeCount stands for three days in their offices. Part of the pilot in BCN. Could not connect the sensor to the encrypted wifi.

1.4 Schools and Academia

Stakeholder	Type	Interactions	agreed involvement	actual involvement
Technologist A	technologist and practitioner with experience in traffic counting	face to face technical meeting	Agreed to help in exploring alternatives to Telraam that suit the urban design, leveraging his experience in Bluetooth based solutions for counting traffic in Barcelona.	Brainstorming sessions: he experienced devices similar to Telraam, but not successfully. He commented that these sensors are not suitable for Spanish cities' urban design: "you have a problem here" he commented.
Technologist B	Technologist and practitioner in citizen science	online meeting	Very interested. Discussion about the technology, the UX, and the suitability to the context. Discussion on setting up a mini case in his town.	Dropped down when unable to find enough suitable participants
Technologist C	Technologist and Assistant Professor University of Bonn	online meeting	Agreed to help with data analysis and to exploring new visualisations	Did not follow up after some good insights which were taken on board.
Technologist D	IaaC and FabLab BCN	Face to face meeting and online meeting	Discussed re-design of Telraam to suit external environments (i.e. inclusion of battery and/or	Conclusion: not doable because of power consumption of Telraam and, more generally of Raspberry Pi (see above).

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

			development of a supporting box for the sensor).	
Instituto Pirenaico de Ecología	Bio Lab	emails and meetings	Their initiative incorporated within WeCount	Partners in the biosensor sensing campaign; responsible for bio magnetic analysis.
ISGlobal	Public Health Research Institute	2 online meetings	Interest in being part of the case study and installing the sensor. Committed to check the conditions of the potential places.	Only two people participated in the Barcelona case study. Ongoing discussion on introducing Telraam sensor in other projects they have.
IES Joaquín Rodrigo de Vicalvaro	High school	Several online meetings, workshop, part of the case study	Agreed to be a community champion within the school and with parents. Pilot has started a workshop with kids and parents has been delivered.	Active counters and active contributions to problem formulation and scoping, counting, and data analysis.
Institut Escola Coves d'en Cimany	School	Online meetings	Students will check requirements. Call scheduled. Will give a lecture in the school about mobility and wecount.	Unknown, we assume some are part of the case study either as members or as counters. Delivery of the lecture was not feasible because of COVID.
Instituto Leon Felipe Getafe	Primary school	Online meetings and dedicated workshop	Full involvement in the case study.	Parents have applied for receiving a sensor. Children have contributed with their perceptions on interpretation of the data collected and in envisioning streets of the future.
Complutense	University	Meetings and dedicated workshop	Part of the case study. Students and lecturers applied for obtaining a sensor.	Vast majority could not meet the requirements. Only 3 sensors were finally distributed from the over 70 people interested.

1.5 Partnerships Established of WeCount Bio Sensor Campaign

Distribution network by district (Barcelona)	**Sant Martí**	Bookstore Abacus Poblenou
		Co-working space Impact Hub
		Co-working space: Attico

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

	Sant Andreu	Bookstore Abacus Fabra i Puig
	Horta-Guinardó	Local association: Pagesos El Carmel
	Gràcia	Local market: Mercat de Pagès Vallcarca
		Co-working space: L'Hort Coworking
		Co-working space: Kubik
		Civic centre Vil·la Urània
	Eixample	Civic centre Fort Pienc
		Bookstore Espai Abacus
		Bookstore Abacus Urquinaona
	Les corts	Co-working space: Attico
	Ciutat Vella	Ideas for Change office
		Centre Cívic Pati Llimona
	Sarrià-Sant Gervasi	School: Institut Montserrat Roig
		Co-working space: Attico
	Sants-Monjuïc	Bookstore Abacus Sants
		Mercat de la Terra
Distribution point (Madrid)	**City Centre**	Medialab Prado

The WeCount Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 872743

Appendix 2: Communication and Dissemination

2.1 Third parties Communication and Dissemination Items and estimated outreach

Title of publication	Title of the medium	Date	people reached (estim.)	Website
Un proyecto colaborativo para instalar sensores y observar el tráfico desde los hogares europeos	Ferrovial	4/3/2020	NA	https://blog.ferrovial.com/es/2020/03/un-proyecto-colaborativo-para-instalar-sensores-y-observar-el-trafico-desde-los-hogares-europeos/
Front preliminar per evitar contaminació ambiental i acústica després del virus	L'Independent de Gràcia	17/4/2020	NA	http://www.independent.cat/2020/04/17/front-preliminar-per-evitar-contaminacio-ambiental-i-acustica-despres-del-virus/
We Count ja aterra els sensors a Gràcia	L'Independent de Gràcia	23/5/2020	NA	http://www.independent.cat/2020/05/23/we-count-ja-aterra-els-sensors-a-gracia/
We Count ja aterra els sensors a Gràcia	L'Independent de Gràcia	23/5/2020	NA	http://www.independent.cat/2020/05/23/we-count-ja-aterra-els-sensors-a-gracia/
Ros de Olano a We Count: 5.000 vehicles i 500 vianants diaris	L'Independent de Gràcia	14/6/2020	NA	http://www.independent.cat/2020/06/14/ros-de-olano-a-we-count-5-000-vehicles-i-500-vianants-diaris/
El projecte We Count arrenca oficialment amb 200 sensors	L'Independent	28/6/2020	NA	http://www.independent.cat/2020/06/28/el-projecte-we-count-arrenca-oficialment-amb-200-sensors/
WeCount: 200 sensores en Madrid y Barcelona medirán la movilidad urbana	Adigital	7/7/2020	NA	https://www.adigital.org/wecount-200-sensores-mediran-la-movilidad-urbana-en-madrid-y-barcelona/
Vecinos colocarán sensores en su ventana para mejorar el aire y la movilidad	EFE	11/7/2020	NA	https://www.efe.com/efe/espana/destacada/vecinos-colocaran-sensores-en-su-ventana-para-mejorar-el-aire-y-la-movilidad/10011-4294576
Vecinos pondrán sensores en su ventana para mejorar el aire y la movilidad	EFE Verde	11/7/2020	NA	https://www.efeverde.com/noticias/vecinos-pondran-sensores-ventana-mejorar-aire-movilidad/
Vecinos de Madrid y Barcelona colocarán sensores en sus ventana para mejorar el aire y la movilidad	Telemadrid	11/7/2020	83,198	http://www.telemadrid.es/noticias/madrid/Vecinos-colocaran-sensores-ventana-movilidad-0-2248875097--20200711114606.html
Vecinos de Madrid y Barcelona colocarán sensores en sus	Yahoo Noticias	11/7/2020	NA	https://es.noticias.yahoo.com/vecinos-colocar%C3%A1n-sensores-ventana-mejorar-

ventana para mejorar el aire y la movilidad				091043422.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAIYm63kzf30e-ATvU_iVwG4z5RReLFYNG8HM3Er3lykDPOE5GQU87VPH0QbQbLj-7-sgA42JbxRca_SUCCKFBjntfl8QFEsty3LVXlTuOlquV9s-rtfa_GKQf1xinXrSOQ8UAZmPKUKxTE8XTaNt9MxH_-49YMF8x-rnDbFaAB1Z
Vecinos de Madrid y Barcelona colocarán sensores en sus ventana para mejorar el aire y la movilidad	La Vanguardia	11/7/2020	482,000	https://www.lavanguardia.com/vida/20200711/482232860097/vecinos-colocaran-sensores-en-su-ventana-para-mejorar-el-aire-y-la-movilidad.html
Vecinos de Madrid y Barcelona colocarán sensores en sus ventana para mejorar el aire y la movilidad	COPE	11/7/2020	NA	https://www.cope.es/actualidad/sociedad/noticias/vecinos-colocaran-sensores-ventana-para-mejorar-aire-movilidad-20200711_810537
Vecinos de Madrid y Barcelona colocarán sensores en sus ventana para mejorar el aire y la movilidad	El Diario.es	11/7/2020	NA	https://www.eldiario.es/sociedad/vecinos-colocaran-sensores-en-su-ventana-para-mejorar-el-aire-y-la-movilidad_1_6097813.html
200 hogares ceden sus ventanas para medir el tráfico	Canarias 7	13/7/2020	91,000	
Más de 200 personas de Madrid y Barcelona pondrán sensores en sus ventanas para mejorar el aire y la movilidad	La Sexta	19/7/2020	NA	https://www.lasexta.com/noticias/sociedad/movilidad-sostenible/mas-200-personas-madrid-barcelona-pondran-sensores-sus-ventanas-mejorar-aire-movilidad_202007195f1419de8fbe650001cbe827.html
Barceloneses voluntarios ayudan a medir el tráfico en calles secundarias	La Vanguardia	24/8/2020	482,000	https://www.lavanguardia.com/ocio/viajes/20200824/483017613562/barceloneses-voluntarios-ayudan-a-medir-el-trafico-en-calles-secundarias.html
Una empresa mide el tráfico de calles secundarias de Barcelona	Metropoli Abierta	24/8/2020	NA	https://www.metropoliabierta.com/el-pulso-de-la-ciudad/empresa-mide-trafico-calles-secundarias-barcelona_30474_102.html
Barceloneses voluntarios ayudan a medir el tráfico en calles secundarias	ABC.es	24/8/2020	2,104,272	https://agencias.abc.es/noticia.asp?noticia=3478386
Iniciativa per mesurar el trànsit dels carrers secundaris amb l'ajuda dels barcelonins	Betevé	26/8/2020	NA	https://beteve.cat/ciencia-i-tecnologia/projecte-sensors-we-count-transit-carrers-secundaris-barcelona/
Fresas en tu balcón para conocer la calidad del aire que respiras	Nobbot	14/9/2020	NA	https://www.nobbot.com/futuro/fresas-en-tu-balcon-para-conocer-la-calidad-del-aire-que-respiras/

Vigilantes del aire	Meteored - Tiempo.com	15/9/2020	NA	https://www.tiempo.com/ram/vigilantes-del-aire.html
WeCount: 300 plantas de fresa para medir la calidad del aire en Madrid	Medialab Prado	23/9/2020	NA	https://www.medialab-prado.es/actividades/wecount-300-plantas-de-fresa-para-medir-la-calidad-del-aire-en-madrid
El proyecto de ciencia ciudadana WeCount medirá también la calidad del aire en Madrid y Barcelona	Adigital	25/9/2020	NA	https://www.adigital.org/el-proyecto-de-ciencia-ciudadana-wecount-medira-tambien-la-calidad-del-aire-en-madrid-y-barcelona/
¡Por una mejor movilidad!	Tienes Sal?	28/9/2020	NA	https://blog.tienes-sal.es/we-count/
Maduixes "vigilants de l'aire"	Institut Montserrat Roig Gràcia	29/9/2020	NA	https://agora.xtec.cat/iessecretaricoloma/portada/maduixes-vigilants-de-laire/
300 plantas de fresa gratis para medir la contaminación de Madrid	Time Out Madrid	30/9/2020	NA	https://www.timeout.es/madrid/es/noticias/300-plantas-de-fresa-gratis-para-medir-la-contaminacion-de-madrid-093020
300 plantas de fresa gratis para medir la contaminación de Madrid	rastreadosdechollos.com	30/9/2020	NA	https://rastreadordechollos.com/300-plantas-de-fresa-gratis-para-medir-la-contaminacin-de-madrid
RECOGE TU PLANTA DE FRESAS EN MADRID Y AYUDA A MEDIR LA CALIDAD DEL AIRE	Lahuertoteca	30/9/2020	NA	https://lahuertoteca.es/plantas-de-fresas-en-madrid-para-medir-la-calidad-del-aire
WeCount: 300 plantas de fresa para medir la calidad del aire en Madrid	Madrid.es - Madrid City Council	1/10/2020	NA	https://www.madrid.es/portales/munimadrid/es/Inicio/Cultura-ocio-y-deporte/Actividades-y-eventos/WeCount-300-plantas-de-fresa-para-medir-la-calidad-del-aire-en-Madrid/?vgnextfmt=default&vgnextoid=dee9a1b66ddd4710VgnVCM1000001d4a900aRCRD&vgnextchannel=6381f073808fe410VgnVCM2000000c205a0aRCRD
Fresas en los balcones para medir la calidad del aire en las ciudades	La Vanguardia	1/10/2020	482,000	https://www.lavanguardia.com/natural/contaminacion/20201001/483777251500/fresas-balcones-medir-calidad-aire-ciudades.html
Mil plantas de fresa medirán la calidad del aire en Madrid y Barcelona	EFE Verde	1/10/2020	NA	https://www.efeverde.com/noticias/mil-plantas-fresa-mediran-calidad-aire-madrid-y-barcelona/
Mil plantas de fresa en los balcones medirán la calidad del aire en Madrid y Barcelona	TeleMadrid	1/10/2020	47,123	http://www.telemadrid.es/noticias/madrid/Mil-plantas-mediran-Madrid-Barcelona-0-2273472650--20201001013507.html
Plantas de fresa en los balcones medirán la calidad del aire en Madrid	Gacetin Madrid	1/10/2020	NA	https://gacetinmadrid.com/2020/10/01/plantas-de-fresa-en-los-balcones-mediran-la-calidad-del-aire-en-madrid/

Planta medidora calidad del aire gratis en Madrid	Chollo.es	1/10/2020	NA	https://www.chollo.es/index.php/medialab-prado/planta-medidora-calidad-del-aire-gratis-en-madrid-124271?utm_source=widget&utm_medium=sidebar
Fresas contra la polución	Madrid es Noticia	2/10/2020	198	https://www.madridesnoticia.es/2020/10/plantas-fresa-calidad-aire-madrid/
Plantas de fresa medirán la calidad del aire en Madrid	Noticias de Madrid	2/10/2020	NA	https://noticiasdemadrid.com/tecnologia/02/10/2020/plantas-de-fresa-mediran-la-calidad-del-aire-en-madrid/13140.html
WECOUNT: 300 PLANTAS DE FRESA PARA MEDIR LA CALIDAD DEL AIRE EN MADRID	Madridcultura.es	2/10/2020	NA	https://www.madridcultura.es/evento/42584/wecount-300-plantas-de-fresa-para-medir-la-calidad-del-aire-en-madrid
Mil plantas de fresa medirán la calidad del aire en Madrid y Barcelona	Caixa Bank	4/10/2020	NA	https://agrobankcaixabank.com/Noticias/mil-plantas-de-fresa-mediran-la-calidad-del-aire-en-madrid-y-barcelona
Plantas de fresa medirán la calidad del aire en Madrid (Sección Postecnocracia con Marta Peirano) - Minuto 21:50	Radio Nacional España	6/10/2020	970,000	https://www.rtve.es/alacarta/audios/las-mananas-de-rne-con-pepa-fernandez/mananas-rne-pepa-fernandez-primera-hora-06-10-20/5677980/
WeCount + Plantas de fresa - Minuto 10:20	La 2 (La Metro)	6/10/2020	NA	https://www.rtve.es/alacarta/videos/la-metro/
Ubicación de WeCount: 300 plantas de fresa para medir la calidad del aire en Madrid	Agenda Hoy Madrid	9/10/2020	NA	https://agenda.hoymadrid.app/event/2020-10-09-7bda9f167e7850febae8616b2ef13b24a7715ce81ea463bfe8185440ac2ffa6e.html
WeCount + Plantas de fresa	TVE Catalunya	12/10/2020	NA	https://twitter.com/linformatiu_tve/status/1315655142839115776?s=20
TV Broadcasting TeleMadrid Live	TeleMadrid	13/10/2020	NA	Min 29:55 http://www.telemadrid.es/programas/madrid-directo/Madrid-Directo-2-2277392242--20201014120000.html
Más de 300 plantas de fresa en los balcones para vigilar la contaminación	Heraldo de Aragón	14/10/2020	NA	https://www.heraldo.es/noticias/aragon/2020/09/14/mas-de-300-plantas-de-fresa-en-los-balcones-para-vigilar-la-contaminacion-1395198.html#
Más de 300 plantas de fresa en los balcones para vigilar la contaminación	Heraldo de Aragón	14/10/2020	NA	https://www.heraldo.es/noticias/aragon/2020/09/14/mas-de-300-plantas-de-fresa-en-los-balcones-para-vigilar-la-contaminacion-1395198.html#
Daniel Bruno, encargado análisis científicos de Vigilantes del Aire explica el proyecto	Fundación IberCivis	13/11/2020	NA	https://ibercivis.es/daniel-bruno-explica-la-base-cientifica-del-proyecto-vigilantes-del-aire/

Vigilantes del aire' contra la contaminación	Heraldo de Aragón	26/11/2020	NA	https://www.heraldo.es/noticias/sociedad/2020/11/26/vigilantes-del-aire-contra-la-contaminacion-ciencia-ciudadana-1407124.html
El tancament dels dies 4 i 5 va triplicar el trànsit als carrers secundaris	L'Independent	23/1/2021	NA	https://www.independent.cat/noticia/42487/tancament-dies-4-5-transit-carrers-secundaris

2.2 Example of Communication efforts from alliances

- Adigital - 07/07/2020: *WeCount: 200 sensores en Madrid y Barcelona medirán la movilidad urbana:* https://www.adigital.org/wecount-200-sensores-mediran-la-movilidad-urbana-en-madrid-y-barcelona/ Mention: WeCount, IFC, European Commission.
- Medialab Prado - 24/09/2020: *El proyecto de ciencia ciudadana WeCount medirá también la calidad del aire en Madrid y Barcelona:* https://www.medialab-prado.es/actividades/wecount-300-plantas-de-fresa-para-medir-la-calidad-del-aire-en-madrid Mention: WeCount, IFC, European Commission
- Adigital - 25/09/2020*: El proyecto de ciencia ciudadana WeCount medirá también la calidad del aire en Madrid y Barcelona:* https://www.adigital.org/el-proyecto-de-ciencia-ciudadana-wecount-medira-tambien-la-calidad-del-aire-en-madrid-y-barcelona/ Mention: WeCount, IFC, European Commission.
- ¿Tienes Sal? - 28/09/2020: *Iniciativa WeCount:* https://tienes-sal.ghost.io/we-count/ Mention: WeCount.

2.3 Newsletters

- *¡Es hora de enviar las hojas de tu planta de fresa al laboratorio!* (https://mailchi.mp/15e133fca625/es-hora-de-enviar-las-hojas-de-tu-planta-de-fresa-al-laboratorio).
- *¡Ha llegado el momento de analizar los datos recopilados en tu ciudad!* (https://mailchi.mp/0c49264e35d0/jueguemos-con-los-datos-wecount).
- ¡*No lo olvides! Esta semana analizaremos los datos de movilidad recopilados en tu ciudad* (https://mailchi.mp/18cdd3d7fe26/recuerda-analisis-datos-wecount).
- *¡Descubre los resultados de WeCount e involúcrate en la próxima acción ciudadana para mejorar la vida en tu ciudad!* (https://mailchi.mp/a1a8ec39c01e/descubre-resultados-involucrate).

Appendix 3: Other Dissemination and Outreach Activities

- **Citizens4Science meeting**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, presented the project at the Citizens4Science meeting organised by Ideas for Change.
  Location: Onsite - Ideas for Change offices (Barcelona)
  Date: 6/02/2020 - 6:30 PM
  Organiser: Ideas for Change
  Link: https://www.eventbrite.es/e/entradas-citizens4science-vol-i-86796682213#
  Social media coverage:
  https://twitter.com/Ideas_4_Change/status/1225461017624313857?s=20 /
  https://twitter.com/Ideas_4_Change/status/1212749261928108033?s=20

- **Recuperem la Ciutat mobilisation**
  Description: The team attended the "Let's get our city back!" mobilisation to raise awareness of the project.
  Location: Barcelona (Passeig de Gràcia)
  Date: 11/06/2020
  Organiser: #RecuperemLaCiutat Platform
  Link: https://www.recuperemlaciutat.com/
  Social media coverage: -

- **Urban Mobility Days**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, participated in the panel "Data-driven decision making tools for small and medium-sized cities"
  Location: online
  Date: 1/10/2020 - 10:30 AM
  Organiser: European Commission / Eltis
  Link: http://www.eumd.org/programme
  Social media coverage:
  https://twitter.com/Ideas_4_Change/status/1311570702680682496?s=20

- **Citizen science and SDGs - Knowledge for Change - Berlin (Germany) and online**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, gave the lecture "Scalable by design: a Framework to design more impactful CS interventions" in the Evaluation of programmes and projects: instruments, outputs, outcomes session.
  Location: online
  Date: 14/10/2020 - 4:15 PM
  Organiser: Germany's 2020 EU Council presidency
  Link: https://www.cs-sdg-conference.berlin/files/assets/EU%20Citizen%20Science%20SDG%20Tagung/Programme/CS_SDG_programme.pdf
  Social media coverage:
  https://twitter.com/Ideas_4_Change/status/1315925378838466560?s=20 /
  https://twitter.com/Ideas_4_Change/status/1316729324024799233?s=20

- **ECSA Conference**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, gave the lecture "Citizen Science Toolkits"
  Location: online
  Date: 10/10/2020 - 4:30 PM
  Organiser: ECSA
  Link: https://www.ecsa-conference.eu/Conference_programme.pdf
  Social media coverage:
  https://twitter.com/Ideas_4_Change/status/1301520572808130564?s=20 /
  https://twitter.com/Ideas_4_Change/status/1302879275528249346?s=20

- **WeDiscover Days**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, participated in the workshop "How can citizens produce data to advance their own agenda"
  Location: online
  Date: 30/10/2020 - 6:00 PM
  Organiser: Universitat Pompeu Fabra (Barcelona)
  Link: https://www.upf.edu/web/e-noticies/categorias/-/asset_publisher/wEpPxsVRD6Vt/content/id/237863994/maximized#.YCZBQ5NKhTb
  Social media coverage:
  https://twitter.com/Ideas_4_Change/status/1319579319807561728?s=20

- **Webinar POLIS Mobilising Mobility: Data-driven Urban Mobility Planning and Citizen Science: a match made in heaven - WeCount and ClairCity**
  Description: Giovanni Maccani, coordinator of the WeCount pilots in Madrid and Barcelona, and Lucía Errandonea, participation manager, participated in this webinar.
  Location: online
  Date: 05/11/2020 - 2:00 PM
  Organiser: POLIS
  Link: https://polisnetwork.civi-go.net/civicrm/event/info?reset=1&id=126

Social media coverage: https://twitter.com/Ideas_4_Change/status/1321025645523197953?s=20 /
https://twitter.com/Ideas_4_Change/status/1324335662624083975?s=20