



# Deliverable D1.9

User requirements and log of  
user-centred design



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Abstract of deliverable	The Ground Truth 2.0 project delivers the demonstration and validation of 6 scaled-up citizen observatories in real, operational conditions, with 4 European and 2 African demonstration cases. It demonstrates the technological feasibility, the sustained use and the societal and economic benefits of such citizen observatories. The ultimate objective is the global market uptake of the concept and enabling technologies. This document provides a synthesized analysis of the user requirements collected during the co-design process and implemented in the citizen observatory platforms, as well as a description of the user experiences with the co-design process, techniques and tools employed during the project.

## Versions and Contribution History

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## List of Abbreviations

BRE	Barotse Royal Establishment
CBNRM	Community Based Natural Resource Management
CO	Citizen Observatories
CRB	Community Resources Board
WWF	World Wildlife Fund
CREAF	Centre de Recerca Ecològica i Aplicacions Forestals
DC	Demo Case
DIBA	Diputació de Barcelona
DoA	Description of the Action
EU	European Union
GT2.0	Ground Truth 2.0
GTW	Ground Truth Week
HWC	Human Wildlife Conflict
ICTs	Information and Communication Technologies
METEOCAT	Servei Meteorològic de Catalunya
MMM	Meet Mee Mechelen
MMWCA	Maasai Mara Wildlife Conservancies Association
NGO	Non-Governmental Organization
T	Task
URTT	User Requirements Tracking Tool
VAGs	Village Action Groups
WP	Work Package

## Executive Summary

One of the aims of Ground Truth 2.0 (GT2.0) is to demonstrate that sustainable Citizen Observatories are possible, by making the social dimensions the starting point of their design. The enabling technologies of the respective citizen observatories are therefore tailored to their envisaged societal needs. The user-centred co-design (T1.2) was one of the core tasks of the project, implementing an interactive user-centred design process focused on generating value for users. The Functional Design task (T1.3) provided a methodology to facilitate the communication between WP1 and WP2 by tracking and reporting on the user requirements collected in WP1 to prepare the technical design and development in WP2.

The purpose of this document is to provide a synthesized analysis of the user requirements collected in the interaction moments and implemented in the platforms, as well as a description of the user experiences with the co-design process, techniques and tools employed during the project. The GT2.0 Demo Case successfully facilitated the implementations of a generic process in six Demonstration Cases with different thematic, geographic and cultural contexts. All six cases completed the sequence of steps using the same methodical tools, albeit at different speeds, and with a variety of adaptations of the core process to the needs of the situation.

The deliverable aggregates the co-design process of each Demo Case, including the core descriptors and stakeholders per case, and provides reflections on the co-design experience and dynamics by the cases. It furthermore collates the user requirements of each case, documents the impacts of technical efforts and learning on the delivery, and reflects on the effectiveness of the user requirements tracking tool and functional design method. In this regard, simplifications are suggested as it was noted that the original design proved too complex for the practical use of the demonstration cases, while not providing sufficient guidance in others.

# 1 Introduction

## 1.1 Background

Citizen science, enabled by ICTs, is on the rise. Using their own observations and mobile devices, citizens provide a new data stream that generates localized information about the environmental situation on the ground, complementing existing data systems and surveys. However, many efforts to implement citizen observatories are facing problems sustaining engagement by citizens, limited scalability and limited impact on governance processes. The Ground Truth 2.0 project served to demonstrate and validate the technological feasibility, sustained use and the societal and economic benefits of such citizen observatories, with 4 European and 2 African demonstration cases.

One of the aims of Ground Truth 2.0 (GT2.0) is to demonstrate that sustainable Citizen Observatories are possible, by making the social dimensions the starting point of their design. The enabling technologies of the respective citizen observatories are therefore tailored to their envisaged societal needs. The user-centred co-design (T1.2) was one of the core tasks of the project, implementing an interactive user-centred design process focused on generating value for users. The Functional Design task (T1.3) provided a methodology to facilitate the communication between WP1 and WP2 by tracking and reporting on the user requirements collected in WP1 to prepare the technical design and development in WP2.

Accordingly, the findings documented in this deliverable capture the user perspective on tools developed in other WP1 Tasks, or activities guided by their deliverables (see Figure 1).

## 1.2 Purpose of the document

The purpose of this document is to provide a synthesized analysis of the user requirements collected in the interaction moments and implemented in the platforms, as well as a description of the user experiences with the co-design process, techniques and tools employed during the project.

It collates observations about the initial co-design process model and implementation method, which was developed based on assumptions and known best practices (see DoA and deliverables D5.2, D1.5, D1.6, and D1.10). The analysis in this document is limited to documenting the empirical experience of the Demonstration Cases. It aims to capture the complex dynamics of the user-driven design process as it unfolded in six cases with different geographic, thematic and cultural settings. Implications for the process and tool design will be derived as part of the validation in D1.12, resulting improvements of the process and methods will be presented in D1.13.

## 1.3 Structure of the Document

The remaining document has four sections. Section 2 provides a brief overview over the GT2.0 methodology for user interaction validated in the project, presenting the initial process and methods used both to instruct the Demonstration Cases and to collect the data required for the validation of user requirements (for the methodology for requirements tracking, see D1.6) and to trace user experiences. Section 3 contains a summary and highlights of the user experiences and user requirements reported by the Demonstration Cases, with the complete user inputs documented in Annexes 1-3. Section 4 concludes with suggestions on which parts of the process and tools might require improvements.

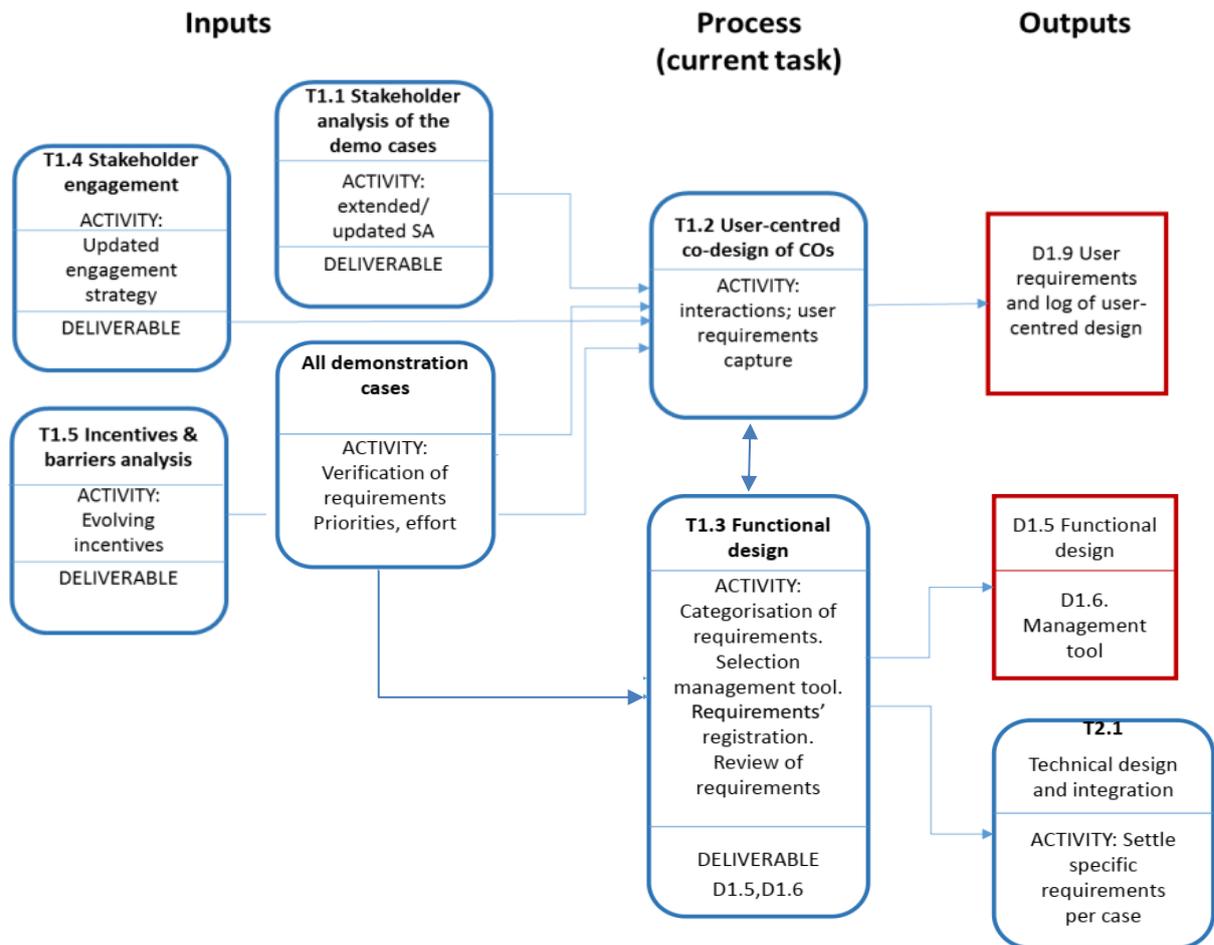


Figure 1 Dependencies and Relation between the Tasks of WP1

## 2 Methodology

### 2.1 Demo Case methodology and co-design process

The approach for producing this deliverable is based on distinct ways of working in the Ground Truth 2.0 project, namely the guidance of the co-design processes in the six Demonstration Cases via a common methodology (based on an initial process model, see section 2.2), accompanied by thorough knowledge management to provide consistent instructions and document emerging outputs and process-based insights (using compendia, see section 2.3). These aspects are summarised in the sub-sections below, followed by a summary of the sources of information for this deliverable.

The '**Demo Case methodology**' applied in the Ground Truth 2.0 project served two purposes. It guided and coordinated the GT2.0 demo cases during implementation of the project, but also created the blueprint for the Ground Truth 2.0 methodology itself. This methodology is a generic process model for developing Citizen Observatories in diverse thematic and cultural contexts. Developing and marketing a validated and refined version of it forms part of the project's exploitation strategy.

To facilitate this effort, the Demo Case methodology paid special attention to generic aspects of the process, as well as to the design of customizable templates and protocols that can be re-used in the future. The methodology took into account the specific characteristics of citizen observatories as hybrid structures that include (1) technical features (IT platform and Smartphone applications), (2) services and social innovation (enabling and improving information for decision makers and collaborative planning processes), as well as (3) community building activities required to reach critical mass and enable commercialization.

Drawing on established methods from software development, innovation management, and business development, the project employed an approach that

- applied **one generic approach** to building a CO in all six cases, but allowed tailoring to the context
- **implemented** the approach in each of the six demo cases **in parallel but at different speeds**
- **maintained clear responsibilities** for milestones and deliverables of the overall GT 2.0
- provided DCs and stakeholders with one coherent set of instructions and requests at a time;
- guided DCs in the production of useful outputs for GT2.0 WPs.

The resulting method allowed the parallel production of concept notes and deliverables by GT2.0 Task Leaders, the collation and structuring of Task inputs into coherent Demo Case instructions by the Project Management team, and the delivery of Demo Case inputs to the project as well as delivery of the COs themselves by the Demo Case teams (see Figure 2).

For the purpose of this deliverable, it is important to note that all observations including user feedback reflect experiences with this multi-purpose process. Accordingly, the analysis has to carefully separate the different functions of the methods employed, as well as the response of users to them. For example, a 'regular' CO co-design process in the future will very likely neither involve validation exercises for the method, nor require coordination between a 'method development team' and a 'CO development team'. The following sections present findings related to the core co-design process only.

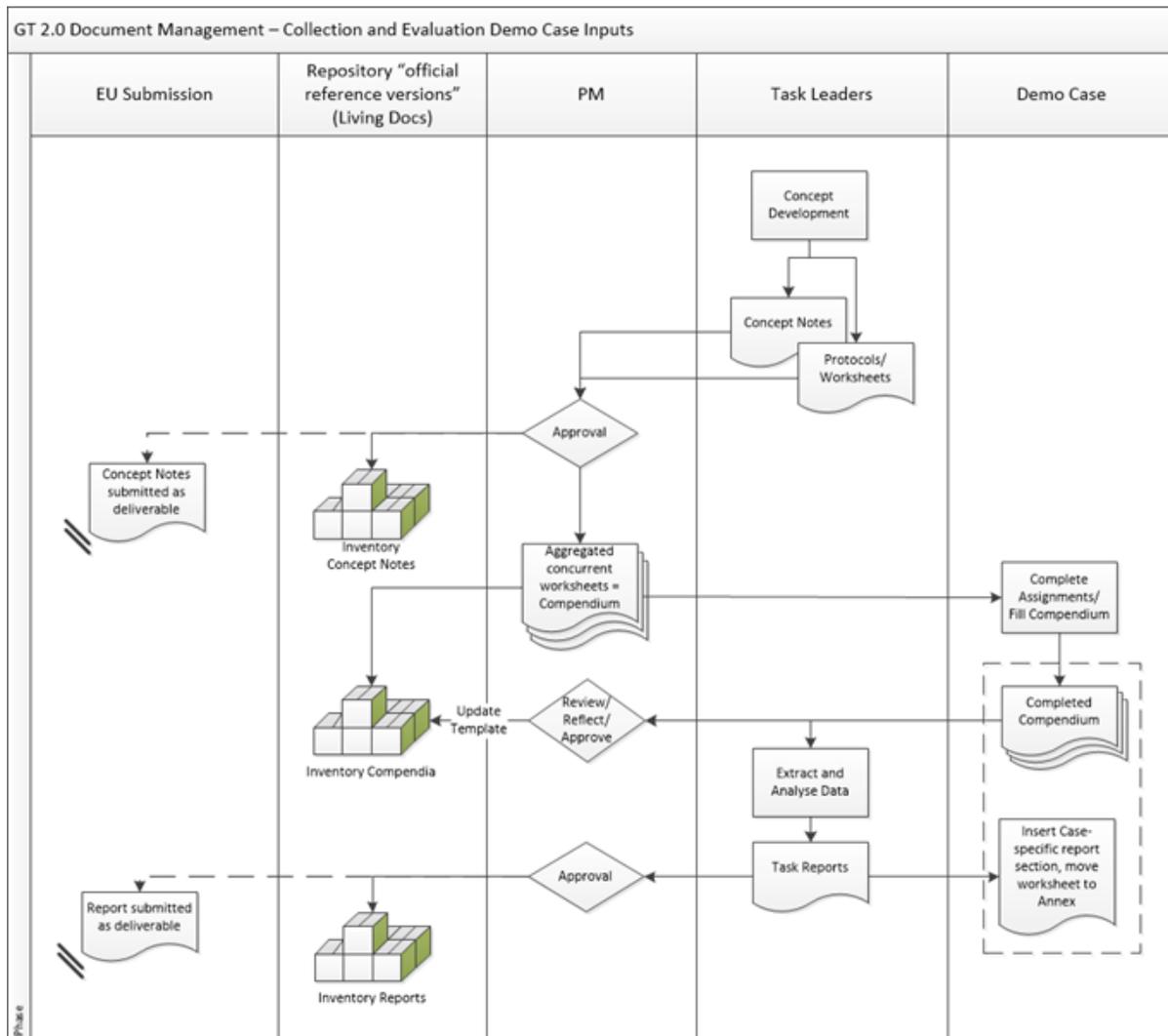


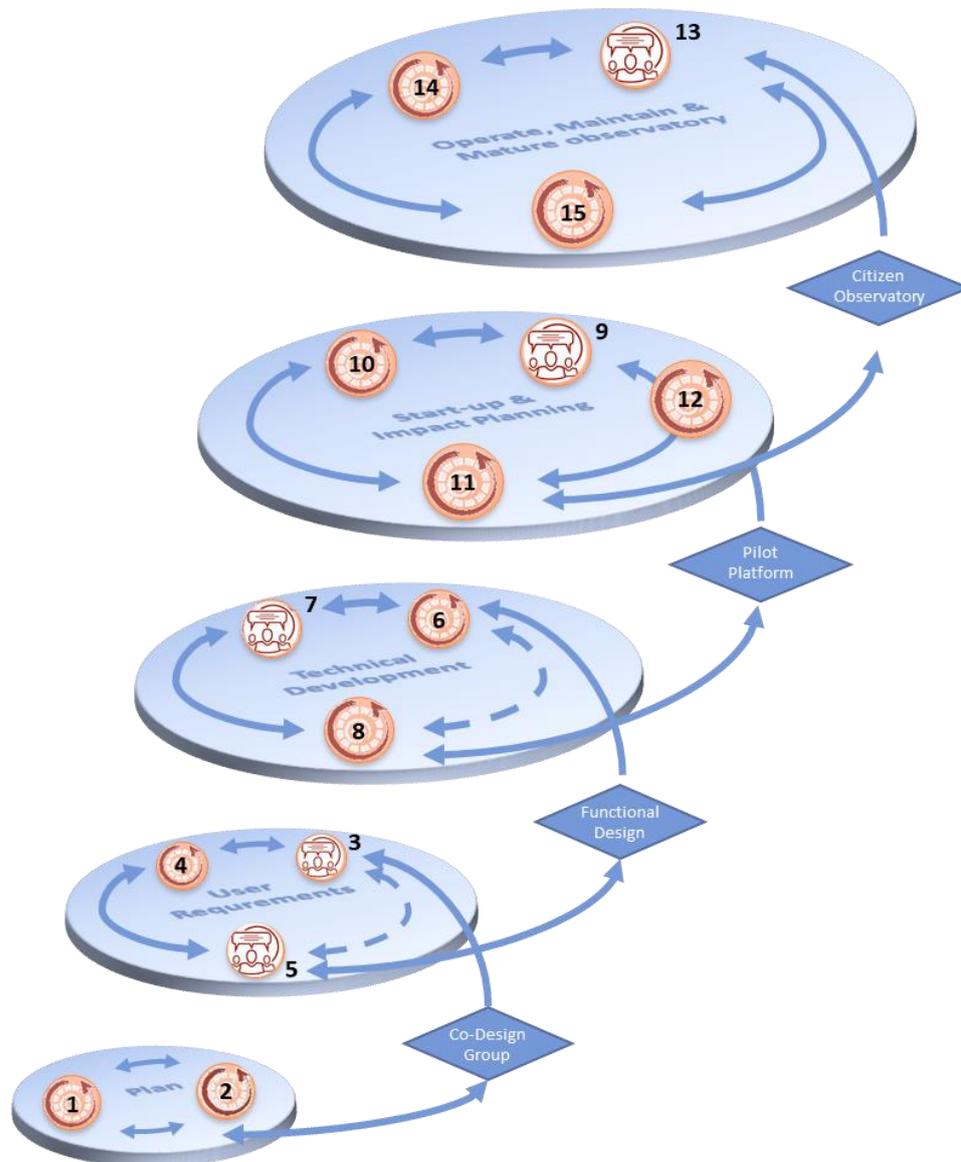
Figure 2 The GT2.0 document management process

## 2.2 Initial process model validated in the Ground Truth 2.0 project

The project adopted a generic sequence of activities with possible iterations and feedback loops (see Figure 3). The design and development of the demo case platforms was refined in five phases of user-centred design activities:

1. The **Planning** phase serves to set up basic project infrastructure, tailor the methodology to the specific circumstances of each Demo Case and perform baseline analyses.
2. The **User Requirements** phase serves to assemble a core group of stakeholders, negotiate a shared vision for the purpose of the Citizen Observatory and collect functional requirements on the form of ‘stories’ of how future participants will interact with the platform, its services and data.
3. The **Technical Design** phase serves to translate the function design into a technical design, and develop, code and test functional components of the platforms and data aggregation tools.
4. The **Customization and Roll-out** phase serves to design, customize and test the interface and feedback components of the platforms together with core stakeholders.

- The **Operation & Maintenance** phase starts the final set of ongoing tasks which will be implemented continuously during long-term operation of the observatory.



**Figure 3 The GT2.0 Co-Design "Spiral"**

Each phase contains clusters of parallel activities. Activities are performed and completed with iterations and feedback loops as needed. This means activities can be repeated if an activity-output needs revision, or the activity cycle of a stage can be iterated if the outputs require refinement. Defined activity clusters included formal interactive sessions with stakeholders (guided by T1.2), organized after approval of preparatory analyses. Advancing from one phase to the next involves a Quality Assurance moment, reflecting the principles of a stage-gate-approach.

### **Phase I) Planning & Baseline Analyses**

- Activity Cluster 1: Tailor Methodology: Select tools and methods, technical & quality criteria, planning of the co-design process
- Activity Cluster 2: Baseline analyses of stakeholders, context, incentives/barriers
- ⇒ Gate 1: Approval of the Methodology (basic protocols and checklists per demo case with matching stakeholder map)

### **Phase II) Capture user requirements & functional design**

- Activity Cluster 3: Interactive capture of user requirements and profiles
- Activity Cluster 4: Review case architecture and technical requirements
- Activity Cluster 5: Finalize user requirements analysis and functional design
- ⇒ Gate 2: Approval Story Maps

### **Phase III) Technical design, process & data integration**

- Activity Cluster 6: Technical development and interactive design of political processes
- Activity Cluster 7: Data Integration and Kick-off data Collection
- Activity Cluster 8: Functional test architecture
- ⇒ Gate 3: Approval tested technology components

### **Phase IV) Customize interfaces, test & roll-out platform (1st version)**

- Activity Cluster 9: Configuration and interactive design of custom platform interfaces
- Activity Cluster 10: Test-run and final usability tests
- Activity Cluster 11: Roll-out version 1 of case platforms
- Activity Cluster 12: Plan long term operation
- ⇒ Gate 4: Approval working prototype platforms

### **Phase V) Operation, upscaling and 2<sup>nd</sup> version platform**

- Activity Cluster 13: Plan Community activities
- Activity Cluster 14: Implement community activities
- Activity Cluster 15: Improve Platform

## **2.3 Knowledge management – compendia**

Each Demo Case received guidance to complete the development journey along the development spiral in the form of ‘compendia’ (see Figure 4). A compendium is a collection of instructions, work sheets and guidelines provided by the Work Packages to the Demo Cases in a specific phase of the project. It is also a workspace for the Demo Cases to provide requested information and data. Over the course of the project, three compendia were developed:

- Getting started compendium
- Co-design compendium
- Launch Compendium

The Demo Case leaders used the compendium to report all results of their activities and workshops, either filling prepared spaces in the document directly, or using links to online forms and Google Sheets provided, with instructions, in the compendium.



Figure 4 Compendia provide coherent sets of instructions to Demo Cases

## 2.4 Data sources and data analysis for this report

Two formats for results documentation constitute the core inputs for this deliverable, the User Requirements Tracking Tool (URTT, see D1.6) on the one hand, and the Session ‘Logbook’ entries on the other. URTTs were used to capture user requirements in the original voice of users, which were translated into functionalities. The GT2.0 methodology provided tools specifically assisting with the translation of stakeholder ideas into technical functions specific to Citizen Observatories. This deliverable catalogues user requirements mapped against delivered functionality. Analysis of the results, both in terms of the effectiveness of the development tools, as well as regarding the performance of the project in delivering on the requirements, will be presented in Deliverable D1.12.

The GT2.0 ‘Logbook’ template was included in the Demo Case compendia, guiding a structured reflection by workshop facilitators about the dynamics and outcomes of each workshop. Logbook entries form key inputs for a range of social science based analyses conducted in the project. While workshop reports and templates for co-design exercises document the results of a workshop, and participant surveys provide direct feedback on stakeholder satisfaction, the logbook collects structured information about participant configurations, competencies, power dynamics and attitudes. It also captures differences between intentions of workshop planners and the reality of the workshop as conducted. In order to examine the Demo Case co-design dynamics, specific logbook entries (related to interaction method, achievement of session objectives, competencies, interaction dynamics and lessons learned) are collated and analysed across events within each Demo Case.

## 3 Reflection on User Requirements and User Experiences

### 3.1 Evolution and Implementation of user requirements

The outcomes of the collection of user requirements were already presented in the Functional Design deliverable (D1.5), including the original User Requirements Tracking Tool (URTT) entries per case. Functionality delivered based on these functional designs is described in deliverables D2.2-D2.7 (platform first version), the final versions of the Demo Case platforms are detailed in deliverables D2.8 – D2.13, respectively. The analysis of the user requirements themselves and delivery on user stories will be presented in D1.12.

For the purpose of this deliverable, a synthesized analysis of the user requirements collected in the interaction moments (in Phase II) and the extent of their implementation in the platforms for each Demo Case are presented in Annex 1 (Log of User Requirements). In preparation of the validation, implementation of the identified requirements is qualified with basic assessments on technical effort and changing understanding of the groups.

From a technical point of view, it indicates per user story whether:

- It is a core/standard function of recommended enabling technology
- It can be done with simple customization of recommended enabling technology
- It would require the integration of an additional tool/service/module
- It would require custom development

From the point of view of the groups, it is cross-checked if user stories identified during the functional design process lost relevance with progressive collaboration of the CO community.

In the sub-sections below, we summarise the co-design process of each Demo Case, including the core descriptors and stakeholders per case, the vision and mission of the CO agreed in the co-design process, as well as core process indicators in terms of the number and type of stakeholder engagements conducted as part of the process. The full reflections of the case experience in implementing the generic steps of the co-design process are presented in Annex 2 (log of user experiences per session/event) and Annex 3 (Demo Case experiences of the Co-design process per step of the process).

### 3.2 User experience: Co-Design in the Demo Case Belgium

Table 1 Summary of the Belgium Demo Case and Co-Design Process Indicators

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<p><b>Name:</b> Meet Mee Mechelen</p> <p><b>Location and scale:</b> City of Mechelen, Belgium</p> <p><b>Issue addressed:</b> Air quality and ambient noise in the city</p>	<p>Regional authorities (Flemish government), city administration, civil society organisations, and research institutes</p>	<p>In Mechelen, all stakeholders cooperate in a sustainable and constructive manner to keep on improving the air quality and the soundscape.</p> <p>The citizen observatory becomes an online and offline meeting place where we gather and build data, information and knowledge about air quality and ambient noise and make all accessible for everyone, to support policymaking and initiatives for a better living environment.</p>
<p><b>Process indicators</b></p>	<p>8 co-design sessions and meetings (incl. some bilateral/split groups), 4 measurement campaigns, 3 public outreach campaigns (uit zonder uitlaat), 2 information session to discuss results with the public with 3 parallel interactive workshops, 18 working group meetings (monthly - 9 x air quality and 9 x noise pollution), 4 planning/discussion meetings, 5 bilateral meetings, 2 public discussion evenings on noise, GTW event.</p>	

The co-design group of the Belgian Demo case was populated mostly by people with a strong sense of local identity and the language used was that of a professional setting, but linked to the self-identity in the group. This co-design dynamic was set in a context of customarily involving "organized citizens" in political consultations which creates a pool of well recognized civilian experts in Belgium. Nevertheless, the stakeholder dynamics were characterised by power play between citizens and policymakers, especially during the definition defining the problem/main issue to be addressed by the future citizen observatory. Specifically, it was difficult to identify and agree upon the vision, mission and objectives; this was also perceived as an abstract stage of the co-design process by the participants and not all approaches (e.g. use of post its) were equally well-received by participants. Discussing draft versions of the vision, mission and objectives was more constructive and well received.

The presentations by the technology partners to demonstrate available tools were well received. It was the first time that participants started to grasp the technological aspects of the citizen observatory. The analysing the results of the first measurement campaigns led to key learning moments, as it became clear that there the group mostly represented stakeholders affected by air and noise pollution, but fewer stakeholders involved with decisions affecting the situation, such as road construction and citizens commuting.

The case illustrates connection between the interests and styles of stakeholders, and the outcomes and challenges of the resulting observatory. A key lesson reported by the case is that "you don't choose your volunteers, but they choose you". Lead participants sign on to pursue their specific interests; and conflicts in style or interests can shape the interaction dynamics in design workshops. For some issues, the guided co-design process led to important learning moments. For example, the process revealed that civilian experts, often from organized civil society organizations, are already consulted in political processes to a higher

degree than other citizens had assumed. Also, having a diverse group of stakeholders in the room during the data analysis revealed that having the information does not equal having a solution, as some activists were made more aware of potential unintended consequences of choices, realizing, for example, that a pollution map coloured for maximum political effect had the potential to negatively affect real estate prices.

At the same time, a CO as conceptualized by the GT2.0 project is based on the participation of different stakeholders including decision-makers, and facilitates interactions with connections to decision-making processes. In this regard, the self-selection of stakeholders can have a relevant impact. In the Belgian case, the DC team reported difficulty boosting engagement for other actions besides monitoring, as data collection was the activity that created most of the enthusiasm. It was noted that working with policy makers in particular requires specific interaction dynamics, which can be time-consuming. The combination of a civilian group with, relatively speaking, less interest in CO activities outside of data collection, and a CO setup embracing the political dimension, creates the need for strong community organizers initiating activities, which the case has difficulty to find.

The incorporation of the formal launch of the Meet Mee Mechelen CO in a bigger (city-wide) public event meant that a wide audience could be reached. The most successful activities in terms of engagement for the Belgian Demo Case have been the monitoring itself, organised as a campaign, and the public event organised to present the results. The current initiative is reinvigorated to start noise pollution measurements as a means of expanding the platform. An operational model was only developed late in the process, connecting the observatory to the larger Klimaan network, establishing Meet Mee Mechelen as a Working Group of Klimaan, providing activities on the topic of air quality for Klimaan.

### 3.3 User experience: Co-Design in the Demo Case The Netherlands

Table 2 Summary of the Dutch Demo Case and Co-Design Process Indicators

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<p><b>Name:</b> Grip op water Altena</p> <p><b>Location and scale:</b> Island of Altena (initially 3 municipalities of Werkendam, Aalburg en Werkendam – merged into Altena at the beginning of 2019), The Netherlands</p> <p><b>Issue addressed:</b> Flooding ("water nuisance") in the urban and rural areas caused by extreme rainfall and climate change</p>	<p>Water authority, municipalities, nature focussed interest groups, local companies around gardening, and individual citizens.</p>	<p>The citizen observatory is a place (on- and offline) where collected observations, knowledge and warnings are shared, where bottlenecks and measures are constructively discussed along short communication lines and where it is clear which actions are taken by which party.</p>
Process indicators		
<p>5 co-design sessions</p> <p>10 planning meetings</p> <p>9 bi-lateral meetings</p> <p>1 CO launch event</p> <p>1 public event</p>		

2 excursions (1 incl. the consortium)

3 outreach (stands at other events)

The dynamics of the co-design process in the Dutch Demo Case was shaped both by the nature of the observed phenomenon, and by political dynamics between the relevant authorities involved. With regard to the observed phenomenon, a complicating factor is that observations of pluvial flooding cannot be planned ahead, as they only occur under severe weather conditions. In a related effect, interest and awareness in the community for pluvial flooding is at least partly connected to experiencing (or remembering) the effects of pluvial flooding. Therefore, the community is both affected by oscillating attention levels, and crystallized around creating communication channels about the issue and measures that can be taken outside of newsworthy events. With regard to the political dynamics, the

During the co-design process, it was quickly established that a lack of data is not the key issue in the case. The water board was interested only in specific additional data lacking in their data sets, and access to and sharing of exiting data was a major bottleneck. Two successful online surveys showed that there is a large awareness of the topic in the area, and over the course of the process the municipality and water board have become more aware of community dynamics. Many people were already taking actions on flood prevention, but there was little communication between parties. This insight led to a shift in objectives.

The dynamics of the design process themselves were shaped by a struggle to clarify what role technology could play in improving the collaboration and communications issues identified as core challenge. The concept of a 'platform' was too abstract and hard to grasp in the beginning and only landed when mock-ups were shown. Citizens were willing to try new functionality and applications, but technical skills are limited, highlighting the importance of the two way dialogue of the co-design, in which technical partners provide structured inputs for consideration of the future users in ways that allow meaningful feedback.

The resulting platform includes a website with info on pluvial flooding (incl. historical events), information on projects from the municipality and the water board, measures that citizens can take, online questionnaires and observations. Information that was previously only available only for experts, is now available for larger public. In the case of a future flooding event, an infrastructure for communication is now available.

Balancing the interests of the different stakeholder groups was a key challenge of the process facilitators, as the links with institutional mandates of municipalities and water boards mean that stakeholder groups could be mobilized but not with the immediate expectation of future ownership. The resulting co-design group was small, which was considered an asset for decision making. However, stakeholders from municipality had difficulty to find the time to engage in the process, and more so to act on project outcomes. Outreach events were used to increase visibility and attract new participants of the CO, and while the group of followers (email updates, social media) keeps growing, the core of active group organizers remains small.

For continued operation of the platform, hosting by the municipality is under consideration. As a second option, the CO could continue as a working group of one of the existing local nature organisations. The decision represents one of hosting by decision-makers versus hosting by citizens and has not been made.

### 3.4 User experience: Co-Design in the Demo Case Sweden

Table 3 Summary of the Swedish Demo Case and Co-Design Process Indicators

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<p><b>Name:</b> VattenFokus</p> <p><b>Location and scale:</b> Mälarendalen region, Sweden</p> <p><b>Issue addressed:</b> Water quality management in socio-ecological systems in the Mälarendalen region</p>	<p>Administrative and political representatives of local authorities, local community members, water authorities, NGOs, the cadaster and the university</p>	<p>We envision a society where government, business, citizens, researchers and civil society organisations collaborate to be active stewards of a sustainable environment.</p> <p>Our mission is a citizen observatory that supports all stakeholders to collaborate in the governance and action of the aquatic ecosystems by collecting data, sharing knowledge, making data accessible that complements established governmental initiatives.</p>
Process indicators		
<p>3 co-design sessions</p> <p>3 further stakeholder meetings to present tools, website, and gather stakeholder feedback and engagement of local citizens.</p> <p>2 Data collection “Blitzes”</p>		

The co-design dynamic in the Swedish Demo Case was shaped by the need to find community leaders and political experts who were identified and engaged (or sometimes ‘wooed’) individually, and on a personal level. The case reported that building the case on champions from the start might have been helpful, i.e. that an attempt to activate larger numbers early on is not necessarily the strongest strategy in Sweden. Partly as a result, the Swedish co-design process experienced a change in focus and geographical reach over the course of the project. While initially a strong focus was on Stockholm municipality, the process was driven by the personal networks of partners, and ultimately focused on Flen and Dunkern village with a more coherent co-design group.

In terms of results of the process, requirements were implemented mainly by combining existing tools with new functions on the web interface. Analysing the user requirements expressed in vision and user stories implied that there was a certain gap between the ambitious goals of the group, and the practical function of the CO that can be achieved with the stakeholder community. For long term sustainability, cooperation with existing organized groups such as the Naturskyddsforeningen or other suitable NGOs with national stature (and existing stable communities) will be key.

### 3.5 User experience: Co-Design in the Demo Case Spain

Table 4 Summary of the Spain Demo Case and Co-Design Process Indicators

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<p><b>Name:</b> RitmeNatura.cat</p>	<p>Meteorological institute, research centre and</p>	<p>In the digital world, there will be a place that allows citizens, managers,</p>

<p><b>Location and scale:</b> The part of Spain that encompasses the autonomous community of Catalonia, Spain</p> <p><b>Issue addressed:</b> Creating collective knowledge about the local impact of climate change on nature and its rhythms in Catalonia in order to contribute to better adaptation policies</p>	<p>representatives of regional authorities and of citizen-observer communities.</p>	<p>and politicians to access and share phenological information. Such a place will allow communication among stakeholders and will be sustainable in time.</p> <p>The Observatory will be the place where phenological data, in particular, that collected by citizens, will be stored and made accessible in real-time, with the aim of influencing decision making.</p>
<b>Process indicators</b>		
<p>5 co-design sessions</p> <p>1 workshop</p> <p>1 outreach presentations at conference</p> <p>4 campaigns (with presentation of RitmeNatura)</p> <p>1 exhibition</p>		

The Spanish Demo Case built on previous Citizen Science initiatives in the same area, leading to the ambition of RitmeNatura to become an umbrella-platform that would include the input of existing data collection platform, but with a stronger connection to climate action, and community communications.

The composition of the group consisted mainly of stakeholders with institutional mandates, such as the Catalan meteorological institute, CREAM, and policymakers, giving the co-design group an institutional character. As also observed in other Demo Cases with strong institutional links, clarifying formal roles and ownership was an important concern for these stakeholders, creating a reactive and cautious dynamic. It also complicated the transfer of responsibilities for administering and organizing the community, as many engaged group members were not adequately mandated by their employers to take on responsibilities outside the co-design process. –With regard to impacts, however, the focus on institutional stakeholders proved very useful. For example, the Barcelona citizen science office (Oficina de Ciencia Ciudadana) was an active member of the co-design group, which contributed to the successful engagement of schools, and current considerations to incorporate citizen science both into school curricula and future biodiversity monitoring in Catalonia.

Citizens were not directly involved in the co-design process, only ‘by proxy’ through representatives of the existing platforms. This was not caused by a lack of interest - dissemination events are very well attended by the public – but likely by the very practical reason that meetings could only be held between 9 and 5, for all intents and purposes excluding the working population. At the same time, the process created great synergy and personal affinity between stakeholders with experience and a shared focus on citizen science (CREAM, Meteocat, DIBA).

With regard to user requirement and the resulting platform, the case was challenged by two aspects. Taking advantage of an existing platform (natusfera) served to improve the chances for long-term sustainability, but also meant that requirements noted by the co-design group were subject to approval by the pre-existing platform owner. The second challenge was to user expectations. After data collection activities, users seemed to expect feedback and become bored and de-motivated if such feedbacks were not available. As phenology data is not subject to fast changes, creating ‘action’ on the platform might be a long-term challenge.

However, the app also experiences technical issues, which may have contributed to some of the user reaction.

The outcomes of the collection of user requirements were already presented in the Functional Design deliverable (D1.5), including the original User Requirements Tracking Tool (URTT) entries per case. Functionality delivered based on these functional designs is described in deliverables D2.2-D2.7 (platform first version), the final versions of the Demo Case platforms are detailed in deliverables D2.8 – D2.13, respectively. The analysis of the user requirements themselves and delivery on user stories will be presented in D1.12.

For the purpose of this deliverable, a synthesized analysis of the user requirements collected in the interaction moments (in Phase II) and the extent of their implementation in the platforms for each Demo Case are presented in Annex 1 (Log of User Requirements). In preparation of the validation, implementation of the identified requirements is qualified with basic assessments on technical effort and changing understanding of the groups.

From a technical point of view, it indicates per user story whether:

- It is a core/standard function of recommended enabling technology
- It can be done with simple customization of recommended enabling technology
- It would require the integration of an additional tool/service/module
- It would require custom development

From the point of view of the groups, it is cross-checked if user stories identified during the functional design process lost relevance with progressive collaboration of the CO community.

A reflection on the lessons learned with regard to the requirement tracking and functional design method is included in section 4

In the sub-sections below, we summarise the co-design process of each Demo Case, including the core descriptors and stakeholders per case, the vision and mission of the CO agreed in the co-design process, as well as core process indicators in terms of the number and type of stakeholder engagements conducted as part of the process. The full reflections of the case experience in implementing the generic steps of the co-design process are presented in Annex 1 (log of user experiences per session/event) and Annex 2 (Demo Case experiences of the Co-design process per step of the process).

### 3.6 User experience: Co-Design in the Demo Case Kenya

**Table 5 Summary of the Kenyan Demo Case and Co-Design Process Indicators**

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<p><b>Name:</b> Maasai Mara Citizen Observatory</p> <p><b>Location and scale:</b> A part of the Mara ecosystem (incl. Maasai Mara National Reserve, Mara Triangle and conservancies around it), Kenya</p>	<p>National level authorities, county level authorities, individual local Maasai, organised groups of citizens, citizens associations, local universities, museums, community churches, and knowledge and data service providers, schools.</p>	<p>We envisage a society in which all stakeholders are working together to ensure the balance between sustainable livelihoods and biodiversity management in the Mara ecosystem.</p> <p>The citizen observatory will constitute a multi-stakeholder platform for generating and sharing of data, information, and knowledge to improve policymaking and implementation for sustainable livelihoods and biodiversity management in the Mara ecosystem.</p>

<b>Issue addressed:</b> Balancing biodiversity management and sustainable livelihoods		
<b>Process indicators</b>		
5 co-design sessions		
2 Soft launches		
3 Outreach events		
1 Training		

The co-design process in the Kenya Demo Case was characterized by the differing interests of the represented stakeholders, reflected in different understanding in particular between Narok County Government and the local Maasai in terms of what to monitor. This led to the formulation of a vision directly expressing this underlying dynamic, in envisioning ‘balancing sustainable livelihoods and biodiversity management’. With this outcome, the case demonstrates that a co-design process does not necessarily have to lead to all sides adopting the same interests, but that visibility for different perspectives itself can be a core function, creating local value.

In terms of evolving understanding of the local needs, the co-design process over time abandoned the idea of having lodges and tourists as primary sources of income and data. It was discovered that functions connected to the local authorities play a more prominent role. In practical terms, defining the role of local authorities has proven challenging. Closely connected to this challenge was realization that there was a requirement for a complex data policy, detailing access to and visibility of data, which was not fully discovered during the early design stages of the process.

In terms of co-design dynamics, the process benefitted from the involvement of a number of very active stakeholders. A WhatsApp group with 63 members and a separate student group facilitated continuous exchange. Five co-design workshops were held, but the frequency of face-to-face meetings was still not considered sufficient to keep momentum. Engagement of decision-makers presented the biggest challenge due to frequent changes in representatives attending meetings. It was also noted that the representatives of local authorities were sometimes not senior enough to make meaningful co-design contributions without consulting superiors. A challenging issue to address in the organization of the process was the local political custom of providing financial benefits for attending meetings (per diems), which can create difficulties for a citizen science initiative that depending on motivated champions.

Feedbacks imply that it might have been useful to discuss issues of sustainability earlier in the process. The impression is that stakeholders might be more willing to invest in the process if a longer term perspective beyond the project is more tangible.

### 3.7 User experience: Co-Design in the Demo Case Zambia

Table 6 Summary of the Zambian Demo Case and Co-Design Process Indicators

CO identity and location	Core stakeholders/ owners	Result: Vision and Mission of the CO
<b>Name:</b> National CBNRM Observatory	Village Action Groups, CRBs and regional/national CRB Associations; government departments with CBNRM	Communities, government agencies, and donors collaborate respectfully and effectively in implementing natural resource

<p><b>Location and scale:</b> National umbrella platform, linked to jurisdiction of 'Community Resources Boards', an institution under Zambian Wildlife law linked to traditional chiefdoms, Zambia</p> <p><b>Issue addressed:</b> Community-based Natural Resources Management</p>	<p>involvement; district administrations; town councils, conservation NGOs.</p>	<p>management and conservation efforts that benefit local communities.</p> <p>The "Niti Luli" platform will provide the virtual space for a "permanent community meeting" of local communities, government agencies, NGOs and donors, improving coordination between government agencies and donors and giving communities more influence in decisions affecting their lives and livelihoods.</p>
<p><b>Process indicators</b></p>		
<p>5 co-design sessions (4 in pilot area, 1 national) with &gt;100 stakeholders</p> <p>12 preparatory and special planning sessions (VAGs, CRB, Rangers, Technical staff, internal stakeholders)</p> <p>1 high-level workshop and &gt;20 briefings/presentations to decision-makers committees and authorities</p> <p>2 roadshows with 17 village meetings in 13 communities with &gt; 800 participants</p>		

The co-design outcomes of the Zambian Demo Case was shaped from the beginning by the fact that the core stakeholders on the citizen side represent legally mandated institutions established under several laws for decentralized natural resource management. Accordingly, the role and purpose of actors was clearly pre-determined as the case began. The process was shaped by the fact that natural resources management involves a complex landscape of government levels and structures, with parallel and overlapping jurisdictions. Early on it became clear that a local platform has little meaning in Zambia, as the relevant decisions are taken at the level of national departments. Connecting the local level to the national level thus became a core requirement in itself. Similarly, the issues raised by local stakeholders affected more than one department. In this regard, the co-design results suggested that a range of departments would need to be connected, as communities identified lack of coordination between departments as part of the core challenge.

As a result, the resulting platform design in Zambia went far beyond the scope of the originally suggested Demo Case, with a national geographic scope, and full institutional embedding. The process took more time than the other cases, with the development process not fully concluded at the end of the project period. With regard to the co-design dynamics, three main aspects determined the dynamics and duration of the process.

First, the pilot area took place in an area with the low mobile phone penetration, low capacity and general lack of basic infrastructure. Most of the target area is sparsely populated rural area, without roads, reliable and affordable transport, power, and big gaps in network connectivity. The process therefore involved formal workshops with the co-design group, as well as roadshows from village to village to validate the findings of the co-design group, and create broad awareness for the process in a situation where few other forms of communication exist. The CO introduces new technology in the area, and one core purpose is to help solve the fundamental logistical challenges that prevent effective information, consultation and collaboration, but the co-design process itself was fully subject to this challenge. Choosing to deliver a high level of community engagement was crucial, and successfully built credibility and trust towards the platform. The fact that the project took the time not only to visit villages for an initial consultation, but returned to report back, was clearly noted as extraordinary in communities. At the same time, this level of engagement is time and resource intense, and long technical delays with delivery of the platform make the stakeholders impatient.

Second, the multi-level, multi-stakeholder character of the case put the process facilitators repeatedly in the role of intermediaries. Distance alone prevented national level representatives from attending the co-design workshops, as traveling from Lusaka to Sesheke is a 13 hour drive by car. Accordingly, a range of stakeholders had to be updated repeatedly between workshops, and in each case had to be approached in the right way accounting for political dynamics. The facilitators were challenged to navigate the political landscape in the right way, understanding and linking the interests of national authorities to the local discussion of an abstract, not-yet-existent CO platform. Such a process requires significant capacities on the side of the process coordinators. In the case of the Zambian DC, it was made possible by a team of local professionals with extensive experience in the Zambian politics, advising an European partner who had sufficient experience and capacity to aggregate and process inputs collected in a wide range of meetings and workshops held in addition to the formal interaction moments. Over a dozen workshops, trainings and larger scale briefings of individual stakeholder groups were held ahead and around interaction moments, as well as 17 village meetings in two roadshows attended by hundreds of regular community members. Language and cultural barriers meant that the facilitator engaged in extensive discussions with translators and community facilitators after each event to fully grasp the outcomes and their implications, amounting to the data equivalent of dozens of semi-structured interviews. Resource limitations within the DC team meant, however, that the process encountered severe difficulties several times due to staff turnover and geographical distance.

Finally, the institutional embeddedness of the platform had significant implications for the technical requirements of the CO. Early on in the co-design process, it became clear that hosting security-relevant data on foreign servers could prevent the use of the platform for formal department procedures. Furthermore, the need for a national scale observatory combined with poverty on the citizen side implied that a platform had to be based on open source technologies. At that point in the process, the provisions of the EU consortium and grant agreements brought the co-design process temporarily to a halt, as the GT2.0 budget linked funding for the demo case to an enabling technology not in line with these identified requirements. Re-negotiating and re-allocating funding took almost six months, and the lack of familiarity of the new technical partners with the case led to additional delays.

Considering the time and effort involved in the case might raise the question if the case ran off track. In this regard, it should be emphasized that all requirements and design aspects of the case were discovered by following the co-design process. While the facilitators played an outsized role in communicating detailed between stakeholders, it was reconfirmed at various stages that the CO vision design was, nevertheless, fully based on requirements formulated by stakeholders, down to the language used to describe the platform, its purpose and its functions. Accordingly, the case demonstrates both the opportunities and challenges involved with fully committing to a user-driven design process, especially if and when the result diverge from expectations and assumptions of a project supporting the process.

## 4 Conclusions: Implications for co-design and user requirements tracking

### 4.1 Implications of the User experiences for validation and Recommendations

As documented above, the GT2.0 Demo Case successfully facilitated the implementations of a generic process in six Demonstration Cases with different thematic, geographic and cultural contexts. All six cases completed the sequence of steps using the same methodical tools, albeit at different speeds, and with a variety of adaptations of the core process to the needs of the situation.

A detailed analysis of the effectiveness of the method will be presented as part of the deliverable D.12. A number of cross-cutting observations regarding the user experience emerged at this stage, and should be reviewed in greater detail in D1.12, and revised for the Recommendations and Guidelines (D.13). Specifically,

- 1) The timing and structure of the stakeholder analysis during the co-design process requires revision. In the co-design process as implemented, it presented a big effort at a time when it was not yet clear to the co-design group itself which stakeholder needed to be considered. In contrast, at the time the team required stronger guidance for outreach and campaign planning, no such guidance was provided.
- 2) With regard to the stakeholders participating in the co-design process, the inclusion of institutional actors is both a defining factor for a citizen observatory, and seems to be one of the core factors shaping the dynamics of a co-design process.
- 3) With regard to the documentation produced for the GT2.0 project, the principle of using ‘compendia’ as working books seemed to have achieved its purpose in producing coherent and useful information about all demo cases. At the same time, one original intention of the method was to transform the compendia over time from working books with instructions into briefing books with results. This process was not fully completed in the cases, while at the same time new staff coming into cases struggled to catch up with the amount of information produced, as the intended summary briefing books were not easily available. The potential of the compendia as case documentation might require further consideration.

### 4.2 Revision of the requirements tracking

In GT2.0, Functional Design is defined as the method to translate the stakeholders’ requirements into design features based on the GT2.0 platform architecture. Functional requirements were captured in terms of users (“who”), tasks (“does what”) and motivations (“to achieve”). The co-design process employed **Story Maps** as a tool to conceptualize the planned platform. A Story Map consists of high level descriptions of the key activities that users need the system to help do (here referred to as ‘headlines’) and lists of related user interactions that are conducted with or via the CO platform. Story Maps arrange headlines to ‘tell a story’. Telling a story in headlines ideally ensures that the technical platform has an ‘inner logic’ users can follow, and prevents developers from adding random features that sound ‘cool to have’ but do not serve user needs.

“Headlines” describing core activities played a central role in the GT2.0 design process. While driven by the users and the generation of social value, the ‘product’ resulting from the process has pre-determined elements. A citizen observatory is a platform build for a specific purpose, supporting specific type of interactions between specific stakeholder categories. Furthermore, the project aimed to build platforms using customized versions of standardized tools, not build software from scratch. Accordingly, the analysis and processing of user stories by the team had to clarify how user requirements relate to CO functions and domains on the one hand, and how the generic functions of a CO relate to technical tools on the other.

The technical design deliverables present

In this regard, collecting and coding the headlines revealed the need for revision of the headlines originally developed, as well as for a revision of the tracking tool.

With regard to headlines, the process revealed that several of the original headlines could be merged. On the one hand, it became clear that it is very difficult for future users to envision what a “platform” actually is. Therefore, the headlines should be as clear and simple as possible. Furthermore, users did not distinguish certain, technically different features. As a result, the core main headlines were adjusted and simplified (see Figure 5). A more detailed analysis of the functional design step in the GT 2.0 methodology will be presented in D1.12.

The review also considered the effectiveness of the user requirements tracking tool. In this regard, it was noted that the original design proved too complex for the practical use of the demonstration cases, while not providing sufficient guidance in others. Three specific challenges were observed, and should be considered in the validation (see D1.12) and guidelines (D1.13).

First, the user-centred co-design tended to ignore requirements that users deemed too obvious (like logging into a website), or too technical (like administrative functions). Accordingly, an updated version of the URTT should provide a more prepared structure for user requirements, including mandatory elements for

- 1) Elements that establish a platform as CO (e.g. data collection)
- 2) Basic technical functions (e.g. login and help pages)
- 3) Background functions (e.g. moderator functions)

To ensure that the process stays sufficiently user-driven, it will be important to ensure such functions are still subject to user validation.

Second, more guidance is required for easy feedback by social or technical expert advisors to on the suggested user stories is required. This is necessary to identify, for example, user stories that reflect actions the community wants to see, but that cannot take place on a technical platform. Easier access to the user stories would also serve to assist with staff turnover in a co-design process, briefing new participants on the agreed functional wish list.

Figure 5 Revised generic interaction model of CO Functionality

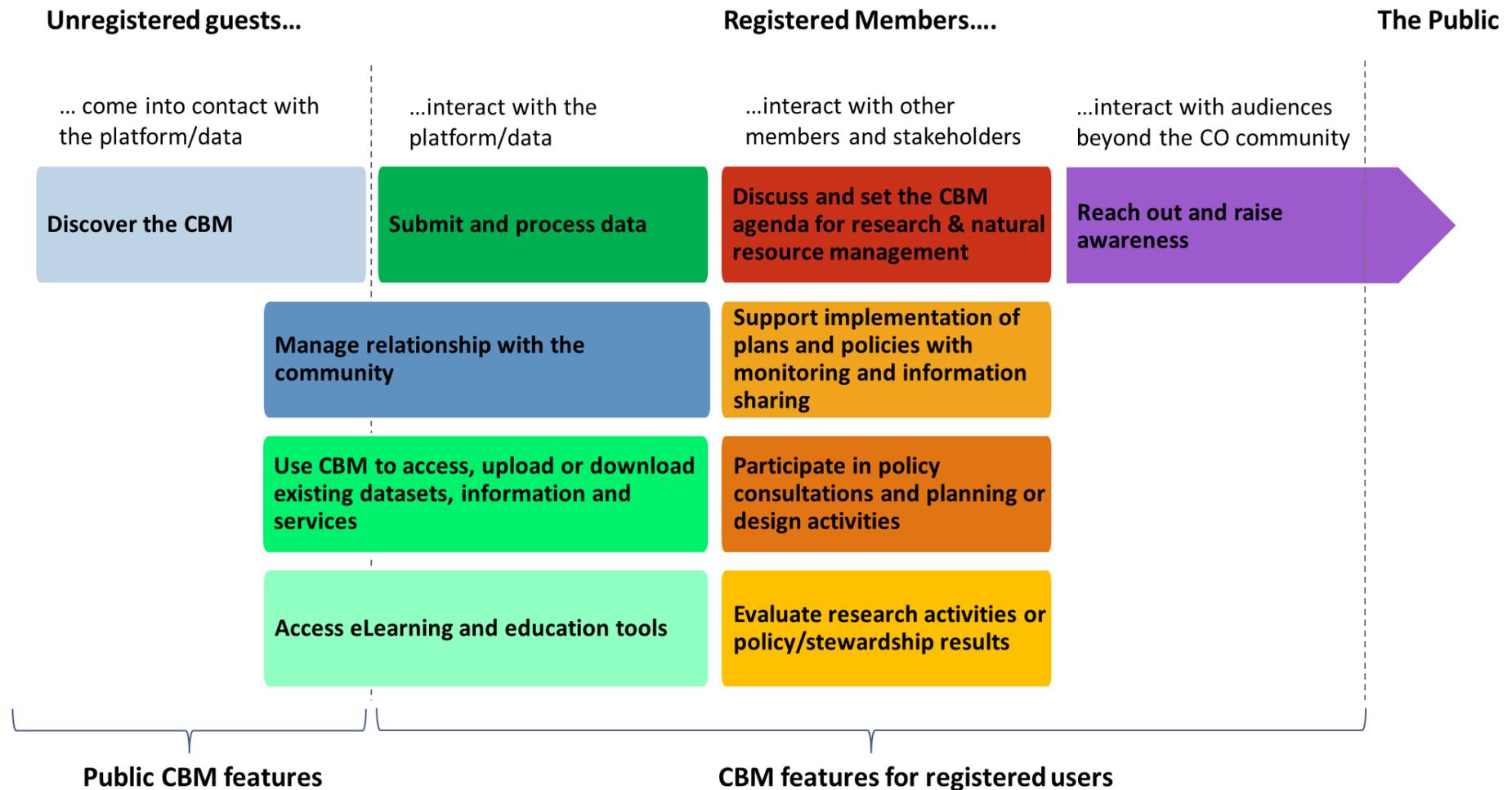


Table 7 Revised headlines for generic CO Functionality

Code	Who interacts with whom?	Main Headline	User Action - new
1.a	New user - platform	Discover the CO	Learn what the CO is and does
1.b	New user - platform	Discover the CO	Access public data/materials
1.c	New user - platform	Discover the CO	other
2.a	New user - platform	Manage relationship with the community	Register account/ agree terms
2.b	New user - platform	Manage relationship with the community	Provide information required for user assessment or verification
2.c	New user - platform	Manage relationship with the community	Create profile & link to other users
2.d	New user - platform	Manage relationship with the community	Choose notification channels
2.e	New user - platform	Manage relationship with the community	other
3.a	User - platform	Submit/process data	Submit open observations for exploration and discovery
3.b	User - platform	Submit/process data	Submit observations according to research protocols and instructions
3.c	User - platform	Submit/process data	create research protocols, coordinate data collection and process data scientifically
3.d	User - platform	Submit/process data	crowdsource processing of observations and inputs of meta-data by citizens
3.e	User - platform	Submit/process data	Integrate external data sets
3.f	User - platform	Submit/process data	other
4.a	User - platform	Access/upload/download data&information	Access and download CO data
4.b	User - platform	Access/upload/download data&information	Create and use resource libraries
4.c	User - platform	Access/upload/download data&information	Buy premium content
4.d	User - platform	Access/upload/download data&information	other
5.a	User - platform	Access eLearning and education tools	Receive generic online instructions for data collection and use of the CO
5.b	User - platform	Access eLearning and education tools	Follow online trainings on generic skills related to participation in policy processes
5.c	User - platform	Access eLearning and education tools	Access educational materials designed for schools and self-guided learning by citizens
5.d	User - platform	Access eLearning and education tools	other
6.a	User - user	Discuss CO agenda	Collect and discuss ideas and suggestions
6.b	User - user	Discuss CO agenda	Interpret exploratory data and link to internal agenda
6.c	User - user	Discuss CO agenda	Develop a shared vision
6.d	User - user	Discuss CO agenda	other
7.a	User - user	Participate in planning/policy consultations	Participate in formal policy consultations by authorized government agencies
7.b	User - user	Participate in planning/policy consultations	Use platform features (fora, simulations etc.) to co-design mutually agreed plans
7.c	User - user	Participate in planning/policy consultations	other

Code	Who interacts with whom?	Main Headline	User Action - new
8.a	User - user	Support policy implementation	Share information on existing policies
8.b	User - user	Support policy implementation	track progress of activities and plans based on collected data
8.c	User - user	Support policy implementation	Encourage compliance and facilitate communication with formal authorities
8.d	User - user	Support policy implementation	other
9.a	User - user	Evaluate activities/results	Review and evaluate CO activities
9.b	User - user	Evaluate activities/results	Review and evaluate resource management initiatives or policies.
9.c	User - user	Evaluate activities/results	other
10.a	User - public	Outreach/Advocacy	Share contents on social media
10.b	User - public	Outreach/Advocacy	Create, send or read newsletters
10.c	User - public	Outreach/Advocacy	Provide and access information/ promotion materials
10.d	User - public	Outreach/Advocacy	Launch or take part in online campaigns
10.e	User - public	Outreach/Advocacy	Reach out to non-participating decision makers
10.f	User - public	Outreach/Advocacy	other



## Annexes

### ANNEX 1: Log of User Requirements

Table A1.1 User Requirements: Belgium

ID	User Stories Belgium	Delivered	Technical effort	Became obsolete
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	x	1	
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community	x	1	
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	x	1	
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible	x	1	
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests	x	1	
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection	x	1	
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success	x	1	
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community	x	1	
CD1	As a (engaged) citizen, I want to better cycling infrastructure, so that cycling is better promoted			x
CD2	As a car driver, I want to better parking infrastructure / park and drive infrastructure, so that I can leave my car outside the city more frequently			x
CD3	As a citizen, I want to develop a vision on cycling in our city, so that citizens can do this in coordination experts	x	1	
CD4	As a citizen, I want to perform counts of cyclists on a regular basis, so that cycling is better organised (protected)			x
CD5	As a citizen, I want to support the organisation of cycling initiative with all primary schools, so that the safety of the children improves			x
CD6	As a citizen, I want to share part of my PC time, so that scientists can analyse data better/ faster/ cheaper			x
CD7	As a citizen, I want to get information on the quality of life (in general), so that I can make better choices (regarding my environment)	x	1	
CD8	As a citizen from outside of Mechelen, I want to follow up on positive stuff being realized, so that we can eventually implement a similar observatory in my city	x	1	

ID	User Stories Belgium	Delivered	Technical effort	Became obsolete
CD9	As a grandparent, I want to engage myself, so that my grandchildren still have worthwhile future	x	1	
CD10	As a involved citizen, I want to greener and more pleasant neighbourhoods, so that I can go out more often			x
CD11	As a policy maker, I want to make issues debatable, so that confidence is created	x	1	
CD12	As a policy maker, I want to mobilize groups and neighbourhoods, so that our streets and squares become greener			x
CD13	As a scientist, I want to have computational time and power from citizens devices, so that I can run complex models			x
CD14	As a tree expert, I want to take up the responsibility to inspect the health of public trees, so that the responsible for all public green can choose best remedies			x
CD15	As a board member of the eco-friendly gardening organisation, I want to involve members in simple monitoring of particulate matter using plants, so that we can deliver data to scientists for analysis			x
CD16	As a citizen, I want to be able to signal stuff to policy makers, so that my living environment improves	x	1	
CD17	As a expert from experience, I want to commit myself, so that air quality and noise can be monitored	x	1	
CD18	As a policy maker, I want to have at my disposal objective registrations of environmental problems and worries of citizens, so that better policies can be implemented closer to the needs of citizens	x	1	
CD19	As a teacher, I want to perform meaningful measurements with my students, so that students get enthusiastic about science			x
CD20	As a citizen, I want to be involved in the organisation of events in my neighbourhood, so that to ensure disturbances remain limited			x
CD21	As a citizen, I want to have a low emission zone, so that air quality improves			x
CD22	As a citizen, I want to have a 'clear' channel to connect with policy makers using this observatory, so that we can jointly steer policies	x	1	
CD23	As a citizen, I want to mobilize others, so that we can monitor air quality on a regular basis	x	1	
CD24	As a citizen, I want to have an app, so that I can easily pass on info on bad air quality or noise disturbance	x	1	
CD25	As a citizen, I want to support the project, so that wider sensitization	x	1	
CD26	As a citizen, I want to be part of community, so that I can exchange ideas with like-minded	x	1	
CD27	As a citizen, I want to know the noise impact of the local highway E19, so that well suited measures can be taken		2	
CD28	As a citizen living close to the local highway E19, I want to want to know what are the time periods with biggest noise disturbance, so that I can take action to push policy makers so they initiate measures			x
CD29	As a citizen of Hombeek (part of Mechelen), I want to better circulation of traffic in the centre of our village during morning rush hour, so that we have less nuisance (better air quality, less noise, safer traffic situation)			x

ID	User Stories Belgium	Delivered	Technical effort	Became obsolete
CD30	As a citizen/ organisation, I want to subsidies / support from the city, so that small actions can be scaled up			x
CD31	As a cyclist, I want to know where air pollution is severe, so that I can avoid these locations when cycling	x	1	
CD32	As a cyclist, I want to know the impact of air pollution along my trajectory from the city outskirts to the city centre, so that I know if I should take an alternative route	x	1	
CD33	As a environmental expert at the city administration, I want to monitor air quality, so that to agree on a geographical coverage of the low-emission-zone which will be introduced	x	1	
CD34	As a involved citizen, I want to receive correct information/feedback/education, so that I can convince others to join	x	1	
CD35	As a member of the cyclist organisation, I want to know the AQ and noise situation along our cycling lanes, so that I can inform other members on healthier routes	x	1	
CD36	As a nature lover, I want to want to know where and when noise is disturbing, so that go to a 'quiet' zone to have a walk in the green		2	
CD37	As a noise expert, I want to get data monitored by citizens (smart phones), so that to prepare policy work		2	
CD38	As a of a car-sharing initiative, I want to support sensitization for it, so that more people practice car sharing			x
CD39	As a policy maker, I want to have a AQ monitoring campaign prior and after installing a low emission zone, so that I can prove we are installing good policies	x	1	
CD40	As a policy maker, I want to develop a masterplan on cycling infrastructure, so that a sustainable vision on mobility gets impact			x
CD41	As a policy maker, I want to listen to the problems, so that collaboration is encouraged	x	1	
CD42	As a policy maker, I want to map air quality problems, so that I can take the right measure to tackle air pollution	x	1	
CD43	As a policy maker, I want to convince political fractions (= political parties), so that a sustainable city with less air pollution and less noise disturbance leads to better quality of life	x	1	
CD44	As a policy maker, I want to have direct communication lines, so that we can increase the support for policies (regarding AQ and noise)	x	1	
CD45	As a policy maker, I want to monitor and map noise disturbance, so that action can be taken			x
CD46	As a policy officer and advisor, I want to that this observatory enables us to have a faster way to create public support, so that necessary change/ transition can be faster implemented	x	1	
CD47	As a policy officer and advisor, I want to ee the results of AQ and noise mapping initiatives at street level, so that the city can decide where cyclist and walking routes are best realized	x	1	
CD48	As a policy officer and advisor, I want to receive the monitoring data and perception of citizens in Mechelen, so that we can add these to our website on environmental topics	x	1	
CD49	As a science centre, I want to take up a coordinating role, so that the project can be presented at many schools and school classes can join the project			x

ID	User Stories Belgium	Delivered	Technical effort	Became obsolete
CD50	As a scientific facilitator, I want to educate people, so that they can join the project with a better understanding			x
CD51	As a scientific facilitator, I want to develop and practice fun and educative workshops, demo's and activities on air quality and noise, so that citizens are aware of these problems and what is their role			x
CD52	As a scientist, I want to develop efficient and cheap monitoring techniques, so that we can collect sufficiently large data sets			x
CD53	As a scientist, I want to receive information on registered complaints, so that I can map hotspots			x
CD54	As a teacher in science, I want to show a noise map of Mechelen, so that my students can couple scientific data to their living environment	x	1	
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform			x

Table A1.2 User Requirements: Sweden

ID	User Stories Sweden	Delivered	Technical effort	Became obsolete
CD3	As a Resident of Flen& very interested in sustainable farming, I want to make sure we improve the soil quality to retain nutrients and manage the addition of different organic manure better, so that We understand: 1. Micro-organism status (soil life) – e.g. fungi, bacteria etc. 2. how to measure nutrient concentrations in solid and liquid manure to be able to dose organic manure in a way to minimise our impact on surrounding water bodies.		2	X
CD5	As a Environmental Engineer at SVOA (Public Agency), I want to A lifecycle perspective on water pollution to be used throughout society, so that Some of the work done at SVOA would not be necessary. I have an easier time convincing people that the issue is important!		2	X
CD12	As a NGO-AKVO, I want to Citizens to have mandate to make decisions based on collected data, not only report the data,, so that People realize that they have to contribute		3	X
CD20	As a ecovillage resident, I want to The rule should be that if we emit less, we also pay less tax, so that There is incitement to emit less.		3	X
CD21	As a NGO-Akvo, I want to Move away from the individualist perspective. so that . People learn to take responsibility.		3	X
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	X	1	
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community	X	1	
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	X	1	
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection	X	1	

ID	User Stories Sweden	Delivered	Technical effort	Became obsolete
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success	X	1	
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community	X	1	
CD1	As a Resident of the Ecovillage in Flen, I want to understand nutrient fluxes in our ecovillage, so that We get optimum plant nutrition and nutrient cycles without contributing to eutrophication	X	1	
CD2	As a Resident of the Ecovillage in Flen, I want to not damage the water quality. To know if the bathing water quality in the sea nearby is good (we don't know that now), so that We live up to the ecovillage/community's ambition or goal + to have a good relationship with the nearby village	X	1	
CD4	As a Resident of the Ecovillage in Flen, I want to understand nutrient flows within and into / out from our property (ecovillage), so that We can develop our ecovillage to perform as mature ecosystem and demonstrate how everyone can live in eco-harmony.	X	1	
CD6	As a Software systems provider & Data aggregator, I want to Enable all participants with tools and knowledge, so that We have more high quality data and information to make better decisions together	X	1	
CD7	As a Marine Biologist working with citizen engagement, I want to participate & see more platforms where citizens and policy makers actually meet and discuss and co-decide, so that Data collected within water management by citizens actually can be used by authorities and policy makers and in the end create better water quality	X	1	
CD8	As a Limnologist (also working in public agency), I want to improve the way of sharing data and results with citizens, so that We raise the awareness among citizens on water quality issues	X	1	
CD9	As a Government agency employee, I want to Robust data both from citizens and experts. Have a physical place for citizen observatory. Concrete goals and objectives, so that The data is trustworthy. Online spaces are complemented with a space that belongs to the citizens. Our organizations can commit.	X	1	
CD10	As a NGO- akvo, I want to Connect citizens, businesses and governments together with data of good quality, so that We can collaborate.	X	1	
CD11	As a NGO - Akvo, I want to have accessibility to data. To know the quality of the data. To have accessibility to easy to use tools, so that Collaborations between different stakeholders can be facilitated.	X	1	
CD13	As a Resident of the Stockholm Archipelago, I want to educate the visitors in how our water management works, so that We can keep a healthy sea and a sustainable living. So that future generations can also come and enjoy this very nice place!	X	1	
CD14	As a Industry representative (Ericsson), I want to Improve knowledge of our solutions (sensor based or otherwise), so that We can contribute to a better world and create smart cities	X	1	
CD15	As a Scientist /Water Expert/ Hydrologist, I want to better understand and interpret data & visualise it, so that To increase the awareness of water quality status in Sweden (both landscape & seascape)	X	1	
CD16	As a Researcher at a Tech Company (Ericsson Sustainability), I want to formulate tools and platforms and procedures and partnerships, so that We jointly can explore new and innovative and sustainable ways of organising ourselves	X	1	
CD17	As a Public-sector employee at LM, I want to contribute to the development of citizen observatories, so that My organisation can be better at taking advantage of data	X	1	

ID	User Stories Sweden	Delivered	Technical effort	Became obsolete
	collected from other sources (such as citizens), as well as supply data to the community from the start			
CD18	As a NGO - Akvo, I want to look at this [water quality] holistically, in a circular perspective. Look at it [the water quality] geographically.to take a circular perspective instead of removing or stopping, so that We not only move the problem somewhere else but actually do something about it.	X	1	
CD19	As a NGO - Akvo, I want to An engagement process on how to deal with problems, so that We can solve problems in collaboration.	X	1	
CD23	As a member of the public, I want to know why I should help the citizen observatory, so that I take part in the short and long terms.	X	1	
CD24	As a scientist, I want to know the value of my contribution, so that I am not wasting my spare time.	X	1	
CD25	As a citizen activist, I want to be able to set up on-line collaboration groups with discussion and document repository, so that issues can be progressed, proposals and feedback (concerns, objections) shared from group to community, so better decisions can be made.	X	1	
CD26	As a citizen, I want to submit data / pictures that show pollution, so that the problem gets addressed.	X	1	
CD27	As a citizen activist, I want to data collected in a way that “joins up” issues, so that people can better see the big picture (awareness).	X	1	
CD29	As a local/regional politician, I want to get in contact with voters and learn more on how to manage local environment, so that I make better political decisions.	X		
CD30	As a local authority (ecologist. I used to be one), I want to reliable data that I know of the origin and method of collection (e.g. by who, when, how – metadata), so that I can use this as evidence when I provide advise with the decision-making process.	X		
CD31	As a research scientist, I want to good quality data that has been collected with a purpose, consistently and over a sufficient special and temporal scale, so that I can answer questions and fill gaps in knowledge.	X		
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform	X		
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible		2	
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests		2	
CD22	As a ecovillage resident, I want to A life-cycle perspective, so that We can change the way we live.		3	
CD28	As a local authority, I want to know the return on investment for citizen observatories, so that I can assess whether it is a good economic decision.		3	

**Table A1.3 User Requirements: Kenya**

ID	User Stories Kenya	Delivered	Technical effort	Became obsolete
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	x	1	

ID	User Stories Kenya	Delivered	Technical effort	Became obsolete
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community	x	1	
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	x	1	
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible	x	1	
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests	x	1	
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection	x	1	
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success		2	
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community	x	1	
CD1	As a Pastoralist, I want to share the disadvantages of fencing, so that preserve the cultural pride of free grazing/ranging	x	1	
CD2	As a Researcher, I want to do a qualitative research on land use and tenure changes, so that I can advise from a scientific point of view on the negative effects of these changes on the biodiversity of Maasai Mara ecosystem to mitigate them		2	
CD3	As a scientific researcher, I want to share my observation of lions and cheetahs numbers and trends, so that create a better understanding in this regard	x	1	
CD4	As a Local citizen, I want to collect data on the big five animals (data on population, distribution), so that I can contribute to the database of the occurrences of these animals so as to identify the critical species for protection	x	1	
CD5	As a scientist, I want to ensure that the data in the repository is quality controlled and assured, so that the best data is available for all stakeholders	x	1	
CD6	As a Member of (rimpe?!) cooperative, I want to model livestock patterns, so that local farmers can have a model livestock patterns field for more livestock production			x
CD7	As a Local citizen, I want to map our area, so that so that people can navigate their way to our area, trade is promoted, better planning becomes possible	x	1	
CD8	As a Local citizen, I want to Help create awareness about keeping the park clean, so that when other people come to our parks, they keep the environment clean	x	1	
CD9	As a Tour guide, I want to share my wildlife observations, so that trends can be monitored	x	1	
CD10	As a Member of MMWCA, I want to share my conservation experience, so that I help increase land under conservation	x	1	
CD11	As a Civil society organization, I want to support continuous awareness creating to the society, so that they continue conserving the biodiversity that they have	x	1	
CD12	As a Policy maker, I want to share information with the community, so that enhance collaboration in management	x	1	
CD13	As a Policy maker, I want to share my wildlife observations and current legislations, so that wildlife protection can be enhanced	x	1	
CD14	As a ICT professional, I want to receive quality data, so that so it can be digitized, analysed, modelled, produce products, inform meaningful decisions and save lives	x	1	

ID	User Stories Kenya	Delivered	Technical effort	Became obsolete
CD15	As a scientist, I want to collect more data on the use of water resources by humans, cattle and wildlife, so that understand better the supply and demand of water in the Mara	x	1	
CD16	As a scientist, I want to understand better the use of water resources in the Mara, so that make better use of the available resources		2	
CD17	As a researcher, I want to export data from systems, so that use the data in other systems for further analysis	x	1	
CD18	As a Pastoralist, I want to be able to access info/trace and follow up to reported HWC incidents, so that avoid further retaliation/escalation	x	1	
CD19	As a Pastoralist, I want to know real time market prices and carrying capacity of the grazing lands, so that so I can sell my cattle in time	x	1	
CD20	As a Pastoralist, I want to obtain feedback/instructions from KWS/others upon reporting wildlife sightings near settlements/farms, so that take informed next steps (whom to call, which KWS personnel is close and where)		2	
CD21	As a Pastoralist, I want to easily share my deep knowledge on my environment, so that better ecosystem and livelihood management in the Mara	x	1	
CD22	As a Pastoralist, I want to know about alternative livelihoods, so that so I can reduce the amount of cattle while still being able to feed my family and pay school fees for my children	x	1	
CD23	As a Maasai pastoralist, I want to be able to engage in dialogue with government officials, so that share the logics behind my livelihood strategies in the face of commercial farming and conservation in the Mara region	x	1	
CD24	As a Pastoralist, I want to have tools to support the community-based decision making on the use of water resources in the community, so that better manage the water resources		2	
CD25	As a Citizen, I want to have access to information about wildlife trends and revenue collection and distribution, so that to enhance our understanding of how biodiversity is being managed		2	
CD26	As a Citizen, I want to be able to share my observations on livestock numbers, so that better manage grazing	x	1	
CD27	As a Nature enthusiast, I want to see better interventions and guidelines put in place, so that conserve the biodiversity knowledge		2	
CD28	As a Tour guide, I want to help avoid littering inside the park, so that I help conserve the environment	x	1	
CD29	As a Tour guide, I want to help avoid going off-roading, so that I help preserve the park	x	1	
CD30	As a Tour guide, I want to advise people to avoid feeding wild animals in the park, so that I help preserve the park			x
CD31	As a Conservationist, I want to introduce herbs plants / medicinal to conservation field, so that local conservationist can benefit from agroforestry and vegetation cover to prevent erosion			x
CD32	As a Member of MMWCA, I want to coordinate all conservancies in the Mara, so that I contribute to effective management of land and wildlife habitat			x
CD33	As a Member of MMWCA, I want to increase conservancies, so that we ensure a better management of the land			x
CD34	As a Wildlife officer, I want to educate the locals on wildlife management, so that they realize benefits from the wildlife conservation		2	
CD35	As a KWS, I want to monitor wildlife, so that we are able to better protect it	x	1	

ID	User Stories Kenya	Delivered	Technical effort	Became obsolete
CD36	As a Policy maker, I want to involve the general public in in forming legislations and policies that affect environment and biodiversity conservation, so that to enhance public engagement in policy and decision making	x	1	
CD37	As a Conservation area manager, I want to share HWC (Human Wildlife Conflict) data, so that policy makers and citizens are informed on the cost of living with wildlife	x	1	
CD38	As a Land-use planner, I want to share information based on observations/interviews concerning charcoal burning by locals, so that suitable environment friendly economic activities can be studied/introduced to the area		2	
CD39	As a Member of the county government (officer in physical planning department), I want to share pictures of fences and GPS coordinates of the fenced areas, so that the extent of the subdivision and the fencing can be monitored	x	1	
CD40	As a Narok county government, I want to produce legislations on land use zoning, so that protect land under Mara ecosystem for conservation			x
CD41	As a Law enforcer, I want to articulate, undertake my duties, so that the management of the biodiversity environment is conducive			x
CD42	As a Teacher of geography, I want to show the importance of conserving and managing our biodiversity, so that several species of plants and animals do not get extinct, and the natural ecosystem is fully sustained for the benefit of our communities (current and future generations)	x	1	
CD43	As a Teacher of geography, I want to ensure that the current climate is not interfered, so that our biodiversity is not affected through imbalance within the ecosystem	x	1	
CD44	As a Community member, I want to be involved in matters of conservation that affect me and my well-being, so that I can improve my personal well-being	x	1	
CD45	As a Wildlife expert, I want to offer scientific wildlife data, so that inform ecosystem management and for sustainable ecosystem services	x	1	
CD46	As a Wildlife expert, I want to provide environmental conservation education, so that to make informed decisions on best land-use practices			x
CD47	As a Scientist, I want to share observation on water levels in the rivers, so that improve the catchment conservation	x	1	
CD48	As a Meteorological institute, I want to provide weather predicting in an app, so that people are prepared	x	1	
CD49	As a Donor funding projects in the water sector, I want to see (more) impact of the interventions, so that measure the effectivity of measures and adjust strategies			x
CD50	As a Conservation area manager, I want to visualise HWC data (crop damage, people injured/killed, livestock kills, wildlife injured/killed), so that in order to actively inform the public and other stakeholders on the extent and cost of past, current and future HWC	x	2	
CD51	As a Meteorologist, I want to access to rainfall and other weather data, so that I can give climate services in return	x	1	
CD52	As a lodge owner, I want to give my guests access to information that makes their experience more complete, so that I can have more customers while contributing to their understanding of the environment	x	1	
CD53	As a policy maker, I want to engage with local stakeholders and decision makers, so that ensure that policies supportive of pastoralism are reconciled with other laws/policies that have conflicting provisions over land and natural resources	x	1	
CD54	As a Maasai, I want to contribute to digital (participatory GIS) mapping activities, so that include my local knowledge in spatial representation of the ecological, social and economic landscapes	x	1	

ID	User Stories Kenya	Delivered	Technical effort	Became obsolete
CD55	As a Church, I want to create awareness on environmental issues, so that community members understand why some changes in behaviour are needed	x	1	
CD56	As a crop farmer, I want to increase crop production, so that more crops are locally produced and cheaper available for the local population			x
CD57	As a tourist, I want to want to know the official roads, report driver misbehaviour and report litter in the reserve, so that contribute to sustainable tourism so that these valuable natural resources remain available for future generations	x	1	
CD58	As a policy maker, I want to capture the past, current and future statistics of livelihoods in the Mara region, so that inform my policy making activities		3	
CD59	As a tourist, I want to know where in the park I am and how big my chance is to see an animal during my safari, so that make most out of my expensive trip	x	1	
CD60	As a tourist, I want to share digital pictures of the park, so that to attract more tourists to beautiful places to look out for during their visits	x	1	
CD61	As a Research body, I want to provide data, so that effective management	x	1	
CD62	As a Researcher, I want to share knowledge on biodiversity that I have, so that communities and other interested parties can benefit from what I have researched	x	1	
CD63	As a Community member, I want to penalty should be applied to anyone who does pollution in our environment especially the Mara national reserve, so that Protect the environment			x
CD64	As a Member of MMWCA, I want to know the value of land under conservation, so that increase protection of wildlife			x
CD65	As a community member, I want to share my waste management practices with others, so that keep the Mara ecosystem clean and habitable	x	1	
CD66	As a researcher, I want to provide data and information to policy makers, so that policy will be based on sound scientific evidence	x	1	
CD67	As a researcher, I want to take part in coming up with environment related curricula for primary and secondary schools, so that children will get aware about the HWC			x
CD68	As a community member, I want to share indigenous knowledge about wildlife and livelihoods, so that it can complement scientific information and is respected and recognised as an important resource		2	
CD69	As a donor funding water projects, I want to disseminate monitoring/evaluation reports, so that relevant authorities can use the results	x	1	
CD70	As a ICT professional, I want to track/monitor overall usage of the platform with fine grained analysis, so that it is possible to evaluate usage trends, sources, etc. as a basis of feedback on success of the platform	x	1	
CD71	As a community member, I want to help working on the real challenges at the ground level, so that contribute to the solution	x	1	
CD72	As a researcher, I want to have access to a broad based platform, so that share my findings for a broader uptake	x	1	
CD73	As a tour guide, I want to be involved in agreeing on park zones and safe viewing areas, so that so that we can reduce the waste material in your park		2	
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform	x	1	

Table A1.4 User Requirements: Zambia

ID	User Stories Zambia	Delivered	Technical effort	Became obsolete
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	x	1	
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community	x	3	
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	x	1	
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible	x	1	
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests	x	1	
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection		3	
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success	x	1	
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community		2	
CD2	As a VAGs and Community members, I want to post input into agenda setting, so that to increase visibility of local concerns and enable tracing of responses	x	1	
CD7	As a Project partners (DNPW, WWF, donors), I want to involve CRB in policy implementation, so that to ensure local inputs, objections and opportunities are recognized and captured		3	
CD9	As a CRB/WWF, I want to jointly track progress on workplans, so that to stimulate faster progress and re-build trust		3	
CD10	As a Project partners, I want to share&visualize project impacts, so that to create better understanding of benefits and higher incentives for desired practices		2	x
CD11	As a Project partners, I want to integrate data of impact assessments or survey into the CO database, so that to create better understanding of benefits and higher incentives for desired practices	x	3	x
CD13	As a Project partners, I want to post results data for review by CRB/VAGs, so that to create better understanding of benefits and higher incentives for desired practices	x	1	
CD14	As a Project partners, I want to discuss status surveys and impact assessments in CRB/VAG/community meetings, so that to create better understanding of benefits and higher incentives for desired practices		3	x
CD15	As a WWF/communities, I want to develop simple monitoring and reporting tools and procedures for project implementation, so that to enable more local budget autonomy while complying with donor standards regarding budget use and accountability		2	x
CD16	As a Community members, I want to monitor timber harvesting and deforestation, so that to support implementation of more sustainable practices and counter negative impacts of licensing practice on communities (e.g. in droughts)	x	1	
CD17	As a Communities/Forest Department, I want to Share good practices on fire management, so that to decrease late burning and spreading fires	x	1	

ID	User Stories Zambia	Delivered	Technical effort	Became obsolete
CD18	As a Community members, I want to monitor wildlife corridors and alert CRBS/BRE to new settlements, so that to enable quick responses and prevent future human-animal conflicts	x	1	
CD19	As a Government entities active in the area, I want to keep CRBs fully informed about (planned) changes to project or policy implementation in their jurisdiction, so that to ensure CRB rights and authority can be fully executed		3	
CD20	As a Local communities/CRBs, I want to have easy access to information about scholarships, promotions and vacancies, so that to increase opportunities for locals and identify potential discriminatory practices		2	
CD21	As a Development partners, I want to jointly work on community sensitizing, so that to achieve the shared development vision, reduce friction and increase synergies between different efforts		3	
CD22	As a Community members, I want to report observations of poaching anonymously, so that to reduce retaliation and reliance on WPO discretion for the protection of witnesses	x	3	
CD23	As a All local officials, I want to have access to and fully understand applicable local agreements and memoranda of understanding, so that to ensure local rights and privileges are respected and enforced	x	1	
CD24	As a VAGs/CRB/Forest Department, I want to send alerts to inform communities of end of the burning season, so that to discourage late burning (and related spreading of fires)	x	2	
CD25	As a Dept of Meteorology/Project partners, I want to provide accurate weather information and predictions, combined with relevant services and recommendations for daily practice (planting/harvesting, personal), so that to decrease the impact of climate change related changing weather patterns on yields and household income		2	x
CD26	As a Project partners, I want to track/monitor/visualize project impacts, so that to create more focus on measurable benefits and subsequently more incentives for desired behaviours		3	
CD27	As a WWF, I want to Collects more direct inputs and feedback from local communities, so that to better understand current practice and needs and improve the "fit" of interventions		1	?
CD28	As a Community members, I want to create and maintain an inventory (e.g. with photographs, maps, text notes) or resources and species with commercial and/or touristic potential, so that to support job and income generation activities based on sustainable and long-term resource use	x	1	
CD29	As a Local CO users, I want to create and update more accurate and open maps of the area, so that to support infrastructure planning, land-use monitoring, and support other economic activities	x	1	
CD30	As a BRE/CRBs, I want to track timber licensing and other concessions, so that to ensure mandate for local authorization is observed, and local ownership enforced		3	
CD31	As a Local communities, I want to have open communication channels to project officials, so that to simplify and reduce efforts of consultations	x	2	
CD32	As a WWF, I want to shares more information about applicable rules and (donor) regulation, so that to create transparency on spending practices, including identification of bad practices as opposed to externally imposed restrictions		1	?
CD33	As a WWF, I want to reviews impacts of regulation and interventions based on local data, so that to improve design and effectiveness of interventions		3	?
CD34	As a CRBs, I want to are consulted/involved in WPO recruitment procedures, so that to ensure fair hiring practices and presence of accepted officers	x	2	

ID	User Stories Zambia	Delivered	Technical effort	Became obsolete
CD35	As a Community members/VAGs/CRBs, I want to observe/report activities and results of conservation agriculture practices, so that to enable visualization and feedback on benefits		1	
CD36	As a WWF/CRBs, I want to negotiate joint ventures including enterprises and conservation, so that to generate incentives for conservation as well as local income		3	x
CD37	As a WWF/VAGs/Communities, I want to continue maintenance of the "Event Book" in electronic form, so that to reduce turnover times and cost for processing data, and make results and responses easily accessible to communities	x	1	
CD38	As a VAG/DNPW, I want to raise awareness in communities on the benefits of conserving wildlife, so that to stop killing of wildlife		2	
CD39	As a VAG members / DNPW, I want to train community members in honest unanimous reporting and sending out alerts, so that to stop poaching at the expense of/without benefits for local communities and for future generations to appreciate wildlife	x	1	
CD40	As a Local communities/authorities, I want to track proceedings against offenders, so that to increase accountability and reduce incentives for offenses		3	
CD41	As a VAG members/BRE/Forestry Department, I want to monitor [offenses] to support/increase compliance, so that Halt and reduce deforestation	x	1	
CD42	As a CCCCDP partners and communities, I want to share lessons between different project communities, so that to enable spreading of successful ideas and prevent repetition of mistakes	x	1	
CD43	As a Community members, I want to reporting observations of illegal fishing practices, so that to support enforcement of regulations and protect fishstocks and their breeding habitats	x	1	
CD44	As a VAGs/CRB/Dept Fisheries, I want to raise awareness for fishing practices that damage fishstocks and breeding habitats and share good practices, so that to protect fishstocks and counter rise of illegal fishing methods that endanger fisheries potential		2	
CD45	As a WWF, I want to provides interactive (game-based?) support for crop planning, so that to support improvements related to both resilience and nutrition		3	?
CD46	As a Community members, I want to observe/monitor the status of Devils Claw, so that to enable control of harvesting & trade and prevent (a rise of) the exploitation and sale for dumping prices of a plant with commercial potential	x	2	
CD47	As a Community members, I want to report incidents of harrassment easily and anonymously, so that to support integrity in enforcement and protect complainants and witnesses from retaliation	x	3	
CD48	As a VAGs/CRB, I want to use online/messaging tools to increase exchange and consultation between meetings, so that to improve inclusion of local communities and reduce negative impact of distance and lack of easy transport	x	2	
CD49	As a Community Members/BRE/Project Partners/Donors, I want to Raising Awareness on the negative effects of early marriages, so that to stop early marriages so that children can complete their education		2	
CD55	As a CRB/DNPW, I want to lobby for training of more community scouts, so that to develop tourism opportunities in the area		?	x
CD56	As a VAG/Community Members, I want to alerting law enforcers on suspicious poaching activities, so that for future generations to appreciate wildlife	x	1	
CD57	As a WWF/VAG members/DNPW, I want to engaging the communities in conservation efforts, so that to stop poaching at the expense of/without benefits for local communities and for future generations to appreciate wildlife	x	1	
CD58	As a CRB/Forest Department, I want to recruit forest guards, so that Halt and reduce deforestation		3	x

ID	User Stories Zambia	Delivered	Technical effort	Became obsolete
CD59	As a Forest Department, I want to understand laws and related rights (training in respected/recognized institutions), so that Halt and reduce deforestation	x	1	
CD60	As a CRBs, I want to engage donors and other stakeholders on realizing budgets and benefits, so that to improve transparency and trust among partners and stakeholders		3	
CD61	As a VAG/CRB/BRE/DNPW/WWF, I want to sharing reports with stakeholders, so that to improve transparency and trust among partners and stakeholders	x	1	
CD62	As a CRB/VAG/Community members, I want to integrate other communities in the area, so that to avoid targeting on the same community	x	1	
CD63	As a CRBs and project partners, I want to track and monitor assets and project progress interactively (e.g. including electronic "check-out" or shared items and possibly budget tracking), so that to increase transparency, accountability and identify problems or delays		3	x
CD64	As a National Departments/ Project Partners, I want to advocate for punishment of offenders and parents who marry underaged girls, so that to stop early marriages so that children can complete their education		2	
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to to on the CO platform	x	1	

**Table A1.5 User Requirements: The Netherlands**

ID	User Stories The Netherlands	Delivered	Technical effort	Became obsolete
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	x	1	
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community		2	x
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	x	1	
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible		3	x
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests	x	1	x
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection		3	x
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success	?	?	?
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community	x	1	
CD1	As a citizen, I want to share information with municipalities and water board through shorter lines, so that better information is available for all parties.	x	1	
CD2	As a citizen, I want to observe and inform, so that my environment becomes safer.	x	1	

ID	User Stories The Netherlands	Delivered	Technical effort	Became obsolete
CD3	As a citizen, I want to inform and be informed, so that more interaction is created.	x	1	
CD4	As a water board employee, I want to share information on water management with citizens, so that citizens are better informed about water levels and the work of the water board.	x	1	
CD5	As a policy maker, I want to share actual information, so that to inform citizens/farmers/etc about possible extreme weather.	x	1	
CD6	As a water board employee, I want to receive information from citizens about extreme situations (high/low water levels, flooding), so that I can respond adequately.	x	1	x
CD7	As a policy maker, I want to be informed of inconvenience situations or situations that may cause inconvenience, so that get even more insight into the functioning of the sewage and water system.	x	1	
CD8	As a citizen, I want to receive suggestions on what we can do ourselves, so that I can prevent/reduce nuisance.	x	1	
CD9	As a citizen, I want to raise awareness on how we shape our gardens, so that water can enter the soil more easily.	x	1	
CD10	As a water board employee, I want to share information with citizens to raise awareness on what they can do themselves for a climate-proof environment. so that they can contribute to a climate-proof living environment.	x	1	
CD11	As a policy maker, I want to stimulate/inform citizen residents, so that they know what they can do themselves against flooding.	x	1	
CD12	As a citizen, I want to receive early rain forecasts, so that I can prepare for it.		2	x
CD13	As a citizen, I want to receive weather/water warnings from policy makers/scientists, so that I can take measures.		2	x
CD14	As a citizen, I want to be able to see where and when how much water (rain) is forecasted, so that measures against flooding can be taken in advance.		1	x
CD15	As a citizen, I want to share/receive early weather warnings, so that I can take measures.		2	x
CD16	As a citizen, I want to get informed in the case of possible extreme weather, so that I can take measures (partition in front of the door, set up pump and aggregate, move furniture upstairs)		1	x
CD17	As a citizen, I want to get informed timely about extreme weather messages through an app, so that I can warn my surroundings and take measures against possible damage in my house.	?	?	?
CD18	As a policy maker, I want to get information from the ordinary man/woman about specific problems in their neighbourhood, so that 0	x	1	
CD19	As a policy maker, I want to hear solutions from the ordinary man/woman, so that 0	x	1	
CD20	As a policy maker, I want to that citizens are informed and know about all we are doing against flooding, so that (more) understanding and trust is created.	x	1	
CD21	As a citizen, I want to measure more (on amateur level), so that scientist use this in their models/programs/apps/Twitter/internet	x	1	x
CD22	As a citizen, I want to report as soon as possible when something is happening, so that action can be taken sooner and through a shorter route.		2	x
CD23	As a policy maker, I want to monitor during heavy rain showers, so that I can take measures or anticipate on them.	x	1	x
CD24	As a policy maker, I want to get (objective) information from citizens living in the area, so that this improves my knowledge on the system functioning.	x	1	x
CD25	As a scientist, I want to a lot of sensors, so that I can properly validate my model.		3	x
CD26	As a scientist, I want to receive observations from citizens, so that better weather and water information/forecasts can be provided.	x	1	x
CD27	As a scientist, I want to receive data from citizens (picture water level), so that we can improve forecasts/recommendations.	x	1	x

ID	User Stories The Netherlands	Delivered	Technical effort	Became obsolete
CD28	As a data scientist, I want to know where there is too much/too little water, so that I can advise/model/understand what the best operational water management is.	x	1	x
CD29	As a citizen, I want to help develop our quarter, so that a better water system is created.	x	1	
CD30	As a citizen, I want to sustainable and future-proof solutions, so that we get happy again.	x	1	
CD31	As a citizen, I want to sustainable and future-proof solutions, so that we get our living pleasure back.	x	1	
CD32	As a citizen, I want to sustainable and future-proof solutions, so that we can sleep (more) quietly.	x	1	
CD33	As a policy maker, I want to more water storage, so that more water can be stored.			
CD34	As a policy maker, I want to that water and green areas are chosen more often instead of parking lots or houses, so that a climate-adaptive living environment arises.	x	1	
CD35	As a policy maker, I want to reduce real estate taxes for greener gardens, so that people are stimulated to increase greenery.			
CD36	As a policy maker, I want to involve citizens in pumping rain water away, so that more can be pumped out.		1	
CD37	As a citizen, I want to visualise problem, so that I can consciously decide about measures and investments.	x	1	
CD38	As a citizen, I want to get access to information about my direct surroundings, so that I can possibly take measures timely.	x	1	
CD39	As a policy maker, I want to interpret the monitoring, so that I can adjust measures cq risk policy.	x	1	x
CD40	As a policy maker, I want to correct weather forecasts, so that I can perform the right actions at the right moment.	x	1	x
CD41	As a emergency worker, I want to know where I can deploy my material, so that our work is functional and has visible effects.		1	x
CD42	As a water level administrator, I want to know where there is still room for water during flooding events, so that I can coordinate better.		2	x
CD43	As a citizen, I want to understand and visualise where flooding will happen (low-lying areas), so that we can keep the water longer in the higher areas (storage).	x	1	x
CD44	As a scientist, I want to know where flooding arises, so that we can make better use of places without flooding.	x	1	x
CD45	As a citizen, I want to have easy and clear insight into ground water levels, so that there is more information about how much water is already within an area.		1	
CD46	As a farmer, I want to view ground water levels, so that I can improve decisions to whether to irrigate.		1	
CD47	As a farmer, I want to view ground water levels, so that I can get better insight into the moisture condition of plots (crops).		1	
CD48	As a farmer, I want to view the water levels online, so that better protect the crops on the land against flooding, for example by cleaning ditches and tell the water board to respond more adequately to weather forecasts.		1	
CD49	As a farmer, I want to view with which capacity pumping stations are pumping, so that better protect the crops on the land against flooding, for example by cleaning ditches and tell the water board to respond more adequately to weather forecasts.		1	
CD50	As a farmer, I want to view water level slopes in waterways, so that better protect the crops on the land against flooding, for example by cleaning ditches and tell the water board to respond more adequately to weather forecasts.		1	
CD51	As a farmer, I want to understand why water drainage stagnates, so that this can be solved.		2	

ID	User Stories The Netherlands	Delivered	Technical effort	Became obsolete
CD52	As a citizen, I want to contribute, give feedback, so that plans for rain water drainage will be improved.		1	
CD53	As a citizen, I want to contribute to finding solutions, so that changes will be faster.		1	
CD54	As a citizen, I want to join conversations about the measures to take, so that support is broadened.		1	
CD55	As a citizen, I want to evaluate the effect of the measures taken for future rain showers, so that 0		1	x
CD56	As a citizen, I want to feedback about certain solutions for water management, so that I can take advantage of that.		1	
CD57	As a citizen, I want to understand how policy making works, so that I can better understand why some plans cannot be executed.	x	1	
CD58	As a citizen, I want to understand how policy makings works, so that I better understand why some (simple) plans cannot be formalized.	x	1	
CD59	As a policy maker, I want to learn about what went wrong/was forgotten, so that I know what caused this flooding.	x	1	
CD60	As a water board employee, I want to collaborate with citizens and other policy makers, so that we can work together on a climate-proof living environment.	x	1	
CD61	As a policy maker, I want to know where future building is planned, so that I can think ahead about possibilities for additional water storage.		1	
CD62	As a water board employee, I want to have more influence on spatial planning, so that more space can be reserved for water.		1	
CD63	As a meadow bird protection agency/citizen, I want to create wet areas for structural water storage, so that a win-win situation arises for citizens, farmers and nature.			
CD64	As a meadow bird protection agency/citizen, I want to nature friendly shores and wide channels/ditches, so that water can be stored and drained faster.			
CD65	As a (CO) citizen/policy maker/scientist, I want to advertise/make ourselves known, so that we get more input, support, knowledge and feedback.	x	1	
CD66	As a citizen, I want to attention in local newspapers, radio and tv, so that awareness is created amongst the people living in this region	x	1	
CD67	As a policy maker, I want to that citizens can learn from each other, so that they can take adequate measures themselves.	x	1	
CD68	As a policy maker, I want to that also citizens without damage become more aware of their influence, so that citizens with damage get less damage.	x	1	
CD69	As a policy maker, I want to know where, when, how much and how long there was nuisance, so that I can determine whether measures are necessary or adequate.	x	1	
CD70	As a policy advisor, I want to share data from water management, so that citizens/stakeholders have more insight into the functioning of the water system and our work.		1	
CD71	As a scientist, I want to standardized noted data (location, time, unambiguous concepts), so that these are clear and simple to process.		1	x
CD72	As a policy advisor, I want to talk with citizens/stakeholders about ideas/worries, so that we can anticipate on these when making plans.	x	1	
CD73	As a policy advisor, I want to involve citizen/stakeholders in setting goals for the implementation of climate adaptation, so that these are region specific and effective.	x	1	
CD74	As a policy maker, I want to have access to actual information about (imminent) extremes, so that I can intervene adequately.		1	x
CD75	As a scientist (water board employee), I want to use the data available to me to support (and test) the plans, so that the quality of the implementation increases.		1	x
CD 76	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform		1	x

ID	User Stories The Netherlands	Delivered	Technical effort	Became obsolete
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform		1	x

**Table A1.6 User Requirements: Spain**

ID	User Stories Spain	Delivered	Technical effort	Became obsolete
CF1	As a interested stakeholder (all types), I want to learn what the CO is and does, so that I can decide whether is matches my interests and needs	x		
CF2	As a new participant, I want to register my user account , so that I become a member of the CO community	x		
CF3	As a CO community member , I want to submit observations , so that data relevant to me becomes part of the CO dataset	x		
CF4	As a Participating expert/data aggregator, I want to contribute to the collection method and processing of observations, so that the CO dataset remains valid and credible	x		
CF5	As a interested stakeholder (all types), I want to access and download collected data from the CO, so that I can use the data in decisions or according to my personal interests	x		
CF6	As a CO community member, I want to take part in interpreting the collected data and discuss what to do with the findings , so that I partake in shaping and achieving the purpose of the data collection		3	
CF7	As a CO community member (decision maker), I want to share information of existing policies and plans , so that more stakeholders contribute to its implementation and success			x
CF8	As a CO community member, I want to promote the activities, findings or recommendations of the CO, so that more stakeholders learn about and contribute to the shared goals of the CO community	x		
CD1	As a Citizen, I want to search for information, so that I can obtain an overview of the existing data by species and temporality.	x		
CD2	As a Scientist, I want to search for information, so that I can obtain an overview of the existing data by species and temporality.	x		
CD3	As a Scientist, I want to review existing observations, so that I can add what is missing to ensure completeness of the observations.	x		
CD4	As a Scientist, I want to The observations are accompanied by a quality indicator, so that I can have confidence in them.	x		
CD5	As a Citizen, I want to know who and how validates my data, so that To be confident about my data.	x		
CD6	As a Politician, I want to That agreements exist with observatories from other regions, so that I can have a global perspective.			x
CD7	As a Scientist, I want to That agreements exist with other observatories, so that Data can be integrated to broaden the scope of analysis of observations.		2	
CD8	As a Scientist, I want to upload datasets from my phenological observations (collected previously to the platform), so that They are available and integrated with other observations or data sources.	x		

ID	User Stories Spain	Delivered	Technical effort	Became obsolete
CD9	As a Scientist, I want to register my data, so that To quantify my scientific contribution.	x		
CD10	As a Scientist, I want to have a return/recognition of my activity, so that To "measure" my scientific contribution.	x		
CD11	As a Citizen, I want to make contributions and comments, so that I can create and contribute in the community.	x		
CD12	As a Citizen, I want to make contributions and comments, so that I can ask questions and get answers.		2	
CD13	As a Citizen, I want to display the observation(s), so that To validate/comment it.	x		
CD14	As a Scientist, I want to write comments, so that I can validate the observations and help to reach consensus.	x		
CD15	As a Scientist, I want to display the observation(s), so that To validate/comment it.	x		
CD16	As a Citizen, I want to receive notifications about points of interest, so that I can make observations where and when they are needed.		3	
CD17	As a Citizen, I want to have some return (asap), so that To recognise my participation.		2	
CD18	As a Scientist, I want to send notifications so people can make observations on specific points, so that The spatial and temporal distribution of the observations is increased.		3	
CD19	As a Citizen, I want to upload photos or occasional observations, so that Other users help me identify what I am observing.	x		
CD20	As a Citizen, I want to have simple apps/interfaces, so that To upload my observations quickly.	x		
CD21	As a Citizen, I want to submit data following a simple protocol, so that My observations are useful.	x		
CD22	As a Scientist, I want to submit data following an established protocol, so that My observations are comparable within the platform and with other platforms.	x		
CD23	As a Scientist, I want to submit data following an established protocol, so that The completeness and traceability of observations are ensured.	x		
CD24	As a Citizen, I want to The scientists validate my data, so that They ensure my observations are correct.	x		
CD25	As a Scientist, I want to Data debugging tools, so that Quality of data is ensured.	x		
CD26	As a Scientist, I want to Statistical tools for data processing, so that Statistical summary information can be generated.		2	
CD27	As a Scientist, I want to validate data of the observations provided, so that Quality of data is ensured.	x		
CD28	As a Politician, I want to have more information, so that To understand better data and thus make better decisions.		3	
CD29	As a Politician, I want to learn some key words, so that To model my speech and win votes.	x		
CD30	As a Citizen, I want to have technological tools and to know how to use them, so that To collect data in a more effective manner.	x		
CD31	As a Citizen, I want to know more about policies/strategies, so that To improve my knowledge and understand the support/data that I can provide.		2	
CD32	As a Citizen, I want to Field guides that describe the biology of each species. so that I have the necessary knowledge to make the observations.	x		
CD33	As a Citizen, I want to access field guides describing the biology of each species, so that To ensure that I have the knowledge needed for the observation.	x		

ID	User Stories Spain	Delivered	Technical effort	Became obsolete
CD34	As a Scientist, I want to Field guides that describe the biology of each species, so that I have the necessary knowledge to make the observations.	x		
CD35	As a Scientist, I want to I want to know, in a simple manner, how the pictures should be uploaded according to the protocol (instructions on how collect the observation), so that To upload the data properly.	x		
CD36	As a Citizen, I want to Teaching / evaluation tools that allow me to test my level of knowledge, so that The quality of my observations is ensured.	x		
CD37	As a Citizen, I want to Graphical reference information that allows me to visually validate the observation made, so that Continuous learning and observations quality are ensured.	x		
CD38	As a Citizen, I want to A game, so that To explain climate change and its effects to my children.			x
CD39	As a Citizen, I want to know, in a simple way, how to upload the data following the protocol (instructions on how to collect the observation), so that I can upload data properly (how the system works).	x		
CD40	As a Scientist, I want to know, in a simple way, how to upload the data following the protocol (instructions on how to collect the observation), so that I can upload data properly (how the system works).	x		
CD41	As a Scientist, I want to have reference graphic information that allows me to validate the observation made, so that To ensure the continuous learning and the quality of the observation.	x		
CD42	As a Scientist, I want to have education/evaluation tools that allows me to test my knowledge, so that To ensure the quality of my observations		3	
CD43	As a Citizen, I want to That background materials about the subject are provided in resource libraries, so that I can interpret the displayed data.			x
CD44	As a Politician, I want to That background materials about the subject are provided in resource libraries, so that I can interpret the displayed data.			x
CD45	As a Scientist, I want to That the information is clearly classified, so that Access to knowledge is facilitated.	x		
CD46	As a Scientist, I want to That background materials about the subject are provided in resource libraries, so that I can interpret the displayed data.			x
CD47	As a Politician, I want to That the information is clearly classified, so that Access to knowledge is facilitated.	x		
CD48	As a Citizen, I want to That the information is clearly classified, so that Access to knowledge is facilitated.	x		
CD49	As a Scientist, I want to search for information, so that I can answer specific questions.		3	
CD50	As a Scientist, I want to search for information, so that I can extract subsets of information.	x		
CD51	As a Scientist, I want to search for a specific object (e.g. an apple tree), so that I can extract series on that object.	x		
CD52	As a Scientist, I want to develop a clear and simple observation protocol, so that To as much people as possible can participate.	x		
CD53	As a Scientist, I want to be able to download automatically data, so that To analyse this data out of the CO.	x		
CD54	As a Citizen, I want to upload auxiliary data sets (e.g. Meteorological), so that I can link climate change to its effects.		3	
CD55	As a Citizen, I want to have interactive systems, so that To visualize data in a personalised way (according to my interests).		2	

ID	User Stories Spain	Delivered	Technical effort	Became obsolete
CD56	As a Politician, I want to upload auxiliary data sets (e.g. Meteorological), so that I can link climate change to its effects.		3	
CD57	As a Politician, I want to have interactive systems, so that To visualize data in a personalised way (according to my interests).		2	
CD58	As a Scientist, I want to upload auxiliary data sets (e.g. Meteorological), so that I can link climate change to its effects.		3	
CD59	As a Scientist, I want to upload works elaborated with data from the Observatory, so that I can disseminate scientific activity.		2	
CD60	As a Scientist, I want to have interactive systems, so that To visualize data in a personalised way (according to my interests).		3	
CD61	As a Citizen, I want to have predictions about climate change in nature, so that I can know what will happen in the future.		3	
CD62	As a Citizen, I want to The gamification of the observatory, so that More people is motivated to participate.		3	
CD63	As a Citizen, I want to gamify the CO, so that To motivate people to participate.		3	
CD64	As a Politician, I want to have phenological forecasts, so that I can make projections and take decisions.		3	
CD65	As a Scientist, I want to have phenological forecasts, so that I can make projections.		3	
CD66	As a Scientist, I want to The gamification of the observatory, so that More people is motivated to participate.		3	
CD67	As a Businessman, I want to have graphs that represent data included in the Observatory, so that I can draw conclusions on spatial and temporal patterns.		3	
CD68	As a Citizen, I want to have graphs that represent data included in the Observatory, so that I can draw conclusions on spatial and temporal patterns.		3	
CD69	As a Politician, I want to have graphs that represent data included in the Observatory, so that I can draw conclusions on spatial and temporal patterns.		3	
CD70	As a Scientist, I want to have graphs that represent data included in the Observatory, so that I can draw conclusions on spatial and temporal patterns.		3	
CD71	As a Scientist, I want to have geo-referenced information, so that To understand patterns and provide information.	x		
CD72	As a Citizen, I want to That curricula include the effects of climate change on nature in the training itinerary, so that Population become sensitive to this matter.		2	
CD73	As a Politician, I want to That educational policy takes into account the effects of climate change on nature, so that Population become sensitive to this matter.			x
CD74	As a Citizen, I want to That the observatory has an agenda of interesting events for the Observatory's community, so that I can know and participate in events related to the effects of climate change on nature.	x		
CD75	As a Politician, I want to invite Observatory members to work tables, so that They get involved in other activities linked to the effects of climate change.			x
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform	x		
AF1	As a CO community member, I want to access help functions, so that I am able to complete actions I want to on the CO platform	x		



## ANNEX 2: Log of User Experiences per session/event

Table A2. 1 Log of user experiences: Belgium

Questions	GT2.0 Belgian DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies of participants	Interactions of participants
Entry 1 - First Co-Design event (session 1/2) – Group 1	Yes, the central problem has been discussed and refined, the personal and societal impact of air pollution and noise disturbance in Mechelen discussed and causal relations identified and classified where opportunities to intervene are observed.	Very experienced with the systems analysis and the political process.	One of the participants is hard to moderate as he tends to dominate the discussion. The group was mostly open to listen to others views. A lot of preconceived ideas about solutions to and causes of the environmental problems at hand.
Entry 2: First co-design event (session 1/2) – Group 2	Yes	Highly competent and experienced in political processes. Valuable contribution from one of the participant adding new perspectives (philosophical twist to the subject).	Very open to listen to each other's ideas and support them, having only 4 participants who already know each other makes it easy to have a more thorough discussion.
Entry 3: First co-design event (session 2/2)	Mostly Yes, CO objectives are agreed on, vision and mission are yet to be formulated.	Highly competent and experienced in political processes. Also quite familiar with the citizen science concept (data monitoring) they mentioned a lot words like (data bank, big data, citizen platforms) due to previous similar initiative in the city.	Level of participation was good up to the point when they were asked to write to the story cards. But the session was long (3 hrs) and at the end they started losing focus.
Entry 4: Second co-design event	Yes	Same as before but because the lack of the younger generation there wasn't as much discussion.	Level of participation was good up but they were a little hesitant to get up and participate compared to previous sessions.
Entry 5: Third co-design event	Yes, the stakeholders are willing to take up a role in the organisation of the event 'Uit zonder Uitlaat'. Not much critical feedback on the technical scheme and the tools presented. Expectation management regarding options for an online discussion board 'communicated'.	Same as before, very competent group and this session we had lively discussions.	Level of participation was good up + good discussions despite the lower attendance.

Entry 6: Third co-design event – bilateral with policy maker	Yes, one of the participants ensures that the City of Mechelen will fully support the initiatives we are taking and that the city employees are encouraged to cooperate. She was positive about the technical solutions we offer.		This was a good opportunity to discuss the role she sees for the city. She is very supportive of the project, made several constructive suggestions for the Uitzondering Uitzondering stand of the Mechelen observatory.
Entry 7: 4th co-design event	Partly, it was an important discussion with the stakeholders to agree on a name and website-address for our CO. This aspect and the further organisation of 'Uitzondering Uitzondering'. Not much critical feedback on the technical scheme and the tools presented. Expectation management regarding options for an online discussion board 'communicated'.	Same as before, very competent group and this session we had lively discussions. 2 new people: little bit of briefing but good to have 'new energy in the room'.	Level of participation was good up + good discussions despite the lower attendance. Partly the low attendance made it possible to have an open discussion. Regarding conflicts we have the long history of one participant challenging the city of Mechelen regarding environmental topics and his frustration of how some trajectories were not successful in the past. Still, everyone is open to listening to other opinions. This time 2 more participants from Leefmilieu group Mechelen Zuid attended, balancing the opinions of LMZ. Point of attention: Two participants tend to dominate the discussion! -> Therefore not everybody is able to share its opinions.
Entry 8: 5th co-design event	Partly, gathering feedback on the tools is done. Organize measurement campaigns needs more work.	Same as before, very competent group.	Level of participation was good up + good discussions.

Table A2. 2 Log of user experiences: Sweden

Questions	GT2.0 Swedish DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 1 - First interaction moment & Co-Design events	The first step was taken, the desired outputs for Flen were achieved and initial community building was done among the invited stakeholders. Work in progress.	They have a strong interest in water quality issues and they are committed to their community. Also quite competent during the causal analysis.	Good interactions as they share a common interest: environment and water quality in their surroundings. This is a unique case, the actual core group is harmonious and clear on what they want but they do not exist in the vacuum when we look at the broader picture conflicts arise.
Entry 2 - Second Co-Design event	Yes, the desired outputs were achieved and initial community building was done among the invited stakeholders, as there were representatives from Flen and Stockholm. The objective was to identify needs in relation to the issue of water quality that impacts on cooperative planning - management of natural resources - environmental stewardship. Challenge, mission and vision of the citizen observatory were agreed, and the session developed smoothly and with a general positive attitude.	Due to their background, they were quite competent during discussions and the causal analysis. Some of the participants need instructions on how to write post-its.	The session developed smoothly and with a positive attitude. Good level of interaction, everyone was involved. There were lively discussions about trends and indicators and participants made their points and gave the space to each other to speak.
Entry 3: Third co-design event	Yes. However, bilateral discussions were necessary to complete the functional design validation and gather more user stories. In the end, we collected 25 user stories.	Somehow limited, due to the small size of the group.	Curiosity: Many questions especially from those who didn't attend to the first WS (the aim of the GT project, main stakeholders). Thorough discussion around the vision, mission, objectives. Participants argued that the objectives are too general (it should focus on water cycle). Lively discussion during the validation of headlines stage. Discussion about the challenge of bringing policymakers on board.

			Overall the participants were very engaged in the session.
Entry 4: Feedback workshop	Greatly, as we kept the attention of our stakeholders, who seemed pleased and curious about the CO and its offer. Appreciated the graphs, and the possibility to choose a name for the CO.	It was interesting to have included a politician, and have his profile mixed with citizens. This created interesting synergies.	There were engaging conversations between participants. All curious about the WaterLitz and the possibilities that the CO offer. Acknowledgement of the importance of engagement and collaboration between different types of stakeholders.
Entry 5: Mock-up session	Yes. Participants experience the practicality of the CO, which is extremely positive for the DC.	Highly competent representatives from Stockholm Vatten and ArtDatabanken, as well as well-informed citizens (there was a limnologist amongst them, a citizen who has studied the environment over many years, the coordinator of the Eko-village).	Very good level of interaction, no passive participants all had the chance to express their opinions either by speaking or writing. Website session, reactions from the audience: Attention. Participation, many questions. Comments and thought give. Tygron station, reactions from audience: Citizen stands up and screams yes! Providing ideas about how to include the Tygron app. Questions about how to use Tygron in the Flen case. FWW STATION: Many questions about the app, importance of having it in Swedish, registration & usage concerns, Doubts about characteristics of the app. etc. See Notes of the session.
Entry 6: Tygron Kick off & Website presentation	Partially for the Tygron session: Obtained initial information for setting up the Tygron engine, but need the perspective of other groups of stakeholders (Municipality, Farmers, Water authorities). For the Website session goals were totally achieved: Many ideas. Obtained feedback about the website.	Highly competent representatives from Stockholm Vatten, as well as knowledgeable & informed citizens (there was a limnologist amongst them, a citizen who has studied the environment over many years, the coordinator of the Eko-village).	Silent in the beginning. Curious. Engaged discussions and many questions as the workshop advanced (providing answers/comments to each other). Apparent shared concern about water quality and engagement in the CO. Attention. Comments show engagement. Interested in sustainable NRM and water quality.

Table A2. 3 Log of user experiences: Kenya

Questions	GT2.0 Kenyan DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 1 - First Co-Design event	<p>Shared goals and values for the future CO have been agreed.</p> <p>General agreement on the process on the insights how the CO will create value.</p> <p>In principle the stakeholders committed, planning the precise timing of the interaction moments ahead is difficult for the stakeholders.</p>	There is a diverse range of competencies. The systemic analysis is difficult for them.	It was fine. Terminology gives issues (livelihood vs. community-based). We should be careful to mention “project” because participants think that there are monetary benefits. Make clearer that GT20 is not a usual capacity development project. So clarify partners and that there are no substantial financial means for participants. We are looking for local champions.
Entry 2: Second co-design event	Yes.	Quite a number of them have experience with political participation; no evidence of strong experience with FD or online platforms.	Harmonious group interactions, no noticeable domination of plenary or group discussions.

Table A2. 4 Log of user experiences: Zambia

Questions	GT2.0 Zambian DC Team observations and assessments		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 1 - First Co-Design event, preparatory workshop CRB	Yes, In some tangential discussion, but that is typical in the setting and were handled so that it did not derail the meeting. Overall good outcome.	The methodology is very different from what they are used to, very demanding in comparison, typically not used to 'thinking through' a problem. Difficult to explain the question –each stage took a bit of explaining, but as soon as the point came across there was a fluent discussion. Examples were important, also dramatizing, jokes. Observation implies a good understanding of the system, there was actual internal discussion about the indicators and what they mean.	Only conflict WWF/CRB, for the exercise itself everybody participated, discussion was lively and included everybody. No visible overpowering/bias created by Induna or Chair. However, chair exhibited demanding behaviour outside the actual discussion, including demands to be provided with materials on the workshop methods and taking the result despite protestations of the community facilitator tasked.
Entry 2: First CO-Design event, preparatory workshop VAGs	Yes, fully.	Less strong on the indicators, but very good at connections. User stories took a bit to get the idea, but then also active discussion which activity to pick etc.	Very active and outspoken, no outright dominant person, once explanation understood, just went with the method.
Entry 3: First co-design event	About 50%. Problem statement agreed with meaningful discussion, activity voting worked well, prioritization of user stories was completed, but did not lead to meaningful selection – everything was chosen with minimal differences in priority. Drafting of objectives failed, both due to time constraints and difficulties of participants to envision outcomes of this project (the concept of a 'platform' is rather alien, more than half of the participants do not have internet access).	Method quite demanding and unusual for participants. Agreeing on a problem not usually that intellectually engaging or challenging, especially since problem rather abstract (information). Had no problem analysis of e.g. complex relationships, interactions and trust, but linking to role of the GT project difficult. Results of two previous sessions were displayed on wall and participants invited to check it out, but no reaction – no curiosity how own results compare to other groups. Not clear why they showed little reaction,	No conflict over differences of CRB and VAG statements, though some fear CRB would get defensive. DAO patronizing exhibiting clear hierarchical sense (type "Mom" – participants internally referred to her as "teacher").

Questions	GT2.0 Zambian DC Team observations and assessments		
	Were the goals of the event achieved?	Competencies	Interactions
		<p>maybe type of invitation (needs physical shepherding and encouragement of doing it as a group activity, you don't just get up and start looking).</p> <p>Users struggled with prioritization of user stories – “everything is important” result, participants struggled differentiating importance of a problem and choosing features of a tool. (Zambia in general culturally not very choosy or coming out criticizing something).</p> <p>Participants had immense difficulty grasping the concept of objectives, the very substantive insight into the problem and required interventions did not lead to a “vision” of a future behaviour they want to see. However, difficulties with timing and facilitation (language) complicated the exercise.</p> <p>Both experience with ICT.</p> <p>Analysing as compared to choosing/judging.</p>	
Entry 4: 2nd co-design event	70%, delayed start, cut the discussion short, agreement in principle on objectives, no discussion of vision and mission. Functional Design conducted but inputs below average.	<p>Warm-up question – which group are you – CRB members extremely hesitant to identify themselves as decision-makers (might have to be addressed in terms of functionality).</p> <p>Discussion mission and vision had to be cut. Discussion of objectives made as simple as possible, still half had a hard time to follow, but in most groups had substantive discussion and followed method.</p> <p>Validation done, but mostly not suitable for the purpose, there was no real reflection on what the structure of the headline means and what that implies for the user stories – with</p>	<p>Plenary very sluggish, almost no contributions. In groups, more active, the tendency of administrators to take the lead role, as understanding better – more facilitator and translator role that guiding results.</p> <p>One VAG member more or less refused engagement with council chair in small group.</p> <p>A concrete participant creates some difficulties in discussions, dominant presence but with absolute passivity (black hole).</p>

Questions	GT2.0 Zambian DC Team observations and assessments		
	Were the goals of the event achieved?	Competencies	Interactions
		more time the discussion might have been more substantive, but mostly critical/an analytical contribution, little to add to the list.	
Entry 5: 3rd co-design event	<p>Technical section – 75%, only tools discussed, but not how communities will be engaging with the data.</p> <p>Objectives and community engagement 100%, mock-up 70% - project information exercise, I&amp;B 100%.</p> <p>Delayed start, slow recap, error in I&amp;B survey, had to be repeated.</p>	<p>Smartphone app no problem even without instruction, competency related exercise revealed no problem with simple graphs of data, but graphs using multiple data entries or transfer questions difficult.</p> <p>Reflection on incentives and barriers difficult, lack of reflexive competencies – check with answers?</p> <p>Continued difficulty to distinguish between general problem statements and specific tasks (structuring of problems) – known problem, but might affect work down the road as influences if VAGs and CRBs can work autonomously.</p>	
Entry 6: 1st National Co-Design Event	Objectives achieved - indirect objective to familiarize national level actors with the concept, got substantive input including proactive suggestions. FD review not fully captured, but general feedback collected.	Unified skill level, all highly educated staff, highly knowledgeable, no problem with the methods and tasks.	Very active and friendly, no opposition, support and openness to exchange and learn, strong openness to advise organizers, some dominant personalities but still happy to give the word to others, though some needed to be called on. NGO and Public officials interacting as peers. Few women, Forestry officer (female) mostly speaking when called on (in plenary), active speakers more male.
Entry 7: 4th IM Sesheke Pilot	<p>Mixed.</p> <p>Data structure - got some feedback - not fully prepared from our side, many additions mean they don't really understand, some genuinely new additions, genuinely new idea on WHY collect data.</p>	<p>Data collection exercise not quite understood, first-timers and hesitance, also mixed between exercises.</p> <p>Police and drug enforcement not there.</p> <p>Community members missing point on some.</p>	<p>People came very late.</p> <p>Groupwork dominated/run by district officials and Chair -</p> <p>Presidents office can't speak in the open. New people very active and open.</p> <p>Community members seemed more intimidated than usual.</p>

Questions	GT2.0 Zambian DC Team observations and assessments		
	Were the goals of the event achieved?	Competencies	Interactions
	Impact journey simplified, objectives mostly achieved. Organizations.		DNPW person blaming forestry, (logging in the park) very emotional. People concerned about the response to data submitted. Always uncertainty if people can talk in the open.

Table A2. 5 Log of user experiences: The Netherlands

Questions	GT2.0 Dutch DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 1 - First Co-Design event (first part)	Yes, the desired outputs were achieved and initial community building was done among the invited stakeholders.	They were quite competent during the causal analysis, and they were very involved with the issue (i.e. flooding). Some of the participants need instructions on how to write post-its.	Good level of interaction, almost everyone was involved. There were some conflicts (e.g. Water Board & municipality, citizens & municipality). However, they made their points and gave the space to each other for discussions.
Entry 2: First co-design event (second part)	Almost, the only thing that we couldn't achieve was a concrete mission, vision and overall objective, but we have the ingredients to produce these.	The participants were very competent; they could work much better with the practices with the post-its (compared to the first meeting). They were very well-informed and could complete the tasks. The farmers were well informed. There was a guy who was very well familiar with the idea of a citizen observatory and could explain it very well from his own experience.	There were a lot of bilateral friendly conversations between people who haven't previously met about the topic at hand. There was some tension between the municipality and the Water Board. Municipality attacked the Water Board on different occasions and complained that they don't listen to the municipality. The municipality asked for measures, but they were corrected by the group. The group mention that better collaboration and communication can solve a lot of issues.
Entry 3: Second co-design event	Yes.	Same groups as previous sessions.	Thorough and lengthy discussion around the vision, mission, objectives. Participants argued that the objectives are too general they could be applied to any case they should be more concrete to the topic of the case. Lively discussion during the validation of headlines stage. A lot of small group discussions. The participants are more familiar with each other, there was a sense of team of 'community' in their interactions with each other. Especially the friendly chats between the waterschap and the gementee. Overall the participants were very engaged in the session.

Questions	GT2.0 Dutch DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 4: Third co-design event	Yes.	Highly competent.	Very good level interaction, no passive participants all had the chance to express their opinions either by speaking or writing.
Entry 5: Fourth co-design event	Yes.	Especially the older participants had problems with the technology, finding their way around the platform. The mobile app is only available for Android and this excluded some participants.	Good interaction, quite some technical assistance required.

Table A2. 6 Log of user experiences: Spain

Questions	GT2.0 Spanish DC Team observations and assessment		
	Were the goals of the event achieved?	Competencies	Interactions
Entry 1 - First Co-Design event	Yes	The high level of the participants and they knowledge contributed to the participation in the session.	There was high participation of the stakeholders in the discussions held during the workshops. They were open to listening to each other and to give their opinion at any time.
Entry 2: Second co-design event	Yes	The high level of the participants and the knowledge about the platforms, data, etc contributed to the participation in the session (most of them had a technical approach).	There were no conflicts during the session. It may come when defining the functionalities (next session). There was high participation of the stakeholders in the discussions held during the workshops.
Entry 3: First co-design event	Yes.	Engineering backgrounds, so some of the activities were too broad and general.	Very amicably, lively and more relaxed than the previous meeting.
Entry 4: Fourth co-design event	Yes.	Scientific and political backgrounds.	Very amicably, lively and more relaxed than the previous meetings.
Entry 6: Sixth co-design session	Yes.	Scientific and political backgrounds.	Very amicably, lively and more relaxed than the previous meetings.

### ANNEX 3: Demo Case experiences of the Co-Design Process

Table A3. 1 Demo Case process experience: Belgium

Co-design process [step]	Process dynamics Belgium
1. Rapid Context Screening	<p>Core findings: pre-screening local identity and population density.</p> <p>Context mapping: political process and hierarchies.</p> <p>Landscape/Identity: landscape fragmented due to population density leads to certain protectiveness of green spaces, intense disconnect centers of economic and personal activity.</p>
2. Tailor Methods to Context	<p>Bilateral meetings to get both authorities and organized citizens engaged. Started with parallel day and evening meetings.</p> <p>Translation of materials - screening mentioned younger people often post in English on social media "because they think they are communicating to an international audience", but co-design group mostly populated by people with a strong sense of local identity. Accordingly, the language was more than working language but linked to the self-identity in the group.</p> <p>Exclusion of the enemy wall might have led to a lengthy discussion on the formulation of main problem.</p> <p>Existence of a process on involving "organized citizens" in political consultations creates a pool of well recognized civilian experts in Belgium. The process plan did not include provisions for people with vastly different levels of experience, with younger people dropping out.</p>
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	<p>Stakeholder dynamics: Power play (trying to make a point) between citizens and policymakers group especially defining the problem (research findings of policymakers vs. daily life experience of citizens).</p> <p>Points of attention to the facilitators: dealing with dominant participants, giving equal opportunity for all to voice their opinions in the session. Also, some participants might come with preconceived ideas about solutions to and causes of the environmental problem at hand.</p> <p>Critical feedback from the participants in the co-design: at the end of this step it was difficult to identify the vision, mission and objectives. It was very abstract, they need a lot of steering/guidance. It was helpful to start with pre-articulated statements. Also formulating the CO user stories was seen as being 'too abstract' difficult to find a balance in communication to find co-design team and not raising expectations that we are going in the beginning already have some concrete actions.</p>
4. Functional Design of CO	<p>WP1 and the DC had to verify the user stories with the CO objectives and created new user stories. Some of the user stories written by the stakeholders had to be split to 2 or 3 to match headlines.</p>

Co-design process [step]	Process dynamics Belgium
	<p>In Antwerp, the CO objectives were derived from the user stories.</p> <p>In Antwerp after creating the user stories and prioritising the headlines, the group moved to reverse impact Journey so as not to lose their momentum.</p>
5. Stakeholder validation of CO Design	Highlights of the IM#3: the group started forming a bond, first signs of a 'group identity.'
6. Technical Design CO	<p>The CO got a name (with the launch of the website).</p> <p>A risk was defined about the potential disengagement of the community members because of having multiple apps (Akvo Flow, Akvo lumen, Tygron Engine, Website, sound measurement devices) .</p>
7. Interactive design of CO interfaces	<p>It was very positive to have tech partners to demonstrate the available technological tools. It was the first moment where people started to grasp the idea of the tech aspect of the CO.</p> <p>The feedback on the technical design was not conclusive. It was better if there was a good summary with go/no go decision.</p> <p>Expectations management is very important. Nice to have or need to have</p>
8. Public launch CO	<p>A public launch event was jointly prepared by the CO members (they discussed in previous sessions how they want to portray themselves to the public). This launch was planned by the Uit zonder uitlaat, a city-wide event where people were encouraged not to use the car.</p> <p>Incorporating the launch in a bigger public (city-wide) event is a good idea to reach wide audience.</p>
9. Plan community mobilization and CO activities	<p>The most successful activities in terms of engagement for the Belgian Demo Case have been the monitoring itself, organised as a campaign, and the public event organised to present the results. The first measurement campaign attracted press interest, leading to two newspaper articles and a boost in interest in the CO, with new participants joining the initiative. At the end of December 2017, the results were presented by the co-design group (volunteers as well as representatives of the City of Mechelen) and GT2.0 staff to an audience of about 45 interested citizens at a dedicated public discussion evening.</p>
10. Implement CO activities with community	<p>In October and November 2017, a first joint measurement campaign for air quality has been organized. 24 volunteers measured black carbon concentrations along 40 kilometres of cycling paths for two weeks. A second measurement campaign on air quality started in February 2018, enabling the CO to map both spatial and temporal changes in urban air quality. A third in July 2018 and a fourth, final one in September 2018.</p>
11. Enhance CO platform	The current initiative is reinvigorated to start doing noise pollution measurements as a means of expanding the platform.

Co-design process [step]	Process dynamics Belgium
	The enhanced services are a tool for collaborative planning through serious gaming, a 3D environment that allows users to interact with other individuals and provides them with not only data but also social communication.
12. Develop model for long-term operation and growth of CO	There is no finalized plan for sustainability, but the Klimaan initiative has embraced MMM and the group will come together every month in a location made available. There are talks with other initiatives around air quality to create a standard for the City of Mechelen and a central air quality database for the city (Neighbourhood initiatives etc.)
13. Operation and maintenance of CO platform	Till this point is very much the responsibility of the DCL, stakeholder attitude: you are paid to do it. It is difficult to change that attitude. The city offered at some point to host the platform, but some citizens voiced concerns about this option "trust issue!"
14. CO management	After holding 4 measurement campaigns, the core group shifted their focus on taking actions based on the results, more measurements were seen as unnecessary if actions for mitigations were not taken.
15. Public/CO community activities	The most successful activities in terms of engagement for the Belgian Demo Case have been the monitoring itself, organised as a campaign, and the public event organised to present the results. The results of monitoring were presented by the co-design group (volunteers as well as representatives of the City of Mechelen) and GT2.0 staff to an audience of about 45 interested citizens at a dedicated public discussion evening.

Table A3. 2 Demo Case process experience: Sweden

Co-design process [step]	Process dynamics Sweden
1. Rapid Context Screening	Landscape/Identity: strong identity with Swedish "pristine" nature [debatable] vs. awareness of citizens living next to water bodies with quality issues.
2. Tailor Methods to Context	The CO community around VattenFokus, especially the co-design group, is built on or through the personal network of project partners. Cold-approaches have not worked well in this Demo Case.
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	Identifying community leaders and keeping CO members engaged throughout the (lengthy and abstract) process, in general, has been challenging. A lot of effort was spent on bilateral meetings, calls, etc. to maintain engagement.

Co-design process [step]	Process dynamics Sweden
4. Functional Design of CO	Proceeded through three co-design workshops with stakeholders, tool developers, and Demo Case leaders. Resulting in agreement on vision and objectives, functional design, and also the participant's commitment to the coming activities. Missing stakeholders (politicians and some water authorities) hard to engage because there is a perception that water quality is only for experts. This made it even harder to engage citizens since they can't see the meaning of taking part if they can't influence politicians.
5. Stakeholder validation of CO Design	"Feedback workshop" with stakeholders on preliminary results. Positive response and engagement of participants indicate implicit validation of CO Design. Good engagement but again there was an issue of few participants. Could cause drop off of participants if the Citizen Observatory does not appear to grow or gather interest.
6. Technical Design CO	Existing tools (testing kits, mobile app from Earthwatch, Tygron engine visualization) were combined with new technical design of website. Helpful having pre-existing tools which can be reused although some complications arise in adapting the tools e.g. translation.
7. Interactive design of CO interfaces	"Mock-up session" with stakeholders, resulting in feedback per tool and shared understanding of the needs. Mainly positive response. Despite attempts to increase attendance (rescheduling the meeting to different time slots/days), there were still not a lot of participants. Still in contact with lots of stakeholders through bilateral meetings and they still show interest in the citizen observatory. It is just difficult to gather them all in the same session which limits the success of each meeting.
8. Public launch CO	Kick-off and website presentation meeting with stakeholders. More feedback and suggestions on how to improve the website. Feedback on the Tygron engine was also positive, but with some concerns about how to use it in VattenFokus. More thought might need to be given as to which tools are most appropriate for the citizen observatory.
9. Plan community mobilization and CO activities	Invitations to local municipalities and local organisations, and also invitations directed to specific key persons (including personal networks). As before, most of the successful contacts come from personal networks. This raises a challenge following staff turnover.
10. Implement CO activities with community	To recruit and spread the word about the observatory the strategy of Vatten Fokus consists of organizing activities, such as train the trainer events, WaterBlitz campaigns with respective feedback sessions, as well as assisting to local seminars, conferences and events related to water and environment issues.
11. Enhance CO platform	Use of visualization and graphical modelling by a tool for collaborative planning through serious gaming to build a 3D environment where users can take measures, see effects, interact with each other and learn from a serious game how different stakeholder's views impact the policy process. The conclusion was, that still it was unclear how this could be used in VattenFokus.

Co-design process [step]	Process dynamics Sweden
12. Develop model for long-term operation and growth of CO	In terms of scaling up the CO, the scale up took different form than increasing the number of participants, such as scaling up to different topics and different cities.
13. Operation and maintenance of CO platform	Plan to cooperate with Naturskyddsforeningen or other suitable NGOs with national stature and recognition.
14. CO management	A continuous dialogue with county administration, local organisations and groups of active observers.
15. Public/CO community activities	Participating in regional "Water Week" in August, and GT2.0 Week in September.

Table A3. 3 Demo Case process experience: Kenya

Co-design process [step]	Process dynamics Kanya
1. Rapid Context Screening	(Prevent Bias)- Provided very useful information about the social, institutional, economic and environmental context and guided our efforts for establishing the CO system (e.g. understanding human wildlife conflict as an issue of concern for communities and inviting relevant stakeholders to the co-design meetings).  Landscape/Identity: Serengeti ecosystems and pastoralist society.
2. Tailor Methods to Context	
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	An evident division between the desires of different stakeholders (especially the Narok County Government and the local Maasai) in terms of what to monitor led to defining the aim of the CO initiative as balancing sustainable livelihoods and biodiversity management.
4. Functional Design of CO	The functional design was guided by the feedback from stakeholders during three co-design workshops. According to the DC platform deliverable. The key outputs are: 1. Supporting implementation of plans and policies with monitoring and information sharing; 2. Use of a knowledge hub to access existing data, information and services; 3. Evaluate research activities or policy and stewardship results; 4. Discuss and set observatory agenda;

Co-design process [step]	Process dynamics Kanya
	5. Participate in policy consultations and planning; 6. Platform to submit their data and process for use.
5. Stakeholder validation of CO Design	
6. Technical Design CO	Mara Collect App, Mara CO app, CO website, TAHMO weather stations installed and connected to the platform.
7. Interactive design of CO interfaces	
8. Public launch CO	The CO system has not officially been launched yet, problems with the county government (in terms of what to publish, how and their role in the CO initiative) contributed to this delay. The web-platform and App are already up and running and were launched and tested separately on two events: once during a public event of the MaMaSe project (AKA the soft launch of the CO) and during the March for Elephants organised by the Friends of the Mara.
9. Plan community mobilization and CO activities	Planning community mobilization and data collection activities are hindered by the 'data policy' that is currently being finalized and still needs to be discussed by the CO members.
10. Implement CO activities with community	Implementation of activities is also hindered by the data policy.
11. Enhance CO platform	Visualization tools both for charts and also spatial data platforms. Other enhancements are: scientific validation process, knowledge exchange hub and community page.
12. Develop model for long-term operation and growth of CO	The initial report on market analysis and uptake the Narok County Government, lodges and conservancies are identified as the potential customers, but based on the discussions among the DC team the idea of lodges paying for maintaining the CO is not that strong anymore. From my recollection, MMU has expressed interest in hosting the CO system in the future (but this is not included in the market analysis and uptake report.
13. Operation and maintenance of CO platform	
14. CO management	
15. Public/CO community activities	

Table A3. 4 Demo Case process experience: Zambia

Co-design process [step]	Process dynamics Zambia
1. Rapid Context Screening	Landscape/Identity: Barotse plains and Kalahari sands transitional landscape, with strong cultural connections (the king IS the land, flooding cycles).
2. Tailor Methods to Context	<p>Preparatory meetings with sub-groups to provide 'safe spaces' to form opinions.</p> <p>The important difference with other cases: Target audience recognized mandate holders under Zambian law. 'Citizens' elected every three years, departments as custodians of defined community activities, also pre-existing data collection efforts in target community. Accordingly, the method has to recognise legacies and jurisdictions to a different degree than cases based on volunteer groups alone.</p> <p>Individual briefings of all authorities that 'might be' important -courtesy visits.</p> <p>Almost no smartphone penetration - method needs to focus on the social side.</p>
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	<p>Cultural context strongly collective - engagement in an observatory at the civilian level is decided by 'the community' (villages under village headmen) not 'citizens'. Process involved formal workshops with co-design group followed by a roadshow from village to village to validate the findings of the co-design group, it creates broad awareness for the process in a situation where few other forms of communication exist, and co-design members will rarely report back, as many potential members as possible and gain approval and credibility at the community level.</p> <p>In contrast, political stakeholders are strongly hierarchical; participants need to know they have the backing of superiors to participate.</p> <p>Enemy wall very successful, Lozi language has a specific term for a person that acts against the interest of the community.</p>
4. Functional Design of CO	<p>The reality of participation and community-based NRM is far from the vision included in-laws. The functional design contains a realistic assessment of the current state on the one hand, with an emphasis on supporting specific current activities and addressing capacity gaps. On the other hand, the co-design group also formulated a more visionary of this that should be done and how they should be done.</p> <p>User stories drew heavily on process documents of the participants, such as minutes of past meetings that included specific lists of issues and challenges. Even though these minutes reflect discussions the same community had only a few weeks or months earlier, capacities to recall and contribute personal experiences. Possible influences on this</p>

Co-design process [step]	Process dynamics Zambia
	<p>dynamic include low ability to anticipate what a CO is and how it would be used (concept too abstract), meaning it is difficult to reflect what information is relevant. It also includes the experience of communities with donors, which triggers tendencies to try and find out what the donor wants to hear</p> <p>One exercise as simplified method showed a word cloud of verbs detailing possible activities that can be supported with/addressed through a CO.</p>
5. Stakeholder validation of CO Design	In the initial prioritization of the user stories, only few of them were voted as priorities. In the validation, many more stories were 'voted up'.
6. Technical Design CO	<p>The tool for communicating data collection results back to communities requires offline capability because, in terms of technical infrastructure, there is a lack of access to grid electricity, poor cellular network coverage in large parts of the area and lack of smartphones. Use of feature phones and design of processes how to get data to the platform is needed.</p> <p>License costs show that potential hosts and owners will be neither willing nor able to provide the substantive funds for these costs. Open source vs. Partners tools with licenses</p> <p>Demo Case experienced extensive adjustment as the project started with a suggested enabling technology with a data storage model likely not usable with government departments. The initial screening/co-design could have helped by raising question regarding legal and technical boundary conditions.</p>
7. Interactive design of CO interfaces	The interfaces were demonstrated and tried out in several community meetings. It was found intuitive and easy to use even by community members who had never used a smartphone. The "reverse" input of first recording the incident and then deciding what type of incident it was seemed rather useful. Translating the interface into Lozi is important, as is thinking about icons and voice recordings (or accessibility tools).
8. Public launch CO	n/a, not yet launched

At this stage, Zambia Demo Case has not performed 8-15 activities yet.

Table A3. 5 Demo Case process experience: The Netherlands

Co-design process [step]	Process dynamics The Netherlands
1. Rapid Context Screening	(Rapid) Has to be rapid because in the Dutch DC a lot of time was spent on identifying and engaging stakeholders that turned out not be very relevant when the CoDesign process continued (e.g. KNMI, weather amateurs).
2. Tailor Methods to Context	Six bilateral meetings were held with the water board, municipalities, weather professionals (KNMI) and amateurs (HWA) to discuss their roles in the CO. Careful balancing between different stakeholders: mobilizing them but not promising ownership. Water authority was keen to take the lead and did the first round of invitations. The water board leading initially created confusion about the role of Ground Truth 2.0. But with GT2.0 as a neutral leader of the CoDesign process the input and interests of the other stakeholders were better guaranteed.
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	Agreeing on what the essence of the problem was, got a lot of emotions in the room. Creating more storage capacity for extreme rain events is not challenging in a technical sense, but often requires collaboration between waterschap and municipality and citizens often don't know what measures are being taken. One of the citizens joining the CoDesign meeting told the municipality and water authority that they should improve their collaboration for the sake of her home.
4. Functional Design of CO	Should a CO / CO always collect data? Tools to improve collaboration and communication got priority in this DC A complicating factor for data collection in this case is that observations of pluvial flooding cannot be planned ahead, they can only be done in case severe weather occurs and then need to happen in a short time frame. To generate a large response, people need to already know that the functionality exists. Therefore, the focus of the observatory is split into 1. sharing information about measures against pluvial flooding (continuous) and 2. sharing information about pluvial flooding (incidental).
5. Stakeholder validation of CO Design	The concept of a platform was hard to grasp in the beginning and only landed when mock-ups were shown.
6. Technical Design CO	Citizens were willing to try new functionality and applications, but their technological skills are not very high, so user-friendliness is important as well as using the Dutch language throughout. The existing data collection app turned out to be rather complicated to use and is only available for Android. Therefore, a choice was made to use web forms that can be directed integrated into the informative maps.
7. Interactive design of CO interfaces	Chicken and egg: building a forum without users or collecting users without a forum? Is a forum needed or would social media (Facebook, Twitter) be sufficient?

Co-design process [step]	Process dynamics The Netherlands
8. Public launch CO	<p>The first version of the platform was tested by the co-design group and released in January 2018. Along with the platform website, the online presence on social media (Twitter, Facebook) was initiated.</p> <p>The first public activity Grip op Water organized was an excursion to a recently created water storage area in Andelsch Broek attracting 18 external participants. This excursion was widely announced in local newspapers and social media channels.</p> <p>The CO was officially launched at the Weidevogelfestival, an anniversary event organised by stakeholder Altenatuur. The material in the stall was about climate proof gardens in general, visitors did not get a good picture of the objectives of Grip op water Altena.</p>
9. Plan community mobilization and CO activities	Reverse Impact Journey with planning group and changing roles
10. Implement CO activities with community	Mainly outreach events to increase visibility and attract new participants. While the group of followers (email updates, social media) keeps growing, the core group remains small. This limits the capacity to organise more activities.
11. Enhance CO platform	The enhanced services are a Platform that provides weather and water data and creates a chain of information services, connecting a variety of distributed data sources through a system of backend services and is available with real-time thematic maps. Story Maps to create a gallery of maps from different sources and combine them with explanatory text in a consistent way. Inundation map for an entire area that shows the water depth one hour after a heavy precipitation event.
12. Develop model for long-term operation and growth of CO	Potential hosting by (merged) municipalities (willing to pay). Also exploring options to continue as a working group of one of the existing local nature organisations. Need to ensure a representation of citizens, water authority and municipality in the O&M model
13. Operation and maintenance of CO platform	Enhancement of the platform with Story Maps has taken long, data provision by the water board has been the bottle neck.
14. CO management	
15. Public/CO community activities	

Table A3. 6 Demo Case process experience: Spain

Co-design process [step]	Process dynamics Spain
1. Rapid Context Screening	Landscape/Identity: 'Popular' climate indicators, economic centre with green 'backyard'.
2. Tailor Methods to Context	RitmeNatura is built from existing initiatives from the Catalan meteorological institute (FENOCAT) and CREAM (FENODATO). In addition, other observers communities representatives of citizens communities joined the group (ICO, ICHN), and policymakers (Generalitat de Catalunya and Diputació de Barcelona). Because of this set-up meetings could only be held between 9 to 5: in practice excluding citizens. At the start of the project, the members of the co-design group were recruited bilaterally. The intended core group members were contacted to join separately and individually, by phone and over email.
3. Initiate Co-Design Group and Capture CO Requirements (Main outcome of this step: user stories)	Because of its composition, the RitmeNatura co-design group had an institutional character. Citizens were only engaged 'by proxy', via the existing platforms of Meteocat and Natusfera. In this institutional environment, the members are all people representing organisations, who need to fit participation in the CO in their current job descriptions. This created a group dynamic that was quite passive and cautious until the formal roles and ownership were clear.
4. Functional Design of CO	The ambition of RitmeNatura is to be an umbrella-platform with the input of existing platforms.
5. Stakeholder validation of CO Design	Different interests from different stakeholders were to be refined before getting consensus.
6. Technical Design CO	
7. Interactive design of CO interfaces	The Ritme Natura observations are made by observers of existing platforms ICO (birds) and COS (butterflies).
8. Public launch CO	RitmeNatura was launch with a press release, the trainer workshops and presentations. The Climate Change Association (CCCB), attached to the Contemporary museum of Barcelona (MACBA), supported the launch of RitmeNatura along with the promotion of their new Citizen Science office in Barcelona, by the means of a phenology workshop that was designed for citizens to perform activities and collect phenological observations.
9. Plan community mobilization and CO activities	The transfer of responsibilities (like community management) from the co-design facilitators to other members of the group was challenging as many engaged group members were not adequately mandated by their employers to take on responsibilities outside the co-design process.

Co-design process [step]	Process dynamics Spain
10. Implement CO activities with community	
11. Enhance CO platform	The second platform is to provide tools for the community to organise and have online discussions. It has been added a forum, a calendar, a news manager, phenological content provided by the stakeholders. The version allows participants to sign in the system and a visualization tool that provides a view of all the collected phenology data
12. Develop model for long-term operation and growth of CO	
13. Operation and maintenance of CO platform	Not easy to register and upload observations. App is not working well. Difficult to get those things changed due to need for a budget.
14. CO management	
15. Public/CO community activities	Few implication of the core stakeholders