



CitiMeasure - using citizen measurements to create smart, sustainable, and inclusive cities

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Acronyms

BZK	Ministry of the Interior and Kingdom Relations of Netherlands
CoP	Community of Practice
CS	Citizen Science
D	Deliverable
DIY	Do-It-Yourself
EC	European Commission
ECSA	European Citizen Science Association
EIE	Empowerment, Inclusiveness and Equity
EU	European Union
JRC	Joint Research Centre
WG	Working Group

1 Executive Summary

Following a co-creation approach, members of each CitiMeasure working group (WG) discussed and agreed on key elements of an implementation plan to develop the three instruments, namely an implementation timeline, interaction moments (milestones), main tasks, roles of working group members, and means of communication. These elements were included in Deliverable 1.5 Draft Implementation Plan, which has been updated here by documenting the actual steps taken in the development and refinement of the CitiMeasure instruments. The current report thus describes the approach for both instrument development and piloting. This document also includes details about the governance of the project and lessons learned from its implementation.

2 Introduction

2.1 ABOUT CITIMEASURE

Citizen measurement, or citizen science, initiatives contribute to a sustainable transition in European cities. By using an array of tools and instruments, citizens can play a role in the measurement and monitoring of indicators on air quality, temperature, soil moisture, biodiversity, or risk management, among many other environmental areas. Citizen measurement initiatives also can foster communications and interactions among stakeholders and contribute to the democratisation of science and policy. The CitiMeasure project (2021-2023) aims to bring together the experiences and expertise of European cities, organisations and networks in implementing citizen science initiatives (in the form of guidelines, toolbox, web-platform, Apps, etc.). The project builds upon the lessons learned from the Dutch City Deal WGs, a network of stakeholders working on the broader area of smart cities, including citizen measurement initiatives. The City Deals are an instrument of the Dutch Ministry of Interior Affairs and Kingdom Relations. One of these is the City Deal 'A smart city'. CitiMeasure builds upon these experiences and has used those to develop and pilot three 'instruments', namely:

1. An instrument that allows the outputs of different city measurement initiatives to be compared.
2. An instrument that safeguards the digital inclusivity of city measurement initiatives (maximising the opportunities for participation of interested individuals and communities).
3. An instrument that connects information to behaviour and policy change.

A 4th WG, Strategy and Oversight, focuses on providing strategic direction and ensuring cohesion of activities across the three Instrument Sub-Groups and the project in general. CitiMeasure is also raising awareness of the importance of citizen measurement initiatives and capitalising on the results and tools of similar citizen science projects by creating an online European Knowledge Centre with a repository of good practices.

2.2. PURPOSE OF THIS REPORT

The primary purpose of this report is to present the final implementation plan that was used for developing and testing the three CitiMeasure instruments, and the critical milestones, activities, roles, and responsibilities for their successful development and piloting.

2.3 STRUCTURE OF THIS REPORT

Sections 3 to 6 form the final implementation plan. Specifically, Section 3 introduces the timeline and key milestones for each phase of the project. Section 4 describes the main tasks and roles in each of the three instrument WGs and pilots. Section 5 includes the governance and decision-making processes for the development of the CitiMeasure instruments. Finally, section 6 includes the lessons learnt throughout the implementation process and the concluding remarks of this report.

3 Timeline and milestones per phase of the project

3.1 INSTRUMENTS DEVELOPMENT PHASE

Given the fact that the overall timeframe for the development phase of the CitiMeasure instruments was shared across all instrument groups, and because all CitiMeasure WGs met monthly, a standard timeline with key milestones (e.g., interaction moments) was suggested for the development phase of the instruments (see Figure 1). As represented in Figure 1, the instrument development phase started in October 2021 and ended in April 2022.

Throughout the instrument development phase, the WGs met monthly in co-design/ co-creation sessions (seven in total) for a maximum of two hours. Annex 1 presents key tools that were used to support communication, interactions and information exchange among the members of the CitiMeasure WGs. The instrument development phase was divided into three main sub-phases: Share, Analyse and Develop.

- In the 'Share' sub-phase, participants provided documents and sources that were the basis for the development of the instruments. The CitiMeasure team designed draft structures for information gathering in a tabular format that the WG members validated during the second meetings of the WGs in November 2021.
- In the 'Analyse' sub-phase, participants jointly analysed the shared documents and additional sources that were found during the analysis process with the guidance of the CitiMeasure team. The main aim was to extract key learnings, best practices, and relevant knowledge for the instrument development. For that, the CitiMeasure team designed a draft structure for the analysis of these resources and validated that structure with the WG members during the WG meetings.
- In the 'Develop' phase, participants co-designed the structure of the instrument and provided inputs for its content development. Guidelines for the use of the instruments by the pilots were co-designed and were included in D1.7 Pilot Guidelines.

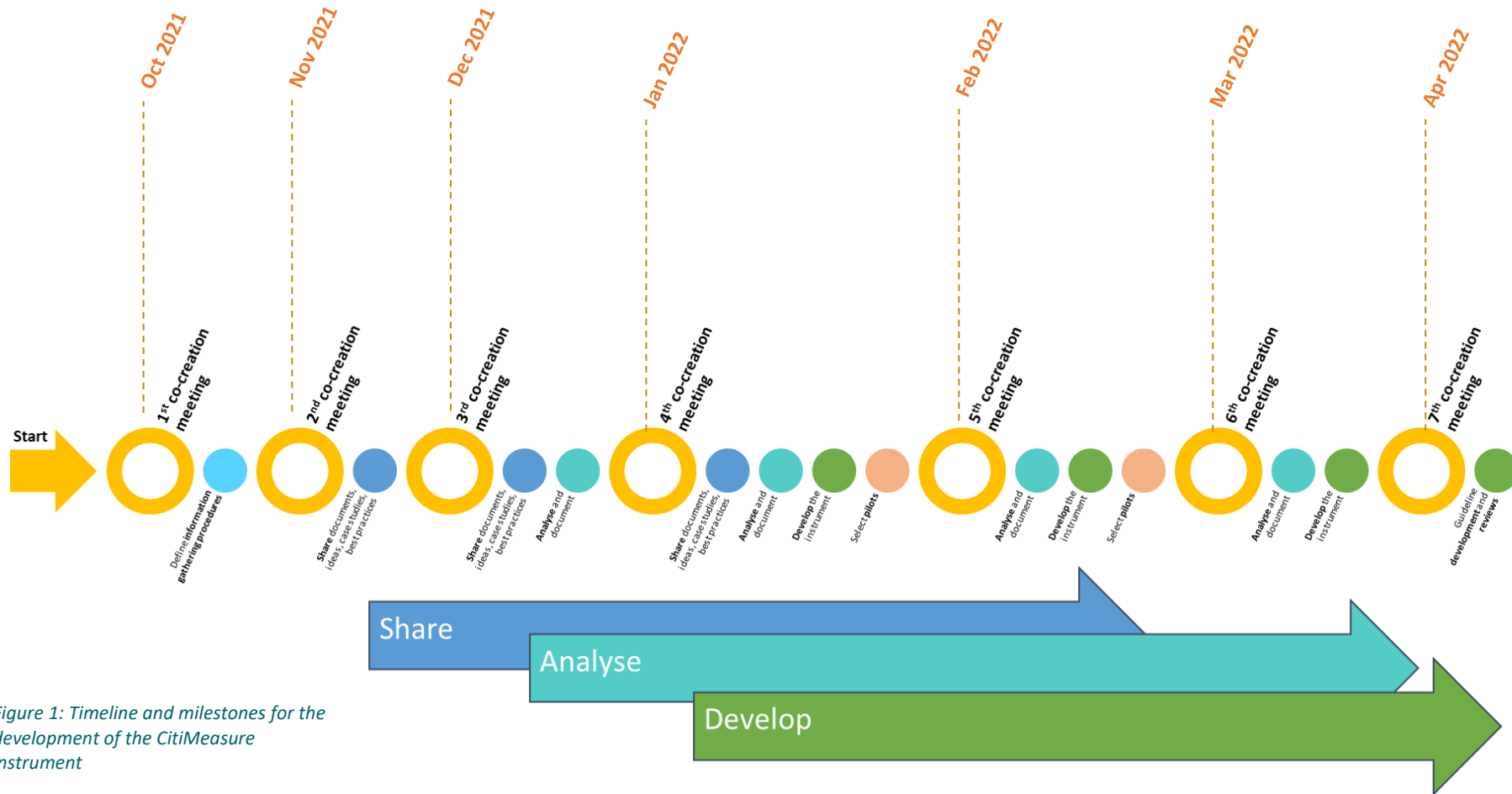


Figure 1: Timeline and milestones for the development of the CitiMeasure instrument

Table 1 includes a summary of each of the co-creation sessions of the three CitiMeasure WGs: Behaviour & Policy, Digital Inclusion and Comparability. In the first two meetings, the vision and objectives of the WGs were co-defined and validated. However, two different pathways started to develop after November 2021. While the Behaviour & Policy and the Digital Inclusion WGs started the instrument development, the Comparability WG changed its vision.

	Behaviour & Policy	Digital Inclusion	Comparability
September 2021	The inception of the working groups and co-creation on initial visions and objectives		
October 2021	Validation of the vision and objectives Discussions about implementation		
November 2021	Co-design of the structure for resource collection Discussions about implementation		Discussion about the vision of the working group and implementation plan
December 2021	Progress with resource collection Co-design of the structure for resource analysis Monitoring and evaluation		
January 2022	Progress with resource collection and analysis Co-design of the structure of the guidelines		Reformulation of vision of the working group Discussions about format of the tool
February 2022	Highlights of resource analysis and next steps		Co-design of the tool
March 2022	Working session to draft the guidelines		Co-design and technical discussions about the development of the tool
April 2022	Working session to draft the guidelines		Co-design and technical discussions about the development of the tool

Table 1: Summary of the co-creation meetings in the instrument development phase

The profile of the Comparability WG members was very diverse and they struggled to agree on a common vision. The members thus reformulated a new vision in January 2022 and the working group took a different approach to that presented in Figure 1. From February to April 2022, the Comparability WG members co-designed the structure of the comparability tool with the guidance and support of an external expert. This structure was then operationalised by a developer from May to September 2022. More details about the development of the comparability tool: CitiAIR can be found in D1.6 Prototype Instruments and D1.12 Final Instruments.

3.1.1 External support to develop the CitiMeasure instruments

The CitiMeasure WGs required external support with the following tasks:

- **Resource collection and analysis.** Given the large number of resources identified to develop the CitiMeasure guidelines on Behaviour & Policy and Digital Inclusion (i.e., more than 100), it was decided to sub-contract an external expert to support analysis of a sub-set of the resources. After an open call of expression of interest, Margaret Gold, an expert on citizen science, was sub-contracted to support the two working groups with the analysis of 20 resources.
- **Design of the structure of an interactive tool.** When the new vision and objectives of the Comparability WG were agreed upon, it was clear that an air quality expert needed to spend time on conceptualization of the instrument. The CitiMeasure team decided to hire an expert who understood the topic of air quality and had technical expertise. After an open call of expression of interest, David Riallant was sub-contracted to design the structure of the interactive tool, with the support of the Comparability WG members and the Eurocities team.

3.2 PILOT PHASE

The aim of the pilot phase was to test the applicability of the CitiMeasure instruments and, through that process, gather inputs for improvement of the instruments. The pilot phase provided an opportunity for hands-on use of the Behaviour and Policy, and Digital Inclusion guidelines, as well as operationalisation of the comparability tool developed by the CitiMeasure WGs. Specific lessons learned from the pilot cases were used to improve the structure and formulation of the guidelines, enhance technical details of the comparability tool, and provide empirical insights relevant for all CitiMeasure instruments.

The CitiMeasure pilot process included four stages, namely, Planning, Piloting, Feedback, and Refinement. Figure 2 provides a high-level summary of the four stages and the main activities at each stage. More details about the stages are provided in the following sections.

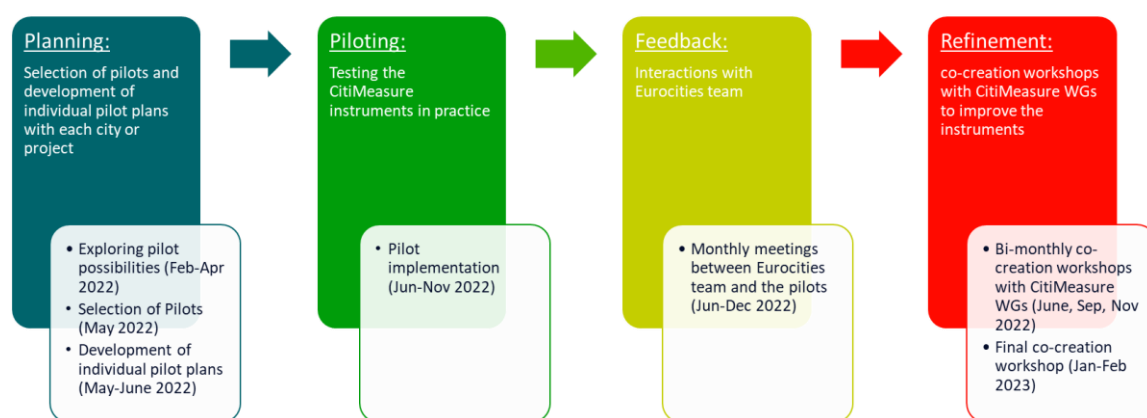


Figure 2: Four stages of the CitiMeasure pilot phase

3.2.1 Planning

The planning of the CitiMeasure pilot phase started with publishing an Expression of Interest (EoI) in February 2022. At the time of publishing the EoI, the first prototypes of the CitiMeasure instruments were still under development. The main aim of the EoI was therefore to explore and have an initial indication of the level of interest in piloting the instruments. The EoI was shared with the CitiMeasure working group members (and through them, with their networks), and the Eurocities network by means of three newsletters to the Environment and Digital (formerly Knowledge Society) Forums. On 15 March 2022, an information session was organised to provide more details about the pilot plans and requirements. The information session was attended by 20 individuals from 5 cities and 11 organizations. The deadline for completing the EoI was 30 March 2022 and in this period 9 EoIs were received from cities, organizations and projects who were interested in piloting the CitiMeasure instruments.

In addition to interest for piloting the CitiMeasure instruments, the main criteria for selecting the pilots included:

1. Feasibility of the desired pilot idea and scope
2. Alignment between the timeline of planned activities of the cities/initiatives and the timeline of the CitiMeasure pilot phase (May – December 2022)
3. Availability of resources (mainly dedicated staff and time) both at the pilot case, and at Eurocities

During April and May 2022, bilateral meetings with potential pilot cases were planned to start the discussions on the scope and feasibility of the pilots. Selected pilots continued meeting with the Eurocities team to work on development of an individual pilot plan during May and June 2022.

While a first selection of the pilots was completed in May 2022, the planning phase was slightly extended due to two main reasons: 1) building trust with potential pilots took time and 2) there was no one-size fits all approach and each pilot case had different needs and realities. This led to a delay in this phase and in the submission of the D1.8 Pilot Plans deliverable.

3.2.2 Piloting

In this stage, the pilot plans were executed in collaboration with the pilot teams. The length of this stage depended on the format of the pilots. In the case of the CitiMeasure project, the piloting of the instruments went from June to December 2022. Possibilities for piloting the CitiMeasure instruments were not limited, but some possibilities included:

- Creating an action plan for a city or citizen science project to apply certain recommendations from the Behaviour and Policy, and Digital Inclusion guidelines
- Tailormade training based on the content of guidelines and the needs of the pilot case
- Policy labs to discuss and disseminate recommendations of the Behaviour and Policy or Digital Inclusion guidelines
- Guided test of the comparability tool
- Guided feedback on the structure and content of the comparability tool

The following boxes provide details about the actual piloting of the CitiMeasure instruments.

Barcelona #1 **Both guidelines**



The pilot consisted of a three-step process:

- (1) An online needs assessment workshop, to identify the focus of the (training) workshops.*
- (2) Workshop on the Behaviour & Policy guidelines (in-person)*
- (3) Training workshop on Behaviour & Policy and Digital Inclusion guidelines (in-person)*

Smartwaterland (citizen science project in the city of Roeselare) #2

Behaviour and Policy guidelines



The pilot consisted in selecting recommendations from the guidelines:

- To strengthen the communication efforts of Smartwaterland by developing a communication plan to disseminate the activities and main outcomes of the project to the school and parents, as well as the public.
- To help develop robust monitoring and evaluation plans for the project to ensure long-term outcomes for the city, all partners, and stakeholders.

Sensor2School (citizen science project in the city of Prague) #3

Digital Inclusion guidelines



The pilot consisted in using the competencies framework:

- To test the application of the Digital Inclusion guidelines to assess the competencies required for, and acquired from, participation in the Sensor2School initiative. To do so, a before and after survey design was used that included a 1st survey before the start of the project and a follow-up 2nd survey after the measurements.

CitiAIR #4

Comparability tool on air quality monitoring initiatives



The pilot of CitiAir consisted of:

- Polishing the online tool by testing it internally to make sure that the wording and structure fit the purpose for a wider audience.
- Adding initiatives to both improve the user experience and create a pool of initiatives that can attract people to use the tool.
- Disseminating the tool as a unique online experience to share valuable information with the aim of improving the comparability of air quality initiatives.

3.2.3 Feedback

Linked to the aim of piloting the CitiMeasure instruments, the feedback stage was designed to capture the lessons learned from the pilot phase. The feedback from the pilots were captured with two main mechanisms, (1) regular meetings and interactions between individual pilot cases and the CitiMeasure team, and (2) dedicated sessions in which the relevant pilots shared their learning with the CitiMeasure working groups. The frequency of the meetings with the individual pilots was decided based on the needs and stages of the pilots. Feedback and exchange sessions between pilots and working groups were organised in June, September, and November 2022. These were moderated sessions with the aim of facilitating co-learning across the CitiMeasure working group members and for improving the instruments.

3.2.4 Refinement

Collected feedback from the previous stage was used to refine and improve the CitiMeasure instruments. This was done in collaboration with the pilot cases and CitiMeasure working group members. The interaction moments in June, September and November 2022 were used to discuss and agree on the details. In between these meetings, working versions of the improved instruments were shared in the online workspace of the working groups (SharePoint) to allow for additional feedback and input from all working group members. A final co-creation session was held at the beginning of 2023 to finalise the refinements.

Figure 3 summarizes the timeline of the CitiMeasure pilot phase and the interaction moments. The hollow grey circles on the timeline represent interactions between the CitiMeasure team and the pilots. This includes regular meetings with the pilots to make sure the planning and piloting phases are on track. The hollow pink circles indicate the months in which a feedback exchange was planned between the pilots and the CitiMeasure working groups. The smaller circles correspond with the four stages of the pilot phase and show the continuation of activities of each phase in each month.

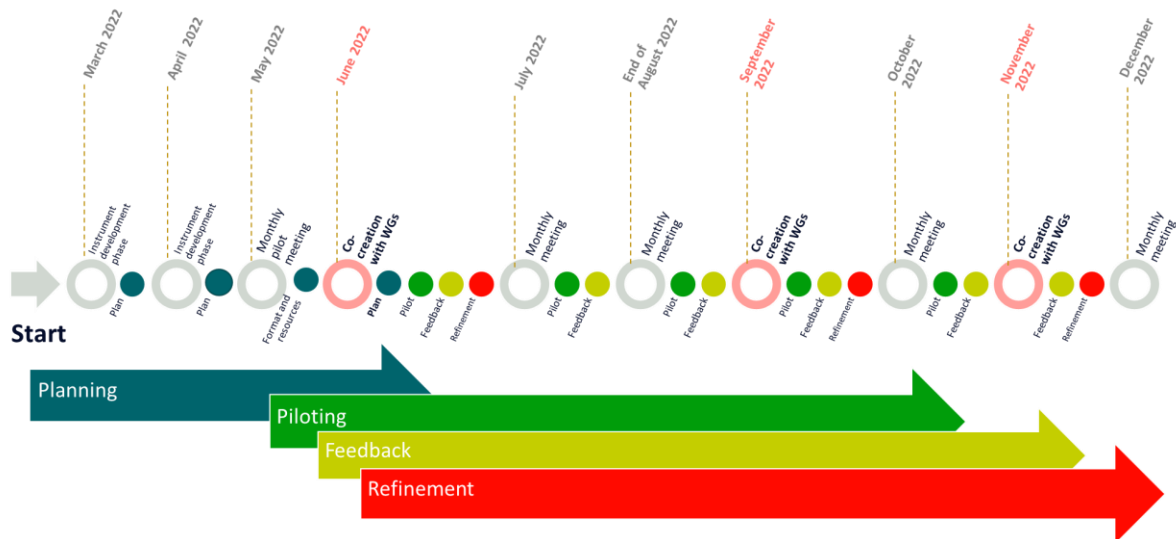


Figure 3: Timeline and interaction moments in the CitiMeasure pilot phase: Timeline and interaction moments in the CitiMeasure pilot phase

The working groups met on four occasions (June, September, November 2022 and January 2023). Table 2 includes a summary of the main discussions in these meetings.

	Behaviour & Policy	Digital Inclusion	Comparability
June 2022	Presentation of the pilot plans		
September 2022	Update about the implementation of the pilot plans Consolidation of the final products and training materials		
November 2022	Consolidation of the final products and training materials	Cancelled	
January 2023	Reflection about working together and feedback Next steps for the visualisation of the guidelines Creation of tasks forces	Reflection about working together and feedback Dissemination of the tool Training material	

Table 2: Summary of the co-creation meetings in the pilot phase

The Strategy & Oversight WG met in September 2022 to discuss the pilot phase and the process for consolidating the guidelines. In February 2023, it was decided to open the final Strategy & Oversight meeting to all the working group members to facilitate interactions.

4 Roles and responsibilities

4.1 IN THE INSTRUMENT DEVELOPMENT PHASE

The development of the CitiMeasure instruments was a collaborative effort that was led by Eurocities. While the Eurocities team designed and moderated the co-creation process, provided guidance, technical support, and content inputs, members of the instrument working groups contributed to the development of the instruments by participating and providing inputs in the three sub-phases presented in Figure 1; namely, information gathering in the 'share' phase, examining the collected information in the 'analyse' phase, and contributing to the development of the structure and content of the instruments in the 'develop' phase. The specific tasks that the members of each CitiMeasure working group were involved in are closely linked to the co-created objectives of that group (for more details see CitiMeasure deliverable 1.4).

Tables 3, 4 and 5 provide a summary of the objectives and main tasks for the instrument development of the CitiMeasure working groups. Since membership and participation in CitiMeasure working groups were completely voluntary, the level of engagement and inputs from the working group members in the main tasks for development of the instruments varied greatly. Nevertheless, the specific roles, responsibilities, and approaches such as creating smaller groups or task forces were discussed and decided in consultation with the members of each working group.

4.1.1 Comparability working group

In the first part of the instrument development phase, the Comparability WG set up a vision to develop a repository of standards on air quality sensors. This vision was linked to specific objectives and tasks such as information gathering and analysis of existing standards. The main methods of information gathering would include collection of resources as a part of desk research; a potential survey for collecting information about existing air quality sensor standards from cities, relevant organisations and experts in the field; and potential collaborations with existing working groups and communities of practice that were working on the topics of comparability and interoperability of sensors, e.g., the Citizen Science Association Data and Metadata working group, and potentially the Interop Community of Practice (CoP) of the WeObserve project.

However, the working group decided to change its vision in their monthly meeting in January 2022 for two main reasons: 1) other organisations such as the Joint Research Centre (JRC) and AirMonTech had already created such repositories, and 2) this is an evolving field and standards become outdated quickly.

Following this rationale, a new vision was developed in collaboration with the comparability WG members to fill in an identified gap about who is using air quality sensors and how: **The CitiMeasure Comparability WG “aims to facilitate information sharing across different cities and organizations involved in air quality monitoring by creating an inventory of air quality monitoring activities and approaches. This inventory will be developed as an interactive tool that can be updated and maintained by the users and will inform citizen science initiatives and city officials on what sensors to use to ensure the comparability with existing observations.”**

Table 3 provides an overview of the initial and final objectives of the Comparability WG.

Initial objectives	Final objectives
1: Identify and compare air quality sensor standards at different levels (regional, national, and municipal) across Europe.	1: <i>Co-design</i> a structure for the <i>inventory</i> of air quality monitoring activities and approaches
2. Investigate and compare the sensors used in existing citizen science initiatives (Including DIY sensors) measuring air quality.	2: <i>Validate</i> the co-designed structure by receiving feedback from the WG members and by testing in for gathering information about at least 5 different cities and organizations.

3. Share best practices (incl. ideas and examples) for sensor guidelines in citizen science initiatives measuring air quality and possibly other domains to learn from.	3: Continuously add to the inventory by completing it for cities and organizations within and outside of the WG.
4. Analyse the market of consumer-grade air quality sensors. (Optional)	4: Create online interactive tool(s) for city officials and citizen science initiatives that facilitates information sharing across cities and organizations by clarifying who is involved in what air quality monitoring activities and how.
5. Create user-friendly guidelines for city officials and citizens that help them select and calibrate sensors according to applicable data and interoperability standards for reference air quality sensors.	5: Add at least 50 initiatives to the CitiAIR tool between April and December 2022.
6. Pilot the developed guidelines in at least one air quality citizen science initiative between April and December 2022.	6: Consolidate the tool with lessons learned from the pilot phase and further analysis by March 2023.
7. Consolidate the guidelines with lessons learned from the pilot phase and further analysis by March 2023.	

Table 3: Old and new objectives of the comparability WG

The working group collaborated in an iterative way and adjusted the approach and format of the tool as the work evolved. Based on the new approach, the working group members and the Eurocities team used Miro to co-create and discuss the main features, sections, visualisation and steps of the online interactive tool.

4.1.2 Digital Inclusion working group

From the list of 6 objectives that were co-created for the Digital Inclusion WG, the first three relate to desk research activities (see Table 4). Information gathering based on objective 1 was achieved through resource collection by the working group members, and in collaboration with existing working groups such as the ECSA Empowerment, Inclusiveness & Equity (EIE) working group. Objectives 2 and 3 relate to analysis tasks that were jointly conducted by the working group members, the Eurocities team and an external expert who was sub-contracted to contribute to the analysis of a sub-set of the collected resources.

The tasks related to drafting guidelines (objective 4) included both discussing and agreeing on a format and structure for the guidelines and their content. The pilot phase (objective 5) focused on tasks related to capturing the lessons learned from the pilots, and the consolidation phase (objective 6) consisted of tasks related to updating and improving the instruments using the lessons learned in the pilot phase. Due to the delay in the planning phase, the piloting of the Digital Inclusion guidelines in the city of Barcelona and Sensor2School officially started in June instead of April 2022.

Objectives	Changes	Tasks
1: Share ideas, case studies, best practices of digital inclusion in citizen science initiatives.		Desk research (resource collection phase) Possible collaborations and information exchange with other working groups and CoPs

2: Jointly analyse and document competencies (knowledge, skills, attitudes) required by citizens to participate in citizen science initiatives, as well as those of policymakers, decision-makers and municipal employees to engage citizens in such initiatives.	Desk research (analysis phase)
3: Map the identified competencies against specific purposes/applications for citizens, policymakers, decision-makers, and municipal employees.	Desk research (analysis phase)
4. Develop guidelines that help cities and citizen science initiatives to understand, identify and enhance capacities and competencies required for digital inclusion of different actors.	Drafting guidelines
5. Pilot the developed guidelines in at least one real-life example of citizen science initiatives between April and December 2022.	5. Pilot the developed guidelines in at least one real-life example of citizen science initiatives between June and December 2022. Capture lessons learned from the pilot(s)
6. Consolidate the guidelines/principles with lessons learned from the pilot phase and further analysis by March 2023.	Updating/improving guidelines

Table 4: Tasks and objectives of the digital inclusion WG

4.1.3 Behaviour & Policy working group

The agreed objectives for the Behaviour and Policy WG were directly linked to specific tasks for this working group. More specifically, objectives 1 and 2 were directly linked with desk research exercises of resource collection and resource analysis that were jointly done by the working group members. Similar to the Digital Inclusion WG, the tasks included discussing and agreeing on a format and structure for the guidelines and their content (linked to objective 3), capturing the lessons learned from the pilots (linked to objective 4), and updating and improving the instruments using the lessons learned in the pilot phase (linked to objective 5).

Due to the delay in the planning phase, the piloting of the Behaviour & Policy guidelines in the cities of Barcelona and Roeselare officially started in June instead of April 2022.

Objectives	Changes	Tasks
1: Share ideas, case studies, best practices related to behaviour and policy change in citizen science initiatives.		Desk research (resource collection phase)
2. Jointly analyse and document the lessons learned from (un-)successful initiatives in terms of catalysing changes in different stakeholders' behaviour and		Desk research (analysis phase)

established decision and policy-making processes.	
3. By March 2022, develop guidelines and principles on behaviour and policy change that help cities and citizen science initiatives foster such changes.	Drafting guidelines/principles Potential collaboration with relevant WGs
4. Pilot the developed best practice in at least one real-life example of citizen science initiatives between April and December 2022.	4. Pilot the developed best practice in at least one real-life example of citizen science initiatives between June and December 2022. Capture lessons learned from the pilot(s)
5. Consolidate the guidelines/principles with lessons learned from the pilot phase and further analysis by March 2023.	Updating/improving guidelines/principles

Table 5: Tasks and objectives of the behaviour & policy WG

4.2 IN THE PILOT PHASE

Eurocities was responsible for coordinating the pilot process. This included providing guidance for the selected pilot cases throughout the process of development and implementation of individual pilot plans. Where needed, Eurocities provided technical support for testing of the instruments, e.g., for operationalizing specific design needs related to the comparability tool. Furthermore, Eurocities coordinated the interactions between the pilot cases, working groups members and external experts to support the refinement of the instrument. Due to the aim and location of the pilots, translating (parts of) the CitiMeasure instruments was needed. Eurocities supported the cases with in-house translations to Czech, Spanish, and Catalan.

4.2.1 Eurocities roles and responsibilities

Figure 4 summarizes the roles and responsibilities of Eurocities in the pilot phase. The Eurocities team provided guidance and technical support, including translation, throughout the pilot phase. It also coordinated with the working groups for feedback.

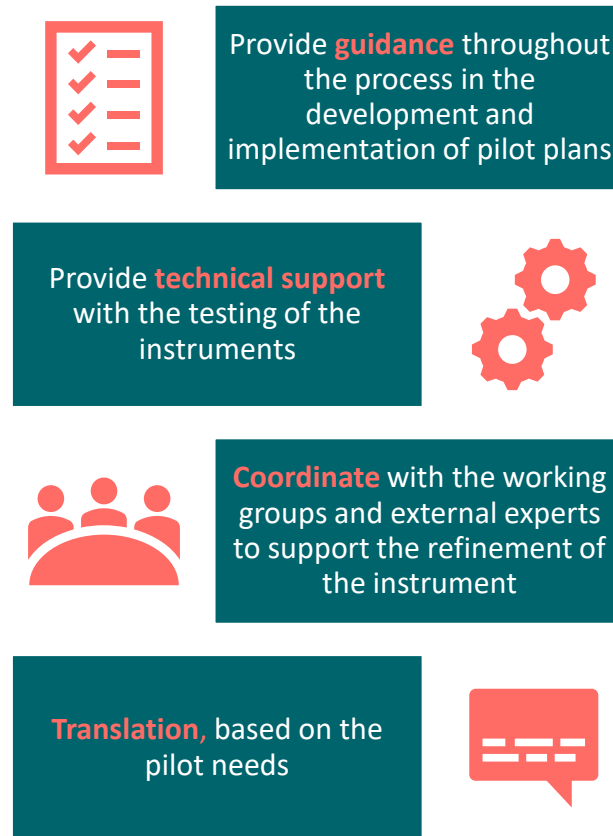


Figure 4: Roles and responsibilities of Eurocities in the CitiMeasure pilot phase

4.2.2 Pilots' roles and responsibilities

The selected pilot cases collaborated with Eurocities for timely co-creation and implementation of the pilot plans. Development and implementation of pilot plans in each case required resources and commitment from the pilot cases. This included resources such as dedicated staff who closely collaborated with the CitiMeasure team in the pilot phase. Moreover, it was essential that the pilot cases provide detailed reflections and feedback on piloting the instrument and help with improvement of the instruments through constant dialogue with the CitiMeasure working groups. Figure 5 provides a summary of the main roles and responsibilities of the selected pilot cases.

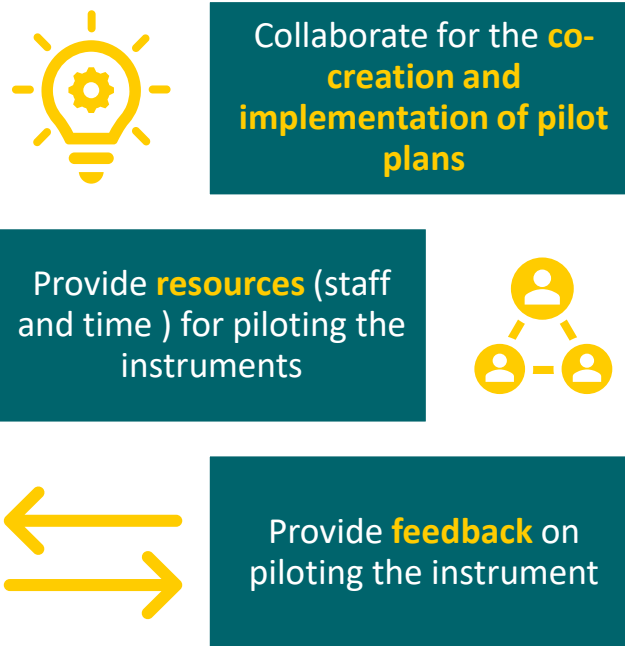


Figure 5: Roles and responsibilities of the cases in the CitiMeasure pilot phase

5 Governance, decision-making

The governance and decision-making approach of CitiMeasure included two main building blocks that played a role in the implementation of the work by the CitiMeasure instrument groups, albeit at different levels. The project steering committee that defined and governed the overall direction of the work and the Strategy and Oversight WG that provided oversight and support for the instrument working groups at a finer level.

The CitiMeasure steering committee included the EC project officer (DG REFORM), a representative of the Dutch Ministry of Interior and Kingdom Relations, and the CitiMeasure team at Eurocities. The steering committee met on a monthly basis and discussed the work progress (including the progress of the work done by the instrument working groups and the pilots) and made decisions on the overall direction of the work. In addition, the CitiMeasure team at Eurocities and the representative of the Dutch Ministry of Interior and Kingdom Relations met with the programme manager of the Dutch City Deal as needed to share the progress of the work and strengthen the link between CitiMeasure and the work that was being carried out by the Dutch City Deal working groups. Feedback and decisions from both meetings provided strategic direction for the instrument working groups.

The Strategy and Oversight WG had 5 specific objectives that helped oversee and provided direction to all phases of the CitiMeasure project. The members of this working group also met regularly to discuss the progress of the thematic instrument groups. Table 6 that was co-created during the second co-design meeting of the Strategy and Oversight WG provides an overview of the objectives and tasks of this working group.

Objectives	Tasks
1: Ensure strong oversight, support, and advice of the WGs and the instruments being developed, including thorough review of the outputs and periodic meetings	<ul style="list-style-type: none"> • Inputs into the instrument and pilot related deliverables • Facilitating interconnections between different working groups • Define overall research questions • Check for cognitive biases • Monitoring & Evaluation (M&E) framework for the instrument development phase • Provide feedback outside Strategy and Oversight meetings
2. Monitoring and supporting the pilots and ensuring the lessons learned are shared	<ul style="list-style-type: none"> • Inputs on the design of the pilot expression of interest • Feedback on the progress of pilots during periodic meetings • Monitoring & Evaluation (M&E) framework for the pilots
3. Developing foresight for citizen science and CitiMeasure	<ul style="list-style-type: none"> • Ideas for long-term vision and upscaling • Possible CitiMeasure-led foresight session. E.g., role of cities in citizen science projects • Engage with ECSA WGs and members
4. Supporting the development of the Knowledge Centre and its long-term business plan	<ul style="list-style-type: none"> • Inputs on the design of the Knowledge Centre structure (good practices, guidelines, and criteria) • Inputs into the business plan of the Knowledge Centre • Exploring possible links with existing platforms, centres, repositories, etc.
5. Engage with external stakeholders and policymakers through events, presentations, and the development of policy briefs.	<ul style="list-style-type: none"> • Help promote CitiMeasure and its results • Facilitating organisation of events • Engage in policy discussions

Table 6: Tasks and objectives of the Strategy & Oversight WG

The Strategy & Oversight WG has not been quite as active and effective as envisioned in the initial planning. This was due to different reasons such as the lack of time of the working group members, and limited expertise on topics such as foresight and business planning, which made it difficult to properly contribute to objectives 3 and 4. However, the working group members managed to contribute to deliverables, to provide relevant inputs and feedback, to join external events to represent the project and to provide inputs for policy influence. They also contributed to the dissemination of the project results through their organisations and relevant networks.

6 Lessons learned and concluding remarks

This section is dedicated to reposting the lessons learned throughout the implementation process and includes some concluding remarks.

1. **It is okay to change vision and adjust to change.** Given the voluntary nature of the contributions of the CitiMeasure working group members, it was important to consider their interests and expertise. While making fundamental changes to any process is challenging, this proved to be a good decision in the case of the Comparability WG. Although this change affected participation at the individual level (some members became more or less active), it helped creating a core group of committed technical experts with knowledge of air quality

and low-costs sensors. This core group remained active throughout the project and made it possible to develop a concrete and focused product: CitiAIR.

2. **Reflect on how to oversee the instrument working groups.** After some time, it became clear that the Strategy & Oversight WG was not exactly functioning as envisioned. Compromises had to be made regarding the amount of interest, information, time, tasks required and expectations of being part of such a working group that was not developing a tangible product. In future projects, it is recommended to better define similar structures. For example, select members from the existing and active instrument working group members or create an incentive mechanism for engaging working group members when there is no tangible product to be developed.
3. **At least one meeting in-person.** While the project was designed in pandemic times, this was an ongoing request by the members. In future projects, it would be recommended to include budget for at least one in-person internal meeting so volunteers can meet with people with whom they have been collaborating to achieve shared vision and objectives.
4. **More cross-working group cooperation.** The Strategy & Oversight WG was supposed to cross-fertilise information between the different instrument working groups. This was not possible due to the lack of time of members to review the work of each working group in detail and other limitations mentioned in section 5. To balance this, several informal chats and Q&A sessions were organised. The CitiMeasure team also opened the last Strategy & Oversight WG meeting to all the CitiMeasure network. This became the most interactive and crowded meeting so far, in comparison to the rest of this working group meetings.
5. **Reconsider the resources for the pilot phase.** Piloting the instruments is essential to make sure that the project outputs have real life applications. However, in future projects, it should be considered that getting pilots on board on a voluntary basis and the planning phase of the pilots is very time consuming. Furthermore, availability of funds for supporting the pilots would result in much more flexibility in testing the products.
6. **Consider various holidays.** When defining the overall timeline for instrument development and piloting in such an international project, there is a need to consider availability of working group members. This needs extra attention when planned activities and active processes coincide with the summer months.

This report presented the final implementation plan for the development and piloting of the CitiMeasure instruments. The tasks and milestones presented in this report were co-created and validated by the working group members. Future applications of the CitiMeasure instruments will depend on the agreed format of the future pilots/use. The current use is thus one of the many possibilities to support cities and citizen science projects to boost their impact. In addition, this report presented the overall governance and decision-making process for the development of the CitiMeasure instruments. This final implementation plan also includes the reflections and lessons learned, as well as deviations from the draft plan, and the logic for those deviations.

Annex 1 – Tools to support the implementation

Throughout the implementation of the CitiMeasure project, three tools have been consistently used:

- Teams: Microsoft Teams has been used for organising all the co-creation meetings. At the inception meeting, we asked participants whether they wanted to continue using this platform, and most of them responded affirmatively.
- Mural or Miro: This programme has been used in all co-creation meetings. It provides a user-friendly way to work together, provide feedback, brainstorm, and share ideas.
- Collaboration space: All the CitiMeasure shared documents are stored in a collaboration space. It has a SharePoint format, and participants registered in our contact management system have access to it.