DELIVERABLE

D6.1 Benefits and Impact Assessment Roadmap

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1.0	26/10	Inge Smets	VMM	Final version
1.1	28/02	Christophe Stroobants	VMM	Revisions after the Period 1 Review Meeting: - Elaborated KPIs - Added methodology - Added impact producing activities to indicator tables - Elaborated qualitative aspects, made questionnaires more prominent

Table of Contents

Executive Summary

In this deliverable, a strategy is outlined on how the outputs of the project will be monitored and evaluated during the open and public rounds starting from small, dedicated user-groups to public testing.

To determine **COMPAIR**'s impact and effectiveness, a comprehensive evaluation strategy is deployed for measuring the impact of the activities during the project's life cycle. This will be done by the evaluation of the quantitative Key Performance Indicators (KPIs) defined in the project proposal and an additional set of both quantitative and qualitative indicators for the aspects participation, inclusiveness, skills, trust and openness. These 5 aspects group the less tangible project impact described throughout the project proposal.

The progress on all indicators during the project is tracked through reporting on numbers realised and responses in both internal and external questionnaires.

1. Introduction

In this deliverable, in line with the WP6 description, a strategy is included to determine whether:
(1) our environmental monitoring capacity has improved;
Under the environmental monitoring capacity is understood the capacity of using the different tools and technologies by the participants.

(2) whether we managed to involve and reach our target groups (citizens of all backgrounds, also the more vulnerable and LSE groups),

(3) whether participating citizens effectively change their behaviour to lower their environmental impact.

Some of the KPIs will be assessed at **project** level, others at **pilot** level or at both levels. The extent of the evaluation of KPIs is at the discretion of every Pilot and reflects the pilot lead's opinion on the need for evaluation.
These KPIs are reflecting the impact of the project. Citizens that are more knowledgeable about their direct environment and their impact on it, are considered a benefit, because they will be more inclined to adapt their behaviour to the benefit of the climate and the local air quality.

First the document contains information about the quantitative KPIs (pilot, project & communication KPIs). Then it continues with a description of the qualitative KPIs (participation & behaviour change, inclusiveness, skills, trust, openness & communication). And at last the progress Table of the KPIs which gives a global view on the evaluation.

2. Methodology

The aim of D6.1 described in the project proposal is "describing the monitoring and evaluation processes agreed with all pilot partners" in order to "determine whether our environmental monitoring capacity has improved, whether we managed to involve and reach our target groups (citizens of all SES groups, also the more vulnerable and lower SES groups) and whether citizens effectively change their behaviour to lower their environmental impact" by using "the impact described in section 2.1 Expected Impacts" of the proposal and the defined KPIs as a starting point.

Typically monitoring and evaluation is performed by appraising indicators and qualitative reporting on a project's impacts. In order to set up the appropriate monitoring and evaluation processes a full overview of the expected impact was therefore required. This full overview was created by undertaking the following steps:
1. Identifying mismatches in the starting points, i.e. expected impacts and defined KPIs
2. Scan of the project proposal for non or less tangible impact statements
3. Aggregation of impact statements into coherent impact areas

As a next step an additional set of indicators and qualitative reporting requirements was drafted:
4. Creation of metrics to quantify some of these impact areas
5. Identification of key aspects on non-tangible impact areas that require monitoring and evaluation
6. Linking impact producing activities in implementation work packages to the required indicators and qualitative reporting

Finally, based on the required metrics and qualitative reporting, the monitoring and evaluation processes were co-defined with the pilots.

The following section will detail the creation of the full overview of the expected impact. The other steps described above are covered in section 3 of this document.

2.1 Creating a full overview of expected impact

As mentioned the main starting points for D6.1 described in the proposal are the expected impact in section 2.1 of the proposal and the list of KPIs to be monitored. KPIs are by definition quantifiable metrics allowing "hard" evaluation based on a target number and achieved number. The full table is included as part of section 3.1 of this document.

A mismatch between these KPIs and section 2.1 was identified, the table below summarises the expected impact for each strand of the quadruple helix. Whereas the KPIs provide quantified metrics that are exclusively output oriented and can be summarised as numbers of:
● Outputs: tools, technologies, pollutants, devices, data, metrics and indicators
● Citizens: users, events, labs, participants, training and workshops
● Publications: policies, papers, reports, case studies, publications and recommendations
● Pilots: pilots, cities, city areas and neighbourhoods

It will not be possible to assess the described expected impacts solely based on these metrics. This mismatch highlights the need for additional monitoring and evaluation aspects to monitor project progress with regards to these impacts.

Policy Maker	Researcher	Communities/Citizens	Businesses
● Better able to meet new Green Deal targets ● More informed environmental policy through new data ● New ability to gather data to support/evaluate other local policies ● Enhanced relationships with citizens through collaboration ● New open data sources for innovation and economic growth	● More data for environmental research ● Improved CS practices leading to higher quality research data ● CS raised on science agenda as a quality research method ● Ability to leverage new pool of researchers ● Faster gathering and analysis of data for important societal challenges	● Increased ability to understand & influence own environmental impact ● New scientific literacy unlocking future opportunities ● Greater social capital through collaboration ● Effective community change by analysing data for local intelligence ● Higher levels of understanding why certain policies have been made	● More open data for innovation ● New green practices for meeting environmental targets ● Ability to influence policy and customer behaviour ● Increased collaboration with customers & stakeholders ● Greater appreciation of the environmental concerns of others

Upon review of these mismatches it also became clear that many impact statements were made throughout specific sections of the project proposal. Therefore an inventory of these statements was made based on a screening of the following chapters in the project proposal:

- Objectives (1.1)
- Concept & methodology (1.3)
- Ambition (1.4)
- Expected impacts (2.1)
- Measures to maximise impact (2.2)

These impact statements were aggregated to 5 coherent impact areas: participation & behaviour change, inclusiveness, skills, trust, openness & communication. The groups are explained in more detail in section 3.2 of this document. The following table outlines all impact statements in these groups including a reference to their location in the project proposal.

Group	Statement	Reference
Participation	Sustaining interest, especially in lower Socio-Economic Status (SES) groups is hard	1.1
Participation	Reasons for participation dropping off can include lack of time, technical issues, perception that the effort was unnecessary or no longer relevant. The key is to have an approach which fosters openness and diversity in representation.	1.3.1
Participation	Despite the quadruple helix concept being around for the last few years, cities tend to fall back on the triple helix and not truly involve society unless in voting or official consultations.	1.3.2

Group	Statement	Reference
Participation	increase participation in Citizen Science for more accurate air quality and environmental data	1.3.2
Participation	makes it easier for all citizens to participate in improving air quality and helping to meet Green Deal targets	1.3.2
Participation	Being able to access certain features from a mobile app is especially important for sustaining participation of lower-income groups who may not have a computer or laptop to work with, just a smartphone which is near ubiquitous.	1.3.3
Participation	We also need a representative behavioural distribution and thus representative participation throughout all SES groups, as people with a lower SES are often more prone to air pollution.	1.3.10
Participation	Adopt a participatory, multi-actor approach to strengthen the science-policy interface where citizens are not just an afterthought but are active contributors to the process	1.4
Participation	new insights will become available about the involvement and degree of long-term participation of SES and disadvantaged groups.	2.1
Participation	Ensures representative participation of (local) population in citizen science activities, in particular the dynamic exposure pilot	2.1
Inclusiveness	empowering people in a CS Lab environment - with a special focus on women, young people, and hard-to-reach group	1
Inclusiveness	Vulnerable people, those from lower SES groups, are cited as being poorly represented.	1.3.1
Inclusiveness	make it more representative through a multi-pronged engagement strategy	1.3.2
Inclusiveness	encourage hard-to-reach people to participate	1.3.2
Inclusiveness	COMPAIR will ensure gender equality, all-round inclusiveness and a gender-neutral language will be used throughout project development. Stereotypes will be avoided.	1.3.11
Inclusiveness	Thanks to COMPAIR all citizens, regardless of education level or socio-economic background, have the inclusive opportunity to influence the quality of their environment through easy-to-use tools which help them collect and understand environmental data. COMPAIR helps policymakers across Europe unlock innovation from CS data to support inclusive policy making and deliver effective policies.	2.2
Skills	with the skills to co-design and undertake environmental scientific experiments around needs and challenges in their locality	1

Group	Statement	Reference
Skills	Everybody today has the opportunity to be a citizen scientist in a manner that matches their interests and skills.	1.1
Skills	Research shows that laypersons can collect data of same quality to experts, if familiarised with the methods.	1.3.1
Skills	support people in delivering environmental benefits on (1) a personal level through increased science skills	1.3.3
Skills	The involvement in air quality monitoring requires certain knowledge and skills on the part of participants. All this will be covered by COMPAIR's comprehensive, multi-stage sensor training programme	1.3.9
Skills	As people engage in data collection with peers, they learn new skills	1.4
Skills	Increases the skill level of citizen scientists through our Citizen Science Lab	2.1
Trust	increase civic engagement and influence more effective long-term environmental policy	1
Trust	ensure Citizen Science is a trusted approach to tackling complex, systemic, environmental problems	1
Trust	Researchers and policy makers rarely trust the value and accuracy of citizen generated data.	1.1
Trust	Governments and scientists are sceptical about data quality and participatory efforts observed in citizen science initiatives.	1.3.1
Trust	professionalise and at the same time simplify the process of collecting and processing CS data, making it open so its value can be scaled from the local level (for behavioural change) to the city level (policy action) and be reused by professional researchers, businesses and citizens themselves	1.3.2
Trust	improve the data quality itself, by utilising expert calibration algorithms for automated quality assessment and validation	1.3.2
Trust	broaden the flexibility of the API and make it more tailored for policy use	1.3.2
Trust	Low-cost sensor data where possible will be calibrated with official city sensors to increase its trustworthiness	1.3.4
Trust		
Openness	make data more accessible and usable by improving its publication and availability through the central Information Manager	1.3.2

Group	Statement	Reference
Openness	Provides new open data sources that can be leveraged for/by innovative start-ups	2.1
Openness	Consortium members are working towards Open Source, Open Access and Open Innovation principles, choosing technical components, where possible, that are Open Source to ensure project results are freely available to all.	2.2.4

3. Evaluation-KPIs

To determine **COMPAIR**'s impact and effectiveness - as outlined in and enhanced through the consolidated roadmap (D8.1) - the team will deploy a comprehensive evaluation strategy for measuring the impact of activities. This will include both quantitative and qualitative KPIs.

3.1 Quantitative KPIs

To capture the outputs and outcomes during the project's life cycle, several measurements and indicators have to be set for each of the key activities. The earlier in the project we start measuring, the less information will be lost and the more information we will capture. The tables below outline quantitative targets for tracking and measuring progress, as described in the Description of Action/project proposal.

3.1.1 Project and Pilot KPIs

The following table contains the quantitative KPIs for pilots and the project as a whole. The project KPIs evaluate the global outcome of the project. The Pilot KPIs evaluate outcomes at pilot level. All quantitative KPIs must be evaluated by every pilot. It is divided into 5 parts- same structure as the project proposal. The right most column provides the impact producing activity in the project. These are provided at either the task level or - in case multiple tasks contribute (e.g. open and public round tasks) - the WP level. The interdependencies are further illustrated in the overarching timeline provided as part of D1.9.

Objectives	Target	Means of Verification	Project level	Pilot level	Impact activity
Accelerate the use of Citizen Science (CS) to combat climate change and air pollution in EU cities					
Pollutants in Augmented Reality (AR) app[1]- different particles visualised and explained	6	Number of particles (i.e pollutants) in the AR app (manual counting)	x		T3.2
Cities-AR app to convey air quality details	4	Number of cities (manual counting)	x		T3.2
Users of the AR app- 500 downloads on Google Play and App Store in total	500	Number of users - Interface in the AR app (e.g statistics from Google Play and App Store) (manual counting)	x	x	T3.2, T5.3, T5.4 & T8.2
Policy measures targeted - relevant policy measures targeted by the project	10	Number of policy measures investigated (manual counting)		x	T5.3, T5.4
Ideathon events Focus on policy co-creation ● 1 White Paper delivered ● 5 Research papers published ● 3 Research organisations benefiting from **COMPAIR** input	4/1/5/3	Number of ideathon events held Number of White Paper delivered Number of papers published Number of Research organisations using **COMPAIR** input for research (manual counting)	x		T5.3, T5.4 & T8.2
Enable Citizens with sensors and tools to obtain meaningful and useful data for problem solving					
Network maps value created to link relevant groups	4	Number of identified relevant population groups - Output from workshops (manual counting)		x	T2.1 & T2.3
Researchers to steer and support each group	2	Number of researchers per group (manual counting)	x	x	T5.3, T5.4
Quadruple Helix events during the project	16	Number of quadruple helix events held (manual counting)	x	x	T2.2, T2.3, T5.3, T5.4, T5.5, T8.2
DIY Sensor Citizen Science Lab established	1	The establishment of a Sensor Citizen Science Lab allowing citizens to construct their own	x		T5.3, T5.4, T8.2

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[1] Augmented Reality app (AR), the DEVA app

Objectives	Target	Means of Verification	Project level	Pilot level	Impact activity
		sensor devices, one for all the pilots (manual counting)			
Sensor devices assembled by citizens	150	Number of sensors that are assembled successfully by citizens (manual counting)		x	T5.3, T5.4, T8.2
Stakeholders involved in experiment co-design	50	Counting number of participating groups (policy makers, citizen organisations,) cumulated for all pilots (manual counting)		x	T2.3, T5.3, T5.4, T8.2
Citizens involved in open and public experiments	300	Counting citizens that are involved, cumulated for all the pilots (manual counting)		x	T5.3, T5.4
10GB new air quality data collected by citizens	10	Volume of air quality data collected by citizens expressed in GB (manual counting)		x	T3.5, T5.3, T5.4
Users of Dashboards (personal, neighbourhood, city)	1000	Number of users (login or google analytics data), that are using the dashboard Interface (manual counting)		x	T3.3, T5.3, T5.4, T8.2
Broaden participation in CS through professional leadership, gamification and co-innovation					
Pathways to behavioural change elaborated	5	Number of descriptions of (path)ways that are assumed to lead to behavioural change (manual counting)		x	T6.2
People participate in **COMPAIR** data jam	100	Number of participants that join the data jam (one data jam organised by the project) (manual counting)	x		T8.1
People participate in **COMPAIR** through gamification	100	Number of participants who use gamification aspects of dashboards and AR app or participate in a real world game (e.g. maximising clean air quality points on school routes) during a **COMPAIR** pilot (user statistics in online tools). Exact gamification aspects are to be determined during innovation processes.		x	T3.3, T5.3, T5.4, T8.2

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Objectives	Target	Means of Verification	Project level	Pilot level	Impact activity
People participate in **COMPAIR** policy ideathons	100	Number of participants in a **COMPAIR** policy ideathon during the 4 that will be organised (manual counting)		x	T5.3, T5.4, T8.2
Target 4 new city areas not covered by official measurements	4	Number of cities (manual counting)		x	T5.3, T5.4
Target 4 neighbourhoods that have problematic air quality	4	Number of neighbourhoods (manual counting)		x	T5.3, T5.4
Minimum of 2 integration/calibrations per pilot city	2	Number of calibrations (manual counting)		x	T3.5
Cities benefit from **COMPAIR** training	300	Number of representatives of cities during **COMPAIR** training (manual counting)		x	T2.2, T5.1, T5.3, T5.4
New cities learn about **COMPAIR**	50	Number of representatives of cities that learned about **COMPAIR** (manual counting)		x	T8.1, T8.2, T8.3
Citizen Science (CS) case studies presented through storytelling	4	Number of cases of CS studies used in storytelling of games (manual counting)		x	T8.3
People enrolled in **COMPAIR** training	100	Number of people (citizens and representatives of cities) enrolled/registered in **COMPAIR** training (manual counting)		x	T2.2, T5.1, T5.3, T5.4
Development of new scientific knowledge and/or innovations with/by citizen scientists in the field of sustainable development and environmental protection.					
Citizens involved in scientific experimentation from a data acquisition, data analysis or result creation viewpoint	600	Number of citizens involved (manual counting)		x	T5.3, T5.4, T8.2
Co-creation workshops with citizen scientists	15	Number of workshops with citizen scientists (manual counting)		x	T2.2, T5.3, T5.4, T8.2
New environmental protection ideas relating to data from CS	10	Number of environmental protection ideas resulting from CS	x	x	T5.3, T5.4, T5.5,

Objectives	Target	Means of Verification	Project level	Pilot level	Impact activity
experiments during the project pilots		experiment data (manual counting)			T8.2
City policies affected with new environmental CS data	5	Number of policy domains (education, traffic, environment, urban planning, economy, …) that are related to the captured environmental CS data and is affected (informed/monitored/adjusted/supported/changed/…) (manual counting)	x	x	T5.3, T5.4, T8.2
Existing citizen science projects reviewed and built upon	15	Number of Citizen Science projects already in place before COMPAIR (manual counting)	x		T1.1, T2.1, T2.2, T2.4
Scientific publications written by the project on citizen science and citizen-driven, evidence-based policy making	6	Number of scientific publications in the making at the end of the project and published 5 years after the project (manual counting)	x		T8.3
Evaluation evidence concerning the societal, democratic and economic costs and benefits of citizen science.					
Develop metrics from MICS (Measuring Impact of Citizen Science) project	15	Number of MICS that are developed during the project (manual counting)	x		T6.1
Align with citizen science indicators from the official list for Monitoring the Evolution and Benefits of Responsible Research and Innovation (MORRI)	6	Assessment of the MORRI list during the project (see Annex 1)	x		T6.1
Include participants from lower-LSE and hard-to-reach groups	200	Number of participants (manual counting)		x	T2.1, T2.2, T5.3, T5.4, T8.1, T8.2
No. citizens in self-analysis mechanism for citizens against metrics	300	Number of citizens that perform a self-analysis in light of the other indicators mentioned in the table (manual counting)		x	T5.3, T5.4

Objectives	Target	Means of Verification	Project level	Pilot level	Impact activity
No. of individual evaluation reports containing complete evidence for CS	4	Number of reports, one from every pilot providing evidence that CS proved useful in the pilot case (manual counting)		x	T5.3, T5.4
Create CS recommendations report towards scientific policy makers on the benefits and obstacles of citizen science, based on the project evidence	2	Recommendations will be differentiated to at least two different target groups (e.g. national level or local level) and hence lead to at least two reports (manual counting)	x		T6.4, T7.3, T7.4
No. of sustainable business models for technology-enabled CS replication	2	Number of outlines of business models (manual counting)	x		T5.5

3.1.2 Communication KPIs

See D8.1 Roadmap with a methodology for achieving them.

The content that will be developed in this project will be translated and available in all pilot region languages (translated by pilot leads). Also in English, to ensure to reach out to lower LSE- and vulnerable groups.

In the table below Y1, Y2 and Y3 list the indicator number to be met at the end of year 1, year 2 and year 3. The numbers are not cumulative.

Activity	Description	KPI
Website	To achieve a number of visits all partners must help promote the project through their own networks. All communication material must contain the URL and links to the project website should be included on social media tweets. Regular news posting on the website and sharing via different channels will amplify impact.	Y1: 250 visitors Y2: 500 visitors Y3: 1000 visitors (unique visitors)
Social Media	Regular posting of original content, plus following and retweeting and engaging with the content of non-followers will encourage new followers.	Y3: Twitter followers: 800
Newsletters*	Newsletters will be planned for when major results are achieved (in regular intervals). The newsletter will be sent to those signed up on the website and via Partner networks.	Y1: 2 newsletters Y2: 4 newsletters Y3: 6 newsletters
Press Releases*	As with the Newsletters, Press Releases will be created when major results are released and disseminated through project and partner media channels.	Y1: 1 PR Y2: 3 PR Y3: 5 PR

Collaborations/ Clustering	Collaborating with other projects, networks and organisations sharing knowledge and promoting **COMPAIR** findings through these clusters.	Y1: 5 projects Y2: 10 projects Y3: 20 projects
Brochures*	Brochures will be updated throughout the project based on project phase, results and audience needs at that time.	By the end of Y3, 3 brochure designs
Roll-Up Banners*	To maximise presence at all events mobile roll-up banners will be designed to reflect the current project stage.	By the end of Y3, 3 banners
Publications	Publications include a mix of Open Access papers and conference publications, weighted towards the second half of the project when more results are available.	Y1: 5 Y2: 10 Y3: 20
Posters*	Posters provide easy-to-understand graphical summaries of results at conferences or indeed pilot events.	By the end of Y3, 4 postcard designs
Demo Videos*	Videos help convey complex messages through product walkthroughs and testimonials from end users and beneficiaries.	Y1: 2 videos Y2: 4 videos Y3: 6 videos
Events*	Being present at key industry events, giving presentations and manning stands enables direct contact with stakeholders and ability to build a trusted two-way relationship with them.	Y1: 10 events Y2: 20 events Y3: 30 events
Sustainability*	Review of the closest competitors and their business models plus understanding of market direction and user needs will help position **COMPAIR** as an attractive package for technical solution adoption.	Consideration of 10 other initiatives' sustainability models

*Under direct control of the project, where other indicators are dependent on update of audience, stakeholder engagement…

3.2 Qualitative Impact Targets

While quantitative targets are important, they are not enough to understand whether the project conforms to the desired standard. For that reason, qualitative feedback is needed to paint a more complete picture.

Based on the aforementioned methodology, a framework was created on 5 (less tangible) impact areas: participation & behaviour, inclusiveness, skills, trust, openness & communication). This framework synthesises all non-quantitative impact statements in the project proposal to evaluate the qualitative impact of **COMPAIR**.. The following sections outline the impact areas, additional indicators and qualitative reporting requirements to monitor progress in light of these impact areas. The full list of exemplary questions that will be used to gather input on these 5 impact areas can be found in Annex 3 and this document. Please note section 4 on Evaluation strategy describes additional qualitative reporting requirements on these impact areas for each pilot and work package lead on a 6 month basis.

3.2.1 Participation & behaviour

COMPAIR increases public awareness about the importance of the environment and Citizen Science (CS). It brings communities together to work towards shared environmental goals. CS participants will be engaged in problem solving on a local level, and this not just as an afterthought, but as active contributors to the process. It stimulates citizen motivation by showing that their actions and results do matter. Participant motivation is widely noted as an important pathway to behavioural change. Group dynamics and peer-to-peer learning are another important pathway to behavioural change. Feedback from social peers can act as a strong motivator for participants. New behaviour can gradually establish itself as a social norm, helping to speed up its adoption by even more people.

Additional quantitative indicators (incl. target)

- >70% participants report that they received adequate support by researchers
- >70% citizens report positive changes in behaviour

Additional aspects required for qualitative monitoring:
- Motivation to participate
- Self reported behaviour change
    - General behaviour -> open question on what changes or why no changes
    - Mobility related behavioural choices -> open question on what changes or why no changes
    - Amount of discussions on air quality -> -> open question on what topics
- Perceived level of information by COMPAIR

3.2.2 Inclusiveness

COMPAIR will ensure all-round inclusiveness and gender-neutral language in its work. Special tactics will be used for the involvement of women, youth and hard-to-reach groups (e.g. vulnerable people of lower LSE groups), to encourage them to participate in CS, as they are normally poorly represented. Safe training spaces will be established, based on culture and circumstance.

Additional quantitative indicators for Inclusiveness:
- % from lower LSE groups of the total amount of participants in workshops, aiming to be representative for that pilot region
- % from lower LSE groups of the total amount of participants hosting a sensor, aiming to be representative for that pilot region

Additional aspects required for qualitative monitoring:
- Self evaluation on inclusiveness aspects:
    - Level of acceptation vs isolation -> open questions on causes
    - Ease of participation based on level of foreknowledge, skill comparison to peers -> open question on lacking knowledge, skills

- ○ Ability to incorporate results in everyday life -> open question on reasons (lack of financial support, lack of knowledge, skill …)
- ○ Language intelligibility throughout the process: perception of communication in recruitment, experimentation and concluding phases -> open questions on suggestion for used format, difficulty level (new words, unclear terms …), comprehensiveness of answers

3.2.3 Skills

COMPAIR will bolster the skills and science literacy of citizen science participants through training, easy-to-use tools and data visualisations. It will guide the participants into citizen science ecosystems (national and EU-wide). **COMPAIR** makes it easier for everyone to participate in improving air quality and helping to meet Green Deal targets, while instantly informing them about changes that must happen to make the environment more livable in the future.

Additional quantitative indicators for Skills:
- >70% of users report being satisfied with **COMPAIR** tools
- >70% of participants able to extract actual actionable intelligence

Furthermore we will monitor this domain through the following metrics without a predefined target other than positive evolution:
- Online analytics measure the length of the sessions on the **COMPAIR** dashboard, the number of certificates given and the number of Massive Open Online Courses (MOOCs) completed.
- the participants have learned skills for using the tools during the citizen science project that they can use in the future

Additional aspects required for qualitative monitoring:
- Perceived level of guidance -> open questions on both valued guidance and missing guidance
- Ability to use and comprehend tools and information shown -> open questions on aspects that were not understood
- Capability to apply new skills to environmental problems -> open question on skills and knowledge gained

3.2.4 Trust

COMPAIR will increase trust in the quality of citizen science data in 3 fundamental ways. The data will be made more accessible and usable by improving its publication and availability [1]. The data quality itself will be improved by utilising expert calibration algorithms for automated quality assessment and validation, which will also improve the accuracy of the sensors [2]. The flexibility of the API will be broadened and made more tailored for policy use [3]. Community leaders will be engaged to help with the trust through

outreach. As a result, CS data can be trusted for use in official decision making, education and monitoring situations.

Indicators for Trust:
- Looking at the use of the **COMPAIR** data by policy makers or statistical offices.

Additional aspects required for qualitative monitoring:
- Intention to use COMPAIR tools for decision making -> open/follow-up questions on motivation why (not), usefulness of the data
- Stance towards reliability of citizen science data -> open question on negative sentiments

3.2.5 Openness & cooperation

COMPAIR adopts a quadruple helix approach for participation and result generation. It brings people together in design thinking workshops so all views are represented and builds upon existing best practices and engagement through CS labs. It is a collaborative platform for idea generation, knowledge sharing, data collection and brokerage between all quadruple helix stakeholders. Working together will enable each stakeholder to better value and recognise the contributions of each other, improve its social capacity and generate a greater appreciation of the challenges caused by poor air quality. Lessons learned from **COMPAIR** will be captured and shared by the Consortium, through existing CS platforms (e.g EU-citizen.science currently managed by the European Citizen Science Association) and other partner networks (e.g. Open & Agile Smart Cities) in order to maximise impact. Resulting data should be able to be used on a European, national as well as city level and will be included in the EU's Open Data Platform,

Importantly, **COMPAIR** will help sustain impact from technology-enabled Citizen Science by contributing to the MORRi indicators (annex 1) and will also impact UN Sustainable Development Goals (SDGs) (annex 2).

Indicators for Openness & cooperation:
- Count the number of moments of knowledge sharing with other organisations, initiatives, etc
- We will look at the number of 3rd party use of our API's
- Assessment on involvement, contribution and ease of access

Additional aspects required for qualitative monitoring:
- Perceived involvement (cf. inclusiveness)
- Appraisal of citizen contribution -> open question on room for improvement
- Accessibility of the data -> open question on room for improvement

3.3 Critical implementation Risks

The impact evaluation process will contribute to risk identification and assessment. Hence we include this section on critical implementation risks. To maximise our impact, we will update the Risk register to manage our risks.

4.   Evaluation Strategy

Given the identification of all impact areas for **COMPAIR** in chapter 2 and the additional requirements for qualitative monitoring of the less tangible aspects of our impact, the following evaluation strategy was drafted. The strategy consists of 3 major components:

- Information gathering tailored to the experimentation phases in each pilot
- Periodic reports by work package and pilot leads on both quantitative and qualitative aspects
- Synthesis of periodic reports in D6.2 (pathways to behavioural change), D6.3 (pathways to citizen-driven environmental impact) and D6.4 (key messages for environmental policy impact)

4.1 Information gathering in experimentation phases

In order to measure and evaluate the success of the different processes within **COMPAIR**, additional information will be gathered on all of the above indicators and qualitative aspects. The main tool used in this respect will be a questionnaire tailored to the experimental designs of each pilot in the open and public rounds. Data will be gathered before, during and/or after the experiments depending on the exact study design. The questionnaires will cover each of the 5 impact areas and collect data on the aspects mentioned in 3. A general questionnaire (annex 3) was drafted in WP6 to provide a template and starting point to the pilots for collecting feedback from citizens on our impact in each of these 5 impact areas. The pilots will tailor this document to their needs upon finalisation of the experimental design and setup for each experimentation round.

- Time: before, during and/or after pilot. Additionally a follow-up questionnaire can be done to assess sustainability of the change (e.g. 6 months later).
- Tools: e.g. google form, focus groups, paper, interview, quiz, co-evaluation etc
- Response rate: we're aiming for 60% of the participants in the CS project to participate in the survey. This target value stimulates each pilot to actively promote the surveys and other methods of input when they are well below this target. However ultimately not attaining this value does not indicate failure of the entire pilot as high participation in questionnaires is not the main goal. Rather proving the applicability of citizen science data and demonstrating good participation (in line with earlier indicators) are the benchmarks for evaluating pilot success.
- Domains: participation & behaviour change, inclusiveness, skills, trust, openness & communication

4.2 Periodic reporting

The Flanders Environment Agency (VMM) initiates a self-reflection every **6 months** (see Progress Tabel_KPI's) by triggering the work package leaders to evaluate the quantitative KPIs (i.e. adding values in the KPI table every period - every period a new Excel file), as well as the qualitative aspect based on 4 fixed questions. The latter will be fed by information gathered as described under 4.2 using the aspects mentioned in 3.2. The baseline reporting

questions are listed below and have to be answered in relation to each of the 5 impact areas (3.2), by means of illustration we have included exemplary aspects on some impact areas between brackets.

1. What have you done in the past 6 months (to ensure e.g. participation)?
2. Which external feedback or results reflect the positive & negative impact you've had (on e.g. perceived inclusiveness)?
3. Describe how you have contributed and will contribute to the Morri and SDG goals (see annex 1 & 2).
4. Were there missed opportunities (in light of e.g. missing guidance and knowledge gaps with participants)? Could you have done something different / better? Could the project have done something different/better?

Any insights gathered through the questionnaire, interview, co-evaluation sessions etc. for monitoring the 5 qualitative domains, will be reported as part of the answers to these 4 questions. The specific results will be provided as addenda.

The quantitative KPIs relating to communication will be monitored and followed up by 21C, the work package leader for communication, dissemination and replication.

4.3 Synthesis in consecutive deliverables

Lessons learned and other insights captured throughout this process will provide the basis for the consecutive deliverables in WP6: D6.2, D6.3 and D6.4. As with other interdependencies between D6.1 and project activities it was agreed between project management and project officer to include these in D1.9 as part of the overarching project plan.

5. Conclusion

This deliverable will be a "living document" because the progress will be evaluated every 6 months. Because of this, it can be checked in time why certain KPIs are not achieved or are delayed. Given certain indicators are at risk of not being met, this will be escalated to the management call/project management team in order to define actions on how to get things back on track.

This roadmap will be used to elaborate the monitoring and evaluation reports of the behavioural and environmental changes of citizens, "Pathways to Behavioural Change" (D6.2) and "Pathways to Citizen-driven Environmental Impact" (D6.3). With regards to policy impact and in particular trust in citizen science data, the findings will be synthesised in "Key messages for Environmental Policy impact" (D6.4)

6. Annex

Annex 1

MORRi Indicator	COMPAIR Contribution
SLS 4 - Citizen Science activities in RPOs	COMPAIR will publish a number of scientific papers, with at least one towards policy makers with the lessons learned, and one regarding how Citizen Science projects can influence the scientific agenda. Citizen scientists will be co-authors.
PE1 - Models of public involvement in Science & Technology decision making	COMPAIR will evaluate the degree to which CS Labs, design thinking, and technology involve citizens, especially LSE groups, in active citizen science actions as well as in policy decisions.
PE2 - Policy-oriented engagement with science	COMPAIR will co-create policy-related dashboards and use an existing City Digital Twin solution (cf. DUET project) in close cooperation with scientists. The dashboards itself will be open to the public so that also amateur scientists and involved citizens can be involved.
PE3 - Citizen preferences for active participation in S&T decision making	COMPAIR will invite citizens to be actively involved. The involvement will be monitored, and strategies will be tested to keep citizens on board. Especially new insights will become available about the involvement and degree of long-term participation of LSE and disadvantaged groups.
PE10 - National Infrastructure for involvement in R&I	COMPAIR will increase the number of citizens, societal actors and policy makers involved in research and innovation. Our methods for stakeholder mapping, engagement and retention will be shared as best practice locally and nationally.

Annex 2

SDG	COMPAIR Contribution	Specific SDG indicator
Goal 3: Good Health and Wellbeing	● Helps reduce the number of deaths and illnesses from hazardous chemicals and air ● Creates better awareness of air pollution levels and personal impact via the AR app, dashboards, and dynamic exposure measurements	3.9
Goal 4: Quality education	● Supplements and reinforces the traditional science curriculum with hands on activity ● Uses professional scientists to facilitate the work of the citizen scientists ● Increases the skill level of citizen scientists through our Citizen Science Lab	4.4, 4.7

Goal 5: Gender equality	● Ensures representative participation of (local) population in citizen science activities, in particular the dynamic exposure pilot ● Ensures woman are represented both as researchers and as citizen scientists	5.5
Goal 8: Decent work & growth	● Open citizens up to the potential of a future science-related career ● Provides new open data sources that can be leveraged for/by innovative start-ups	8.3
Goal 10: Reduced Inequalities	● Ensures lower LSE groups also have access to the same opportunities and knowledge ● Data visual dashboards ensures everyone can easily analyse data	10.2
Goal 11: Sustainable cities & communities	● Enriches existing city data sources that are currently being used for decision making ● Enables anyone to leverage CS Lab & Dashboard for CS experiments for policy ● Leverages business model opportunities for the long-term implementation of CS	11.3, 11.6
Goal 17: Partnerships for the goals	● Positions CS as a resource for high quality research that supports the SDGs ● Raises awareness amongst citizens and communities of the SDGs	17.1, 17.2

COMPAIR

Annex 3

Standard survey

Trust	Options				
1	**Questions to policy makers or statistical offices**				
Would you use COMPAIR data for decision making?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
Do you think this data can provide useful insights?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
Do you think citizens are able to collect reliable data?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
How do you think citizen science processes can be improved? Did you gather any insights?	*Open answer*				
How do you think citizen science can be possitive for your city?	*Open answer*				

Identification				
1	**Regular questions**			
	gender			
2	**Possible questions to caputre the socio-economic status of the participants**			
	Home language			
	The mother's highes level of education			
	Receive a school allowance			
3	**Possible questions at the end of the questionnaire**			
	Would you like to make a recommendation for improvement or just provide personal feedback on the experience, please put it in the box below.			

COMPAIR

Participation & behaviour	Options					
1 Why did you participate in COMPAIR?						
I find it interesting to take part in a scientific study	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I'm curious about the air quality in my neighborhood, on my way to school/work, …	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I want to learn more about the causes of, and solutions to, air pollution	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I want to make other people aware of the importance of air quality	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I assume that this project can help me to take action to improve air quality in my neighborhood	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I am concerned about the air quality for my (grand)children	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
I like the idea of being part of community projects that foster sustainable neighbourhoods	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
2 Are you going to share the knowledge or experience you've gained within COMPAIR with others?	Agree	Neutral	Disagree			
3 Have you adjusted your behaviour compared to before your participation in COMPAIR?						
Do you take air quality into account when choosing a route to work / school?	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
Do you take the bike more often – now that you are more aware about AQ?	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
Have you reduced the use of your car – now that you are more aware about AQ?	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	
4 Did COMPAIR fulfill your expectations?	I had no expectations	Not fulfilled	To a limited extent	Half fulfilled	Largely fulfilled	Completely fulfilled
5 Did the project inform you adequately about the air quality in your neighborhood?	Completelt agree	Mostly agree	Neutral	Mosstly disagree	Completely disagree	
6 Did the project inform you adequately about the air quality on your way to school / work?	Mostly agree	Neutral	Mosstly disagree	Completely disagree		
7 Did you change your mobility due to COMPAIR?						
Car driving	Done more	Done as much as bef	Done less	Do not	Don't know	
Riding my bike	Done more	Done as much as bef	Done less	Do not	Don't know	
Walking	Done more	Done as much as bef	Done less	Do not	Don't know	
Using public transport	Done more	Done as much as bef	Done less	Do not	Don't know	
Flying	Done more	Done as much as bef	Done less	Do not	Don't know	
Opting for healthier cycling and walking routes	Done more	Done as much as bef	Done less	Do not	Don't know	
8 Did you discuss air quality in the last 12 months?						
Addressing AQ issues at my work environment	Done more	Done as much as bed	Done less	Do not	Don't know	
Addressing AQ issues in my immediate vicinity	Done more	Done as much as bed	Done less	Do not	Don't know	
Addressing AQ issues related to AQ at public services or politicians	Done more	Done as much as bed	Done less	Do not	Don't know	
Addressing AQ issues in the school of my (grand)children or in the neighborhood	Done more	Done as much as bed	Done less	Do not	Don't know	
Inform other people about AQ problems and possible solutions	Done more	Done as much as bed	Done less	Do not	Don't know	
9 Did you change your behaviour at home due to COMPAIR?	Yes	No, but planning on doing in the near future	No	Not yet		
10 Do you plan on relocating because of COMPAIR?						
Looked for another school with better air quality	Yes	No, but planning on doing in the near future	No			
Looked for another working place with better air quality	Yes	No, but planning on doing in the near future	No			
Looked for another place to live with better air quality	Yes	No, but planning on doing in the near future	No			
11 Did you talk about COMPAIR?						
With friends	Yes	No				
With family	Yes	No				
With neighbors	Yes	No				
With colleagues at work	Yes	No				
During social activities	Yes	No				
At the children's school	Yes	No				
Other	Yes	No				

COMPAIR

Skills	Options				
1 Did you get enough guidance during the experiment?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
2 Are you satisfied with the tools provided to you in the project (dashboard, app, …)?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
3 Did you understand what was shown on the dashboard?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
4 Did you understand what was shown in the APP?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
5 Do you feel like you've learned something new thanks to this project?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
6 Do you feel more capable to understand AQ problems?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
7 Do you feel more capable to tackle AQ problems?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
8 Have you been able to used data or insights gaterhered in the experiment	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*

Openness & Cooperation	Options				
1 Were you sufficiently involved in the different steps of the experiment?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
2 Did you feel your contribution was appreciated enough?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*
3 Can you easily get access to the COMPAIR data?	*Completely agree*	*Mostly agree*	*Neutral*	*Mostly disagree*	*Completely disagree*

COMPAIR

Inclusiveness	Options				
1 Inclusiveness general					
I had a good feeling about participating	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
I felt accepted amongst other participants	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
I felt out of place amongst the participants	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
2 Representation					
I felt that the foreknowledge of the other participants	was a lot more extensive then mine	was a little more extensive then mine	was the same as mine	was a little less extensive then mine	was a lot less extensive as mine
To participate in this experiment I felt that I was	a lot more skilled then the other participants	little more skilled then the other participants	was equally skilled as the other participants	was a little less skilled then the other participants	was a lot less skilled then the other participants
Incorporating the results in everyday life is due to financial reasons for me	very easy	easy	not easy, not difficult	difficult	very difficult
Incorporating the results in everyday life is due to timemanagement reasons for me	very easy	easy	not easy, not difficult	difficult	very difficult
I feel skilled to incorporate the results in my everyday life	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
3 language intelligibility					
During the recruitment phase	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
During the experiment	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
Of the conclusion sharing afterwards	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
Overall understanding communicaitions during the entire project was	very difficult	difficult	Neutral	easy	very easy
During the recruitment phase understanding communications was	very difficult	difficult	Neutral	easy	very easy
During the experiment phase understanding the communication was	very difficult	difficult	Neutral	easy	very easy
During the conclusion sharing afterwards the communication was	very difficult	difficult	Neutral	easy	very easy
The communicatiion during the recruitment phase was in the right format (brochure, presentation, conversation, …)	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
The communication during the experiment phase was in the right format (brochure, presentation, conversation, …)	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
The communication during the conclusion sharing was in the right format (brochure, presentation, conversation, …)	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
During the recruitment phase the communication contained difficult words or words that were new to me	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
During the experiment phase the communication contained difficult words or words that were new to me	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
During the conclusion sharing the communication contained difficult words or words that are new to me	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
Difficult words or words that were new to me were explained clearly in the communication	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree
Questions were answerd in a comprehensive manner	Completely agree	Mostly agree	Neutral	Mostly disagree	Completely disagree