groundtruth2.0

Environmental knowledge discovery of human sensed data

Deliverable D1.8

Updated report on incentives and barriers

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Abstract of deliverable	Ground Truth 2.0 aims to demonstrate that sustainable Citizen Observatories are possible. This is done using the innovative approach of combining the social dimensions of citizen observatories with enabling technologies, so that the implementation of the respective citizen observatories in six Demo Cases is tailored to their envisaged societal and economic benefits. This document presents the updated analysis of the incentives and barriers for participation in the respective citizen observatories of the Ground Truth 2.0 project that pertain to the core actors (citizens, scientists/data aggregators and decision/policy makers) in each of the six Demo Cases.

Versions and Contribution History

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V0.1	22.7.2019	Uta Wehn	Initial draft
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V0.6	20.12.2019	Uta Wehn, Abeer Almomani, Onno Giller	Reviewer comments addressed throughout
V0.6	21.12.2019	Uta Wehn	Conclusion chapter and executive summary added; final edits throughout

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List of abbreviations

AEMET	Agencia Estatal de Meteorología (State Meteorological Agency)
CBMS	Catalan Butterfly Monitoring Scheme
CBNRM	Community-based Natural Resource Management
CO	Citizen Observatory
CRB	Community Resources Board (Zambia)
DC	Demo Case
DPS	District Planning Subcommittee (Zambia)
EW	EarthWatch
FenoCat	Catalan Phenology Network
FoMM	Friends of Maasai Mara
GT2.0	Ground Truth 2.0
HR	Hydrologic Research
KMD	Kenya Meteorological Department
KWS	Kenya Wildlife Service
MMCO	Maasai Mara Citizen Observatory
MMM	Meet Mee Mechelen
MMU	Maasai Mara University
MMWCA	Maasai Mara Wildlife Conservancies Association
NCRBA	National Community Resources Board Association (Zambia)
NGO	Non-governmental organization
NVFF	Local water authority in Sweden
OMGEVING	Flemish Government Department of Environment
P/DM	Policy and Decisions Makers
S/DA	Scientists and Data Aggregators
SLU	Swedish University of Agricultural Sciences
SMC	Servei Meteorològic de Catalunya
SU	Sweden University
TPB	Theory of Planned Behaviour
UNICEF	United Nations Children's Funds
VAG	Village Action Groups (Zambia)
VITO	Vlaamse Instelling voor Technologisch Onderzoek (The Flemish institute of Innovation and Technology)
WP	Work Package
WUA	Water Users Association
WWF	World Wide Fund for Nature

Executive Summary

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. Ground Truth 2.0 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.

The Ground Truth 2.0 citizen observatories have been co-designed with local stakeholders to enable monitoring, cooperative planning and environmental stewardship, albeit to differing degrees, namely according to the preferences and needs of each co-design group. Achievement of the envisaged outcomes of each citizen observatory is reliant on the stakeholders' continued active involvement in their respective CO observatory. The incentives and barriers for stakeholder involvement may differ considerably not just across the different citizen observatories but also for different stakeholders of the same citizen observatory.

The purpose of this report is to present an updated analysis of the respective incentives and barriers for participation in the Ground Truth 2.0 citizen observatories, investigating the incentives and barriers for participation from the *distinctive* perspective of the three key actors namely citizens, scientists and data aggregators (S/DA) and policy and decisions makers (P/DM). The research aligns with the conceptual framework and baseline analysis of incentives and barriers that was presented in D1.7. The conceptual framework was operationalized as a detailed questionnaire instrument which was applied via interviews with the respective stakeholders of the Ground Truth 2.0 Demo Cases (with the exception of the Zambia DC). In total, 75 interviews were conducted in the Demo Cases in the Netherlands, Sweden, Spain, Belgium and Kenya.

At the time of undertaking the empirical research, all six Demo Cases had completed their co-design processes and five were fully operational (the Zambia Demo Case being the exception): the CO platforms and tools had been implemented, rolled out and were available for the wider public. Therefore, the empirical research aimed to involve respondents beyond the co-design groups of each citizen observatory; yet the extent to which this was successful varied considerably per Demo Case.

The detailed findings for the incentives and barriers for participation in each citizen observatory are presented per stakeholder [citizens (participants as well as non-participants, if reached), scientists and data aggregators (S/DA) and policy and decisions makers (P/DM] and what this implies for each citizen observatory. These incentives and barriers for participation are evolving over time. One of key barriers for continued participation, namely uncertainty about the sustainability of the respective observatory, which was identified in the Demo Cases has been resolved for most of the citizen observatories in the meantime.

The CO-specific findings of this report feed into the tailored engagement strategies for each Demo Case (Task T1.4), WP3 Business Development and WP4 Dissemination and Communication. The results will also be shared with the members of the respective citizen observatories that are continuing their activities beyond the lifetime of the Ground Truth 2.0 project. Overall, this report provides salient empirical evidence that contributes to the emerging understanding of the drivers for stakeholder engagement in the field of citizen science, citizen observatories and ICT-facilitated stakeholder interaction more generally.

1 Introduction

1.1 Background

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. Ground Truth 2.0 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.

The principle concept of the Ground Truth 2.0 citizen observatories is to enable monitoring, cooperative planning and environmental stewardship, by strengthening the full feedback-loop in the information chain from citizen-based data collection to knowledge sharing for joint decision-making, cooperative planning and environmental stewardship. The Ground Truth 2.0 citizen observatories have been co-designed with local stakeholders according to the preferences and needs of each co-design group. Achievement of the envisaged outcomes of each citizen observatory is reliant on the stakeholders' continued active involvement in their respective CO observatory. The incentives and barriers for stakeholder involvement may differ considerably not just across the different citizen observatories but also for different stakeholders of the same citizen observatory (see Figure 1). Task T1.5 of this project is dedicated to identifying the incentives and barriers for the stakeholders' involvement in their respective citizen observatory.

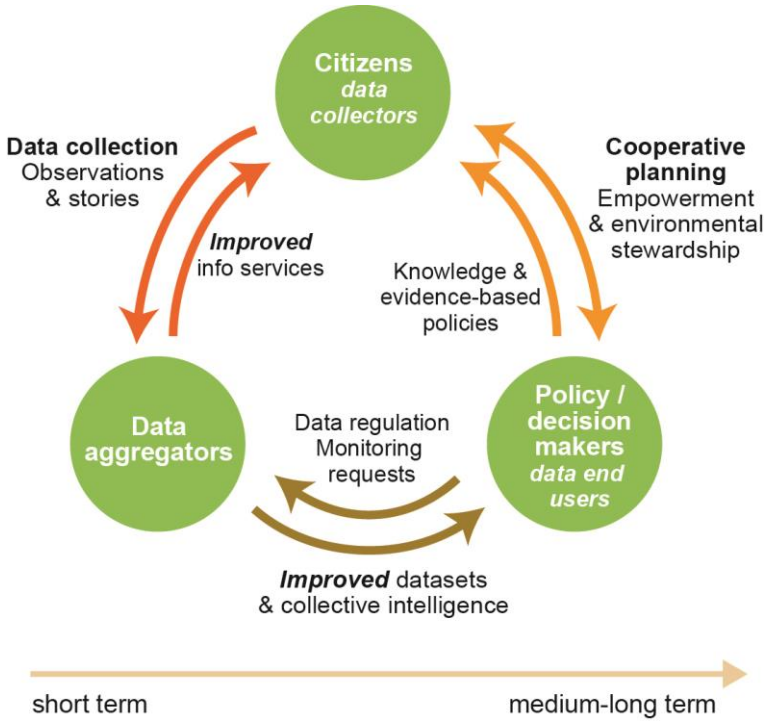

Figure 1. Ground Truth 2.0 core concept

Source: Wehn et al. (2015)

1.2 Purpose of this document

This document presents the updated analysis of the incentives and barriers that was undertaken during the period of March – November 2019. Its results feed directly into Task T1.4 Stakeholder Engagement. The results are also useful to inform other tasks of the project namely, the sustainable business models being developed for each observatory in WP3 Business Development, the outreach activities undertaken by WP4 Dissemination and Communication and, last but not least, for the members of the respective Ground Truth 2.0 Citizen Observatories beyond the end of the Ground Truth 2.0 project life time.

1.3 Structure of this document

This document is structured as follows. Section 2 recaps on the conceptual framework from social psychology (elaborated in D1.7) on which the investigation of incentives and barriers for participation in citizen observatories is based and presents the methods used for implementing the second round of empirical investigation in the six Ground Truth 2.0 Demo Cases. Section 3 presents the results for each Demo Case, summarising the specific incentives and barriers for citizens, data aggregators/sciences and decision/policy makers compared to the baseline measurement taken in 2017. Section 5 concludes with an outlook on the use of these findings by other GT2.0 activities and the six citizen observatories in the Ground Truth 2.0 Demo Cases.

2 Methods

2.1 Conceptual framework

The purpose of the analysis presented in this report was to investigate the incentives and barriers for participation in Ground Truth 2.0 citizen observatories from the *distinctive* perspective of the three key actors identified in Figure (1) namely; citizens, scientists and data aggregators (S/DA) and policy and decisions makers (P/DM).

The research aligns with the baseline analysis presented in D1.7 and the conceptual framing is briefly summarised here. The Theory of Planned Behaviour TPB (Ajzen, 1991), a well-known and tested theory from social psychology served as the conceptual basis for our empirical investigation (Figure 2). According to the TPB, the incentives and barriers consisted of 1) stakeholders' perceptions about the positive and negative outcomes of their participation in the CO, 2) stakeholders' perceptions about social pressure due the acceptance or rejection of their participation in the CO by other people and 3) stakeholders' perception about the presence of certain factors or conditions (i.e. resources, knowledge, opportunities) that facilitate their engagement in the CO activities or, alternatively, obstacles and barriers that hinder their participation.

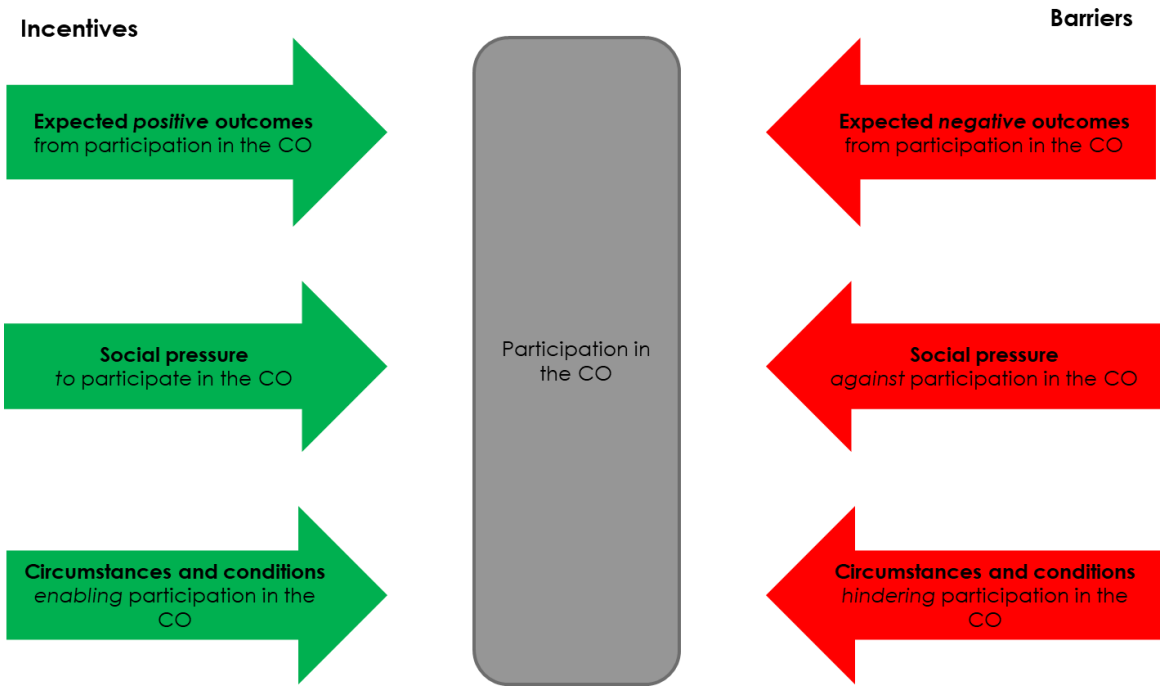

Figure 2. Incentives and barriers for stakeholder participation in CO based on Ajzen (1991)

2.2 Data collection

The conceptual framework was operationalized as a detailed questionnaire instrument. A main distinction was made in the application of this framework, with perceptions captured both, at the individual level (i.e. the perceptions of citizens) and perceptions of organisation (i.e. scientist/data aggregators and Policy/decision makers) as revealed by key interviewees of those organisations. The questionnaire instrument contained closed questions adopted from Wehn and Almomani (2019), followed by open questions

to attain the level of depth required for this analysis. Table 1 presents an overview of the main questionnaire items for which interviewees were asked to prioritise three response options; the selected responses were followed up by open questions. In total, three versions of the instrument were produced: for individual participants and non-participants as well as organisations. These questionnaire instruments were translated into the local languages of the Demo Cases and were converted into a digital form using an advanced survey tool (i.e. Question Pro) in order to facilitate the process of its administration. The questionnaires were administered by the Demo Case teams in the local language and the responses were translated back to English. All the interviewers were given clear instructions on how to deliver the interviews, including a short training on the use of the digital survey tool.

Table 1 Overview of the main items of the questionnaire instrument used for empirical data collection for the incentives and barriers analysis

Conceptual item	Operationalised questionnaire response options
Advantages of participation in the CO	1. …I can obtain data and information that is useful for me 2. …I can directly communicate with the authorities on issues that are important to me 3. …I get the opportunity to discover, try, and use new technologies and innovations 4. …I get the opportunity to learn, enhance my knowledge and expertise 5. …I can enhance my job (or my business), or find job new opportunities 6. …I can be part of a group of like-minded people 7. …I can share my knowledge with others 8. …I would feel good about my self 9. …I can support a cause I consider to be important 10. ...I can be involved in making decisions about [the theme of the CO]– I can get my voice heard 11. …I get the opportunity to do something I enjoy 12. …I can help others 13. Other:…
Disadvantages of participation in the CO	1. …I would have to spend a considerable amount of my time and/or my money 2. ...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.) 3. ...the data I collect and provide could be misinterpreted by others 4. …my online privacy and security could be compromised 5. ...I could encounter unreliable data and information 6. …my input might not make a difference 7. …my job (or my business) could be negatively influenced 8. ...I could encounter risks of injuries, accidents, diseases, theft, etc. 9. ...my input could lead to negative outcomes for others 10. Other:….
Social pressure (positive/negative) to participate in the CO	1. People within my personal circle (e.g. my family, my friends, etc.) 2. People within my work circle (e.g. my boss, my colleagues, etc.) 3. [list of Demo Case specific stakeholders] 4. People in the scientific community (e.g. scientists, researchers, schools, universities, etc.) 5. Members of the local community/residents of the area 6. People in the private, business, or industry sector 7. Other:…
Facilitating/ Hindering factors to participate in the CO	1. The environmental focus and geographical scale of the CO 2. The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning) 3. The state of cooperation and commitment of others to the CO 4. Future sustainability of the CO 5. The information, instructions and the level of assistance I receive from the organizers of the CO 6. Technology aspects; the functionalities & design of the apps,software, or sensors, etc used in the CO 7. The level of feedback I receive from the organizers of the CO 8. The level of recognition and appreciation I receive for my contribution 9. The lack of compensation or rewards for participation in the CO 10. Physical factors e.g. my health, my age, my gender 11. Field conditions e.g. weather, accessibility of data collection site, safety of the site 12. Cultural factors e.g. language, religion, traditions 13. Political factors 14. Other:…
Willingness to participate in the CO	Q: How willing are you to participate in the CO over the coming year? Q: What is the one aspect that will make you (even more) willing to participate in the CO? Q: What is the one aspect that will keep you from participating in the CO?

We administered the questionnaire instruments via interviews with the respective stakeholders of the Demo Cases (with the exception of the Zambia DC). The following stakeholder categories were approached for interviews in each Demo Cases:

- Representatives of S/DA and P/DM organizations involved in the CO. All the S/DA and P/DM organisations that were involved in the co-design and collaborative sessions of the CO were approached for interviews.
- Citizens, whether individuals or representatives of organized citizen groups who participated in the co-design and collaborative sessions or in data collection activities in the CO.
- Citizens outside of the CO, in other words members of the general public. The input of this stakeholder category is important as they represent the potential participants in the CO and their views can inform how to expand the CO beyond its existing base of participants.

Table 2 Overview of interviewee categories, sampling methods and ambitioned number of interviewees

Stakeholder category	Sampling method	Intended # of interviews
Citizen – participants *Individuals or representatives of organized citizen groups who participated in the co-design and collaborative sessions and/or in data collection activities in the CO.*	Cluster sampling based on age and gender	5
Citizen – non participants *Members of the general public in the Demo Case area*	Cluster sampling based on age and gender Snowball sampling	5
S/DA	All organisation represented in the co-design and collaborative sessions	Depends on # of organisations in CO. 1-3 representative per organisation
P/DM		

In total, 75 interviews were conducted in the Demo Cases in the Netherlands, Sweden, Spain, Belgium, and Kenya. The average length of the interviews was 45 – 60 minutes and they were conducted either face to face or via phone/Skype. Each interview started by obtaining informed consent according to the procedure detailed in D6.X.

The number of interviews conducted in each Demo Case is presented in Figure 3 varied for a number of reasons. Firstly, the number of organizations involved in each CO differs. In the Swedish DC, there were four organizations representing the S/DAs (SU, Akvo, EW, Tygron) while in the Dutch Demo Case there was only one (Hydrologic). Secondly, not all targeted interviewee categories could be engaged in interviews. The Swedish DC did not succeed in completing interviews with P/DMs. In the Spanish DC, due to the absence of citizen representation in the co-design group, the majority of the citizens interviewed were non-participants. Finally, in the Dutch DC, the approached non-participants (citizens) approached declined the request for an interview.

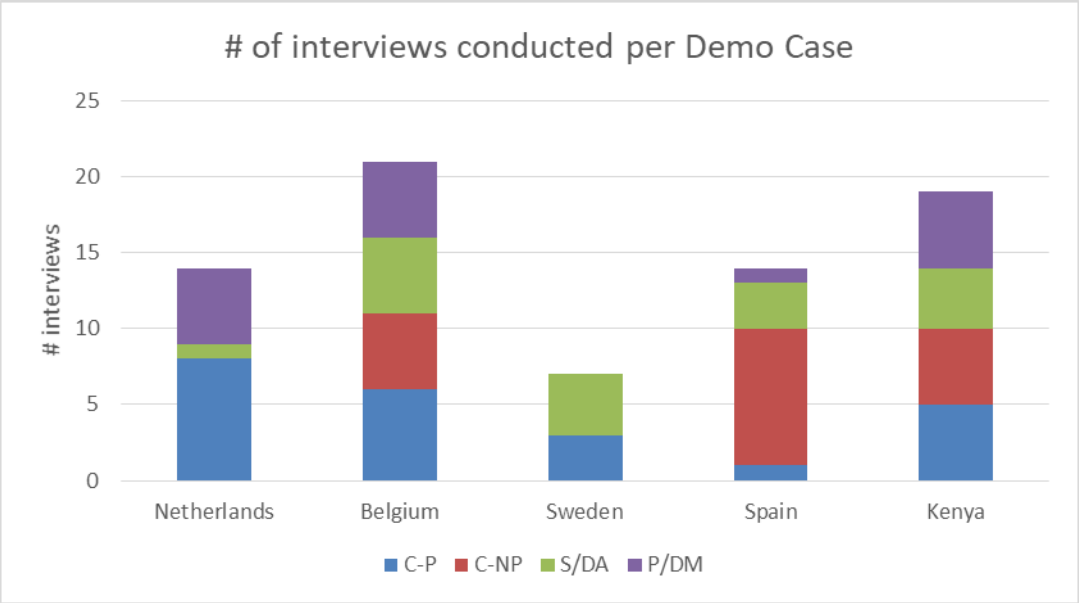

Figure 3. # of interviews conducted for the updated incentives and barriers analysis

A different methodological approach was chosen for the Zambia DC which was strongly shaped by the expansion of the thematic and geographical scope during the co-design process, in order to include authorities relevant to the objectives of the Demo Case. The complexity, institutional embedding and multi-level nature of this CO has two implications for the investigation of incentives and barriers of the respective stakeholders. First, the co-design process has taken more time than in the other Demo Case and the CO is not fully operational at the time of writing. An empirical assessment of the incentives and barriers according to the methods elaborated on above was, therefore, not possible. Instead, the analysis of the incentives and barriers for this Demo Case are based on observations and reflections of the Ground Truth 2.0 Demo Case Team. Second, incentives and barriers have to be considered both at the national and at the local level, with specific relevance of each level. A detailed elaboration of the methodological approach for the Zambia Demo Case is included in section 3.6.

2.3 Data management and analysis

The responses obtained via the questionnaire instruments were translated to English (as needed). Moreover, hand-written notes from the interviews were also transcribed. The resulting data set was then uploaded into the MaxQDA software tool. This tool was used to code the interviewees' answers to the open questions in accordance with the components of the conceptual framework, i.e. advantages and disadvantages of participating in the respective CO; facilitating and hindering factors; the presence or absence of relevant resources for their participation in the CO; and positive and negative sources of social pressure for their participation in the CO. The responses to the pre-defined beliefs were scored and presented in charts in order to summarise the number of times a specific belief was selected (explicitly or via the interviewee's response to open questions). The resulting charts as well as the full data set per stakeholder per Demo Case ((citizens, scientists and data aggregators (S/DA) and policy and decisions makers (P/DM)) were drawn upon for the analysis.

3 Results

3.1 Incentives and barriers to participate in the Belgian CO ‚MeetMeeMechelen‘

In the Belgian CO, the stakeholders wanted to address the air pollution and noise disturbance in the city of Mechelen which have an impact on health, quality of life and social cohesion in the city's neighbourhoods and villages. The CO "Meet Mee Mechelen" is contributing to this by providing an online and offline meeting place where information and knowledge about air quality and ambient noise is made accessible for everyone to support policy making and initiatives for a better living environment. Specifically, the CO will be a place to launch civilian measurement campaigns of noise and air quality in city's neighbourhoods, citizen sensed data will be integrated with existing information on the CO platform where it can be easily accessed, shared, analysed and discussed, thus stimulating a local debate on how to address the issue, and taking up a role in policy preparation, specifically regarding local mobility (planning of cycling infrastructure and circulation plans).

3.1.1 Incentives and barriers for citizens to participate in Meet Mee Mechelen

The interviewees with citizens include six Meet Mee Mechelen (MMM) participants and five non-participants. The participants are representatives of different environmental action groups (i.e. civil action group Leefmilieugroep Mechelen-Zuid, Cycling Federation Fietsersbond, envrionmental NGO Natuurpunt) as well as individual citizens from Mechelen who participated in MMM co-design and collaborative stakeholder sessions, and the air quality measuring campaigns[1]. The non-participants are individual citizens resident in Mechelen. The perceived advantages and disadvantages for participating in MMM elicited from the interviewed citizens are presented Table 3.

A range of personal and societal benefits were perceived by the interviewees. By participating in MMM measuring campaigns the interviewees expected to obtain *local* data about the quality of air and noise levels in the city. They were interested in knowing the quality of air in their neighbourhoods or in the places where they usually go so they can avoid the places where the air quality is not very good, similarly for the noise level data.

[1] At the time of writing this report, noise measuring campaigns had not yet taken place. Discussions were ongoing amongst MMM members about planning noise measurement campaigns.

Table 3 Advantages and disadvantages perceived by citizens to result from their participation in Meet Mee Mechelen

Advantages of participating	Citizens	
	Participants (N=6)	Non-participants (N=5)
...I can obtain data and information that is useful for me	2	4
...I can directly communicate with the authorities on issues that are important to me		
...I get the opportunity to discover, try, and use new technologies and innovations		
...I get the opportunity to learn, enhance my knowledge and expertise	2	
...I can enhance my job (or my business), or find job new opportunities		
...I can be part of a group of like-minded people	2	1
...I can share my knowledge with others	2	
...I would feel good about my self	1	1
...I can support a cause I consider to be important	3	1
...I can be involved in making decisions about air quality and noise pollution in Mechelen – I can get my voice heard	3	2
...I get the opportunity to do something I enjoy		
...I can help others	2	3

Disadvantages of participating	Citizens	
	Participants (N=6)	Non-participants (N=5)
...I would have to spend a considerable amount of my time and/or my financial resources		3
...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.)		
...the data I collect and provide could be misinterpreted by others	2	1
...my online privacy and security could be compromised		
...I could encounter unreliable data and information		2
...my input might not make a difference	3	1
...my job (or my business) could be negatively influenced		
...I could encounter risks of injuries, accidents, diseases, theft, etc.		
...my input could lead to negative outcomes for others		

Some of the interviewed participants are members of an action group called cycling federation 'Fietsersbond' which has a vision to make Mechelen 'the cycling city in Flanders'. For these interviewees, air quality data is "evidence to show the state of air quality and why we need more cycling in the city". By taking part in MMM, they hope to expand the existing database of air quality and noise measurements they have collected earlier and present reliable evidence about air pollution to influence the city's policies regarding mobility e.g. increasing the cycling paths and pedestrian street and introducing a low emission zone in the city. On the other hand, for other interviewees, this data is also important as evidence to raise awareness amongst people on the influence of their mobility choices on air quality around them and to convince people to walk and cycle instead of using cars. It is important to note that involvement in decision making about air quality and noise in the city is thus far limited to the above-mentioned members of the cycling union. The perception of other interviewed participants and non-participants of MMM as 'a platform where I get heard' and 'to let the government know that it is important' indicates their interest in entering the - thus far – closed system of decision making, except for selected citizen expert groups.

Furthermore, for some of the interviewed citizens, being part of a like-minded group (i.e. environmentally conscious citizens), feeling good for doing something worthwhile and supporting a good cause (i.e. making Mechelen a better place to live), and helping others (i.e. other citizens and the government) were amongst the benefits they perceived to gain from participating in MMM.

With respect to the perceived disadvantages from participating in the MMM, the most frequently mentioned disadvantage was the unlikelihood of achieving the desired benefits, particularly with respect to influencing policy. "Something needs to change, but I do not expect it to happen" and "there is no political will for change" were some of sentiments expressed by the interviewees in this regard. Related to this, concerns were expressed that the data they collect could be misinterpreted by others, could be 'cherry picked' or twisted by politicians (or even citizens) to argue that the situation is not that bad and no action needs to be taken.

Furthermore, the 'non-participant' respondents had concerns that measurement taken by non-experts (like themselves) may contain mistakes. Arguably, the reliability of measurements was not an issue for the 'participant' respondents as they had received a comprehensive training on how to use the sensors and how to take the measurements.

Finally, the 'non-participant' respondents considered spending personal time to participate in MMM perceived a disadvantage if such time is spent in "boring meetings" or when they have other commitments and priorities that they need to attend to. Some also indicated that they would consider it a disadvantage if participating in MMM will involve costs (e.g. to buy a bicycle or to travel).

The factors that are perceived to facilitate or hinder the interviewed citizens from participating in the MMM are presented in Table 4.

The information and instructions provided by the organizers of the MMM is the most frequently mentioned factor by the interviewees. Clearly defined tasks, easy to follow instructions ("not too much jargon"), technical assistance on the use of equipment were all mentioned as facilitating factors. For most, but not all, the provided assistance was deemed sufficient. Furthermore, the availability of information about the importance of MMM and how beneficial it will be for the city was particularly mentioned as a facilitating factor by the 'non-participant' interviewees. Similarly, regular feedback from the MMM organizers was also regarded to facilitate participation. The interviewees indicated that they would like to receive feedback about the results of the measurements, to be informed of what is happening in MMM, and the actions that have been taken based on MMM results. Such feedback is important to them because they would like to know if what they are doing is 'making sense' and whether it is worth continuing.

The geographic scale of the MMM (i.e. focus on local level) was regarded as a facilitating factor by the interviewed citizen 'participants' and 'non-participants' alike, given their connection and attachment to the city of Mechelen. On the other hand, the thematic focus of the MMM on air quality and noise was perceived as too limited by one of the interviewees who suggested to include other environmental issues in the scope of MMM.

Different views emerged about the involvement of participants in the design and planning of MMM, i.e. involvement beyond data collection. One interviewed participant mentioned that being involved in the co-design process made them feel more engaged in MMM and thus perceived it as a facilitating factor, while another considered the co-design process as unclear in terms of its end goals.

Commitment and cooperation of others was perceived as facilitating if present and hindering if absent, mostly in relation to the commitment of other volunteers to participate in the MMM measurement campaigns. Perceived lack of political will to make a real change with respect to environmental policies was perceived as a hindering factor for participation in MMM. However, one of the interviewees perceived the openness of political parties to scientific contributions as a facilitating factor.

Table 4 Factors perceived by citizens to facilitate / hinder their participation in Meet Mee Mechelen

Facilitating factors	Citizens	
	Participants (N=6)	Non-participants (N=5)
The environmental focus and geographical scale of Meet Mee Mechelen initiative (e.g. focus on air quality and noise pollution in Mechelen, local or national scale)	3	2
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)	1	
The state of cooperation and commitment of others to Meet Mee Mechelen		3
Future sustainability of Meet Mee Mechelen		
The information, instructions and the level of assistance I receive from the organizers of Meet Mee Mechelen	3	3
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Meet Mee Mechelen	2	1
The level of feedback I receive from the organizers of Meet Mee Mechelen	2	1
The level of recognition and appreciation I receive for my contribution		1
The lack of compensation or rewards for participation in Meet Mee Mechelen		
Socio-economic factors (level of education, level of income, level of technological development)		
Physical factors e.g. my health, my age, my gender	1	
Field conditions e.g. weather, accessibility of data collection site, safety of the site		
Cultural factors e.g. language, religion, traditions		
Political factors	2	1

Hindering factors	Citizens	
	Participants (N=6)	Non-participants (N=5)
The environmental focus and geographical scale of Meet Mee Mechelen initiative (e.g. focus on air quality and noise pollution in Mechelen, local or national scale)	1	
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)	1	2
The state of cooperation and commitment of others to Meet Mee Mechelen		1
Future sustainability of Meet Mee Mechelen	1	
The information, instructions and the level of assistance I receive from the organizers of Meet Mee Mechelen		2
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Meet Mee Mechelen		
The level of feedback I receive from the organizers of Meet Mee Mechelen		
The level of recognition and appreciation I receive for my contribution		
The lack of compensation or rewards for participation in Meet Mee Mechelen		
Socio-economic factors (level of education, level of income, level of technological development)		
Physical factors e.g. my health, my age, my gender		
Field conditions e.g. weather, accessibility of data collection site, safety of the site		1
Cultural factors e.g. language, religion, traditions		
Political factors	3	1

In terms of availability or absence of resources required for participating in MMM, Table 5 and the responses to the open questions on this aspect indicate that the skills and knowledge and the technological tools (e.g. smartphones, internet connections, sensors provided by Vito) to participate in the MMM were deemed sufficient by the interviewees, while money (for transport) and time needed for participation was deemed less sufficient. With regards to additionally required resources, some of the 'participants' mentioned that having speed meters on their bikes would have been helpful during the measuring process[2].

Table 5 Sufficiency of resources for participation in Meet Mee Mechelen perceived by citizens

Resources statements	Citizens - Participants (N=6)					Citizens - Non-participants (N=5)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Meet Mee Mechelen activities			1	1	3			1	3	1
I have sufficient technological facilities to carry out Meet Mee Mechelen activities		1		3	1				1	4
I have sufficient time to carry out Meet Mee Mechelen activities		2	1	2			1	2	2	
I have sufficient financial resources to carry out Meet Mee Mechelen activities		2		2	1		1		4	

[2] The participants in air quality measuring campaigns were asked to cycle on certain speed while taking the measurements to ensure the accuracy of the sensor's reading.

The sources of social pressure perceived by the interviewed citizens to participate in MMM are presented in Table 6. The responses indicate that almost all interviewees perceived encouragement from their families and friends because they are also interested in environmental issues. However, some of the interviewees were discouraged by family members or friends because they do not see the importance of their activities for MMM or because it competes with their personal time.

Only positive pressure was perceived to stem from other stakeholder types involved in MMM, namely Mechelen Stad, Flemish Government Department of Environment, and Vito. Conflicting views emerged regarding local politicians (elected officials of Mechelen Stad), perceived by some interviewees to be in favour citizen participation in MMM, evidenced by the city's involvement in MMM. Another interviewee (non-participant) believed the opposite, arguing that local politicians have goals with which MMM does not align. The general public (other citizens in Mechelen) was regarded as a source of both, positive and negative social pressure for citizen participation in MMM.

Table 6 Sources of positive and negative social pressure perceived by citizens in relation to their participation in Meet Mee Mechelen

Positive pressure	Citizens	
	Participants (N=6)	Non-participants (N=5)
People within my personal circle (e.g. my family, my friends, etc.)	5	5
People within my work circle (e.g. my boss, my colleagues, etc.)		
Officials in government agencies		
Officials in the municipality/city		2
Politicians in the municipality/city		2
Officials in the regional/provincial administration	1	1
Members of the local advisory boards		
People from non-governmental, non for profit, or civil organizations		
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1	1
Members of the local community/residents of the area	3	1
People in the private, business, or industry sector		

Negative pressure	Citizens	
	Participants (N=6)	Non-participants (N=5)
People within my personal circle (e.g. my family, my friends, etc.)	1	2
People within my work circle (e.g. my boss, my colleagues, etc.)		
Officials in government agencies		
Officials in the municipality/city		
Politicians in the municipality/city		1
Officials in the regional/provincial administration		
Members of the local advisory boards		
People from non-governmental, non for profit, or civil organizations		
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		
Members of the local community/residents of the area	2	2
People in the private, business, or industry sector		

3.1.2 Incentives and barriers for scientists/data aggregators to participate in MeetMeeMechelen

The interviewees with scientists and data aggregators in MMM include VITO (The Flemish institute of innovation and Technology) providing technological tools and scientific expertise in addition to their role as lead of the Belgian Demo Case; Akvo and Tygron both providing the technical tools and representing data aggregators[3]; and finally Technopolis (Flemish science centre and activity museum in Mechelen).

These scientists/data aggregators indicated a range of direct advantages for their respective organisations as well as benefits for society at large (see Table 7). The most frequently mentioned advantage of participating in MMM is gaining experience in Citizen Science, i.e. experience with setting up citizen science projects, experience working with citizens, experimenting with the usability of their tools and technical

[3] VITO, Akvo, and Tygron are GT2.0 consortium partners.

solutions by citizens. Apart from this, participation in MMM was perceived an opportunity to create new partnerships and future business opportunities, to increase visibility for their organisation and to expand the client base of the organisation. Improving their organisation's public image was mentioned specifically by the two Belgian interviewees from VITO and Technopolis. Participating in MMM is considered an opportunity to demonstrate that they are actively involved in matters of local importance. Finally, for some of these scientists/data aggregators, the air quality data gathered by the citizens was found to be a 'unique and high resolution data' that are valuable for improving their modelling tools, as well as being a valuable input for planning mobility in the city and eventually contribute to a sustainable society.

Table 7 Advantages and disadvantages perceived by scientists/data aggregators to result from their participation in Meet Mee Mechelen

Advantages of participating	Scientists - Data Aggregators (N=5)
...we obtain data and information that is useful for us	2
...we can share and exchange important data sets with other organisations	
...we obtain access to new technologies and innovations	
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	4
...we can improve the performance of our organisation/group – do the things we do in a better way	1
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	2
...we can have increased visibility for our organisation/group	2
...we can improve our organisation's/group's public profile	2
...we can be involved in making decisions about air quality and noise pollution in Mechelen – have a say in this matter	
...my organisation/group supports the role of	
...my organisation/group contributes to the public good or helps others	1
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Scientists - Data Aggregators (N=5)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	2
...we could obtain unreliable data	
...we could encounter risks associated with sharing our data sets with other organisations.	
...we could encounter risks associated with sharing our data with the public on Meet Mee Mechelen platform	1
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	2
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	
... our input/contribution could lead to negative outcomes for others	1

Overall, the advantages perceived to result from participating in the CO seemed to outweigh the disadvantages which are primarily related to the cost of staff time allocated to tasks related to stakeholder engagement, communication and outreach. For some technology developers, spending these resources on tasks that are not the core focus of their organisation was perceived to be inefficient use of the organisation's resources, and, as a consequence, negatively influencing its performance.

The range of factors that influence (facilitate or hinder) participation in the CO as perceived by this type of stakeholders is presented in Table 8.

Table 8 Factors perceived by scientists/data aggregators to facilitate / hinder their participation in Meet Mee Mechelen

Facilitating factors	Scientists - Data Aggregators (N=5)	Hindering factors	Scientists - Data Aggregators (N=5)
The current state of citizens/volunteers' interest to participate in data collection	1	The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of Meet Mee Mechelen	3	The joint approach for the setup of this initiative i.e. joint design and joint planning of Meet Mee Mechelen	3
The current scope and focus of Meet Mee Mechelen initiative (e.g. the environmental topic and the geographical scale)	3	The current scope and focus of Meet Mee Mechelen initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Meet Mee Mechelen	1	Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Meet Mee Mechelen	
The current state of cooperation and commitment of the other stakeholders	1	The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of Meet Mee Mechelen initiative		The future sustainability of Meet Mee Mechelen initiative	1
Political factors		Political factors	
Cultural factors		Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)		Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)		Field conditions (e.g. weather, accessibility, safety)	1

Most notably, the thematic focus of MMM on air quality and noise is perceived as a facilitating factor for their participation, as it falls within the expertise area of the involved organisations, and the focus on the city rather than the whole of Flanders was considered a plus, since city-level is a scale that the volunteers could feasibly cover in the air measurements campaign. Also, the co-design and joint planning approach for setting up MMM in itself was perceived to help unite different stakeholders around a common goal for MMM, being a "very strong aid in the success of the project". Moreover, for some S/DA interviewees, the co-design approach and the multi-stakeholder workshops provided an opportunity for their organisation to gain the exposure they desired. Nevertheless, some aspects of the co-design approach were hindering factors, for the interviewed consortium partners in particular. The timing of MMM meetings in the evenings were a hindering factor for some of the interviewed organisations. Also, the evolving nature of the CO also meant that the technological tools initially assigned for this DC became irrelevant, i.e. they were not needed at all. While the compatibility of the different technological tools used in MMM was perceived well, uncertainty about the financial sustainability of MMM beyond the GT2.0 project, i.e. "who will cover the license fees for our tools?" was perceived to hamper their longer term participation.

With respect to the presence or absence of relevant resources for their participation in the MMM, the responses presented in Table 9 indicate that the skills, experience, and technological facilities needed to participate in MMM were deemed quite sufficient by all the interview S/DAs. The time and money to participate in MMM were also deemed sufficient, albeit to a lesser extent. According to the elaborations of the interviewed SDAs, the key resources that facilitated their participation in MMM stem from their own knowledge base, i.e. scientific expertise in the topic of air quality and noise pollution (VITO), expertise in data analysis and visualization, communication and dissemination skills (Technopolis). Additional financial resources will be required though to their organisation's participation in MMM after the GT2.0 project.

Table 9 Sufficiency of resources for participation in Meet Mee Mechelen perceived by scientists/data aggregators

Resources statements	Scientists/Data aggregators (N=5)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Meet Mee Mechelen activities				1	4
I have sufficient technological facilities to carry out Meet Mee Mechelen activities				1	4
I have sufficient time to carry out Meet Mee Mechelen activities			2	1	2
I have sufficient financial resources to carry out Meet Mee Mechelen activities			2	1	2

Table 10 indicates the sources of positive and negative social pressure perceived by the S/DA interviewees with respect to their respective organisation's participation in MMM. The responses indicate that they perceived positive social pressure from the *other* stakeholders involved in MMM (i.e. local and provincial administration, citizen action groups, and individual citizens). In one interviewee's organisation, higher management was perceived against their CO participation, owing to concerns about the allocation of staff time to tasks that are not the core focus of the organisation. Tygron and VITO perceived negative social pressure from competitors (other technology/service providers) while for Technopolis misalignment of the thematic focus of MMM with their own annual theme translated into negative pressure. Finally, one of the data aggregators perceived negative social pressure from other organisations in the scientific community, owing to reservations about the accuracy of the technological tools they are providing for this CO.

Table 10 Sources of positive and negative social pressure perceived by scientists/data aggregators in relation to their participation in Meet Mee Mechelen

Positive Pressure	Scientists - Data Aggregators (N=5)
Other people in my organisation	2
Officials in government agencies	
Officials in the municipality/city	2
Politicians in the municipality/city	
Officials in the regional/provincial administration	1
Members of the local advisory boards	
People from non-governmental, non for profit, or civil organizations	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1
People in the private, business, or industry sector	
Members of the local community/residents of the area	1
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Scientists - Data Aggregators (N=5)
Other people in my organisation	1
Officials in government agencies	
Officials in the municipality/city	
Politicians in the municipality/city	
Officials in the regional/provincial administration	1
Members of the local advisory boards	
People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1
People in the private, business, or industry sector	2
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.1.3 Incentives and barriers for policy/decision makers to participate in MeetMeeMechelen

The interviewees in this stakeholder category are representatives of Mechelen Stad (the city administration), the Flemish Government Department of Environment (OMGEVING), and the city parliament.

The advantages and disadvantages that they perceive to result from participating in MMM are presented in Table 11.

Table 11 Advantages and disadvantages perceived by policy/decision makers to result from their participation in

Advantages of participating	Policy - Decision Makers (N=5)
...we obtain data and information that is useful for us	3
...we can share and exchange important data sets with other organisations	
...we obtain access to new technologies and innovations	
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	1
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	1
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	2
...we can be involved in making decisions about air quality and noise pollution in Mechelen – have a say in this matter	
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	3
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Policy - Decision Makers (N=5)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	1
...we could obtain unreliable data	
...we could encounter risks associated with sharing our data sets with other organisations.	
...we could encounter risks associated with sharing our data with the public on Meet Mee Mechelen platform	2
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	1
... our input/contribution could lead to negative outcomes for others	

The air quality maps produced based on the citizens' measurements are perceived as positive outcomes, particularly by the Mechelen Stad and the City Parliament interviewees. On the one hand, using citizen data is seen to help localize environmental hotspots in the city and take more targeted measures to address them. On the hand, it is perceived to help raise public awareness around the issue of air quality in Mechelen. The interviewees from both, Mechelen Stad and the City Parliament, perceived their participation in MMM as an opportunity to 'sit around the table with the citizens' and collaborate on the creation of policy for the city. Mechelen Stad in particular was expecting to build a partnership with involved stakeholders, namely VITO and the citizens, through their participation in MMM. However, the ambitioned collaboration with citizens via MMM in their view has not been fulfilled. Mechelen Stad mentioned it is currently setting up citizen panels as part of the political process, so participating in the MMM provided them with the opportunity to learn and gain relevant experience with the 'methodology of setting up of COs'. Apart from gaining useful experience, participating in MMM was seen as an opportunity for Mechelen Stad to demonstrate their active involvement of in 'smart cities and sustainability' initiatives. Similar expectations and learning opportunities were sought by the participants from the Flemish Department of Environment, wish to explore the feasibility of COs for future applications by the Flemish government, expectation which in their view have not been fulfilled.

While the air quality data collected by citizens was deemed useful for decision making and raising public awareness, there were concerns about how this data will be perceived by the public. 'Incorrect' interpretation of the results by some could mean that people do not understand the issues in full and just focus on the negative part. Also, publishing the results can put the city under public pressure, raising expectations in terms of follow up actions in the short term while "changing policy is a process that takes time". Failing to fulfil people's expectation would thus put the reputation and public image of the city at risk.

A summary of those factors identified to facilitate and those to hinder the P/DMs' participation in MMM are presented in Table 12.

Table 12 Factors perceived by policy/decision makers to facilitate / hinder their participation in Meet Mee Mechelen

Facilitating factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	4
The joint approach for the setup of this initiative i.e. joint design and joint planning of Meet Mee Mechelen	
The current scope and focus of Meet Mee Mechelen initiative (e.g. the environmental topic and the geographical scale)	3
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Meet Mee Mechelen	1
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of Meet Mee Mechelen initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	1
The joint approach for the setup of this initiative i.e. joint design and joint planning of Meet Mee Mechelen	1
The current scope and focus of Meet Mee Mechelen initiative (e.g. the environmental topic and the geographical scale)	2
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Meet Mee Mechelen	
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of Meet Mee Mechelen initiative	2
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

All interviewed P/DMs considered the enthusiasm of other CO members (particularly representatives of the Fietsersbond and Natuurpunt) and the level of their commitment to MMM facilitators for their own participation in MMM, stating that "they keep the CO alive" and that "the conviction of the volunteers is contagious". On the other hand, one of the interviews from Mechelen Stad expressed concerns about the decreasing number of citizens attending MMM Mechelen at subsequent meetings which was deemed to be related to the disagreement that had emerged between citizens and Mechelen Stad over how the air quality results should be presented on maps.

The thematic focus and geographical scale of MMM is regarded to help participation of some P/DMs and hinder others. MMM's thematic focus on air quality and noise was perceived as a facilitating factor because of its importance to the people in the city (according to Mechelen Stad) and for its alignment with their organisation's scope of work (according to Flemish Department of Environment), whereas the city parliament interviewee preferred the inclusion of a wider range of topics in order to reach more citizens. Not surprisingly, the city-level geographical scale of the MMM was seen to help participation of Mechelen Stad and to hinder participation by the Flemish Department of Environment since they preferred activities at regional rather than local scale.

Furthermore, the pace of the co-design process to set up MMM was perceived too slow, some of the co-design steps too theoretical, and the timing of the stakeholder sessions in the evenings were perceived to hamper participation by some of the P/DM interviewees and perhaps the participation of more departments from Mechelen Stad. The uncertainty about the future of MMM, i.e. whether MMM would join other citizen initiatives in the city or proceed on its own, was deemed to hinder participation of Mechelen

Stad. Finally, the use of modern technologies in MMM (e.g. portable air quality sensors) were deemed to foster their participation.

With respect to the presence or absence of resources needed for participating in MMM, a diverse picture emerged from the responses presented in Table 13. The communication and public outreach skills as well as the different communication channels (i.e. Facebook, twitter, Newsletters) offered by Mechelen Stad were deemed an important resource for MMM. In turn, knowledge about air and noise quality, and mapping techniques were particular resources offered by Flemish Department of Environment. On the other hand, staff time and financial resources to fund MMM after the GT2.0 project were perceived to be lacking.

Table 13 Sufficiency of resources for participation in Meet Mee Mechelen perceived by policy/decision

Resources statements	Policy/Decision makers (N=5)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Meet Mee Mechelen activities		1	1	2	1
I have sufficient technological facilities to carry out Meet Mee Mechelen activities		1	1	2	1
I have sufficient time to carry out Meet Mee Mechelen activities		3		2	
I have sufficient financial resources to carry out Meet Mee Mechelen activities		2	1	2	

Sources of perceived social pressure for Mechelen Stad, the Flemish Government Department of Environment and the city parliament to participate in MMM are presented in Table 14. Generally speaking, more sources of positive than negative social pressure were identified. Only positive social pressure was perceived from the respective other policy/decision makers, other MMM members, the city's environmental council and the citizens of Mechelen in general. However, people who are not interested in environmental issues were perceived to be against the city investing its resources in projects of this kind. Industry was also perceived to oppose MMM for their fear of (stronger) regulations. Both positive and negative pressure was perceived from local political parties.

Table 14 Sources of positive and negative social pressure perceived by policy/decision makers in relation to their participation in Meet Mee Mechelen

Positive Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	2
Officials in government agencies	
Officials in the municipality/city	2
Politicians in the municipality/city	2
Officials in the regional/provincial administration	
Members of the local advisory boards	2
People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1
People in the private, business, or industry sector	
Members of the local community/residents of the area	3
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	1
Officials in government agencies	
Officials in the municipality/city	
Politicians in the municipality/city	2
Officials in the regional/provincial administration	
Members of the local advisory boards	
People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	1
Members of the local community/residents of the area	1
People within my personal circle (e.g. my family, friends)	

3.1.4 Concluding remarks

The analysis of the incentives and barriers for participation in Meet Mee Mechelen showed that the involved (and non-participating) citizens, scientists/data aggregators and the City of Mechelen all have their respective expectations of the outcomes they want to achieve by participating in this citizen observatory: the citizens want to effect change, policy makers want to collaborate with citizens in innovative ways and scientists/commercial data aggregators want to gain experience with citizen science in order to move on to new projects. The results also indicate potential clashes in the respective incentives systems for citizens and decision makers that can hold back their further engagement in MMM. These clashes are evident from the policy/decision makers' hesitation to share the air quality results with the public (i.e. concerns about scrutiny and public pressure to act) and citizens' scepticism about the likelihood that their monitoring effort will make a difference. The key aspect that will ensure (continued) participation of citizens is evidence that MMM measurement results are used and that they are helping to effect change while the decision makers in Mechelen Stad and the city parliament need to see relations shift from perceived 'civil activism' towards collaboration and partnership. Finally, the scientists/data aggregators of this CO – with the exception of Technopolis- are Ground Truth 2.0 partners and their views about Meet Mee Mechelen are closely tied to the duration of the project rather than MMM as an initiative in which they will be involved in the long run. Their key motivations are closely linked to their role in the project as data aggregator, technology providers and Demo Case lead, gaining experience in Citizen Science and establishing business partnerships that can open doors to new projects in this field, though some of them would prefer to stick to roles that are more aligned with their competencies and core business, being involved in the "technical" rather than the "social" side of citizen observatories.

3.2 Incentives and barriers to participate in the Dutch CO ‚Grip op water Altena'

In the Dutch CO the stakeholders in Land van Heusden en Altena, the water board Rivierland, the municipality of Altena, citizens and farmers wanted to understand each other's interests and ways of working; and create an awareness about how all are jointly responsible for limiting the damage by pluvial flooding in urban and rural areas caused by the extreme weather resulting from climate change. The Dutch CO, called Grip op Water Altena, aimed to contribute to this by providing 1) a platform to share and access various sources of information relevant to planning for and responding to pluvial flooding and 2) channels serving to improve the communication between citizens, farmers, municipalities and the water authority.

3.2.1 Incentives and barriers for citizens to participate in Grip op Water Altena

The interviewees in this stakeholder category include eight citizens participating in Grip of Water. In terms of perceived advantages from participating in Grip op Water, table 15 indicates that a range of perceived personal as well as societal benefits. The perceived advantages in terms of data and information sharing, communication with authorities, learning and enhancing personal knowledge, and involvement in decision making are closely aligned with the objectives and functionalities provided by Grip of Water Altena.

Table 15 Advantages and disadvantages perceived by citizens to result from their participation in Grip op water Altena

Advantages of participating	Citizens (N=8)
...I can obtain data and information that is useful for me	2
...I can directly communicate with the authorities on issues that are important to me	1
...I get the opportunity to discover, try, and use new technologies and innovations	
...I get the opportunity to learn, enhance my knowledge and expertise	3
...I can enhance my job (or my business), or find job new opportunities	
...I can be part of a group of like-minded people	2
...I can share my knowledge with others	4
...I would feel good about my self	1
...I can support a cause I consider to be important	4
...I can be involved in making decisions about water in Altena – I can get my voice heard	2
...I get the opportunity to do something I enjoy	
...I can help others	

Disadvantages of participating	Citizens (N=8)
...I would have to spend a considerable amount of my time and/or my financial resources	2
...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.)	
...the data I collect and provide could be misinterpreted by others	1
...my online privacy and security could be compromised	
...I could encounter unreliable data and information	1
...my input might not make a difference	3
...my job (or my business) could be negatively influenced	
...I could encounter risks of injuries, accidents, diseases, theft, etc.	
...my input could lead to negative outcomes for others	1

Overall, there are fewer perceived disadvantages of participating in Grip op Water Altena than advantages, with the most notable perception that their input would not make a difference, due to this CO being 'young' and still requiring a critical mass of participants in order to have impact and sustain in the longer term. Other concerns relate to the potential misinterpretation of data in other contexts or projects, wrong conclusions being drawn as well as concerns about the impacts of 'wrong' decisions taken based on Grip op Water data. The disadvantage of having to spend personal time or money by participating in Grip op Water was mentioned by only one of the interviewed citizens.

The factors that are perceived to facilitate the interviewed citizens' participation in Grip op Water are illustrated in Table 16. The environmental focus and geographical scale of Grip op Water perceived as facilitators for their participation, given that they live in the area, feel connected to it and are affected by measures taken in this area and therefore perceive the geographical scale and environmental focus of Grip op Water as appropriate and relevant. Similarly, the state of cooperation and commitment of others to Grip op Water - notably the direct involvement of decision makers as well as farmers - as facilitating factors. A range of other facilitating factors, based on their hands-on involvement in the co-design and implementation of Grip op Water, ranging from weather conditions to create urgency for improved water management, tools and supporting information, appreciation of their contributions as well as a long term perspective in terms of the sustainability of Grip op Water.

Table 16 Factors perceived by citizens to facilitate / hinder their participation in Grip op water Altena

Facilitating factors	Citizens (N=8)	Hindering factors	Citizens (N=8)
The environmental focus and geographical scale of Grip op water Altena initiative (e.g. focus on water in Altena, local or national scale)	4	The environmental focus and geographical scale of Grip op water Altena initiative (e.g. focus on water in Altena, local or national scale)	
The depth and level of involvement offered to the participants in the Grip op water Altena initiative – involvement beyond data collection (e.g. joint design, joint planning)		The depth and level of involvement offered to the participants in the Grip op water Altena initiative – involvement beyond data collection (e.g. joint design, joint planning)	2
The state of cooperation and commitment of others to Grip op water Altena	3	The state of cooperation and commitment of others to Grip op water Altena	6
Future sustainability of Grip op water Altena	1	Future sustainability of Grip op water Altena	4
The information, instructions and the level of assistance I receive from the organizers of Grip op water Altena	2	The information, instructions and the level of assistance I receive from the organizers of Grip op water Altena	
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Grip op water Altena	1	Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Grip op water Altena	1
The level of feedback I receive from the organizers of Grip op water Altena		The level of feedback I receive from the organizers of Grip op water Altena	2
The level of recognition and appreciation I receive for my contribution	1	The level of recognition and appreciation I receive for my contribution	
The lack of compensation or rewards for participation in Grip op water Altena		The lack of compensation or rewards for participation in Grip op water Altena	1
Socio-economic factors (level of education, level of income, level of technological development)		Socio-economic factors (level of education, level of income, level of technological development)	
Physical factors e.g. my health, my age, my gender		Physical factors e.g. my health, my age, my gender	
Field conditions e.g. weather, accessibility of data collection site, safety of the site	1	Field conditions e.g. weather, accessibility of data collection site, safety of the site	1
Cultural factors e.g. language, religion, traditions		Cultural factors e.g. language, religion, traditions	
Political factors		Political factors	

On the other hand, some of the factors perceived to facilitate their participation were also considered as hindering factors if absent, most notably uncertainty regarding the sustainability of Grip op Water and the state of cooperation and commitment of others to Grip op Water (absence of more citizens participating in Grip op Water, uncertainty regarding the interests and level of commitment by the participating decision makers, conflicts regarding 'paid' participation by government officials versus volunteered time by citizens, lack of continuity of in terms of the staff of the participating government organisations and a perceived lack of connection by participant non-residents with the local area of Altena). The depth and level of involvement beyond data collection was perceived hindering by some due to the perceived slow pace of developing Grip op Water and the need for smaller steps or activities to tackle the issue driving Grip op Water.

Furthermore, in terms of the presence or absence of relevant resources for their participation in Grip op Water, the responses presented in Table 17 indicate that most of the interviewed citizens have sufficient skills and experience as well as technological facilities to participate in Grip op Water. However, time and financial resources were deemed insufficient. Responses to the open questions on this issue indicate that

required resources for citizen participation relate to the timing of activities (some prefer working hours rather than evening), costs of running the Grip op Water platform in the long run, and the provision of sensors, rain gauges and other equipment.

Table 17 Sufficiency of resources for participation in Grip op water Altena perceived by citizens

Resources statements	Citizens - Participants (N=8)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Grip op water Altena activities	0	1	2	3	2
I have sufficient technological facilities to carry out Grip op water Altena activities	0	2	2	3	1
I have sufficient time to carry out Grip op water Altena activities	1	2	3	1	1
I have sufficient financial resources to carry out Grip op water Altena activities	0	2	6	0	0

The interviewed citizens indicated only a few, specific sources of social pressure, i.e. those people or organisations they perceive to be in favour of their own participation in Grip op Water (Table 18). People in their personal circle (e.g. husband), their work circle (e.g. the NGO they participate in or company they work for) or in their local community/residential area were perceived to be in favour of their participation were. On the other hand, important referents in their personal circle were also mentioned as critics of Grip op Water, thus exerting negative pressure regarding the interviewees' participation in Grip op Water.

Table 18 Sources of positive and negative social pressure perceived by citizens in relation to their participation in Grip op water Altena

Positive pressure	Citizens (N=8)	Negative pressure	Citizens (N=8)
People within my personal circle (e.g. my family, my friends, etc.)	2	People within my personal circle (e.g. my family, my friends, etc.)	3
People within my work circle (e.g. my boss, my colleagues, etc.)	2	People within my work circle (e.g. my boss, my colleagues, etc.)	
Officials in the water board		Officials in the water board	
Officials in the municipality/city		Officials in the municipality/city	
Officials in the regional/provincial administration		Officials in the regional/provincial administration	
Politicians in the municipality/city		Politicians in the municipality/city	
Officials in government agencies		Officials in government agencies	
People from non-governmental, non for profit, or civil organizations		People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
Members of the local community/residents of the area	1	Members of the local community/residents of the area	
People in the private, business, or industry sector	1	People in the private, business, or industry sector	

3.2.2 Incentives and barriers for scientists/data aggregators to participate in Grip op Water Altena

The analysis of responses in this stakeholder category is based on the responses of Hydrologic Research (HR), representing the data aggregator and scientific expertise in addition to their role as lead of the Dutch Demo Case.

The perceived advantages of their participation in Grip op Water for HR consists of data sharing, learning opportunities and building strategic partnerships/business opportunities (see Table 19). Precipitation and participation forecast data are shared with the local stakeholders; they make Water Board data about water levels publicly available in order to showcase their Hydrologic visualization tools and to illustrate for the Water Board that this is a nice way to make the data publicly available. The expected learning outcomes relate to knowledge and expertise in the social sciences gained from their participation, interactions with Grip op Water stakeholders and understanding their incentives to participate in the CO. Outcomes in terms of strategic partnerships relate to their partnerships with the existing clients (municipalities and Water boards), which are perceived to be strengthened by participating in such interdisciplinary and innovative projects with them and to create different kinds of relationships and interactions.

Perceived disadvantages from HR's participation consists of costs in terms of staff time and burden, and risks associated with sharing their data (see Table 19). The innovative nature of the co-design of Grip op Water and the implementation of its activities implies that they are engaged in activities that are not close to their company's core focus. Sharing all their data publicly bears the risk that the company's services will no longer be needed; moreover, the Water Board, as HR's customer, is concerned that water level data made public could be misinterpreted.

Table 19 Advantages and disadvantages perceived by scientists/data aggregators to result from their participation in Grip op water Altena

Advantages of participating	Scientists - Data Aggregators (N=1)
...we obtain data and information that is useful for us	
...we can share and exchange important data sets with other organisations	1
...we obtain access to new technologies and innovations	
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	1
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	
...we can be involved in making decisions about water in Altena – have a say in this matter	
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Scientists - Data Aggregators (N=1)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	1
...we could obtain unreliable data	
...we could encounter risks associated with sharing our data sets with other organisations.	1
...we could encounter risks associated with sharing our data with the public on Grip op water Altena platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	
... our input/contribution could lead to negative outcomes for others	

From the range of facilitating factors (see Table 20), for HR, the joint approach for setting up Grip op Water was perceived most relevant, with the user stories collected having proven useful for HR's technical activities and constituting useful input to further develop the functionality of their product. Perceived hindering factors for their participation in Grip op Water concern the current scope and focus of Grip op Water as well as the state of commitment and cooperation of the other stakeholders. The focus of Grip op Water on knowledge sharing rather than data sharing, i.e. sharing stories and tips about climate proof water management rather than sharing weather on weather with weather amateurs and weather stations, means that is of lesser interest to them and does not provide opportunities to improve their products.

Table 20 Factors perceived by scientists/data aggregators to facilitate / hinder their participation in Grip op water Altena

Facilitating factors	Scientists - Data Aggregators (N=1)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of Grip op water Altena	1
The current scope and focus of the Grip op water Altena initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Grip op water Altena	
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of the Grip op water Altena initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Scientists - Data Aggregators (N=1)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of Grip op water Altena	
The current scope and focus of the Grip op water Altena initiative (e.g. the environmental topic and the geographical scale)	1
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Grip op water Altena	
The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of the Grip op water Altena initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

The perceived sources of pressure to participate in Grip op Water stem from within HR's organisation as well as external entities (Table 21). Within the organisation, participation is supported by the technical departments because it provides the opportunity to improve HR's technological products and by the business development department because it presents a way to pilot HR's products and get input from different stakeholders. Externally, customers such as Water Board Rivierenland want to collaborate with HR on the development of public portals for their data, so Grip op Water presents a way of making/keeping their customer happy. Negative pressure for HR to participate in Grip op Water is perceived to stem from their competitors.

Table 21 Sources of positive and negative social pressure perceived by scientists/data aggregators in relation to their participation in Grip op water Altena

Positive Pressure	Scientists - Data Aggregators (N=1)	Negative Pressure	Scientists - Data Aggregators (N=1)
Other people in my organisation	1	Other people in my organisation	
Officials in the water board	1	Officials in the water board	
Officials in the municipality		Officials in the municipality	
Officials in the provincial administration		Officials in the provincial administration	
Politicians in the municipality/city		Politicians in the municipality/city	
Officials in the government agencies		Officials in the government agencies	
People from non-governmental, non for profit, or civil organizations		People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	1	People in the private, business, or industry sector	1
Members of the local community/residents of the area		Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)		People within my personal circle (e.g. my family, friends)	

3.2.3 Incentives and barriers for policy/decision makers to participate in Grip op Water Altena

The interviewees in this stakeholder category included three representatives from Water Board Rivierenland and two representatives from the municipality Altena.

A summary of the perceived advantage and disadvantages for participating in this Grip op Water is presented in Table 22. The perceived advantages of their organisation's participation in Grip op Water relate primarily to obtaining data and information as well as technology, (improved) communication and collaboration with different stakeholders and improving their organisation's public profile. Communication by the water board with various stakeholders extends to citizens and landowners such as farmers and the municipality and is of heightened importance for them in view of upscaling of the water board in 2005 and the resulting increased distances. Communication in their view consists of making water level measurements transparent (publicly accessible) and explaining better *how* the water board manages water. The other side of the coin is for the Water Board and the municipality to obtain data and information from other stakeholders, such as reports about problems in and the state of the water system. Improving their organisation's public profile is deemed an advantage of their participation to increase the public's confidence in the municipality and to be able to show what they are doing and why.

One disadvantage of their organisations' participation in Grip op Water mentioned by all interviewees among the decision makers are the perceived burden associated with staff, not only for meetings of the Grip op Water members but also for outreach events that typically take place during weekends and require additional preparation, cutting into the staff's personal time. Concerns were raised to what extent these efforts are paying off and are recognised. Disadvantages of their organisations' participation also concern risks associated with sharing their data with the public on the Grip op Water platform, misuse that leads to flooding, panic or lost investments. Related to this, their public image may suffer if claimed solutions or damage claims cannot be granted.

Table 22 Advantages and disadvantages perceived by policy/decision makers to result from their participation in Grip op water Altena

Advantages of participating	Policy - Decision Makers (N=5)
...we obtain data and information that is useful for us	3
...we can share and exchange important data sets with other organisations	
...we obtain access to new technologies and innovations	3
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	
...we can improve the performance of our organisation/group – do the things we do in a better way	
...we can (better) communicate and collaborate with different stakeholders	3
...we can build strategic partnerships and/or create business opportunities	
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	2
...we can be involved in making decisions about water in Altena – have a say in this matter	
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	1
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Policy - Decision Makers (N=5)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	5
...we could obtain unreliable data	1
...we could encounter risks associated with sharing our data sets with other organisations.	2
...we could encounter risks associated with sharing our data with the public on Grip op water Altena platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	1
... our input/contribution could lead to negative outcomes for others	

The exploration of factors facilitating and hindering their organisation's participation in Grip op Water indicates more, diverse hindering than facilitating factors (see Table 23). All five interviewees identify the current state of (limited) interest by citizens as a hindering factor, perceived to stem from a lack of motivation by citizens, lack of awareness of flood risk, and lack of time that in turn influences their own motivation and commitment to Grip op Water. Related to this, uncertainty about the sustainability of Grip op Water beyond the Ground Truth 2.0 project life time hinders their own commitment and that of others. In addition, lack of political support, lack of extreme weather and the resulting lack of urgency by citizens to participate were raised as hindering factors. Conflicting views were presented regarding the scope of Grip op Water, with the municipality considering the local focus a facilitating factor while the Water Board argued for a wider, regional scope and vision on water, nature and citizen participation.

Table 23 Factors perceived by policy/decision makers to facilitate / hinder their participation in Grip op water Altena

Facilitating factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	1
The joint approach for the setup of this initiative i.e. joint design and joint planning of Grip op water Altena	1
The current scope and focus of the Grip op water Altena initiative (e.g. the environmental topic and the geographical scale)	1
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Grip op water Altena	
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of the Grip op water Altena initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	1

Hindering factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	5
The joint approach for the setup of this initiative i.e. joint design and joint planning of Grip op water Altena	1
The current scope and focus of the Grip op water Altena initiative (e.g. the environmental topic and the geographical scale)	1
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Grip op water Altena	1
The current state of cooperation and commitment of the other stakeholders	2
The future sustainability of the Grip op water Altena initiative	2
Political factors	1
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	1

Concerning the range of skills and technological facilities, the interviewed decision makers indicated sufficient resources to carry out their Grip op Water activities (see Table 24). Regarding time and financial resources, the responses were more diverse, indicating a lack of resources for some, particular in terms of time to carry out Grip op Water activities.

Table 24 Sufficiency of resources for participation in Grip op water Altena perceived by policy/decision

Resources statements	Policy/Decision makers (N=5)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Grip op water Altena activities	0	0	0	4	1
I have sufficient technological facilities to carry out Grip op water Altena activities	0	0	1	4	0
I have sufficient time to carry out Grip op water Altena activities	0	2	2	1	0
I have sufficient financial resources to carry out Grip op water Altena activities	0	1	1	3	0

Positive pressure for their organisation's participation in Grip op Water seem to stem from a diverse set of sources (see Table 25), often colleagues or managers within their own organisations, but also the Water Board and the municipality, respectively, as well as residents in Altena. The reasons for the perceived support for their Grip op Water activities ranges from a general interest in citizen science and citizen observatories, Grip op Water as a communication channel or because it is deemed to fit the organisation's legal mandate, incl. with respect to flooding. Notably, only one mention of perceived negative pressure was made, stating that other's in the municipality do not understand sense of getting involved in Grip op Water.

Table 25 Sources of positive and negative social pressure perceived by policy/decision makers in relation to their participation in Grip op water Altena

Positive Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	3
Officials in the water board	1
Officials in the municipality	2
Officials in the provincial administration	
Politicians in the municipality/city	1
Officials in the government agencies	
People from non-governmental, non for profit, or civil organizations	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	2
Members of the local community/residents of the area	2
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	1
Officials in the water board	
Officials in the municipality	
Officials in the provincial administration	
Politicians in the municipality/city	
Officials in the government agencies	
People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.2.4 Concluding remarks

The analysis of the respective incentives and barriers for participation in Grip op Water by the key stakeholders shows that they have clear expectations and dependencies upon each other to make Grip op Water a success and to ensure its continuation beyond the life time of the Ground Truth 2.0 project. For the decision makers (municipality of Altena and water board Riviervenland), the involvement, commitment and interest of citizens in Grip op Water arises a key motivator for their own continued involvement. The participating citizens, in turn, are motivated by the local focus of Grip op Water and the provided functionalities, new forms of communication and interactions with decision makers and knowledge sharing among residents that Grip op Water can provide. The data aggregator/scientist stakeholders of Grip op Water, Hydrologic Research, is a Ground Truth 2.0 partner and views Grip op Water as a time bound project rather than as an initiative in which HR will be involved in the long run. Its key motivations are closely linked to its role in the project as data aggregator and Demo Case lead and the water board a source of positive pressure, being one of HR's customers.

Both, the interviewed citizens and the decision makers are keen to continue with Grip op Water Altena - but only if the respective other party also does. Moreover, what will make them stay are not simply more people but actual delivery of the expected outcomes, such as shorter communication lines, knowledge sharing, and improved interaction between citizens and the water board and the municipality. The functionalities and relationships for this to happen have been built and created. Some calls for further support in organising Grip op Water are being made and need to be carefully addressed by the Ground Truth 2.0 team, so that momentum is maintained and a virtuous cycle of inter-related incentives among the Grip op Water members is created.

3.3 Incentives and barriers to participate in the Swedish CO ‚VattenFokus'

Water health in the town of Flen, and in Sweden in general, is deteriorating due to current lifestyle choices and consumption patterns, lacking a life-cycle perspective of what is going in and what is being taken out of nature. The stakeholders in this CO wanted to create a society where government, business, citizens, researchers and civil society organisations collaborate to be active stewards of a sustainable environment. The CO, called VattenFokus, intended to contribute to this by supporting all stakeholders to collaborate in the governance and management of aquatic ecosystems in collecting data on water quality of lake Dunkern, sharing knowledge, and by making data accessible that complements established governmental initiatives. Specifically, VattenFokus intends to provide the following:

1) A platform for integrating all new data with existing information into a knowledge hub (CO repository) that offers visualization and eases access and sharing. These two aspects, sharing knowledge and making data on water quality and causes of ecological stress more accessible and open, constitute the main focus of Vatten Fokus.
2) Enabled citizens to submit and process data for monitoring the water quality, share their perceptions and gain insight into water quality and water management.
3) Facilitate joint discussion and analysis of results, review & feedback of campaigns, and support the implementation of plans and policies with monitoring and information sharing.

The following sub-sections summarize the results of the analysis of the incentives and barriers of the citizens as well as the scientists and data aggregators who participated in Vatten Fokus during the lifetime of the Ground Truth 2.0 project.

3.3.1 Incentives and barriers for citizens to participate in Vatten Fokus

Three citizens who actively participated in VattenFokus were interviewed. In terms of perceived advantages of participating in Vatten Fokus, Table 26 indicates that a range of perceived personal as well as societal benefits were indicated by these citizens. However, these results are skewed since one interviewee indicated a whole range rather than the required three key advantages. The perceived advantages of participating in Vatten Fokus in terms of data and information sharing, communication with authorities, and involvement in decision making are closely aligned with the objectives and functionalities provided by Vatten Fokus.

Table 26 Advantages and disadvantages perceived by citizens to result from their participation in Vatten Fokus

Advantages of participating	Citizens (N=3)
...I can obtain data and information that is useful for me	2
...I can directly communicate with the authorities on issues that are important to me	2
...I get the opportunity to discover, try, and use new technologies and innovations	1
...I get the opportunity to learn, enhance my knowledge and expertise	2
...I can enhance my job (or my business), or find job new opportunities	1
...I can be part of a group of like-minded people	
...I can share my knowledge with others	1
...I would feel good about my self	1
...I can support a cause I consider to be important	1
...I can be involved in making decisions about water quality management – I can get my voice heard	1
...I get the opportunity to do something I enjoy	1
...I can help others	1

Disadvantages of participating	Citizens (N=3)
...I would have to spend a considerable amount of my time and/or my money	3
...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.)	
...the data I collect and provide could be misinterpreted by others	
...my online privacy and security could be compromised	
...I could encounter unreliable data and information	
...my input might not make a difference	
...my job (or my business) could be negatively influenced	
...I could encounter risks of injuries, accidents, diseases, theft, etc.	
...my input could lead to negative outcomes for others	

The perceived disadvantages of participating in VattenFokus were limited to considerable amount of time needed to participate in Vatten Fokus. For citizens, there were two distinct sets of activities that required time. One set was the data collection campaigns, which required reading, preparation, training sessions and travel time to the data collection sites. The other set of activities was the organisation of and participating in co-design sessions and Vatten Fokus meetings. The monetary disadvantages mentioned were related to the travel costs to attend both sets of activities.

The facilitating factors, portrayed in Table 27, were perceived by the three interviewed citizens to make it easier for them to participate in VattenFokus and covered a broad range of factors. Linked to the data collection aspect of Vatten Fokus`, the factors perceived to facilitate their participation in Vatten Fokus were the geographical and environmental focus of the CO, the technological aspects of data collection, the training received to be able to carry out the data collection and the field conditions where the data were collected. These citizens perceived as facilitating factors the level of feedback and compensation or reward facilitating, as they were thanked for their efforts and found no need to be paid for their volunteering.

For two of the interviewed citizens, the state of commitment to Vatten Fokus by other stakeholders was perceived to be facilitating, for the third one hindering their participation in VattenFokus, mainly due to the perceived lack of interest and commitment by the authorities in VattenFokus. The future sustainability of VattenFokus was viewed both as hindering and facilitating. The perspective of VattenFokus to continue into the future rather than being a short term activity was perceived as facilitating their participation. However, concerns were raised about the lifespan of the Ground Truth 2.0 project being short term and about the need for other funding to continue the work that has been started.

Table 27 Factors perceived by citizens to facilitate / hinder their participation in Vatten Fokus

Facilitating factors	Citizens (N=3)	Hindering factors	Citizens (N=3)
The environmental focus and geographical scale of the VattenFokus initiative (e.g. focus on water quality management, local or national scale)	1	The environmental focus and geographical scale of the VattenFokus initiative (e.g. focus on water quality management, local or national scale)	
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)	1	The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)	
The state of cooperation and commitment of others to VattenFokus	2	The state of cooperation and commitment of others to VattenFokus	1
Future sustainability of VattenFokus	1	Future sustainability of VattenFokus	1
The information, instructions and the level of assistance I receive from the organizers of VattenFokus	1	The information, instructions and the level of assistance I receive from the organizers of VattenFokus	
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in VattenFokus	1	Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in VattenFokus	
The level of feedback I receive from the organizers of VattenFokus		The level of feedback I receive from the organizers of VattenFokus	
The level of recognition and appreciation I receive for my contribution	1	The level of recognition and appreciation I receive for my contribution	
The lack of compensation or rewards for participation in VattenFokus	1	The lack of compensation or rewards for participation in VattenFokus	
Socio-economic factors (level of education, level of income, level of technological development)		Socio-economic factors (level of education, level of income, level of technological development)	
Physical factors e.g. my health, my age, my gender		Physical factors e.g. my health, my age, my gender	
Field conditions e.g. weather, accessibility of data collection site, safety of the site	1	Field conditions e.g. weather, accessibility of data collection site, safety of the site	
Cultural factors e.g. language, religion, traditions		Cultural factors e.g. language, religion, traditions	
Political factors		Political factors	1

The interviewed citizens indicated that they had sufficient skills, knowledge and experience, sufficient technological facilities, and sufficient time to carry out VattenFokus activities (see Table 28). There was not the same level of conviction in terms of sufficient monetary resources, linked to some of the earlier stated disadvantages for participating, since the costs of travel to meetings and data campaigns were perceived to be substantial by one interviewee.

Table 28 Sufficiency of resources for participation in Vatten Fokus perceived by citizens

Resources statements	Citizens - Participants (N=3)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out VattenFokus activities	0	0	0	0	3
I have sufficient technological facilities to carry out VattenFokus activities	0	0	0	0	3
I have sufficient time to carry out VattenFokus activities	0	0	0	0	2
I have sufficient money to carry out VattenFokus activities	0	1	0	2	0

The interviewed citizens clearly indicated not to have perceived any negative pressure in terms of any stakeholders dissuading them from participating in VattenFokus (Table 29). The three interviewees were unanimous in stating that the people in their personal circle were a key source of positive pressure for them to participate in Vatten Fokus. Mainly, this was perceived to stem from other key participants and

key people in their social circles that live in the area around lake Dunkern, in order to improve the living conditions in their local community. The remaining sources of positive pressure varied across various levels of local government, governmental agencies, non-governmental agencies and the scientific community. The officials in the municipality were perceived as key stakeholders that had also directly contributed to the achieving out of some of the objectives of Vatten Fokus.

Table 29 Sources of positive and negative social pressure perceived by citizens in relation to their participation in Vatten Fokus

Positive pressure	Citizens (N=3)	Negative pressure	Citizens (N=3)
People within my personal circle (e.g. my family, my friends)	3	People within my personal circle (e.g. my family, my friends)	
People within my work circle (e.g. my boss, my colleagues)		People within my work circle (e.g. my boss, my colleagues)	
Officials in the municipality/city	2	Officials in the municipality/city	
Politicians in the municipality/city		Politicians in the municipality/city	
Officials in the regional/provincial administration		Officials in the regional/provincial administration	
The County Council	1	The County Council	
Officials in government agencies	1	Officials in government agencies	
People from non-governmental, non for profit, or civil organizations	1	People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1	People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
Members of the local community/residents of the area		Members of the local community/residents of the area	
People in the private, business, or industry sector		People in the private, business, or industry sector	

3.3.2 Incentives and barriers for scientists/data aggregators to participate in Vatten Fokus

The interviewees in this stakeholder category included one representative from each of the following organisations: Stockholm University, Akvo, Earth Watch, and Tygron. Their perceived advantages and disadvantages are indicated in Table 30.

The representatives of the interviewed organisations were unanimous in the perceived advantage of being able to build strategic partnerships by participating in Vatten Fokus and they support the role of citizens in environmental management and policy making. The strategic partnerships they were referring to were within this stakeholder category (e.g. the other interviewees) and other local actors that would be categorised in this study as policy and decision makers. The remaining perceived advantages were related to obtaining useful data, organisational learning, being involved in decision making and increasing their own organisation's public profile.

A few disadvantages of their organisation's participation in Vatten Fokus were indicated, with the main disadvantage being the time and costs associated with participating in the activities of Vatten Fokus. The organisation of the co-design sessions, the meetings and data collection campaigns put a burden on staff time for most of these organisations. Monetary constraints concern the logistics of the two different data collection locations, and perceived lack of funds to properly organise everything across these locations. As the main local research organisation in Vatten Fokus, Stockholm University highlighted two disadvantages related to the data aspect of Vatten Fokus, as the data could be unreliable and sharing the data

could bring risks with it. The topic of data reliability had been brought up during the data collection campaigns since the citizens were obtaining different measurements than the local water authority (NVFF). This could be an issue since the collaboration with the local authorities was seen as key, yet concerns about unreliable data could cause the local authorities to question whether the activities of Vatten Fokus are meaningful. The risks associated with sharing the data on the Vatten Fokus platform related to the quality of the measurements, how they are being communicated about and how they relate to existing, official data. It also linked closely to the issue raised about possible unreliability of the data.

Table 30 Advantages and disadvantages perceived by scientists/data aggregators to result from their participation in Vatten Fokus

Advantages of participating	Scientists - Data Aggregators (N=4)
...we obtain data and information that is useful for us	1
...we can share and exchange important data sets with other organisations	
...we obtain access to new technologies and innovations	
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	4
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	1
...we can be involved in making decisions about water quality management – have a say in this matter	1
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	4
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Scientists - Data Aggregators (N=4)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	3
...we could obtain unreliable data	1
...we could encounter risks associated with sharing our data sets with other organisations.	1
...we could encounter risks associated with sharing our data with the public on the VattenFokus platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	
...our input/contribution could lead to negative outcomes for others	

The factors perceived to be facilitating their organisation's participation in Vatten Fokus (see Table 31) highlighted by the scientists and data aggregators were mainly linked to the collaboration between the various stakeholders including citizens and the focus of Vatten Fokus on water quality management. The joint co-design process was seen as key in fostering the collaboration between the stakeholders, as it is uncommon for some stakeholders to be included in the process from the very start, which GT2.0 and VattenFokus did offer. The collaboration between stakeholders, and the commitment of citizen scientists to Vatten Fokus in general and to measure water quality were also perceived as key facilitating factors without which VattenFokus would not have succeeded. The final facilitating factor relates to a socio-economic aspect of the CO's technology, since most people were seen to have a mobile phone with internet connections through which they were able to upload the data they collect. There was thus not a large threshold perceived for citizens to join in with the data collection campaign.

Aside from a few aspects, the hindering factors differed quite strongly with the facilitating factors. Political factors were seen as hindering since the political system is decentralised in terms of decision making and not used to using CS data, which renders influencing policy making and interacting with the authorities difficult. Cultural factors perceived to be hindering their organisation's participation referred to language

barriers for some organisations with low competence in the Swedish language, as well as perceived citizen attitudes where the issues raised were considered to be of low urgency and a municipal issue to be addressed within the budget of public authorities and not a task for volunteers. Technological aspects that were perceived to hinder participation relate to perceived limits to the user-centred design, by building on existing tools and technologies for the app and the website rather than designing them from scratch. This was deemed to have put some citizens off from continuing with the data collection campaigns.

Related to this, factors that were perceived to both hinder and facilitate their organisation's participation in Vatten Fokus were the joint nature of the co-design and planning, socio-economic factors and the current state of commitment to Vatten Fokus by other stakeholders. The joint approach was seen as facilitating by some, as a hindering factor by others as there was a perceived overlap in the tools the various organisations brought to Vatten Fokus, which meant that in certain cases some organisations did not contribute as much as they intended to. The socio-economic factors were brought up by Tygron, as they felt that the citizens and other participants in the session which involved the Tygron engine were not computer literate enough to fully participate in the session, thus the benefits they could derive from using the technology would be limited. The state of commitment and cooperation by the various stakeholders was mentioned due to the fact local and regional government (including agencies) were perceived as not being very cooperative due to the fact that citizen science did not fit into their governance structure and view of the world. This point links closely with the hindering factors mentioned when discussing the political and cultural hindering factors. The last hindering factor perceived by this stakeholder category was the future sustainability of Vatten Fokus, as it is unclear if Vatten Fokus is going to continue after GT2.0, with the lack of external funding for future activities regarded as a major obstacle.

Table 31 Factors perceived by scientists/data aggregators to facilitate / hinder their participation in Vatten Fokus

Facilitating factors	Scientists - Data Aggregators (N=4)
The current state of citizens/volunteers' interest to participate in data collection	2
The joint approach for the setup of this initiative i.e. joint design and joint planning of VattenFokus	2
The current scope and focus of the VattenFokus initiative (e.g. the environmental topic and the geographical scale)	2
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in VattenFokus	
The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of VattenFokus initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	1
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Scientists - Data Aggregators (N=4)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of VattenFokus	1
The current scope and focus of the VattenFokus initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in VattenFokus	2
The current state of cooperation and commitment of the other stakeholders	2
The future sustainability of VattenFokus initiative	2
Political factors	2
Cultural factors	2
Socio-economic factors (level of education, level of income, level of technological development)	1
Field conditions (e.g. weather, accessibility, safety)	

The interviewed scientists and data aggregators all indicated that they had sufficient skills and technological facilities to carry out the activities in VattenFokus, yet they differed in their opinion on the time and money they had available (Table 32). The low scores here correspond with those for the cost-related disadvantage of participating in Vatten Fokus and for staff time involved for carrying out the activities of Vatten Fokus.

Table 32 Sufficiency of resources for participation in Vatten Fokus perceived by scientists/data aggregators

Resources statements	Scientists/Data aggregators (N=4)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out VattenFokus activities	0	0	1	3	0
I have sufficient technological facilities to carry out VattenFokus activities	0	0	1	2	1
I have sufficient time to carry out VattenFokus activities	0	1	2	1	0
I have sufficient money to carry out VattenFokus activities	0	1	2	1	0

The two groups of stakeholders were perceived as exerting positive pressure regarding the participation of the S/DAs' organisations: other people in their own organisation and members of the local community (Table 33). A few also indicated perceiving positive pressure from the local and regional administrative bodies, as well as non-governmental organisations. Negative pressure was perceived as limited, stemming from local and national government as well as the private sector.

Table 33 Sources of positive and negative social pressure perceived by scientists/data aggregators in relation to their participation in Vatten Fokus

Positive Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	3
Officials in the municipality/city	1
Politicians in the municipality/city	
Officials in the regional/provincial administration	1
The County Council	
Officials in government agencies	
People from non-governmental, non for profit, or civil organizations	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	
Members of the local community/residents of the area	2
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	
Officials in the municipality/city	1
Politicians in the municipality/city	
Officials in the regional/provincial administration	
The County Council	
Officials in government agencies	1
People from non-governmental, non for profit, or civil organizations	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	1
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.3.3 Concluding remarks

The analysis of both, the interviewed citizens' and scientists/data aggregators' incentives and barriers for participation in Vatten Fokus shows that a key aspect is the collaboration and communication with the other stakeholders, and that such collaborations and continued dialogue between key stakeholders are essential for the future sustainability of Vatten Fokus. For the scientists/data aggregators (Stockholm University, Akvo, Earth Watch, and Tygron), the opportunity to build and foster partnerships with other organisations as well as to support citizens in their ability to carry out Vatten Fokus activities, were key to

their involvement and participation in the continued development of Vatten Fokus. The participating citizens, in turn, are motivated by the ability to collect data, learn new skills and techniques and the possibility to interact with decision makers and other key stakeholders in Vatten Fokus. The aspect of Vatten Fokus that was considered problematic for both the stakeholder categories interviewed, was the amount of time and money needed to carried out Vatten Fokus activities.

Most of the interviewed citizens and the scientists/data aggregators are keen to continue Vatten Fokus. Although these citizens were extremely willing and would continue with the activities of VattenFokus regardless, one mentioned the need to engage the Swedish Water Authority, otherwise all efforts would be wasted. For the scientists/data aggregators (Stockholm University, Akvo, Earth Watch, and Tygron), interest from citizens, from other local stakeholders and financial support are key to ensure to continue participating in Vatten Fokus. The continued future of VattenFokus seems to rest on the ability to raise enough funds to keep the core stakeholders committed, and on the capacity of this core group to be able to (re-)engage local policy/decision makers to commit to making citizen science a more active part of the decentralised decision making structure in Sweden.

3.4 Incentives and barriers to participate in the Spanish CO ‚RitmeNatura.cat'

This citizen observatory aimed to create collective knowledge about local impacts of climate change on nature and its rhythms in Catalonia, in order to contribute to better adaptation policies. The CO stakeholders wanted to create an open Citizen Science platform dedicated to storing, commenting, sharing and disseminating facts and information for understanding the impacts of Climate Change on nature as well as sharing opinions and proposals about the effects of Climate Change on nature and influence related decision-making processes. RitmeNatura.cat contributed to this by providing a central community portal for existing different citizen science initiatives and by creating synergies with existing platforms. In other words, the RitmeNatura.cat became an umbrella of information and organizations related to the effects of Climate Change on nature in Catalonia.

The following sub-sections summarize the results of the analysis of the incentives and barriers for citizens, both those who have and have not participated in the activities of RitmeNatura.cat, scientists/data aggregators and policy/decision makers related to RitmeNatura.cat.

3.4.1 Incentives and barriers for citizens to participate in RitmeNatura.cat

In this stakeholder category, the analysis is based on interviews with one citizen who already actively participated and nine citizens who have not (yet) participated in RitmeNatura.cat. In terms of perceived advantages of participating in RitmeNatura.cat, Table 34 indicates that a range of perceived personal and societal benefits were indicated by the interviewed citizens. The perceived advantages were that they could support a cause that is important to them, they get to learn and enhance their own knowledge and expertise, that they get to share their knowledge and expertise with others, and that they get to be involved in making decisions on climate change. These beliefs concur across the interviewed participant and non-participants. The interviewed participant also perceived being able to help others an advantage of participating in RitmeNatura.

The perceived disadvantages of participating in RitmeNatura.cat by the participant related to data issues, both for the data collected within RitmeNatura.cat as well as the privacy of his own data. Encountering unreliable data was also perceived as a disadvantage by the interviewed non-participants. The citizens themselves were questioning the accuracy of the data collected by citizen scientists, mainly due to the complexity of phenology and the perceived difficulty of being able to identify it correctly. They also raised concerns about the simplification of the phenophases, as being a method that could decrease accuracy of the phenological identification process, and thus decrease in data accuracy. The interviewed participating citizen noted that he had encountered data of bad quality and thus his fear was based on real experiences, such as instances of incorrectly confirmed data points and citizens submitting data from books rather than from nature. The data quality of such instances should be controlled better. Outside of the data issue, the non-participants also considered the amount of time and financial resources to participate hindering factors, involving extra time and effort spent on something that is normally considered a hobby.

Table 34 Advantages and disadvantages perceived by citizens to result from their participation in RitmeNatura.cat

Advantages of participating	Citizens	
	Participants (N=1)	Non-participants (N=9)
...I can obtain data and information that is useful for me		1
...I can directly communicate with the authorities on issues that are important to me		1
...I get the opportunity to discover, try, and use new technologies and innovations		1
...I get the opportunity to learn, enhance my knowledge and expertise		3
...I can enhance my job (or my business), or find job new opportunities		2
...I can be part of a group of like-minded people		2
...I can share my knowledge with others	1	4
...I would feel good about my self		2
...I can support a cause I consider to be important	1	4
...I can be involved in making decisions about climate change – I can get my voice heard		3
...I get the opportunity to do something I enjoy		1
...I can help others	1	

Disadvantages of participating	Citizens	
	Participants (N=1)	Non-participants (N=9)
...I would have to spend a considerable amount of my time and/or my financial resources		6
...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.)	1	1
...the data I collect and provide could be misinterpreted by others		1
...my online privacy and security could be compromised	1	1
...I could encounter unreliable data and information	1	4
...my input might not make a difference		1
...my job (or my business) could be negatively influenced		
...I could encounter risks of injuries, accidents, diseases, theft, etc.		
...my input could lead to negative outcomes for others		

The factors identified to facilitate participation for the interviewed citizens in RitmeNatura.cat are indicated in Table 35. These consist of two broad sets: the environmental and geographical focus of RitmeNatura.cat and the technological and training support they had received or would need if they were to join the activities of RitmeNatura.cat. The environmental and geographical focus of RitmeNatura.cat turns out to be a key incentive, since the focus on climate change and phenology is an issue that both the participant and non-participant were interested in, and being able to undertake RitmeNatura.cat-related activities in the area they live in was also seen as facilitating. The technological and training support was also seen as key, in terms of the ease of use of the app and support on questions on how to properly use the app and contribute their data to RitmeNatura.cat. This engagement was linked closely to the depth and level of involvement the interviewed citizens perceived to be needed to facilitate their participation in RitmeNatura.cat.

The factors perceived to hinder the interviewed citizens not yet participating in RitmeNatura.cat on some points mirror the facilitating factors, namely if technology is not easy to use or if the support and feedback they receive from in RitmeNatura.cat is lacking. This was confirmed by the interviewed participant, who highlighted support and feedback as key hindering factor, referring to community management and engagement activities, disconnect between Natursfera and RitmeNatura.cat and a lack of more general feedback from Natusfera on RitmeNatura.cat. The other two perceived hindering factors indicated by the non-participants are linked to the future sustainability of RitmeNatura.cat and the state of commitment and cooperation of other RitmeNatura.cat participants. The latter was confirmed by the interviewed participant with respect to low numbers of committed citizens in RitmeNatura.cat. The future sustainability of RitmeNatura.cat was regarded as a key hindering factor: if this was only to be a short term activity, and commitment by other citizens and participating stakeholders was going to stop in the near future, then it would not be worth their time and effort to contribute to RitmeNatura.cat.

Table 35 Factors perceived by citizens to facilitate / hinder their participation in RitmeNatura.cat

Facilitating factors	Citizens	
	Participants (N=1)	Non-participants (N=9)
The environmental focus and geographical scale of the RitmeNatura.cat initiative (e.g. focus on climate change, local or national scale)	1	6
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)		3
The state of cooperation and commitment of others to RitmeNatura.cat		1
Future sustainability of RitmeNatura.cat	1	2
The information, instructions and the level of assistance I receive from the organizers of RitmeNatura.cat		2
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in RitmeNatura.cat	1	2
The level of feedback I receive from the organizers of RitmeNatura.cat		2
The level of recognition and appreciation I receive for my contribution		1
The lack of compensation or rewards for participation in RitmeNatura.cat		
Socio-economic factors (level of education, level of income, level of technological development)		
Physical factors e.g. my health, my age, my gender		
Field conditions e.g. weather, accessibility of data collection site, safety of the site		1
Cultural factors e.g. language, religion, traditions		
Political factors		

Hindering factors	Citizens	
	Participants (N=1)	Non-participants (N=9)
The environmental focus and geographical scale of the RitmeNatura.cat initiative (e.g. focus on climate change, local or national scale)		
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)		
The state of cooperation and commitment of others to RitmeNatura.cat	1	3
Future sustainability of RitmeNatura.cat		3
The information, instructions and the level of assistance I receive from the organizers of RitmeNatura.cat	1	2
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in RitmeNatura.cat		3
The level of feedback I receive from the organizers of RitmeNatura.cat	1	1
The level of recognition and appreciation I receive for my contribution		
The lack of compensation or rewards for participation in RitmeNatura.cat		
Socio-economic factors (level of education, level of income, level of technological development)		
Physical factors e.g. my health, my age, my gender		1
Field conditions e.g. weather, accessibility of data collection site, safety of the site		1
Cultural factors e.g. language, religion, traditions		
Political factors		1

The interviewed citizens, both the participant and the non-participants, indicated that they had sufficient skills, knowledge and experience to carry out RitmeNatura.cat activities (see Table 36). Technological facilities were deemed more than sufficient by the interviewed participant; for some of the interviewed non-participants, this was also the case but some indicated gaps. These gaps concern the lack of a smartphone capable of running the applications as well as the technical know-how for using the technology required to participate in RitmeNatura.cat. The interviewed participating citizen was a little less emphatic about the amount of time and money he had to carry out the activities, while the interviewed non-participants seemed less able to judge whether they had enough time and money since they had not participated yet in RitmeNatura.cat activities.

Table 36 Sufficiency of resources for participation in RitmeNatura.cat perceived by citizens

Resources statements	Citizens - Participants (N=1)					Citizens - Non-participants (N=9)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out RitmeNatura.cat activities	0	0	0	0	1	0	0	0	4	5
I have sufficient technological facilities to carry out RitmeNatura.cat activities	0	0	0	0	1	1	1	1	4	2
I have sufficient time to carry out RitmeNatura.cat activities	0	0	0	1	0	1	1	4	3	0
I have sufficient financial resources to carry out RitmeNatura.cat activities	0	0	0	1	0	1	1	4	1	2

With respect to sources of positive or negative pressure to participate in RitmeNatura.cat (Table 37), the interviewed participating citizen perceived positive pressure from his personal circle in his private as well as his work life, along with the positive pressure from other observer groups. Yet both, work life and other

observer groups were also perceived to put negative pressure and dissuade him from participating in RitmeNatura.cat. For these perceived positive and negative pressures, it seems that the work circle had interest in the data, so positive pressure was reliant on the relevance of RitmeNatura.cat data. Other observer groups were perceived to exert positive pressure to participate in RitmeNatura.cat, since there was exchange of data and information between the groups; yet there was also competition because all of the groups had competing data sharing platforms, according to the interviewed participating citizen.

The interviewed non-participants perceived positive pressure to join the activities of RitmeNatura.cat from their personal networks, their work life and the scientific community linked to the core focus of this CO. Personal networks were linked to carrying out RitmeNatura.cat activities with their family, as well as the fact that their families are aware of the problems that the climate crisis poses and thus would be happy to see their family member contribute to RitmeNatura.cat activities. Work life was seen as a positive source of pressure for some interviewed non-participants because their work is closely related to in RitmeNatura.cat, colleagues participate in RitmeNatura.cat and are enthusiastic about it. Positive pressure is perceived to be linked to increase in knowledge (one of the perceived advantages of participating in RitmeNatura.cat) that the scientific community could contribute while interacting with citizens via RitmeNatura.cat.

Sources of negative pressure perceived by the interviewed non-participating citizens are the policy making arena, both at national and regional level, and the private sector. The policy making arena was perceived as exerting negative pressure due to their perceived lack of participation, lack of empathy towards the issue and lack of interest whether RitmeNatura.cat has the ambitioned impacts. The private sector was seen as a source of negative pressure because of its focus on profit rather than sustainability and climate change issues, and thus a lack of interest of the activities of RitmeNatura.cat.

Table 37 Sources of positive and negative social pressure perceived by citizens in relation to their participation in RitmeNatura.cat

Positive pressure	Citizens	
	Participants (N=1)	Non-participants (N=9)
People within my personal circle (e.g. my family, my friends, etc.)	1	6
People within my work circle (e.g. my boss, my colleagues, etc.)	1	4
Officials in the national government agencies		2
Officials in the regional/provincial administration		3
Officials in the regional/provincial government agencies		1
People from non-governmental, non for profit, or civil organizations		2
Staff members of the national parks		
Other observer groups	1	3
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		4
Members of the local community/residents of the area		1
People in the private, business, or industry sector		

Negative pressure	Citizens	
	Participants (N=1)	Non-participants (N=9)
People within my personal circle (e.g. my family, my friends, etc.)		1
People within my work circle (e.g. my boss, my colleagues, etc.)	1	
Officials in the national government agencies		2
Officials in the regional/provincial administration		3
Officials in the regional/provincial government agencies		1
People from non-governmental, non for profit, or civil organizations		1
Staff members of the national parks		
Other observer groups	1	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		1
Members of the local community/residents of the area		
People in the private, business, or industry sector		3

3.4.2 Incentives and barriers for scientists/data aggregators to participate in RitmeNatura.cat

The interviewees in the scientists/data aggregator (S/DA) stakeholder category included one representative from each of the following organisations: Meteorological Service of Catalonia, CBMS, Natusfera, and Starlab. The perceived advantages and disadvantages are portrayed in Table 38.

The representatives of the interviewed organisations perceived various advantages of participating in RitmeNatura.cat, cutting across societal and organisational advantages. Concurrent beliefs relate to the ability to obtain data that is useful to their organisations and better communication between stakeholders.

Only a few disadvantages of their organisation's participation were perceived, with the main disadvantage being the time and costs associated with participating in the activities of RitmeNatura.cat. The lack of monetary compensation for the time put into RitmeNatura.cat and the increasing need for funds to lead RitmeNatura.cat by GT2.0 partner organisations were reasons for perceiving this as the key disadvantage. The risk of obtaining unreliable data was mentioned, as one interviewee raised the point that the process of data validation was not clear. The risks associated with sharing the data on the RitmeNatura.cat platform related to leaking the data to 3rd parties, arguing for improved security of RitmeNatura.cat's online platform.

Table 38 Advantages and disadvantages perceived by scientists/data aggregators to result from their participation in RitmeNatura.cat

Advantages of participating	Scientists - Data Aggregators (N=4)
...we obtain data and information that is useful for us	2
...we can share and exchange important data sets with other organisations	1
...we obtain access to new technologies and innovations	1
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	
...we can (better) communicate and collaborate with different stakeholders	2
...we can build strategic partnerships and/or create business opportunities	1
...we can have increased visibility for our organisation/group	1
...we can improve our organisation's/group's public profile	
...we can be involved in making decisions about climate change – have a say in this matter	1
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	1
...my organisation/group contributes to the public good or helps others	1
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Scientists - Data Aggregators (N=4)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	3
...we could obtain unreliable data	1
...we could encounter risks associated with sharing our data sets with other organisations.	1
...we could encounter risks associated with sharing our data with the public on RitmeNatura.cat platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	
... our input/contribution could lead to negative outcomes for others	

A summary of the factors perceived to influence (facilitating and hindering) their participation in RitmeNatura.cat is presented in Table 39. The factors perceived by the interviewed scientists and data aggregators to be facilitating their organisations' participation were linked mainly to the collaboration between the various stakeholders, including the citizens, in RitmeNatura.cat, the thematic focus of RitmeNatura.cat on climate change and the perceived future sustainability of RitmeNatura.cat. The thematic focus of RitmeNatura.cat on phenology and climate change and the region that the CO activities are carried out in are not surprising, given that the interviewed organisations are based in the region, had an interest in the focus of RitmeNatura.cat and had participated in the co-design of RitmeNatura.cat.

The future sustainability being regarded as a facilitating factor for their organisation's participation was related to their participation in the co-design process, since otherwise 'the work done would have been a waste of time'. Moreover, RitmeNatura.cat was considered not just a short term project but something that continued beyond the end of the GT2.0 project. This also explains why the future sustainability of RitmeNatura.cat was seen as a key hindering factor by two of the four interviewees, although it was regarded as something that would need to be worked on through commitment and partnerships between organisations, and to focus on increasing citizen participation in RitmeNatura.cat to make it a success in the future. Hindering technological aspects were possible data sharing issues in terms of incompatibility with other observer groups and a perceived lack of user-centred focus of the current technology used within RitmeNatura.cat activities. Political factors hindering their participation were mentioned by one interviewee, since changes at the top of key RitmeNatura.cat organisations, the Generalitat (SMC) and Diputació de Barcelona, could see governmental organisations stop supporting the activities of RitmeNatura.cat.

Table 39 Factors perceived by scientists/data aggregators to facilitate / hinder their participation in RitmeNatura.cat

Facilitating factors	Scientists - Data Aggregators (N=4)
The current state of citizens/volunteers' interest to participate in data collection	2
The joint approach for the setup of this initiative i.e. joint design and joint planning of RitmeNatura.cat	1
The current scope and focus of the RitmeNatura.cat initiative (e.g. the environmental topic and the geographical scale)	2
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in RitmeNatura.cat	1
The current state of cooperation and commitment of the other stakeholders	2
The future sustainability of the RitmeNatura.cat initiative	2
Political factors	
Cultural factors	1
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Scientists - Data Aggregators (N=4)
The current state of citizens/volunteers' interest to participate in data collection	1
The joint approach for the setup of this initiative i.e. joint design and joint planning of RitmeNatura.cat	1
The current scope and focus of the RitmeNatura.cat initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in RitmeNatura.cat	2
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of the RitmeNatura.cat initiative	2
Political factors	1
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

On the whole, the interviewed scientists and data aggregator organisations participating in RitmeNatura.cat indicate that their respective organisations had sufficient skills, technology, time and money to carry out RitmeNatura.cat activities. For some, lack of time and money to carry out the activities is perceived as hindering their participation, but no further elaboration on why this was the case was provided during the interviews (see Table 40).

Table 40 Sufficiency of resources for participation in RitmeNatura.cat perceived by scientists/data aggregators

Resources statements	Scientists/Data aggregators (N=4)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out RitmeNatura.cat activities	0	0	0	2	2
I have sufficient technological facilities to carry out RitmeNatura.cat activities	0	0	1	3	0
I have sufficient time to carry out RitmeNatura.cat activities	1	1	0	2	0
I have sufficient financial resources to carry out RitmeNatura.cat activities	1	0	0	3	0

All four interviewed SDA organisations perceived positive pressure to participate in RitmeNatura.cat from the scientific community (see Table 41). The data collected by RitmeNatura.cat and the wider processes that happened during the joint co-design of RitmeNatura.cat are of interest to the participating organisations, as well as organisations that partner with RitmeNatura.cat organisations. The regional and provincial administration was perceived as a source of positive pressure for two interviewed organisations' participation in RitmeNatura.cat. This is because one interviewed organisation, CBMS, is funded by the administration, and they have been actively involved in the agreement that is currently ensuring the future sustainability of RitmeNatura.cat.

A few sources of negative pressure were identified, namely competition between national and regional governmental organisations, and between RitmeNatura.cat and other observer groups in terms of online data platforms. The private sector was also perceived as a source of negative pressure, since an increase in data confirming climate change would work against 'their plan to ignore and deny that climate change is an issue'. Lastly, the aforementioned facilitating factor, the funding coming from the regional government, could also turn negative as changes in priorities would mean changes in funding and pressure on the participating organisations to adhere to those funding rules.

Table 41 Sources of positive and negative social pressure perceived by scientists/data aggregators in relation to their participation in RitmeNatura.cat

Positive Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	1
Officials in the national government agencies	
Officials in the regional/provincial administration	2
Officials in the regional/provincial government agencies	1
People from non-governmental, non for profit, or civil organizations	
Staff members of the national parks	
Other observer groups	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	4
People in the private, business, or industry sector	1
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	
Officials in the national government agencies	1
Officials in the regional/provincial administration	1
Officials in the regional/provincial government agencies	
People from non-governmental, non for profit, or civil organizations	
Staff members of the national parks	
Other observer groups	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	1
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.4.3 Incentives and barriers for policy/decision makers to participate in RitmeNatura.cat

For the stakeholder category of policy and decision makers who participate in RitmeNatura.cat, only a representative of the Diputació de Barcelona was available to be interviewed. For the Diputació de Barcelona, the main advantages of participating in RitmeNatura.cat (see Table 42) are perceived to be access to data and information that is useful for the organisation, improving the performance of their organisation and building strategic partnerships with other organisations. The data collection and management done by RitmeNatura.cat could help increase the efficiency of planning national parks, and would help with the creation of a protocol for monitoring phenology. The only perceived disadvantage was the possibility that the organisation's participation in RitmeNatura.cat activities could have negative outcome for others (climate deniers), arguing that the data collected within RitmeNatura.cat could confirm the existence of Climate Change and the impact it has on the national parks.

Table 42 Advantages and disadvantages perceived by policy/decision makers to result from their participation in RitmeNatura.cat

Advantages of participating	Policy - Decision Makers (N=1)
...we obtain data and information that is useful for us	1
...we can share and exchange important data sets with other organisations	
...we obtain access to new technologies and innovations	
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	
...we can improve the performance of our organisation/group – do the things we do in a better way	1
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	1
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	
...we can be involved in making decisions about climate change – have a say in this matter	
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Policy - Decision Makers (N=1)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	
...we could obtain unreliable data	
...we could encounter risks associated with sharing our data sets with other organisations.	
...we could encounter risks associated with sharing our data with the public on RitmeNatura.cat platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	
... our input/contribution could lead to negative outcomes for others	1

In terms of factors facilitating or hindering his organisation's participation in RitmeNatura.cat (Table 43), the interviewee from Diputació de Barcelona indicated that the joint approach and the wide scope of RitmeNatura.cat (which goes beyond the borders of the park) as key facilitating factors. This is because the organisation did not have the resources and competencies to carry out all the activities by themselves and the collaboration with other organisations is key. Perceived hindering factors for their participation in RitmeNatura.cat are linked to a lack of coordination between the various stakeholders in RitmeNatura.cat, as well as the possible diverging political interests with the more science-based planning and monitoring of the national parks. Uncertainty about the future sustainability of RitmeNatura.cat was also cited as hindering.

Table 43 Factors perceived by policy/decision makers to facilitate / hinder their participation in RitmeNatura.cat

Facilitating factors	Policy - Decision Makers (N=1)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of RitmeNatura.cat	1
The current scope and focus of the RitmeNatura.cat initiative (e.g. the environmental topic and the geographical scale)	1
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in RitmeNatura.cat	
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of the RitmeNatura.cat initiative	
Political factors	
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Policy - Decision Makers (N=1)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of RitmeNatura.cat	
The current scope and focus of the RitmeNatura.cat initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in RitmeNatura.cat	
The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of the RitmeNatura.cat initiative	1
Political factors	1
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

The interviewee indicated that Diputació de Barcelona has sufficient skills and technology to be able to carry out the activities of the RitmeNatura.cat, yet it is unclear whether or not they have the time available and he indicated lack of money to carry out RitmeNatura.cat activities (Table 44). This was linked to the need to have more in-house staff trained to properly support the activities in RitmeNatura.cat.

Table 44 Sufficiency of resources for participation in RitmeNatura.cat perceived by policy/decision

Resources statements	Policy/Decision makers (N=1)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out RitmeNatura.cat activities	0	0	0	1	0
I have sufficient technological facilities to carry out RitmeNatura.cat activities	0	0	0	1	0
I have sufficient time to carry out RitmeNatura.cat activities	0	0	1	0	0
I have sufficient financial resources to carry out RitmeNatura.cat activities	0	1	0	0	0

In terms of perceived sources of positive and negative pressure for their participation (Table 45), Diputació de Barcelona mentioned to perceive positive pressure from national governmental organisations, regional and provincial administration and members of the local community mainly due to its various facilitating role with regards to the RitmeNatura.cat's activities (legal, coordination or to respond to the needs and concerns of the local communities). Encouragement from local communities was perceived because of the current interest by citizens in the national parks who want to contribute time and effort. Negative pressure was perceived from national government agencies, mainly because they could critique Diputació de Barcelona's competencies to manage the territory about which RitmeNatura.cat contributes data and knowledge, while there were questions from the scientific community about the validity of citizen science

data for climate change data in general, which could thus include RitmeNatura.cat's phenology data. The private sector was perceived to exert negative pressure towards Diputació de Barcelona's participation in RitmeNatura.cat, since RitmeNatura.cat may contribute to the formulation of policy that would negatively influence the private sector's economic interests.

Table 45 Sources of positive and negative social pressure perceived by policy/decision makers in relation to their participation in RitmeNatura.cat

Positive Pressure	Policy - Decision Makers (N=1)
Other people in my organisation	
Officials in the national government agencies	1
Officials in the regional/provincial administration	1
Officials in the regional/provincial government agencies	
People from non-governmental, non for profit, or civil organizations	
Staff members of the national parks	
Other observer groups	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	
Members of the local community/residents of the area	1
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Policy - Decision Makers (N=1)
Other people in my organisation	
Officials in the national government agencies	1
Officials in the regional/provincial administration	
Officials in the regional/provincial government agencies	
People from non-governmental, non for profit, or civil organizations	
Staff members of the national parks	
Other observer groups	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1
People in the private, business, or industry sector	1
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.4.4 Concluding remarks

Inclusive collaborations, continued dialogue between the key RitmeNatura.cat stakeholders (including other observer groups) and continued data collection and quality validation are essential for the future sustainability of RitmeNatura.cat. Also, continued support from scientific and governmental institutions was perceived as key for the continued participation in RitmeNatura.cat by citizens, scientists/data aggregators and policy/decision makers alike. Competition between RitmeNatura.cat and other observer groups and their respective data collection and sharing platforms may be stand in the way of recruiting observers. These may be attracted not only to because of the data collection activities but by the opportunity to learn new skills and techniques as well as the possibility to interact with decision makers and other key stakeholders in RitmeNature.cat. The sustainability of RitmeNatura.cate it rests on continued collaboration and commitment by the various stakeholders, both in financial and operational terms since funds still need to be sourced beyond the end of GT2.0. Political factors could influence this, as political changes might cause RitmeNatura.cat to fall 'off the radar' for the region.

3.5 Incentives and barriers to participate in the Kenyan CO ‚Maasai Mara Citizen Observatory‘

The Maasai Mara Citizen Observatory (MMCO) aims at balancing sustainable livelihoods and sustainable biodiversity management in the Mara ecosystem. The MMCO aims to contribute to this by providing a multi-stakeholder platform for generating and sharing of data, information and knowledge and to develop shared inventories and databases (for Mara biodiversity, livestock and crop, land and water resources and climate information) to improve policy making and implementation for sustainable livelihoods and biodiversity management in the Mara ecosystem.

3.5.1 Incentives and barriers for citizens to participate in Maasai Mara Citizen Observatory

The interviewees in the citizen stakeholder category include five MMCO participants and five non-participants. The participants are representatives of two wildlife conservancies, a Water Users Association (WUA), Olderkesi Maasai community, and the Ole Tipis Girls Secondary School who participated in MMCO co-design and collaborative stakeholder sessions (i.e. are members of MMCO co-group). The non-participants are pastoralists from different Maasai communities in the Mara region and students from Maasai Mara University (MMU). Overall, the interviewees covered all different forms of citizen participation in this CO (participation in co-design, sharing data with the app and weather stations, and participatory mapping).

The perceived advantages of participating in MMCO for this stakeholder category are illustrated in Table 46. The perceived advantages include personal benefits such as access to useful data and information, communication with authorities, use of new technologies, learning and enhancement of personal knowledge, enhancement of work performance or job opportunities as well as societal benefits such involvement in decision making about livelihood and biodiversity in the Mara and helping others.

Overall, the main perceived benefits are a) access to useful data and information such as weather related data, water levels in the Mara River, the status of shallow reservoirs and ponds (dry/full), status of pasture in grazing areas (green/dry) is of particular importance for the pastoralists as well as for wildlife conservancies for the purpose of planning grazing activities; b) reporting human wildlife conflict incidents (mainly attacks of wild animals on humans and cattle) to responsible authorities (i.e. KWS) to take necessary action; and c) improving job performance as a result of having advanced tools (e.g. use of the Mara Collect app by the conservancy rangers in their daily patrols, and the MMCO platform to facilitate data sharing between different conservancies) or enhancing job opportunities, particularly for university students as a result of gaining new knowledge and skills.

The interviewees perceived far fewer disadvantages resulting from their participation in MMCO compared to the advantages they perceived to gain. The disadvantages mentioned by the interviewees (Table 46) are related to the cost of purchasing data bundles in order to use the app, the risk of being injured or attacked in the field while making observations of wild animals, unreliability of data collected by non-experts, the risk of shared data being misused by others, this was a particularly related to reporting deaths of endangered animals being exaggerated or used as bad publicity for conservancies, and, finally, not being able to help people (not making a difference).

Table 46 Advantages and disadvantages perceived by citizens to result from their participation in Maasai Mara Citizen Observatory

Advantages of participating	Citizens	
	Participants (N=5)	Non-participants (N=5)
...I can obtain data and information that is useful for me	4	2
...I can directly communicate with the authorities on issues that are important to me	1	4
...I get the opportunity to discover, try, and use new technologies and innovations	1	2
...I get the opportunity to learn, enhance my knowledge and expertise	1	2
...I can enhance my job (or my business), or find job new opportunities	3	1
...I can be part of a group of like-minded people		
...I can share my knowledge with others		
...I would feel good about my self		
...I can support a cause I consider to be important		
...I can be involved in making decisions about livelihoods and biodiversity in the Mara – I can get my voice heard	2	
...I get the opportunity to do something I enjoy		
...I can help others		1

Disadvantages of participating	Citizens	
	Participants (N=5)	Non-participants (N=5)
...I would have to spend a considerable amount of my time and/or my financial resources		2
...the data I collect and provide could be improperly used by others (e.g. malicious use, opportunistic use, etc.)	1	1
...the data I collect and provide could be misinterpreted by others		
...my online privacy and security could be compromised		
...I could encounter unreliable data and information	1	1
...my input might not make a difference		1
...my job (or my business) could be negatively influenced		
...I could encounter risks of injuries, accidents, diseases, theft, etc.		2
...my input could lead to negative outcomes for others		

The factors that the interviewees perceived to facilitate their participation in MMCO are presented in Table 47. The focus of on wildlife conservation in MMCO was a facilitating factor for those who are interested in environmental issues. The joint approach of MMCO and the involvement in the co-design process being able to share ideas with other stakeholders, and being recognized and appreciated for one's efforts and contribution were also mentioned as facilitating factors. But perhaps the most notable facilitating factor is having enough information, instructions and assistance from the 'organizers' of MMCO. Besides being adequately trained on the use of the technological tools, the interviewed citizens (particularly the non-participants) stressed that (more) information about the MMCO initiative, its objectives and goal and, most importantly, how it can benefit the communities is a major facilitating factor for them and for other community members to take part in this initiative (share data through the app). According to the interviewees, community meetings (Barazzas) are the most common way of communicating this information and to reach out to the public. On the other hand, the lack of clear messages and sufficient information were perceived as a hindering factor, especially given the voluntary nature of citizen participation in MMCO and the absence of financial compensations.

Other hindering factors mentioned by the interviewees (presented in Table 47) are related political and cultural factors; the perceived general lack of political will to support citizen empowerment, and a community culture mostly led by elderly men which can be hindering for women and young people. Socio-economic factors such as the high level of illiteracy of local community members, language barriers (many people do not speak English) and access to technology (most people do not own smartphones) are mentioned as major hindering factors for people to use the app. Finally, the lack of local ownership of the MMCO platform and the resulting uncertainty regarding its sustainability was as a factor holding back the participation of some interviewees.

Table 47 Factors perceived by citizens to facilitate / hinder their participation in Maasai Mara Citizen Observatory

Facilitating factors	Citizens	
	Participants (N=5)	Non-participants (N=5)
The environmental focus and geographical scale of Maasai Mara Citizen Observatory initiative (e.g. focus on livelihoods and biodiversity in the Mara, local or national scale)	1	1
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)	1	
The state of cooperation and commitment of others to Maasai Mara Citizen Observatory	1	
Future sustainability of Maasai Mara Citizen Observatory		
The information, instructions and the level of assistance I receive from the organizers of Maasai Mara Citizen Observatory	2	4
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Maasai Mara Citizen Observatory		
The level of feedback I receive from the organizers of Maasai Mara Citizen Observatory		
The level of recognition and appreciation I receive for my contribution		1
The lack of compensation or rewards for participation in Maasai Mara Citizen Observatory		
Socio-economic factors (level of education, level of income, level of technological development)		
Physical factors e.g. my health, my age, my gender		
Field conditions e.g. weather, accessibility of data collection site, safety of the site		
Cultural factors e.g. language, religion, traditions		
Political factors		

Hindering factors	Citizens	
	Participants (N=5)	Non-participants (N=5)
The environmental focus and geographical scale of Maasai Mara Citizen Observatory initiative (e.g. focus on livelihoods and biodiversity in the Mara, local or national scale)		
The depth and level of involvement offered to the participants in this initiative – involvement beyond data collection (e.g. joint design, joint planning)		
The state of cooperation and commitment of others to Maasai Mara Citizen Observatory		
Future sustainability of Maasai Mara Citizen Observatory	1	
The information, instructions and the level of assistance I receive from the organizers of Maasai Mara Citizen Observatory	1	
Technology aspects; the functionalities & design of the apps, software, or sensors, etc used in Maasai Mara Citizen Observatory		
The level of feedback I receive from the organizers of Maasai Mara Citizen Observatory		
The level of recognition and appreciation I receive for my contribution		
The lack of compensation or rewards for participation in Maasai Mara Citizen Observatory	1	1
Socio-economic factors (level of education, level of income, level of technological development)	5	2
Physical factors e.g. my health, my age, my gender		1
Field conditions e.g. weather, accessibility of data collection site, safety of the site	1	
Cultural factors e.g. language, religion, traditions	1	1
Political factors	2	

Furthermore, in terms of presence or absence of relevant resources for their participation in MMCO, the responses presented in Table 48, combined with responses to the open ended questions, indicate that availability of time for participation is not an issue hindering participation; however, the absence of skills and lack of financial resources are. The interviewees indicated the need for additional skills and knowledge to use the app, mapping tools, etc. and additional financial resources to purchase smartphones, data bundles, and cover the cost of travel.

Table 48 Sufficiency of resources for participation in Maasai Mara Citizen Observatory perceived by citizens

Resources statements	Citizens - Participants (N=2)					Citizens - Non-participants (N=2)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Maasai Mara Citizen Observatory activities	0	1	0	0	1	0	0	0	0	2
I have sufficient technological facilities to carry out Maasai Mara Citizen Observatory activities	0	0	1	1	0	0	1	0	0	1
I have sufficient time to carry out Maasai Mara Citizen Observatory activities	0	0	0	0	2	0	0	0	1	1
I have sufficient financial resources to carry out Maasai Mara Citizen Observatory activities	1	1	0	0	0	0	1	1	0	0

Note: the results in this table are based on the responses of four interviewees in this stakeholder category.

The interviewed citizens indicated different sources of social pressure that can influence their participation in the CO (presented in Table 49). The interviewees perceived that their participation in MMCO is (or will be) encouraged by their family members, by colleagues at work, by conservation related NGOs and by the technology provider (i.e. Upande), and by government agencies (i.e. KMD) and universities as they would benefit from the data that the citizen will share on MMCO platform.

On the other hand, the interviewees perceived that their participation in MMCO is (or will be) discouraged by the county government because of the concerns they raised about sharing sensitive data (e.g. elephant deaths) on open platforms. Negative pressure is also perceived for citizens by some of the conservancies due to 'competition over projects', as indicated by one of the interviewees.

Conflicting views emerged with regards to the position of KWS of citizen participation in MMCO. Some interviewees perceived KWS to be in favour of their participation because KWS supports conservation efforts, while other interviewees perceived that it will oppose their participation because of their concerns about security of sensitive data but also because they will face public pressure to act when reporting human-wildlife-conflicts on open platforms. The interviewed citizens indicated that the local chiefs are very influential in Maasai communities and, as such, they are an important source of influence. According to the interviewees, the local chiefs can be a source of positive social pressure *if* they are convinced of the benefits of the MMCO to the community and a source of negative pressure if they are not. The perceptions about other members of the community being in favour or and against the MMCO are also related to the perceived benefits of MMCO for the community.

Table 49 Sources of positive and negative social pressure perceived by citizens in relation to their participation in Maasai Mara Citizen Observatory

Positive pressure	Citizens	
	Participants (N=5)	Non-participants (N=5)
People within my personal circle (e.g. my family, my friends)		2
People within my work circle (e.g. my boss, my colleagues)	1	2
Officials in the national government		
Officials in Narok County government		
Officials in government agencies	2	
People from non-governmental, non for profit, or civil organizations	1	1
Members or officials in Maasai Mara Wildlife Conservancies Association		
Local chiefs		1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	2	
Members of the local community/residents of the area	1	2
People in the private, business, or industry sector		

Negative pressure	Citizens	
	Participants (N=5)	Non-participants (N=5)
People within my personal circle (e.g. my family, my friends)		
People within my work circle (e.g. my boss, my colleagues)		
Officials in the national government		
Officials in Narok County government	2	1
Officials in government agencies	1	2
People from non-governmental, non for profit, or civil organizations		
Members or officials in Maasai Mara Wildlife Conservancies Association	1	
Local chiefs	1	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)		
Members of the local community/residents of the area	1	1
People in the private, business, or industry sector		

3.5.2 Incentives and barriers for scientists/data aggregators to participate in Maasai Mara Citizen Observatory

The interviewees in the scientist/data aggregator category include representatives from three organisations: educators from Maasai Mara University, and GT2.0 partners TAHMO and Upande as technology and sensor providers.

The advantages of participating in the MMCO as perceived by the interviewees in this stakeholder category are illustrated in Table 50. The interviewees indicated a number of advantages both, for their respective organisations and for society at large.

Obtaining important data sets such as weather and biodiversity data (citizen-collected data) as well as facilitating access to and exchange of data sets from other organizations (e.g. Narok County Government, KWS) as well as access to advanced technologies such as Open Street Map tools and gaining new GIS skills were particular advantages perceived by MMU to result from their participation in MMCO. Whereas the advantages of participating in this CO as perceived by TAHMO and Upande (both technology developers and partners of GT2.0 Project) were more focused on building partnerships for future business opportunities, increasing the visibility of their respective organisations and enhancing the functionalities and performance of the technical tools they provide. The interviewees also indicated that by taking part in MMCO, their organisations contribute to the empowerment of local communities and to citizen involvement in decision making about wildlife and livelihood in the Mara.

The perceived disadvantages of participating in MMCO (Table X) for the interviewed S/DAs are mainly related to the cost of staff time allocated for participating in stakeholder workshops and for stakeholder engagement, thus creating pressure on staff while performing their regular duties. Concerns about the accuracy and reliability of data shared by non-experts on the MMCO platform and risks of exploitation of data for monetary gains by others were particular disadvantages perceived by MMU. Moreover, expected negative outcomes for their organisation's public image as a result of their participation in MMU were also raised, seemingly related to intricate 'no bribe, then blame' customs of some other MMCO stakeholders.

Table 50 Advantages and disadvantages perceived by scientists/data aggregators to result from their participation in Maasai Mara Citizen Observatory

Advantages of participating	Scientists - Data Aggregators (N=4)
...we obtain data and information that is useful for us	2
...we can share and exchange important data sets with other organisations	1
...we obtain access to new technologies and innovations	1
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	1
...we can (better) communicate and collaborate with different stakeholders	
...we can build strategic partnerships and/or create business opportunities	2
...we can have increased visibility for our organisation/group	1
...we can improve our organisation's/group's public profile	
...we can be involved in making decisions about livelihoods and biodiversity in the Mara – have a say in this matter	1
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	2
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Scientists - Data Aggregators (N=4)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	3
...we could obtain unreliable data	1
...we could encounter risks associated with sharing our data sets with other organisations.	1
...we could encounter risks associated with sharing our data with the public on Maasai Mara Citizen Observatory platform	
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	1
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	1
... our input/contribution could lead to negative outcomes for others	

A range of factors are perceived to facilitate the interviewees' respective organisations participating in the MMCO (Table 51). With respect to the state of current citizen or community interest as a facilitating factor, the level of interest and enthusiasm that the local university students usually have to volunteer for environmental causes was considered a promising indication of their willingness to actively participate in MMCO which was perceived as facilitating factor for the interviewees. However, they were less certain about the willingness of local community members to participate in MMCO.

Bringing different stakeholders together to co-design the MMCO was also perceived to facilitate their respective organisations' participation in this initiative. According to the interviewees, the co-design approach "allows one to accommodate the interests of the involved stakeholders" and "not just pushing technical solutions". Another facilitating factor that was mentioned is the thematic focus of MMCO which is in line with their organisation's scope. The strong influence of local chiefs on community members was perceived by the interviewees as an opportunity to expand the reach of the MMCO.

Different views emerged about the current state of cooperation and commitments of other stakeholders, it was perceived as a facilitating factor by some interviewees, and as a hindering factor by others. This was mainly related to a lack of commitment to attend MMCO stakeholder workshops or training sessions. Uncertainty about the sustainability of MMCO after the GT2.0 project lifetime was a general concern amongst the three interviewed S/DAs. According to the interviewees, the sustainability of MMCO hinges on the political will and commitment of government stakeholders to this initiative as well as on securing a source of funds to maintain the platform. Another hindering socio-economic factor perceived by this stakeholder category is related the generally low level of literacy of local communities in the Mara.

Table 51 Factors perceived by scientists/data aggregators to facilitate / hinder their participation in Maasai Mara Citizen Observatory

Facilitating factors	Scientists - Data Aggregators (N=4)	Hindering factors	Scientists - Data Aggregators (N=4)
The current state of citizens/volunteers' interest to participate in data collection	3	The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of Maasai Mara Citizen Observatory	2	The joint approach for the setup of this initiative i.e. joint design and joint planning of Maasai Mara Citizen Observatory	
The current scope and focus of Maasai Mara Citizen Observatory initiative (e.g. the environmental topic and the geographical scale)	1	The current scope and focus of Maasai Mara Citizen Observatory initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Maasai Mara Citizen Observatory		Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Maasai Mara Citizen Observatory	
The current state of cooperation and commitment of the other stakeholders	1	The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of Maasai Mara Citizen Observatory initiative		The future sustainability of Maasai Mara Citizen Observatory initiative	4
Political factors		Political factors	1
Cultural factors	1	Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)		Socio-economic factors (level of education, level of income, level of technological development)	2
Field conditions (e.g. weather, accessibility, safety)		Field conditions (e.g. weather, accessibility, safety)	1

With regards to the presence or absence of resources, Table 52 indicates that all three S/DA interviewees thought they have sufficient skills and experience to participate in the MMCO. However, financial resources and technological facilities for their participation were deemed insufficient. The responses to the open questions on this aspect relate mostly to the financial resources needed to sustain the MMCO platform after the GT2.0 project fund ends.

Table 52 Sufficiency of resources for participation in Maasai Mara Citizen Observatory perceived by scientists/data aggregators

Resources statements	Scientists/Data aggregators (N=4)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Maasai Mara Citizen Observatory activities	0	0	0	3	1
I have sufficient technological facilities to carry out Maasai Mara Citizen Observatory activities	0	2	0	2	0
I have sufficient time to carry out Maasai Mara Citizen Observatory activities	0	1	0	1	2
I have sufficient financial resources to carry out Maasai Mara Citizen Observatory activities	1	1	0	2	0

The perceived sources of social pressure by this category of stakeholders are illustrated in Table 53. Generally speaking, the three interviewees perceived only positive social pressure from within their respective organisations and from the scientific community, particularly schools, universities, the African conservation centre and Kenya National Museum who will benefit from the data provided by MMCO. With regards

to government agencies, KMD is also indicated as a source of positive pressure. Different views about Narok County Government emerged. On the one hand, it is perceived to be as a source positive pressure because Narok County needs the scientific expertise of the S/DAs and, on the other hand, it is perceived as a source of negative pressure because they are perceived not to be fully committed to the MMCO. Similarly, MMWCA was perceived as a source of positive as well as negative pressure. This perception was based mainly on the level of MMWCA cooperation with the interviewees' organisations in previous projects.

Similar to what is indicated by the interviewed citizens, the interviewed scientists and data aggregators indicated the local chiefs as strong source of social pressure. Local chiefs are perceived to be against the MMCO if they are not convinced that it will benefit their respective communities.

Table 53 Sources of positive and negative social pressure perceived by scientists/data aggregators in relation to their participation in Maasai Mara Citizen Observatory

Positive Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	2
Officials in the national government	
Officials in Narok County government	1
Officials in government agencies	2
People from non-governmental, non for profit, or civil organizations	2
Members or officials in Maasai Mara Wildlife Conservancies Association	1
Local chiefs	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	3
People in the private, business, or industry sector	
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Scientists - Data Aggregators (N=4)
Other people in my organisation	
Officials in the national government	
Officials in Narok County government	2
Officials in government agencies	
People from non-governmental, non for profit, or civil organizations	
Members or officials in Maasai Mara Wildlife Conservancies Association	1
Local chiefs	1
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	1

3.5.3 Incentives and barriers for policy/decision makers to participate in Maasai Mara Citizen Observatory

The interviewed policy/decision makers are representatives of Kenya Wildlife Service (KWS), Kenya Meteorological Department (KMD), and two departments of Narok County Government, namely the Department of Environment, Energy, Natural Resources, Water and Irrigation, and the Department of Wildlife and Tourism.

Many advantages were perceived by this category of stakeholders to result from their participation in MMCO. According to responses presented in Table 54, access to data and the multi-stakeholder communication facilitated by MMCO seem to be the two main benefits expected by these interviewees.

They perceived their participation in community-based monitoring as a "fast and cheap" way to obtain data from places they cannot reach. The data they are interested in are wildlife observations (especially spotting of rare and endangered species) and information about human-wildlife conflict incidents (e.g. about poaching and hunting) which can help them in developing targeted strategies and management plans. Another perceived advantage of the MMCO is the ability to *easily* share data sets between different

organisations through the MMCO platform instead of going through the existing lengthy formal procedures. In addition to that, the interviewees mentioned that their participation in MMCO gave them an opportunity to closely communicate with different stakeholders, i.e. government agencies, research institutes, and NGOs. For these interviewees, the joint stakeholder sessions were seen as a forum to meet, discuss and deliberate thus "exchanging knowledge between the organisations, not just exchanging data".

Access to advanced technologies such as a central data repository, mapping tools, apps and sensors were perceived by the interviewees as another advantage for their respective organisations' participation in the CO. Finally, the sense of shared responsibility and stewardships towards the conservation of wildlife that can be fostered by involving community members in monitoring is a societal advantage perceived by this stakeholder category.

On the other hand, community participation was perceived to be highly demanding since the involved organizations have to invest considerable time and effort to demonstrate the benefits of MMCO to the communities in order to keep them on board. Another disadvantage indicated by the interviewees is the questionable reliability of data shared by citizens, particularly given concerns about people faking human-wildlife conflict to get compensated.

All three interviewed S/DAs expressed concerns about sensitive data being shared on public platforms, given most notably the risk of exposing endangered animals to poachers when sharing wildlife observations, and the risk of bad publicity for MMCO if poaching and animal death incidents is picked up by (social) media.

Table 54 Advantages and disadvantages perceived by policy/decision makers to result from their participation in Maasai Mara Citizen Observatory

Advantages of participating	Policy - Decision Makers (N=5)
...we obtain data and information that is useful for us	3
...we can share and exchange important data sets with other organisations	1
...we obtain access to new technologies and innovations	2
...we gain concrete financial returns or save costs via more efficient use of our resources	
...we get the opportunity for learning and enhancing our organisation's/group's knowledge and expertise	1
...we can improve the performance of our organisation/group – do the things we do in a better way	1
...we can (better) communicate and collaborate with different stakeholders	3
...we can build strategic partnerships and/or create business opportunities	
...we can have increased visibility for our organisation/group	
...we can improve our organisation's/group's public profile	
...we can be involved in making decisions about livelihoods and biodiversity in the Mara – have a say in this matter	
...my organisation/group supports the role of citizens in environmental management and policy making (Citizen empowerment)	1
...my organisation/group contributes to the public good or helps others	
...my organisation/group contributes to the personal satisfaction and growth of the staff	

Disadvantages of participating	Policy - Decision Makers (N=5)
...we incur considerable costs associated with staff time allocated to this initiative, or put a burden on our resources	1
...we could obtain unreliable data	2
...we could encounter risks associated with sharing our data sets with other organisations.	
...we could encounter risks associated with sharing our data with the public on Maasai Mara Citizen Observatory platform	4
...the performance of my organisation/group could be negatively influenced (need to change the way we do things, slow down our progress, detracts us from our core focus)	
...we could weaken our competitive position or our power of influence	
...the public image of my organisation/group could be negatively impacted	1
... our input/contribution could lead to negative outcomes for others	

The factors that were perceived by the S/DA interviewees to facilitate and hinder their respective organisation's participation in MMCO are illustrated in Table 55. The facilitating factors included the co-design approach for setting up MMCO which created an opportunity for multi-stakeholder collaboration, the

focus on wildlife and livelihood in the Mara, and the opportunity to reach a wide range of local Maasai communities via the local chiefs and leaders. Perceived hindering factors relate to the uncertainty about the sustainability of MMCO beyond the GT2.0 project and some political conflicts with regards to some government entities' policy in dealing with donor-funded projects such as Ground Truth 2.0.

Table 55 Factors perceived by policy/decision makers to facilitate / hinder their participation in Maasai Mara Citizen Observatory

Facilitating factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	1
The joint approach for the setup of this initiative i.e. joint design and joint planning of Maasai Mara Citizen Observatory	1
The current scope and focus of Maasai Mara Citizen Observatory initiative (e.g. the environmental topic and the geographical scale)	1
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Maasai Mara Citizen Observatory	
The current state of cooperation and commitment of the other stakeholders	1
The future sustainability of Maasai Mara Citizen Observatory initiative	
Political factors	
Cultural factors	1
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

Hindering factors	Policy - Decision Makers (N=5)
The current state of citizens/volunteers' interest to participate in data collection	
The joint approach for the setup of this initiative i.e. joint design and joint planning of Maasai Mara Citizen Observatory	
The current scope and focus of Maasai Mara Citizen Observatory initiative (e.g. the environmental topic and the geographical scale)	
Technology aspects; the functionalities & design of the data collection apps, sensors, softwares, website, etc used in Maasai Mara Citizen Observatory	
The current state of cooperation and commitment of the other stakeholders	
The future sustainability of Maasai Mara Citizen Observatory initiative	2
Political factors	1
Cultural factors	
Socio-economic factors (level of education, level of income, level of technological development)	
Field conditions (e.g. weather, accessibility, safety)	

In terms of availability or absence of resources for participation in MMCO, the responses presented in Table 56 together with the responses to the open ended questions indicate that the interviewed S/DAs collectively have a wide range of knowledge and expertise on wildlife issues and wildlife data collection methods and GIS skills. However, they do require additional skills to use the tools and in terms of techno-logical facilities the availability of internet connections is an issue. The interviewees also mentioned the need for additional financial resources to recruit staff and to cover the cost of staff travel to attend MMCO meetings.

Table 56 Sufficiency of resources for participation in Maasai Mara Citizen Observatory perceived by policy/decision

Resources statements	Policy/Decision makers (N=2)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have sufficient skills, knowledge, and experience carry out Maasai Mara Citizen Observatory activities	0	0	0	2	0
I have sufficient technological facilities to carry out Maasai Mara Citizen Observatory activities	0	0	1	1	0
I have sufficient time to carry out Maasai Mara Citizen Observatory activities	0	0	0	2	0
I have sufficient financial resources to carry out Maasai Mara Citizen Observatory activities	0	1	1	0	0

Note: the results in this table are based on the responses of two interviewees in this stakeholder category.

With regards to social pressure, the three S/DA interviewees indicated only a few sources of positive and negative pressure (presented in Table 57). Positive pressure is perceived by them from the scientific and research community and from the local Maasai communities (conditional to them seeing a benefit in MMCO).

Negative pressure from within their organisation is related to their respective organisation's concern about data security and sharing sensitive data with the public on platform of MMCO. The negative pressure from the business and industry sector is specifically related to market competition, e.g. the weather station manufacturing industry being weakened by manufacturers of low cost weather stations.

Table 57 Sources of positive and negative social pressure perceived by policy/decision makers in relation to their participation in Maasai Mara Citizen Observatory

Positive Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	
Officials in the national government	
Officials in Narok County government	
Officials in government agencies	
People from non-governmental, non for profit, or civil organizations	
Members or officials in Maasai Mara Wildlife Conservancies Association	
Local chiefs	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	1
People in the private, business, or industry sector	
Members of the local community/residents of the area	1
People within my personal circle (e.g. my family, friends)	

Negative Pressure	Policy - Decision Makers (N=5)
Other people in my organisation	2
Officials in the national government	
Officials in Narok County government	
Officials in government agencies	
People from non-governmental, non for profit, or civil organizations	
Members or officials in Maasai Mara Wildlife Conservancies Association	
Local chiefs	
People in the scientific community (e.g. scientists, researchers, schools, universities, etc.)	
People in the private, business, or industry sector	1
Members of the local community/residents of the area	
People within my personal circle (e.g. my family, friends)	

3.5.4 Concluding remarks

Overall, the Maasai Mara Citizen Observatory was recognised as a useful multi-stakeholder platform that provided the useful tools and data for communities to improve the balancing of biodiversity and their livelihoods in the Mara ecosystem.

The results indicate that all – citizens, scientists/data aggregators and policy/decision makers – involved in MMCO are driven by the need for data. Interestingly the scientists and policy/decision makers are mostly interested in biodiversity conservation data (e.g. observations of wildlife species, data about poaching, or hunting) while citizens are more interested in livelihood management related data (e.g. data about weather, grazing spots, and water resources), which are supported by MMCO platform. Another important functionality supported by MMCO platform is the ability to share, exchange and store data sets of different organisations, i.e. the MMCO online platform was designed to be a central data repository for the various datasets that are collected by different organisations. However, some the concerns by some

P/DM organisations about the implications of sharing (what they consider) sensitive data on public platforms slowed down the progress of MMCO and the opportunity to widely promote the platform. In order to move MMCO forward, the CO members asked the DC team to help develop a policy for data sharing on the MMCO platform. The MMCO members have been actively involved in reviewing/revising this data policy over the past few months. Endorsement of this data policy by the MMCO members will mark the formal, public launch of the MMCO platform.

Although the low average level of literacy among community members as well as weak internet infrastructure pose considerable constraints for panning out MMCO, this analysis provides promising indications of the willingness of the local communities to join MMCO and to actively participate in sharing data on this platform, on the condition that sufficient efforts are spent on community awareness raising and engagement. However, lack of clarity on local ownership of the MMCO platform once the Ground Truth 2.0 project finishes was perceived as a main obstacle for the continuity of the Maasai Mara Citizen Observatory.

3.6 Incentives and barriers to participate in the Zambia CO 'National CBNRM Observatory Zambia'

The National Community-based Natural Resource Management (CBNRM) Observatory Zambia is a community-based monitoring system, tailor-made to support the day-to-day work of the community-based groups sharing legal responsibility for natural resource management under Zambia's decentralized policies. It will serve to simplify access to information, to increase influence of communities in decisions, and to reduce bottlenecks in processes created by distances and lack of resources. The Citizen Observatory offers tools to collect and submit data currently collected with pen and paper and make information more easily available in remote areas. Furthermore, it will provide services for improved implementation of CBNRM related laws, for example providing mapping functions in support of zoning decisions, communication channels to submit reports to authorities, or provide access to data relevant to evidence-based advocacy.

The Zambian DC is focused on a pilot area in the Silowana Complex in Western Province, which suffers from continuous natural resource degradation and poverty. Local benefits of conservation efforts are limited in part due to inadequate information and lack of coordination, communication and transparency between different governance levels in the planning and implementation of programmes on the one hand, and insufficient attention from the side of Community Resources Board (CRB) to the needs of the Village Action Groups (VAGs).

The Zambian Demo Case was strongly shaped by the expansion of the thematic and geographical scope, in order to include authorities relevant to the objectives of the case. Due to political regulation, decisions regarding the design and use of a CO have to be taken by national level departments, with local decision-makers at the district level acting mainly as implementing parties once the higher level decision has been taken. In particular, data is collected at the local level, but reported to central authorities, with all decisions about data use and data policy at the central level. The result is the design for a national platform with a central policies and oversight by national level departments, as a pre-condition for the CO to have connection to formal decision-making. The envisioned operational and upscaling model is that local community-based natural resource committees, in collaboration with their local councils and district administrations, use customized modules of the platform to use as their version of the CO, technically implemented as a closed subgroup of the national platform. Some data will be available publicly and nationally, some data, such as the minutes of meetings, will be only available to a local subgroup.

3.6.1 Note regarding the methodological approach for this chapter

For the purpose of this deliverable, the complexity, institutional embedding and multi-level nature of the CO have two implications. First, the process has taken more time than in the other Ground Truth 2.0 Demo Cases, and the CO is not fully operational at the time of writing. An empirical assessment was, therefore, not possible – there are no members with experience of participating in an active CO. The incentives and barriers described below are based on observations and reflections of the Demo Case Team. Second, incentives and barriers have to be considered both at the national and at the local level, with specific relevance of each level. At the national level, the decision by organizations to participate determine whether the Zambian CO can exist and be effective as such. Any major national department dropping out of the process would severely affect the potential of the CO to achieve its objectives. Participation of the local level, in contrast, will determine the value of the CO, as the lack of infrastructure and capacity at the local level makes the digital infrastructure of the CO valuable. The incentives and barriers at the local level are, therefore, of crucial importance in principle. At the same time, Zambia has over a hundred community-

based natural resource committees, including 76 Community Resource Boards, forestry and fisheries committees. Should the local members in the Sesheke pilot area be unable or unwilling to participate, the CO might still operate in other areas. Accordingly, reflections about the local level have implications both for the successful begin of operations in the pilot area, and should be considered in the planning of processes to roll out the observatory on other local communities.

With regard to the reflections presented in this chapter, the analysis takes as an opportunity the amount of individual interactions that was required to support a co-design process in a culture placing strong emphasis on face-to-face interaction and political courtesy, and a low capacity environment with the need to provide additional support to stakeholder groups. The process required a wide range of meetings and workshops in addition to the formal interaction moments. In particular, over a dozen workshops, trainings and larger scale briefings of individual stakeholder groups were held ahead and around interaction moments, bringing the individual perspective of community representatives, wildlife police officers and national level decision-makers into sharper focus. 17 village meetings in two roadshows were conducted to discuss the observatory with hundreds of regular community members. Language and cultural barriers meant that the DC Team 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. Two MSc thesis projects carried out in the pilot area conducted 96 in-depth interviews on aspects of local culture, the result of which also served to inform this section. And finally, at least 50 individual meetings with ranking decision makers at various levels took place. While often arranged as courtesy calls to keep key stakeholders involved, or to secure approval for next steps, the questions asked and issues raised in such individual meetings provide rich insights into the attitudes and concerns of the actors. Therefore, we are confident that the reflections presented in this chapter are well substantiated.

3.6.2 Incentives and barriers for citizens to participate in the National CBNRM Observatory Zambia

Both local culture and the design of the observatory creates a distinct profile for civilian members of the CO. Most prominently, the institutional embedding changes the relevance of volunteers in the CO. The main data collectors will be members of village level groups linked to CBNRM, such as Village Action Groups (VAGs). As the current plan is to enshrine use of the CO in CRB bylaws, such actors will volunteer to become members of the CO with the decision to stand for election. Owing to the limited number of smartphones in rural areas, other community members are expected to contribute to the data collection by reporting incidents to VAGs members.

Community members are eager to begin using the observatory to collect data. In meetings, civilians and community representatives express the expectation that using the platform will bring great advantages. The main perceived advantages of participating in the CO include access to technology and information, as well as easier communication with involved official departments. Communities do not expect any disadvantages resulting from their involvement in the CO. However, a careful analysis of statement made by community members raises the question to which degree expectations are realistic. In communities consisting mainly of illiterate subsistence farmers, citizens have in-depth understanding of their environment, but show little awareness for (or interest in) the precise roles, responsibilities and means of different actors, in particular government departments and international projects. Statements made in meetings and workshops imply that community members vastly overestimate the resources available to authorities, as failure to solve certain problems is frequently blamed on intentional disregard for local needs. As

a consequence of low levels of civil education, the presumed benefits of the CO are likely subject to significant distortions. Despite extensive information campaigns during the roadshows, the CO Team personally witnessed community members voicing the belief that launching the CO meant that everybody would receive a free smartphone. Similarly, statements regarding the expected benefits imply that community members assume that making it simpler to report incidents will automatically lead to speedier responses by government departments. On other words, while it is indeed the purpose of the observatory to make the delivery of certain government functions more efficient, advantages described by community members represent projected desires rather than conscious reflection on what an observatory is and can do. To a degree, this distortion might be caused by the absence of a functioning platform, which means that the observatory remains an abstract idea rather than a tangible product to many citizens at this point. Going forward, the CO Team will have to carefully monitor and manage that the introduction of the platform leads to a more realistic understanding, rather than an abrupt disappointment.

With regards to sources of social pressure at the local level, both types of pressure are observable and expected. In public, attitudes are overwhelmingly positive, with statement of village representatives typically expression a variation of the notion that nobody could possible oppose something so positive. At the same time, the distribution of benefits from natural resources is a highly political matter. In theory, fully implementing decentralized natural resource management and the associated benefit sharing schemes would increase long-term revenues both for the government and communities. In practice, specific agencies and individuals benefit from an non-transparent and unbalanced system. In addition, scepticism and mistrust towards initiatives introduced to the local context persist. The specific characteristics of the local culture at the pilot site mean that the attitude of a small number of individuals can create intense social pressure, with significant impact on the participation in the area. Specifically, Lozi culture is a system which is based on a strong collective identity, very deferential towards its leaders, and involves the demand to prove that one is a 'good Lozi' including social sanction for aberrant behaviour. Accordingly, if the village leadership embraces an institution like the CO, the pressure to conform will be high. The village roadshows also demonstrated on several occasions that membership in the CO is approaches as a collective decision by the entire community, not an individual decision. (In a telling example, implementing European requirements for informed consent created strong negative responses on several occasions, as the notion that individuals might opt out after the community has agreed to participate was deemed deeply offensive.)

However, the same logic dictates that the opposition of a local traditional leader would make it difficult for a VAG to engage community members in data collection. In this regard, it should be noted that the institutions of Village Action Groups and Community Resource Boards in itself is still perceived as an 'outside construct' in many village areas, making the CO part of a larger picture. Some communities suspect that VAG members gain benefits from natural resources at the expense of the rest of the village, and in such communities, the observatory might be rejected along with VAG members responsible for it. In summary, the importance of social conformity in the pilot area is hard to overestimate, to the degree that it is difficult to grasp from a European perspective. To illustrate, during the course of the project, the team witnessed a witch doctor being called in to pass sentence on the former Chair and Vice-chair of one Village Action Group, in a conflict with roots in accusations related to their time in that position. And while the related ceremony does not cause direct physical harm, the curse of a witch doctor is locally believed to ultimately cause death, meaning the accused were, in essence, sentenced to death by their own community.

With regard to wider implications of these observations, conversations and observations shared in planning workshops with representatives of communities from other parts of Zambia suggest that social pressures in the pilot area are extreme, and not representative for Zambia as a whole. Barotseland is a kingdom that pre-dates colonial times, and has always been a strict hierarchical, or even feudal, system. In most other areas of Zambia, outside of Lozi culture, submission to leaders seems less pronounced, and traditional leaders, while treated with deference, have much less power.

One aspect that might have wide-ranging implications for participation is the role of gender expectations. An ethnographic study in the pilot area revealed that women who went to the houses of a male representative to report on an issue might be accused of infidelity. The findings imply that in the absence of female VAG contact persons, a significant share of the population – women of reproductive age – would face severe barriers to participation. Similarly, the opportunity for women to stand for election and serve in a meaningful role in the VAG depends on domestic situation. While strict gender roles, like deference to traditional leaders, seem to be particularly pronounced in the pilot area, conversations with coordinators from other regions suggest that it likely plays a role in other parts of Zambia as well. In this regard, nominating a female community member, specifically a respected older widow, as contact point for women seeking to report their observations, might a highly relevant enabling factor for female participation.

With regard to social pressures at the national level, the main stakeholder group are members of Community Resource Boards who have been elected to represent other boards at the regional and national level. As the associations are membership based, the interest of local CRBs in having the observatory available will create substantial pressure to keep it operational. Furthermore, national stakeholders are dependent on donor funding, and under constant pressure to demonstrate their contributions to conservation outcomes. If operating the observatory became recognized by donors as a tool for positive impacts (and ideally, operational cost-saving, e.g. in the production and distribution of reports), it would create additional, significant pressure.

In terms of enabling and hindering factors, logistical, technical and capacity issues are the main aspects. The core factor driving participation in the observatory are the huge distances CRBs have to travel to visit their associated villages, or the offices of authorities to file reports. In the absence of offices, roads, and transport, any meeting involves walking for hours (or even days) in blistering heat. Information is only available if department officials or NGO field officers mobilized the resources to produce and print hardcopy reports, and provide vehicles to distribute them. Invitations to events frequently reach CRBs only when it is too late to make travel arrangements. The CO system, with centralized email addresses on phones handed over to new VAG members after elections, distribution of instructions through videos, and access to reports between physical meetings, will effectively take distance out of the equation for a range of tasks, and thus goes to the heart of one of the biggest practical challenges CRB members across the board have expressed. Furthermore, new technologies are, by definition, very attractive, and will raise the social status of VAG members operating it.

With regard to hindering factors, the reliance on externally provided hardware, likely including resources for data plans, poses the biggest hindering factor, in some areas extending to the absence of network connectivity. Furthermore, few people speak English, so uptake will depend on the ability of the CO organizers to provide information in local languages, and ideally include audio and video in information and training materials. However, the ability to access information will likely play only a limited role in participating in the observatory. Based on the experience of this project, as well as insights from parallel projects, suggest that the biggest hindering factor for CBNRM in Zambia is not the level of information, but a widespread sense in communities that ordinary citizens do not have the right or capacity to take action

and solve problems themselves. As mentioned in connection with the expected advantages above, expectations regarding the observatory include the hope that better communication of incidents will help to bring authorities to the area who are able and responsible for solving problems. This underdeveloped sense for civilian responsibility and activism is likely a strong hindering factor. At the same time, the platform might also contribute to strengthening awareness for actions communities can take themselves. Sometimes, representatives of government departments and NGOs re-inforce a passive attitude in local communities by infantilizing low capacity beneficiaries depending on their support. If the platform creates exposure to the voices of peers who successfully solved problems in their own communities, it could create a new channel for capacity development, over time turning the hindering factor into an enabling factor.

3.6.3 Incentives and barriers for scientists/data aggregators to participate in the National CBNRM Observatory Zambia

At the current state of development, the Zambian CO does not include dedicated Data Aggregators as such. The data aggregation functions are part of the mandates of both citizens and decision-makers. On the citizen side, it is a core function of the Secretariat of the National Community Resources Board Association (NCRBA) to aggregate reports from the local committees, share such information among CRBs and use it for evidence-based advocacy. On the decision-maker side, the CO aims to interface with the regular data collection and monitoring mechanism of the various departments, both to make more departmental data accessible, and to make it possible for citizen collected data to enrich data sets used by departments. In the case of the local council in the pilot area, an effort is ongoing to better integrate data from different departments when preparing inputs to regular national planning processes. This means that this stakeholder is, in fact, becoming a data aggregator, and the potential of the platform to support such efforts creates an incentive to participate.

Commercial data aggregators have been involved in the project as partners for development of the platform. However, the official nature of some of the data to be processed in the platform led to a change in enabling technology half-way through the project, as the system likely has to be migrated to servers under Zambian control when entering full operation. There are examples for data collection initiatives with databases stored outside the country, specifically the UNICEF initiated collection of Water and Sanitation data, but in contrast to the CO, this initiative does not involve law enforcement and security services. Accordingly, incentives and barriers for the main data aggregators are the incentives and barriers for the national subgroup of citizens, and the national department level of the decision makers, respectively. On the citizen side, an additional key hindering factor for this group is the complete lack of experience of the organizations with the task.

Apart from the civilian and public actors considered above, there have been exploratory talks with representatives of various scientific research and training institutes, who have expressed great interest in becoming part of the CO. Furthermore, the organizations considered as technical potential host for the data platform might come to play a role as data aggregator. However, interaction with these stakeholders has been preliminary and limited, insufficient to substantiate reflections on their incentives and barriers.

3.6.4 Incentives and barriers for policy/decision makers to participate in the National CBNRM Observatory Zambia

Decision makers involved in the CO involve local authorities on the one hand, and national level departments on the other. Full involvement of these authorities is crucial for the success of the observatory given that a core incentive for citizen involvement is the expectation that submission of reports will lead

to improved responses from authorities. Local authorities include the local councils, with chairs directly elected since 2016 on the one hand, and district administrations, with officials nominated by the national government, on the other. The co-design process included both sides extensively from the start. Involvement of the national level departments was recognized as crucial early on in the process, as district official act only as implementers of central policies, and only collect data for reporting to central offices. In a highly hierarchical political culture, there is little room for discretion for district officials. The room to act is bigger for local councils, who have been empowered and made more autonomous by the constitutional change (see institutional analysis in D1.11), but the structures are new and related procedures are still being built. For the incentives and barriers of participating in the CO, this plays a key role, as the decision which authority should receive which report as it is submitted has emerged as one of the single most important challenges for the co-design process. The project has identified the so-called District Planning Subcommittee (DPS), which includes the district, the local council, and the MPs constituency office, as the group best suited to make the respective decision at the local level. During future upscaling exercises, the DPS of the respective district will likely be the target group of decision-makers to engage for a 'mini co-design' creating the locally customized version of the CO (naming of the subgroup, selection of topics, addition of local data collections).

With regard to expected advantages of the CO, initial reactions of all government levels to the proposition of the CO are typically very positive. Statements in formal impact interviews of the project, in public fora like workshops, or in private meetings with European project partners, frequently mentioned that the platform will be hugely beneficial, or even facilitate 'revolutionary' change. However, such statements are not necessarily a reliable indicator of personal expectations. In a country very experienced with international donors, it is a routine reaction of many stakeholders to indulge project owners, and public officials are highly experienced in providing answers they believe the donor wishes to hear. The detailed exercises of the co-design process demonstrated on several occasions that local authorities do not normally expect projects to be strongly interested in what they have to say. It takes considerable effort and structured workshop methods to engage in reflection that mentally links the activities of a project to daily routine activities. Accordingly, the Team suggests that for analysis of the advantages and disadvantages expected by decision makers, statements made for the benefit of an audience should largely be disregarded. They might help to establish if the general attitude towards the initiative is positive or negative, but offer little insight beyond that. However, on a small number of occasions, decision makers pro-actively engaged in conversations regarding specific functions of the platform, indicating elements considered as real advantages. Two named advantages stand out in this regard, one raised by the local council, and one by the national departments of Forestry and Fisheries.

The local council in the pilot area expressed a belief that participation in the CO might create specific benefits for them, as a tool to compensate for a limited local resources. It was suggested that local officials face challenges similar to the CRBs, with reports by wards counsellors and ward development committees reaching the authorities with huge delays due to distances and lack of transport. While the delivery of public services is not technically a core function of the observatory, access to a technology that can support such services provides a strong incentive for the local council to participate.

The national departments of Forestry and Fisheries are the stewards of two of Zambia's main CBNRM policies, with provisions for Forestry and Fisheries Committees in Communities. However, compared to the CRBs established under Wildlife law, these policies are relatively new, and few such community initiatives exist. Several interactions with the departments during the project period suggest that the national leadership of the departments is disappointed with the state of implementation, and has an interest in accelerating the implementation of these policies. In this context, officials commented on the capacity of

their officers at the district level. The forestry and fisheries departments, unlike the wildlife department, do not command rangers and related fleets of vehicles. Accordingly, their ability to roll-out community-based programmes is lower, and depends on the state of information and training if individual officers at the district offices. For this reason, the capacity of the platform to make available to communities information on process and regulation designed by the national departments, was perceived as potentially very valuable. The political dynamics between departments involved in CBNRM are shaped by the differences in experience, resources and power. Therefore, providing clear advantages to departments other than Wildlife and community committees other than CRBs is a relevant issue for the sustainability of the platform.

With regard to data collected in the platform, gaining access to additional data is currently perceived of limited value by almost all departments with which the CO Team interacted. In general, departments seem deeply sceptical towards data collected by sources other than officers trained in house. In general, the reliability of the data is questioned, and in the case of wildlife data, a clear concern is that poachers might be able to use the collected data to pinpoint the location protected species. Accordingly, exposure to community-collected data might over time demonstrate its reliability to decision makers, creating an advantage for citizen participation over time. From department side, positive responses are typically related to the technology, for example the department of agriculture, who expressed immediate interest in adding geolocation to the data extension agents collect for statistical purposes.

The biggest observed hindering factor linked to decision makers is the low ability or willingness to dedicate time or resources towards the process in the absence of an external project acting as facilitator, organizing meetings and moving the process forward. This is not necessarily an issue of lacking will. At the local level, its capacity is the most relevant hindering factor. At the national level, department representatives explained that departments implementing primary policies are peers, which means the right of either department to engage others in a discussion of collaboration is legally limited. Accordingly, outside facilitation was a necessary enabling factor that allowed departments to come to the table in a matter they themselves consider useful. However, such collaborative workshops only serve to discuss and share information, it cannot support a mandate for departments to take actions.

It should be noted that many initiatives involving the use of smartphones in data collections are ongoing in Zambia. Such initiatives include extension of the data collection by Wildlife Police Officers (to complement the currently used SMART system), NGO funded projects on conservation agriculture, collection of water and sanitation related data by the Ministry of Water currently implemented in 104 of Zambia's 116 districts, and an effort by the Department of Meteorology to support the reporting from weather stations to the ministry. The number and range of related projects demonstrates that the advantages of ICT platforms for data collection, reporting and sharing is widely recognized. At the same time, conversations with government officials involved in such initiatives show that financial and technical restrictions are wide-spread. In almost all cases we observed, the related platform is initiated and financially supported by international donors (WWF for the SMART extension, Bengo for agricultural collection, UNICEF for the system of the Water ministry). In all instances, it is reported that initiatives struggle with the resource needs after projects expire. Data plans are one concern, even when amounts are very small, though the biggest issue is the smartphones breaking down. This implies that rather basic technical capacities, such as keeping smartphones operational, are making small repairs, could significantly contribute to the longevity of such initiatives. Furthermore, it was observed different data collection initiatives are rarely connected, even if they are implemented by the same agencies, and the redundancy of efforts is obvious. As installing several tools on one smartphone creates marginal costs close to zero, inter-departmental agreements that any government linked phone should be made available for collection of data for any tool

currently in use, it could vastly expand the availability of data submission and access points, while also enabling cost sharing. This would like be a major enabling factor for long-term operation.

As a final observation, the co-design method should be considered an enabling factor of the CO, in particular the focus of the process on ensuring all relevant actors were identified and consulted. As the co-design advanced and the suggested platform became more tangible, several departments, and in particular the Zambian security and intelligence services made inquiries to establish if the project was encroaching on their jurisdictions. As of this point, in all cases the CO Team could convincingly document that the respective authority was informed and consulted in advance.

3.6.5 Concluding remarks

The previous sections have outlined that the scepticism of departments towards data collected by citizens, or in fact any source not under their control, runs deep. One interesting implication of this analysis is, therefore, that it might be interesting to analyse the incentives and barriers of national level departments from two different perspectives, considering them decision-makers or data aggregators, respectively. This could yield valuable insights regarding role identity of such actors, and how it influences decisions to participate.

The most likely factor that would make national departments actively drop out of the CO process is loss of control over how the data is collected and used, as all consider data related to resources under their jurisdiction as their property and responsibility. Politically speaking, there is little room for the idea of legitimate (in the sense of widely accepted) data sets that are not sanctioned by the respective department. However, the most likely scenario is that departments might drop out of the process by neglect, if there is no sufficient support for a structured process that creates meeting spaces. As long as the observatory is a ‘voluntary‘ initiative, interactions about and with the platform would likely have to stabilize and become institutionalized for quite time to create independent momentum within department, depending on department staff members feeling to have a stake in its existence and motivated to justify engagement. Embedding the observatory in an official national CBNRM policy would be the best way to counteract this scenario, as it creates legitimate reasons for department members to dedicate official time to its maintenance. However, this will likely be a necessary, not a sufficient condition. Finding ways to link submissions to and from the platform to in-house procedures without significant organizational change will likely be an important factor, but first and foremost requires openness of department leadership to discuss such linkages. As of this moment, there are indications that such openness exists, but it is unlikely that the process will be self-guided by departments without some form of external facilitation. Accordingly, successful establishment of a Steering Committee creating a platform for continued interaction and discussion, is assumed to form a core enabling factor. As noted, the cascade effect of enabling factors has to be carefully considered in this case, as a department dropping out of the national level platform also eliminates value at the local level CO.

4 Conclusions

This report has presented the updated analysis of the respective incentives and barriers for participation in the Ground Truth 2.0 citizen observatories. Specifically, we have analysed the incentives and barriers for each of the three core stakeholder types of citizen observatories, namely citizens, scientists/data aggregators and decision/policy makers. At the time of the empirical research, all six Demo Cases had completed their co-design processes and five are fully operational (the Zambia Demo Case being the exception): the CO platforms and tools had been implemented, rolled out and were available for the wider public. Therefore, the empirical research aimed to involve respondents beyond the co-design groups of each citizen observatory; yet the extent to which this was successful varied considerably per Demo Case.

The incentives and barriers for participation are evolving over time. One of key barriers for continued participation, namely uncertainty about the sustainability of the respective observatory, which was identified in the Demo Cases has been resolved for most of the citizen observatories in the meantime.

The CO-specific findings of this report feed into the tailored engagement strategies for each Demo Case (Task T1.4), WP3 Business Development and WP4 Dissemination and Communication. The results will also be shared with the members of the respective citizen observatories that are continuing their activities beyond the lifetime of the Ground Truth 2.0 project. Overall, this report provides salient empirical evidence that contributes to the emerging understanding of the drivers for stakeholder engagement in the field of citizen science, citizen observatories and ICT-facilitated stakeholder interaction more generally.

References

Ajzen, I. (1991). The theory of planned behavior. Organizational behavior and human decision processes, 50(2), 179-211.

Wehn, U. and Almonmani, A. (2018) Initial report on incentives and barriers, Ground Truth 2.0 Deliverable D1.7, May.

Wehn, U. and Almomani, A. (2019), Incentives and barriers for participation in community-based environmental monitoring and information systems: a critical analysis and integration of the literature, Environmental Science & Policy, Special Issue on Shared Environmental Information System (SEIS), Volume 101, 341-357.

Wehn, U., Alfonso, L., Lobbrecht, A., van de Giesen, N., van der Kwast, H., & Joshi, S. (2015). Ground Truth 2.0 - Environmental knowledge discovery of human sensed data, Horizon 2020 Innovation Action proposal accepted for funding by the European Commission.