



Deliverable D3.2

Updated report on market analysis
and market uptake



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List of abbreviations

CAPEX	Capital Expenditure
CO	Citizen Observatory
CS	Citizen Science
DC	GT 2.0 Demonstration Case
DCL	GT 2.0 Demonstration Case Leader
EC	European Commission
EQL	Environmental quality of life
GT2.0	Ground Truth 2.0 project
ICT	information and Communications Technology
IPR	Intellectual property rights
LUM	Land Use Mapper
LULC	Land use land cover
OPEX	Operating expenditure
OSM	Open Street Map
QoL	Quality of life
PESTEL	political, economic, social, technological, environmental and legal
SVA	Social Value add
SVP	Social value proposition
SWOT	Analysis of supplier strengths and weaknesses, and market opportunities and threats
TAM	Total addressable market
tbc	to be confirmed
VA	Value add
WB	Water Board
WP	Work package

Executive Summary

One of the key objectives of WP3 (Business development to accelerate uptake) is to evaluate all the critical elements for the viability and sustainability of Ground Truth 2.0 (GT2.0) services.

The first step to reach this objective is to carry out an in-depth market analysis. As an updated report to the initial deliverable (D3.1), this is the final vision on what the market is for the developed COs, and GT2.0 ‘tools/products’. In parallel, task 3.3 has developed business models for each of these GT2.0 tools, products or services. The final deliverable of WP3 is the Exploitation Roadmap (D3.4) and will include a strategic plan for sustainability options for each of COs, as well as commercial exploitation of the GT2.0 products/tools.

The market analysis carried out in this report builds on the stakeholder analysis undertaken in WP1 and also on the functional definition of the six citizen observatories (CO), detailed within WP2.

The first step of a market analysis is to clearly define the end-user needs for the GT2.0 products and services. For this updated report, the services considered are the six COs, and three other products including the Land Use mapper, the GT2.0 methodology and the Quality Tool.

The six COs launched in the GT2.0 project have been developed through different co-design sessions with the participation of different stakeholders and possible end-users. The feedback of CO leaders on how they see and what they expect for each CO has been a key element to producing this report. The six demo cases have been analysed independently; for this reason, each CO has a specific chapter that evaluates its value proposition and possible expansion.

In the Conclusions chapter we evaluate some common characteristics of the COs that are important to point out. One example is that in all cases they have recognised the significant social value of the COs, and as such we followed a non-profit business model approach. In many cases, the social value proposition lies in the CO offering a communication channel between decision makers and citizens, a way to improve government transparency and improved citizen engagement in local environmental activities. In some COs, quantifiable financial benefits (such as cost savings) are also expected.

Of the 6 COs, the Belgian one has a local/urban focus (Meet Mee Mechelen/Antwerp), three have a larger multi-city or regional focus (Grip of Water Altena, Vattenfokus, Maasai Mara and RitmeNatura), while only one has a national focus (Zambia CBNRM). This illustrates that these CO can expand in the market either by geo replication or by geo expansion.

Government authorities in some shape or form are involved as key stakeholders in the all the GT 2.0 COs, either as data suppliers or ‘customers’. This brings up two issues. Firstly, to gain governmental support for such initiatives, the authorities will need to gauge the impact that the COs will have on the public (level of public good), as well as the number of citizens that will be targeted. Secondly, all governments have limited resources and thus the COs will have to ‘compete’ with other social programmes for public support and funds. In general, the ‘mission’ of a CO should match one of the priority goals of their governmental ‘customer’, to achieve this end. Fortunately, this already applies to the COs, since the relevant governmental bodies were part of the co-design process and thus their requirements in this regard have been considered and, to some extent, steered the design of the CO.

The two demo cases in Africa face similar, ‘typical’ African challenges that do not necessarily apply in Europe. They face a general lack of resources and infrastructure, and a reluctance on the part of some decision-makers to share data or for more transparency. On the other hand, the ‘need’ for programmes that will benefit citizens, and help to relieve poverty by better, ‘combined’ management of natural resources (such as wildlife), is so much greater than in Europe.

In this deliverable, we also included an analysis of the commercial opportunities for the GT2.0 products, i.e. the Co-design methodology and tools (e.g. OSM land use/land cover mapper and data quality tool). Unfortunately, the OSM LULC Mapper is not sufficiently mature to be a marketable product yet. In contrast the Quality Tool is ready for market and the Co-design methodology will be made available by the end of 2019. The strongest opportunity for these products lies in the expected rapid growth in the number of CS and CO projects. Such community-based projects are proving to be a new trend for environmental monitoring and information gathering. The expectation is that funding agencies will become more and more interested in commissioning projects which can clearly demonstrate impacts related to social value creation and the involvement of citizens and local communities.

Key words: Market Analysis, Sustainability, Value proposition, Competition, SWOT, PESTEL

1 Introduction

1.1 Background

Citizen Science, enabled by ICTs, is on the rise. However, many efforts to implement citizen observatories are facing problems sustaining engagement by citizens, limited scalability and limited impact on governance processes.

Ground Truth 2.0 will deliver the demonstration and validation of 6 scaled-up citizen observatories in real, operational conditions, with 4 European and 2 African demonstration cases. It will demonstrate 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 final goal of the work undertaken in WP3 ‘Business development to accelerate market uptake’ is to assess the sustainability of the Ground Truth 2.0 outcomes. As a first step to reach the global objective, Task 3.1 focuses on the market research and analysis for the GT2.0 COs and products.

1.2 Purpose of the report

By market analysis we understand both a qualitative and quantitative assessment of a market. It includes the identification of key actors, the market segments, the competition, the barriers or the size of the market both in volume and value.

The outcomes of the GT2.0 project are identified as follows:

- The six established citizen observatories
- A methodology framework for project co-design
- A tool for checking data quality
- The OSM Land Use /Land Cover mapping product.

Coming up to the end of the GT2.0 project, the six COs are still at different stages of maturity. They have all been launched and while some of them are operational, others are still under the final stages of development. The three GT2.0 ‘outcomes or tools’ were not analysed previously, as they were not sufficiently developed at M18. This has been rectified in this report, and additional chapters include the market analysis for the Methodology, the Land use mapper and the Quality tool.

1.3 Structure of the report

This document is structured as follows. Section 2 provides an overview about which is the status of the market for COs and details the methodology for market research applied within the project. These sections have been retained from D3.1 to provide background to this stand-alone report. Sections 3 to 8 describe the analysis carried out for each of the COs and have been updated since the submission of D3.1 in Feb 2018. Sections 9-12 are new and include the analysis results for the GT2.0 Methodology and ‘tools’ (Land Use and Land Cover Mapper, and the Quality tool) and Section 10 outlines the overall conclusions.

2 Market Analysis applied to COs

2.1 Introduction

Citizen science (CS) has been used in a wide range of areas around the world since the 20th century (Palacin-Silva et al., 2016). A study from 2016 indicates that the largest impact of citizen science has been in research on biology, conservation and ecology, and is utilized mainly as a methodology of collecting and classifying data (Kullenberg et al., 2016). The next examples show some of the main studies.

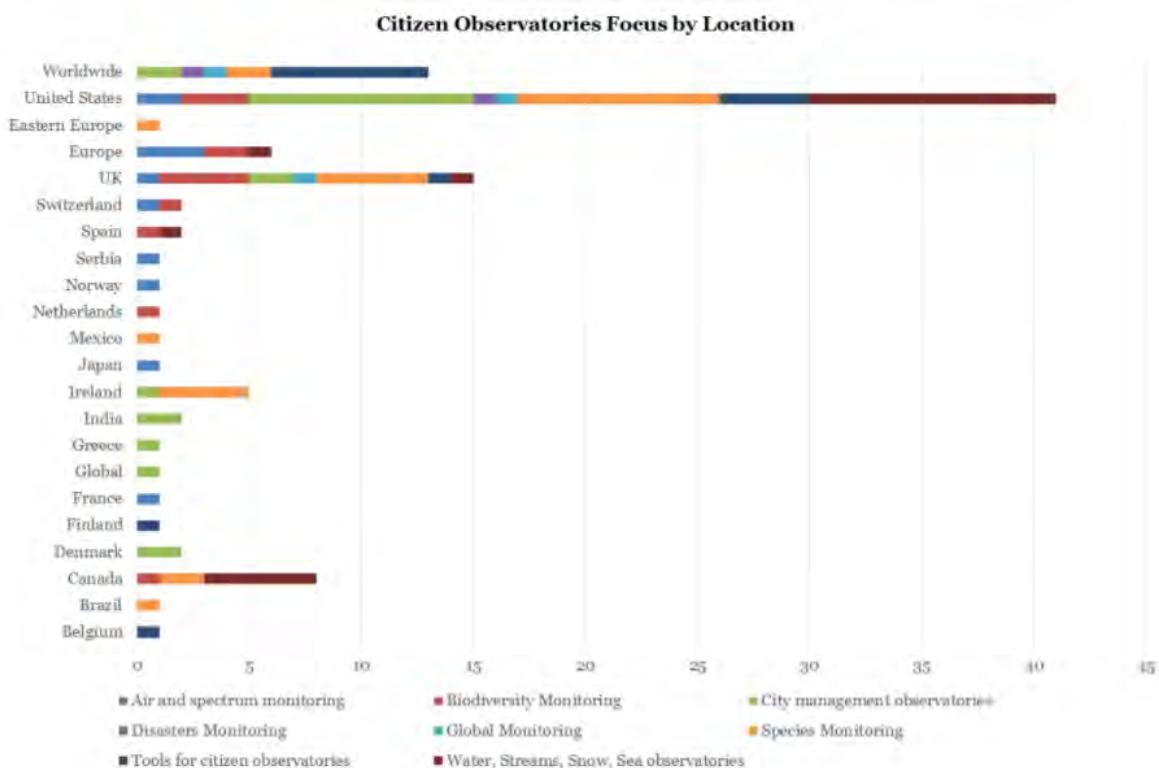
- Astronomy has long been a field where amateurs have contributed throughout time, all the way up to the present day. (Mims and Forrest, 1999).
- Butterfly counts have a long tradition of involving individuals in the study of the range of butterflies and their relative abundance. Two long-running programs are the UK Butterfly Monitoring Scheme (started in 1976) and the North American Butterfly Association's Butterfly Count Program (started in 1975). (Ries; UKBMS)
- The North American Bird Phenology Program (historically called the Bird Migration and Distribution records) may have been the earliest collective effort of citizens collecting ornithological information in the U.S. (NAPP). The program, dating back to 1883, was started by Wells Woodbridge Cooke. Cooke established a network of observers around North America to collect bird migration records. The Audubon Society's Christmas Bird Count, which began in 1900, is another example of a long-standing tradition of citizen science which has persisted to the present day.
- CS has been extended to the ocean environment for characterizing ocean dynamics and tracking marine debris. For example, the mobile app Marine Debris Tracker is a joint partnership of National Oceanic and Atmospheric Administration (NOAA) and the University of Georgia. Long term sampling efforts such as the continuous plankton recorder have been fitted on ships of opportunity since 1931. Plankton collection by sailors and subsequent genetic analysis was pioneered in 2013 by Indigo V Expeditions as a way to better understand marine microbial structure and function (Lauro et al., 2014).
- CS has recently developed in Coral reef studies. For example, the *Monitoring through many eyes* project collates thousands of underwater images of the Great Barrier Reef and provides an interface for elicitation of reef health indicators (Queensland Gov). Additionally, the National Oceanic and Atmospheric Administration offers opportunities for volunteer participation. By taking measurements in The United States' National Marine Sanctuaries, citizens are able to contribute data to a variety of marine biology projects. By enabling these citizens, NOAA benefited from 137.000 hours of research during 2016. (NOAA).
- CS has a long tradition in Natural Science; but nowadays, CS projects can also be found in various fields of science like Art history. The Zooniverse is home to the internet's largest, most popular and most successful citizen science projects. The Zooniverse and the suite of projects it contains is produced, maintained and developed by the Citizen Science Alliance (CSA). As of 14 February 2014, the Zooniverse community consisted of more than 1 million registered volunteers (Hall, 2014). The volunteers are often collectively referred to as "Zooites". The data collected from the various projects has led to the publication of more than 100 scientific papers. A daily news website called 'The Daily Zooniverse' provides information on the different projects under the Zooniverse umbrella, and has a presence on social media.

At the SciStarter website (scistarter.com) there are more than 1,100 active and searchable global citizen science projects.

According to a study carried out for the Finnish Environment Institute (Palacin-Silva et al., 2016), USA, UK and Canada are the leaders in citizen observatories and environmental citizen observatories in the world

(Figure 2-1). Within Europe, over 16 countries are actively involved running some type of environmental citizen observatory. United Kingdom is by far the most active country in this field with 38% of the total citizen observatories in the continent, followed by Ireland with 13% of observatories and, Spain, Switzerland and Denmark with 5% each.

Figure 2-1 Citizen Observatories' distribution by location and type¹



108 citizen observatories were identified worldwide (Palacin-Silva et al., 2016). According to their focus, they were classified into eight major domains and applications:

1. **City Management:** Grouped observatories that support decision makers managing city issues such as: transportation, bicycle routes, land usage, energy consumption, surroundings classification, environmental conditions, traffic and parking monitoring, citizen needs and perceptions.
2. **Species monitoring:** Involving single species monitoring projects: insects, bats, birds, butterflies, sea species and game animals.
3. **Water, streams, snow, sea:** Observatories that are collecting data about water quality, precipitation, streams, lakes, snow, ice and sea environments.
4. **Biodiversity monitoring:** Observatories that focus on monitoring biodiversity, flora, forests, mountains, biosphere and trees.
5. **Air and spectrum monitoring:** Observatories that gather data about air quality, noise, sounds and radiation.

¹ Source: Palacin-Silva et al., 2016

6. **Tools for citizen observatories:** Involving tools that are useful for creation or integration of citizen observatories, such as: configurable citizen observatories (plug and play tools), image classification components and sensors monitoring components.
7. **Global monitoring:** Astronomy and climate change observatories that monitor global trends.
8. **Disasters monitoring:** Observatories that are looking at earthquake monitoring and early detection.

The term Citizen Observatory (CO) is related to the concept of Citizen Science (CS), and was coined by the European Commission for community-based environmental monitoring and information systems, which build on innovative and novel Earth observation applications embedded in portable or mobile personal devices. This means that citizens can help and be engaged in a community for observing our environment. To raise awareness on these types of projects, a new web site has been started for European projects called Citizen Observatories (citizen-obs.eu) and the social media hashtag: #observe4earth. Currently this website lists four H2020 projects, one of which is Ground Truth 2.0. In addition, the EC launched the WeObserve project² at the end of 2017, to improve the coordination between existing COs and related citizen science activities, and to create a sustainable ecosystem of COs that can systematically address the identified challenges of awareness, acceptability and sustainability, and that help move citizen science into the mainstream. The project consortium brings together the H2020 COs of Ground Truth 2.0, GROW³, LandSense⁴, and Scent⁵.

Based on the above classification, the six demo cases of Ground Truth 2.0 have been evaluated; identifying case by case the possibilities to include other themes in the already developed citizen observatories. Looking at the topics covered each of the resulting GT2.0 COs, some of them focus on just one topic, while others can cover several themes:

- Meet Mee Mechelen CO, Belgium: Air quality monitoring + Noise monitoring + Urban Heat Stress (in Antwerp)
- Grip op Water Altena CO, The Netherlands: Disaster (flood) monitoring + local mitigation measures
- RitmeNatura.cat CO, Spain: Biodiversity + Species monitoring + Climate change
- VattenFokus CO, Sweden: Water quality monitoring
- Maasai Mara CO, Kenya: Biodiversity/wildlife monitoring and conservation + water resource information
- Zambian CBNRM CO, Zambia: Biodiversity/wildlife monitoring and conservation

It should be noted that since the last report (D3.1), the Zambian CO has been expanded from a regional system for the Silowana complex (called the NitiLuli CO) to a national system – the Zambian Community Based Natural Resources Management (CBNRM) CO. Also, a new CO has been started in Antwerp with the focus on urban heat stress.

² <https://www.weobserve.eu/>

³ <https://growobservatory.org/>

⁴ <https://landsense.eu/>

⁵ <https://scent-project.eu/>

2.2 General considerations for CO market analysis

There are general considerations when we talk about the market for citizen observatories that must be considered. In a CO context, the end-user (in marketing parlance) can also be a contributor and/or be part of the CO community (and thus part of the supply chain) and often there are communities of users, rather than individual users of the products/services.

Furthermore, the organizations involved in communities want to make a difference, rather than make a profit and there is less focus on competition and more on collaboration and opportunities for alliances. A huge emphasis is placed on enhanced communication, raising awareness of what the CO is trying to achieve.

It is also important to consider that the marketing concept of producing goods and services that closely meet user's needs, has been achieved upfront through the co-design process of CO specification.

Considering the CO context, both financial and social dimensions shall be studied in the market analysis. In terms of competition, it is unlikely that the GT2.0 COs will be faced with competition from other COs due to the lack of incumbent COs (in 2018), as well as the local geographical focus of the COs. However, competition could arise from a number of other sources:

- Other information sources or portals open to the public (incumbent or new ones).
- Competition for public funding and/or donations (also from the status quo).
- Competition for the time & effort from involved communities.
- Competition for citizen's free time.

The last two categories overlap to some extent as citizens form part of involved communities as well. However with the latter, we intend the broader group of citizens, who are not necessarily part of the communities, but who will contribute data to the CO by sending in observations or measurements.

2.3 Applied methodology

The market analysis includes an in-depth research of the market segments, added value, barriers and opportunities. It includes both qualitative and quantitative analysis.

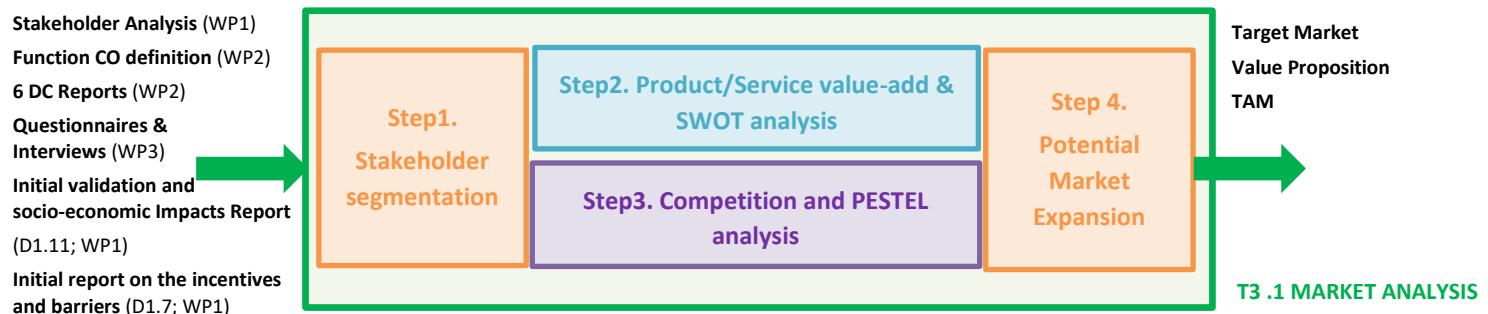
The total addressable market (TAM) is the total market demand for a product or service and usually is a term that helps to prioritize business opportunities by serving a quick metric of the underlying potential of a given opportunity (Blank and Dorf, 2012).

There are two approaches for market analysis and TAM estimation:

- The **Bottom-Up Approach** sizes a market using projections of individual clusters. It must first identify the customer segments it intends to reach, and then make estimations of their size and growth.
- The **Top-Down Approach** involves defining a “universe” target market and applying various filters that continually reduce the figure to an estimation of the “net” market.

The Ground Truth 2.0 project validates six specific Citizen Observatories, so in this case we will use the **Bottom-Up Approach**, using the obtained experiences and sizing the market with projections from these six case studies. Following the Bottom-Up Approach previously defined, the Market Analysis evaluated in Task 3.1 has been developed following four specific steps, as illustrated in Figure 2-1: (1) Stakeholder segmentation, (2) Product/Service value-add & SWOT analysis, (3) Competition and PESTEL analysis, (4) Potential Market Expansion.

Figure 2-2 Steps to develop a complete Market Analysis: Inputs & Outputs (self-creation, Starlab)

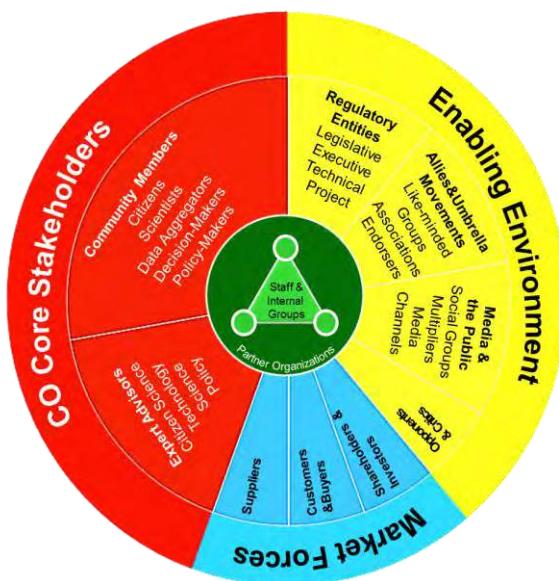


Step 1: Market/Stakeholder segmentation

The market can be segmented according to customer groups with common requirements, such that products/services can be tailored or customised to their particular requirements. The specific needs of the end-users, or in this case the core CO stakeholders, have been taken into account upfront as per the co-design process. However, the long-term sustainability of the COs will not only depend on these core stakeholders, but also on a wider range of stakeholders.

For this project, WP 1 developed an integrated analytical framework, drawing on a broad set of sources and analytical approaches to stakeholder analysis, social network analysis and knowledge network analysis. The resulting framework clusters the stakeholder groups into 10 main categories. Categories are based on the role of a stakeholder in the project, i.e. on the rationale and logic guiding their engagement (see Fig 2-3 below).

Figure 2-3 Diagram illustrating the GT2.0 stakeholder categories⁶.



⁶ Source: D1.1 Initial Stakeholder Analysis of the Demonstration Cases

For the market analysis we have to consider all the types of stakeholders. The core stakeholders have participated in the design of the COs according to the needs of their group or community – thus they are the key starting point for our ‘end-user’ needs analysis. The six specific demo cases have been reviewed in order to collect current needs (drivers why end-users are part of the community today) as well as their futures needs (motivation to continue being part of the community after the end of the project).

By definition, the Market Forces stakeholders – customers & buyers, suppliers, shareholders & investors - will be key for ensuring the long-term sustainability of the COs, and thus the market research will focus on these stakeholders in particular. The Enabling Environment stakeholders are important for market acceptance and uptake of the COs and will be reflected in the Strengths, Weaknesses, Opportunities and Threats (SWOT) and the Political, Economic, Social, Technological, Environmental and Legal (PESTEL) analyses.

Thus, for each of the COs, we will recap the stakeholder analysis from WP1, and ‘repackage’ it to be better aligned with the market analysis task. The information will be presented in tabular format (Annex I).

Step 2: Product/Service value-add & SWOT analysis

The key element of this phase is identification of outcomes of the COs (products/services) and clarification of the **Added Value** offered by these. Here we are building upon the work undertaken by WP1 – mainly the Incentives and Barriers analysis (D1.7 Initial report on incentives and barriers) and the Initial validation and socio-economic Impacts Report (D1.11), as well as the functional definition of the six citizen observatories (WP2).

As explained above, WP3 is following a non-profit model for sustainability of the CO platforms, and in line with this, we will identify the social value-add proposition of the COs in addition to any economic value-add.

To identify the value-add of each of the COs, we have used a combination of sources including:

- The incentives and barriers from D1.7 (May 2018).
- The responses of the demo teams to an initial market questionnaire at the occasion of the Stockholm plenary meeting in May 2017.
- Telephone interviews with the demo case leaders during the month of January 2018.
- Presentations on CO updates from demo case leaders throughout 2018 and 2019 at numerous GT2.0 plenary meeting, and subsequent discussions with them.
- Final verification through individual breakout discussions with demo case leaders and leaders of the GT2.0 tools, at the Plenary meeting in Delft at the beginning of June 2019.

This allowed us to identify not only the value-add but also to start compiling the SWOT (Strengths and Weaknesses of the suppliers, Opportunities and Threats offered by the market) analysis. Once again, the results of this analysis will be presented in tabular format (Annex I).

Step 3: Competition and PESTEL analysis

In this analysis the focus changes to the external market environment for the COs. We consider the competition/collaboration faced by the COs as well as any external market drivers (PESTEL -political, economic, social, technological, environmental and legal) that will impact the market uptake of the COs

and their outcomes. The latter factors can boost the market uptake, i.e. drive it positively (+), or inhibit market uptake, i.e. drive it negatively (-), or some factors are still to be determined as they depend on an, as yet unknown, outcome (\pm). The five main sources of competition identified above are used here. The outcomes will, for the most part, be subjective and thus we present the level of competition on a scale of low, medium or high. The results will be presented in tabular format as follows.

Table 2-1 Analysis of competitive factors

Competition from/for	Level of competition
Other COs	<i>Low/med/high</i>
Other public information sources and portals	<i>Low/med/high</i>
Public funding and donation sources	<i>Low/med/high</i>
Time & effort of involved communities	<i>Low/med/high</i>
Citizens' time	<i>Low/med/high</i>

Table 2-2 PESTEL analysis

Political	<i>Political factors are how the government intervenes in the economy</i>
Economic	<i>Economic factors include economic growth, interest growth, interest rates, exchange, access to affordable internet and the inflation rate. These factors greatly affect how businesses operate and make decisions</i>
Social	<i>Social factors include the cultural aspects and health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety</i>
Technological	<i>Technological factors include technological aspects like R&D activity, automation, technology incentives and the rate of technological change</i>
Environmental	<i>Environmental factors include ecological and environmental aspects such as weather, climate, and climate change, which may especially affect industries such as tourism, farming, and insurance</i>
Legal	<i>Legal factors include discrimination law, consumer law, antitrust law, employment law, and health and safety law</i>

Note that positive drivers will be indicated with '+', inhibitors with '-' and those with as yet unknown outcomes with ' \pm '.

Step 4: Potential Market Expansion

The final step in this market analysis is to better understand the current and potential market for the COs. Normally, this step would start with a quantitative estimation of the total addressable market (TAM) for the goods or services on offer, analysed per market segment. However, as explained in section 2.3, in this case trying to ring-fence the TAM for the COs does not really make sense. Our opinion is that it might be more informative to estimate the public outreach for each of the COs, although this approach still needs to be validated.

As part of the final sustainability roadmap for each of the COs (to be reported in D3.4 at the end of the project), WP3 will make recommendations regarding the market expansion possibilities for each of the COs beyond the end of the project. We will consider two axes of expansion: (1) **Thematically**, to include other environmental thematic areas and (2) **Geographically**, towards other regions, countries or continents.

Thematic expansion is possible within the COs as they have been initially developed with a limited number of environmental parameters in mind. Geographic expansion might prove more challenging for the six demo cases of GT 2.0, since the majority have (by design, or by co-design in this case) a local focus which the core stakeholders want to retain (as this is seen as a key advantage of the COs). Thus, rather than geographic expansion of the individual COs, we will need to consider geographic ‘repetition’ of the COs – i.e. a copy of the CO based in another city, region or country. This might not apply to the whole CO platform, but it should at least apply to the front-end of the CO platform – such that the user ‘sees’ (through the user interface) only a local system and data.

In the next chapters, the final market results for each of the demo cases/COs are presented.

2.3.1 Methodology for GT.0 outcomes/tools

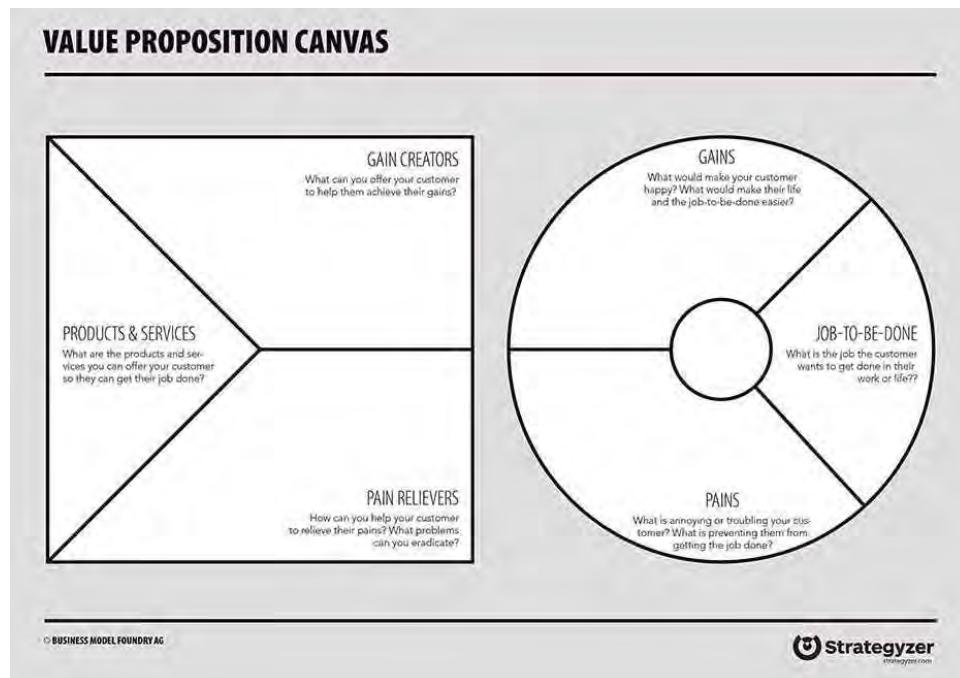
We adopted a similar approach for the market analysis of the GT 2.0 tools (LU mapper, Quality Tool and Co-design Methodology), as described in the section above, using a **Bottom-Up Approach**, based on the obtained experiences and discussions on the sizing of the market with the development teams. The starting point was the same for the COs – the value proposition methodology and canvas from Strategyzer⁷, shown in the figure below. The development teams also completed a questionnaire (included Annex IV), but this was slightly different from that for the COs, as these are commercially exploitable products. The questionnaire responses are presented in the new chapters of this report (chapters 9-11), mostly in tabular format (illustrated below).

The outcomes of this analysis is likewise presented in four steps (1) Stakeholder segmentation, pains & gains (2) product/service value-add & SWOT analysis, (3) competition and PESTEL analysis, (4) potential market expansion.

The key aspect of this approach is the identification of the value add or benefits that the customers will gain, which is further detailed in the gains and pain relief analysis. This is the same for the CO and the GT2.0 products, as is the SWOT analysis. However, the competitor analysis is more straightforward for the products since it only has to consider the availability and pricing of similar products, as per standard market analyses. Finally the total addressable market (TAM, i.e. total number of potential customers) for these products is estimated – also a simpler exercise compared to that of the COs. In the case of the GT2.0 products, the challenge lay in the best identification of the potential customer groups. Moving from market analysis to exploitation options, the standard business model canvas was applied to these products – as is reflected in deliverable D3.3 (Business models).

⁷ www.strategyzer.com

Figure 2-4 Diagram illustrating the Value Proposition Canvas methodology.



3 Belgium Demo Case - Meet Mee Mechelen CO

In this section, we present the market research results for the CO Meet Mee Mechelen, based on information collected up to the end of May 2019.

1.1 CO recap

The Meet Mee Mechelen citizen observatory was launched in the city of Mechelen, Belgium, with a focus on air quality and noise.

The CO was a fresh opportunity to start a constructive collaboration between volunteers, many from environmental action groups, the city of Mechelen, and environmental experts. The constructive dialogue is a first output. The main focus of the observatory in the first two years has been to monitor air quality at a variety of locations in the city throughout the year. The CO offered expert guidance in setting up measurements campaign and links to other initiative. In addition to collecting data, sharing the data, providing analyses and scientific context, the CO has provided the start for knowledge exchange between the stakeholder parties. Currently, the focus of the CO shifts from data collection to supporting actions to improve air quality. Activities related to noise are being initiated with similar goals, namely a constructive dialogue, and, if necessary, additional monitoring and knowledge exchange to support local action.

The CO members can be defined by three groups:

- Firstly, volunteers who joined either individually or representing an environmental action group or neighbourhood committee.
- Secondly, the city of Mechelen, represented by the Alderman for Environment (elected politician part of the team in the city hall) and the environmental administration. Additionally, a representative from the regional (Flemish) environmental administration joins the CO.
- Thirdly, environmental experts joined the CO, mostly from the Ground Truth 2.0 consortium, some independent experts (local scientific education centre Technopolis).

The most important outputs of the CO so far are the results of the air quality measurements campaigns and the analysis of those results, the increased media and public interest in air quality to make it one of the priorities during the local elections, and the joint actions by volunteers and city officials to improve air quality.

The Meet Mee Mechelen platform was launched in late 2017 and can be visited at <https://mechelen.meetmee.be>. The results of their 4 air quality measurement campaigns (in 2017 and 2018) are visible, as well as a noise measurement data from 2015. A small noise measurement campaign will be organised in the summer of 2019.

1.2 Stakeholder segmentation

Table 3-1 The Meet Mee Mechelen core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	Leefmilieugroep Mechelen-Zuid (Environmental Action Group for Mechelen South)	Better living/mobility environment in Mechelen

		Sustainable community through which they can have a say in urban planning and policy making
	Nekkerspoel neighbourhood community (suburb of Mechelen)	Better living/mobility environment in Mechelen Sustainable community through which they can have a say in urban planning and policy making
	Cycling federation (Fietsersbond)	Better environment for cycling in the city
DATA AGGREGATORS	VITO - Flemish Institute for technological research (group on air quality)	Complement their current commercial AIRQMap.com product with data collected by citizens/crowdsourcing Gain experience in citizen science projects (as scientific advisors to Flemish Gov.) Access to new customers
	Akvo – providing technical tools and apps	Increase commercial opportunities through showcasing their tools and apps
	TYGRON- providing technical tool	Increase commercial opportunities and experiment with different context in other countries through showcasing Tygron engine
POLICY MAKERS	Municipality of Mechelen	Better signalling of problems areas (for air quality and noise) Improved involvement of citizen groups Less civil frustration Reduced miscommunication between municipality and citizens

Table 3-2 Identification of Meet Mee Mechelen 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	VITO	
	AKVO	
	Citizens of Mechelen	Suppliers of observations
CUSTOMERS/BUYERS	Mechelen municipality/local council	
POSSIBLE SHAREHOLDERS & INVESTORS	LNE (Flemish Dept for Environment, Nature and Energy)	LNE offers local authorities subsidies for the implementation of local measures to improve local environmental Quality of Life (QoL)
	Flanders Environment Agency (VMM - Vlaamse Milieumaatschappij)	Within the remit of this Agency that works towards a better environment in Flanders regarding water, air and the environment

	Belgian Interregional Environment Agency (IRCEL)	Complementary data for their ambient air quality reporting throughout Belgium -IRCELline (using a network of static sensors)
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1.3 Product/Service value-add and SWOT analysis

Table 3-3 Incentives (taken from D1.7) for Meet Mee Mechelen

Citizens	Data Aggregators	Policy Makers
Opportunity to expand the existing database of air quality and noise measurements & create good & reliable data	Akvo: Business improvement and how to use their technical tools for citizen science projects	Localization of the environmental hotspots in the city and consequently take more targeted measures to address them.
Provide basis for evidence-based sound policies		Channel for government agencies to share their reports with citizens.



Table 3-4 Value-add, Opportunities and Strengths for Meet Mee Mechelen

Financial Value –add	Social Value-add	Opportunities	Strengths
More data will be available to citizens and policy makers for 'free' (limited additional costs)	Citizens will have additional information (better overview) on air quality and noise for better quality of mobility	Localization of the environmental hotspots in the city and consequently municipality can take more targeted measures	Data on air quality and noise will be more reliable
Cost savings by municipalities by targeting measures in most 'problematic' zones (rather than across the whole city)	Improved citizen participation in municipal/local gov. urban planning, and hence less civil frustration	Akvo: Improved business based on 'show-casing' their technical tools for citizen science projects	CO will provide basis for evidence-based sound policies on mobility (cycling paths, transport circulation)
Fewer illnesses (and hence lower costs for national health system) due to improved air quality	Improved environmental conditions/EQL for citizens of Mechelen	Mechelen municipality could obtain funds from the LNE (Flemish Dept for Environment, Nature and Energy) to implement Meet Mee Mechelen (as it falls under local measures to improve local environment)	CO offers improved communication between government agencies and citizens
		VITO: Access to new customers and gain experience in citizen science	VITO has in-depth experience in the field of air quality monitoring

Table 3-5 Barriers (taken from D1.7) for Meet Mee Mechelen

Citizens	Data Aggregators	Policy Makers
Connection of VITO to the Flemish Administration (VITO is an independent research centre but is owned and funded by the Flemish government).	n/a	Lack of resources: time, money
Noise perception is subjective and thus hard to quantify in ways that makes sense to the citizens		
Lack of resources (time and finance)		



Table 3-6 Threats and weaknesses for Meet Mee Mechelen

Threats	Weaknesses
Lack of resources on part of citizens and local governments to participate and fund the CO.	Lack of independent monitoring - VITO is an independent research centre but is owned and funded by the Flemish government, and thus might be perceived to have a hidden agenda
LNE need to be convinced about the value of the CO to citizens before they will consider funding it	Noise perception is subjective

1.4 Competition and PESTEL

Table 3-7 Analysis of competitive factors for Meet Mee Mechelen

Competition from/for	Level of competition	Comments
Other Cos	low	
Other public information sources and portals	med	VITO's AIRQMap.com service, but its country-wide resolution is much lower than in Meet Mee Mechelen
Public funding and donation sources	high	

Time & effort of involved communities	high	
Citizens' time	med	

Table 3-8 PESTEL analysis for Meet Mee Mechelen

Political	+ National and regional governments are prioritising EQL issues for their citizens ± A change of government in Belgium might impact these priorities
Economic	- A drop in economic growth in Flanders/Belgium will impact political willingness to fund such initiatives
Social	+ Pressure from citizens to access information on EQL and to improve EQL + Citizens and local governments want improved channels of communication for public consultation
Technological	+ Improved reliability of low-cost sensors will boost uptake
Environmental	+ Increasing awareness of the health impact of noise pollution and air quality (action becomes more urgent)
Legal	± No changes foreseen re public consultation

1.5 Potential Market Expansion

Table 3-9 Up scaling potential for Meet Mee Mechelen

Stakeholder groups		Comment
Policy & decision makers	Antwerp municipality	A second CO in Sint-Andries, a district of Antwerp, is being realised for monitoring and actions taken regarding heat stress. The latter is linked to the climate adaptation plans and Smartzone projects in the city of Antwerp.
	Other cities in Flanders (Ghent, Brugge, etc.)	Where the citizens are concerned by air or noise pollution, or heat stress in the urban areas.
NGOs and citizen-led groups	Better Environment Flanders (Bond Beter Leefmilieu Vlaanderen)	Social pressure in favour of participation in the CO
	Contact Nature (Natuurpunt)	
	Climate Robust Sint Andries, citizen organisation	They strive to improve the living quality in the quarter for everyone and were very interested in the data gathering around Heat stress and dialogue with broad range of stakeholders in the quarter. They are now an active part of the CO in Antwerp.

Local advisory boards	Cultuurraad	
	Milieuraad	
	Wijkraad	
	Battel	
Scientists/data aggregators	Experts from other research organizations	Social pressure in favour of participation in the CO. They are also involved in linked projects where co-creation with stakeholders becomes more and more important.
	Universities or Environmental Experts	

Table 3-10 Thematic expansion for Meet Mee Mechelen

Additional thematic area	Likelihood	Comment
Heat stress in urban areas	high	A CO concerning heat stress is being realised in Antwerp. Mechelen could also be interested in monitoring heat stress.
Water quality	low	The local municipality of Mechelen is not responsible for this issue
Mapping/planning of green areas	medium	The local municipality of Mechelen is already taking care of this under other initiatives The local municipality of Antwerp is very interested in gathering information on greening private gardens. In Sint-Andries this corresponds to the mapping of cool areas within the neighbourhood.

Table 3-11 Geographic expansion for Meet Mee Mechelen

Additional geographic area	Likelihood	Comment
Antwerp	high	A CO for heat stress in Antwerp is realised.
Other Belgian Cities	medium	These cities are all developing climate adaptation plans . Also air quality is high on the agenda of policy makers as well as citizens in these cities.

Amsterdam	high	Local government is already talking about route planning for urban cycling and walking paths
EU countries with citizens that are concerned about poor air quality: Italy, Hungary, Romania, Greece ⁸ (Flash EuroBarometer 360)	uncertain	Also require citizen activist groups (in cities) that want to become involved and participate
Poland, Czech Rep, Slovakia and maybe in future Romania, Bulgaria		Countries that have serious air quality problems but currently lack air quality experts, however public interest is lower in these countries

Table 3-12 TAM estimates for Meet Mee Mechelen (in terms of citizen outreach)

Country	Region/City	Total number of citizens	Estimated active users of Meet Mee Mechelen
Belgium	Mechelen	85,665 (2017)	1,000 ⁹ (1.2 %)
Belgium	Antwerp	City – 520,504 (2017) Greater metropolitan area - 1.2 million	8,328
Belgium	Brugge	City – 118,187 (2017)	1,890
Belgium	Gent	City – 259,038 (2017)	4,115
Netherlands	Amsterdam	City – 851,573 (2017) Greater metropolitan area - 2.4 million	13,625

1.6 Conclusions

Meet Mee Mechelen shows strong market opportunities and supplier strengths, and limited market threats and weaknesses. Short-term financial value-add is expected from cost savings from obtaining additional citizen data (on air quality and noise) at lower costs, as well as municipal savings from being able to specifically target pollution hotspots. The social value-add is also significant and comes from Meet Mee Mechelen being a new communication channel between local government and the citizens, and that

⁸ above 70% of population think that their air quality has deteriorated over the last 20 years

⁹ personal communication from demo case leader S. Vranckx

it will enable citizens to be involved in municipal decision-making on issues related to EQL, noise levels and bicycle mobility.

It is most likely that the Meet Mee Mechelen CO will achieve sustainability through a non-profit business model based on a strong social value proposition, with the municipality owning/hosting and financially supporting the operations of the CO. Note that the suppliers (VITO and Akvo) are expecting commercial returns for operating and maintaining the CO platform, tools and apps.

The first geographical expansion to the Flemish city of Antwerp is realised. A CO for monitoring heat stress in the city was created in 2019. The development the CO followed a similar process than that in Mechelen, took the lessons learned in Mechelen, so that the team could compress the process into a shorter time scale. Also, the developed apps, can be used in both cities and the platform design of MeetMeeMechelen can be transferred to Antwerp. Ideally, Mechelen could also be interested in the monitoring of temperatures in most densely populated areas. In this way, these two COs could further develop synergistically.

The number of citizens that are expected to actively use the CO platform (contributing with measurements, but also consulting the results) is currently rather low in number but could reach thousands for a city like Antwerp. The number of citizens participating has to be sufficient to persuade the municipality and the LNE that such COs serve a public good, with strong public good value, and therefore that the COs are worth funding. The biggest market challenge for Meet Mee Mechelen lies in the competition they face for government funding. On the positive side, the LNE is looking to support local initiatives that will improve the EQL for citizens, and once the Meet Mee Mechelen and Antwerp COs are operational, they will show convincing outcomes to gain funding from the public sector.

2 Spanish Demo Case – RitmeNatura.cat CO

In this chapter, we present the market research results for the CO RitmeNatura.cat, based on information collected up to the end of May 2019.

2.1 CO recap

RitmeNatura.cat offers a platform to collect and store phenological data, in particular observations collected by citizens. It makes the phenological data accessible in real time. It includes information collected on the phenology of a specific list of plants, birds and butterflies. In practical terms the RitmeNatura platform is formed by two distinct assets:

- The RitmeNatura website which explains the observatory, how it was set up and contains observation guides for the objective species and other documents of interest. In addition to this it includes a link to the second part of the observatory which is the RitmeNatura project on the Natusfera platform.
- The RitmeNatura project on the Natusfera platform has 2 different sub projects that observations can be added to: the recurrent and occasional observations. The recurrent observations are those that are done continuously throughout the year for a specific individual of one of the species of interest, while the occasional ones are open to report on any phenological state of any species of plant or animal. The mindframe behind the recurrent observations is that they will help an observer very similar to the very engaged observers of Fenocat (which report to the Servei Meteorològic of Catalunya). In a way, it will be the entry point for an observer to become so engaged that he/she would like to go on to being a fully-fledged Fenocat observer directly to Meteocat. Another possibility is that the recurrent observation project could become the way to digitize the work that the existing Fenocat observers use, since they now report using a simple system of filling in and emailing a spreadsheet to Meteocat.

The core group of CO member is formed mainly of professionals related to the fields of phenology, meteorology, protected area conservation, climate change and education. These are all people that have a relation to phenology and climate change because of their profession and they come from a variety of institutions (regional government, executive agencies, scientific institutions, NGOs, etc).

After the co-design sessions were done, the core group of individuals that have remained in the co-design group are: the representatives of Meteocat (or Servei Meteorològic de Catalunya), Diputació de Barcelona, CREAf (who is also a member of the GT2.0 consortium) and Natusfera.

Phenology is the study of (the timing of) recurring life cycle events. This includes both animals and plants alike. Plant phenology studies when plants leaf out, when they drop their leaves or when other life cycle events happen; flowering, shoot elongation, needle drop, etc. This is different to the study of biodiversity and, in fact, can be seen as a derivative of biodiversity. Importantly, the phenology of certain species is also tightly coupled to temperature and therefore can be a proxy to understanding the effects of our changing climate.

By making the phenology data accessible, the CO provides a new stream of (previously non-existent) data on biodiversity for policy makers, providing them with better information for planning and management. And last but not least, collecting the data over a longer period, will hopefully create potential for data exploitation and reuse for scientific and research purposes.

The RitmeNatura.cat CO can be visited at <http://ritmenatura.cat/>.

2.2 Stakeholder segmentation

Table 4-1 The RitmeNatura.cat core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	The involved data aggregators provide access to existing communities of citizen scientists.	(thus, for this demo case, citizens are represented through existing communities of data aggregators)
DATA AGGREGATORS	CREAF	
	Natusfera	
	FENOCAT (Part of Meteocat)	Continuous data collection for climate change impact analysis and expansion of monitoring community
POLICY MAKERS	Oficina Catalana del Canvi Climàtic	Improved monitoring (more data inputs) and geographical coverage of phenological observations Improved data quality
	Provincial Council of Barcelona (Diputació de Barcelona)	Information on the local impact of climate change on nature and its rhythms in Catalonia, to contribute to better adaptation policies

Table 3-2 Identification of the RitmeNatura 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	CREAF	CREAF and FENOCAT will finance and maintain the CO
	Natusfera platform	Open portal of information on Spanish biodiversity based on US's iNaturalist (community for observing nature). The RitmeNatura observations are uploaded and hosted on the Natusfera platform.
	FENOCAT	The Fenocat community is a subsection of the MeteoCat and its core group of weather enthusiasts/observers. The community is composed of 50 highly committed citizen scientists observing particular individual plants and animals (mostly migrating) along the year to provide their phenological states several days per week all year round. It is possible that Fenocat will end up sharing historical data with RitmeNatura.

CUSTOMERS/BUYERS	Provincial Council of Barcelona (Diputació de Barcelona)	They manage a large extension of protected areas in the province of Barcelona. They are in the process of setting up phenological monitoring activities among their forestry agents so that these activities are part of their day-to-day responsibilities and help them in decision making in the future.
	MeteoCat - the meteorological agency of Catalonia	Meteocat and CREAF will likely lead and maintain the CO in the long run.
	Oficina Catalana de Canvi Climàtic (department belonging to the regional government)	These are the main policy makers on climate change mitigation and adaptation.
POSSIBLE SHAREHOLDERS & INVESTORS	Catalan biodiversity monitoring agency (non-existent yet so exact name is unknown)	This is an agency that is expected to be created in the coming years. It is expected it will need new reliable streams of data to plan adaptation policies to climate change and phenology data produced by RitmeNatura could be one of these streams. They could potentially finance RitmeNatura's activities as it provides them data that they need for monitoring biodiversity.

2.3 Product/service value-add and SWOT analysis

Table 4-3 Incentives (taken from D1.7) for RitmeNatura.cat

Citizens	Data Aggregators	Policy Makers
The involved data aggregators provide access to existing communities of citizen scientists. This is why, for this demo case, citizens are represented through existing communities of data aggregators.	New partnerships that could result in new business opportunities	More efficient use of public resources if CO can help improve territorial management and planning policies
	Higher visibility of their respective organizations	Better defined adaptation policies to climate change
	Opportunity to increase existing base of participants and attract more users	Citizen-friendly reputation of their respective organizations
	The use of new tech offered by the CO can improve the functionalities of their own platforms	
	Gain access to additional data sets	

	Improving the quality of own data sets by validating it with data from other sources	
	Availability and accessibility to more data as an opportunity to expand scientific research in relevant fields	
	Economic benefits (financial savings) from task sharing with similar projects	



Table 4-4 Value-add, Opportunities and Strengths for RitmeNatura.cat

Financial Value –add	Social Value-add	Opportunities	Strengths
Economic benefits (financial savings) from task sharing with similar projects	Providing citizens with feedback on public policies as well as educating the citizen about local environmental issues.	If a critical number of users can be attracted to CO, then this could justify further public funding	Data quality will be improved by validation of data from various sources
Increased visibility of the organizations involved	Be part of a community sharing the same concerns.	Opportunity to increase existing base of participants and to attract more users	
Additional data at no extra cost	See by themselves the effects of climate change, and communicate it in this way.	The use of new tech offered by the CO can improve the functionalities of existing platforms	
More efficient use of public resources if CO can help improve territorial management and planning policies		Expand scientific research in relevant fields due to more data being available	
New business opportunities for CREAF		The future Catalan biodiversity monitoring agency will need relevant data streams for make informed decisions	

Table 4-5 Barriers (taken from D1.7) for RitmeNatura.cat

Citizens	Data Aggregators	Policy Makers
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The involved data aggregators provide access to existing communities of citizen scientists. This is why, for this demo case, citizens are represented through existing communities of data aggregators.	Existing initiatives/platforms will lose their own identity due to joining a unified platform	Loss of effort and unjustified use of public funds if results are not applied to decision making
	Concerns that CO may not be sustainable after GT 2.0 project	
	Technical difficulties in data processing and aggregation	
	Lack of support from politicians	
	Lack of resources	



Table 4-6 Threats and weaknesses for RitmeNatura.cat

Threats	Weaknesses
Existing initiatives/platforms (like Fenocat) could lose their own identity due to joining a unified platform	The phenological monitoring community is currently small (50 persons)
Lack of resources on the part of the data aggregators	Concerns that CO may not be sustainable after GT 2.0 project
	Relies on support from politicians
	Technical difficulties in data processing and aggregation

2.4 Competition and PESTEL

Table 4-7 Analysis of competitive factors for RitmeNatura.cat

Competition from/for	Level of competition
Other COs	med
Other public information sources and portals	high
Public funding and donation sources	high
Time & effort of involved communities	high
Citizens' time	med

Table 4-8 PESTEL analysis for RitmeNatura.cat

Political	+ Strong commitment from current government re climate change adaptation policies, which will boost uptake of the RitmeNatura.cat CO ± Change of government in forthcoming elections, with potential policy review (on biodiversity) might undermine uptake of CO + Establishment of a new Catalan biodiversity monitoring agency
Economic	- The different levels of administration compete for government funding
Social	+ Inclusion of phenological aspects in the education curricula will increase public pressure to monitor
Technological	+ Improved 3G coverage in remote areas will improve data collection
Environmental	+ Increased severity of climate change over the next few years will increase the use of RitmeNatura.cat
Legal	+ A revision of the climate change mitigation laws is likely to impact the CO favourably

2.5 Potential Market Expansion

Table 4-9 Up scaling potential for RitmeNatura.cat

Stakeholder groups		Comment
CITIZENS	Agricultural sector	To be included as data collectors
	Secondary schools	To be included as data collectors
	Rural agents of the Diputació de Barcelona	By virtue of the METEOCAT-Diputació agreement.
DATA AGGREGATORS	Institut Català d'Ornitologia ICO	
	New biodiversity monitoring agency	
	Rural agents of the Diputació de Barcelona (Provincial Council of Barcelona)	By virtue of the METEOCAT-Diputació agreement.

Table 4-10 Thematic expansion for RitmeNatura.cat

Additional thematic area	Likelihood	Comment
Biodiversity	High	

Table 4-11 Geographic expansion for RitmeNatura.cat

Additional geographic area	Likelihood	Comment
No expansion expected at this stage		

Table 4-12 TAM estimates for RitmeNatura.cat (in terms of citizen outreach)

Country	Region/City	Total number of citizens	Likely outreach of RitmeNatura CO
Spain	Catalonia	7.523 million (2016)	# Active participants in: FENOCAT = 50 Natusfera = 2000

2.6 Conclusions

The visible signs of climate change and how it affects the environment in Catalonia is being addressed in existing communities. Most of them, like ICO, ICHN or CBMS are more focused on general biodiversity issues and one, Fenocat, more focused on phenology. However, this community is composed of a specific group of amateur scientists and the technology used to compile, store, and link the data obtained is not optimized, as they carry out occasional observations. The RitmeNatura.cat CO has taken benefit of the existing communities and included data from these which could lead to an opportunity to attract more users, improve functionalities of existing platforms and increase visibility of involved organizations.

The analysis of the CO at this stage has identified two key requirements: (1) define a clear governance of the CO, is a general comment obtained through the co-design sessions with the stakeholders; (2) involve a critical mass of citizens to demonstrate the concern of the region on this global issue with local consequences.

There are plans to establish a Catalan biodiversity monitoring agency within the next few years. The expectation is that this agency will need new reliable streams of data to plan adaptation policies to climate change. The phenology data produced by RitmeNatura could be one of these streams. Thus, they could potentially finance, or at least contribute to the maintenance of RitmeNatura's activities. In the meantime, the continuation of the RitmeNatura CO is guaranteed by the joint financing and maintenance by CREAF and FENOCAT.

3 Kenyan Demo Case - Maasai Mara CO

In this chapter, we present the market research results for the Maasai Mara CO, based on information collected up to the end of May 2019.

1.1 CO recap

In the Maasai Mara CO many parties work together to report human/wildlife conflicts in the Mara ecosystem. The Maasai Mara CO provides a monitoring system for biodiversity, livestock and crop, land and water resources, and climate. The platform is used to promote practices that create balance between livelihoods and biodiversity in the Mara ecosystem. Data, information and knowledge can be generated and shared between citizens, practitioners, researchers and policymakers for informed policies and policy implementation.

The CO-members are a group consisting of the County Government, participating villagers and Maasai pastoralists, wildlife organizations and research organizations.

By collecting and sharing data, information and knowledge, the service aims for improved decision making with a holistic view on balance between biodiversity and livelihoods. This improves natural resource management in the area, and reduces the human/wildlife conflicts. It is a repository for information on:

- Land use and land cover maps (incl. location of fences)
- Livestock, crops and water resources
- Weather forecasts
- Observations of wildlife, flora, conflicts, flood events
- Advice for pastoralists

The Maasai Mara CO platform was launched in June 2018 and can be found at website mara.info.ke. Some modules from the MaMaSe tool (mamase.org) have been included, e.g the Maris¹⁰ database (that includes information on livestock pricing, as well as low cost sensor data on weather and water levels). The MaMaSe project developed a geoportal for improving water safety and security in the Mara River Basin.

1.2 Stakeholder segmentation

Table 5-1 The Maasai Mara CO core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	Villagers, Maasai pastoralists	Reduction of conflict between pastoralists and wildlife tourism To find best grazing opportunities For a share of revenues from tourism to reach them
	Maasai Mara Wildlife Conservancies Association (MMWCA)	Wildlife conservation and/or sustainable livestock rearing in conservancy areas

¹⁰ Maris is the database from the MaMaSe project that includes grazing opportunities, or lack of grazing

	Friends of Maasai Mara organization (FoMM)	Wildlife conservation through community engagement, action, education
	Ole Tipis Girls Secondary School	Getting access to weather data
DATA AGGREGATORS	Upande	Business development for bespoke services
	TAMHO	
	Maasai Mara University	Access to new technology and tools for data collection
	National Museums of Kenya	More data
	African Conservation Centre	Data for sustainable management
POLICY MAKERS	Narok County Government	Digitisation of paper records (of events) held by the county Expressed interest in hosting the platform
	Kenya Wildlife Services	Easier access to information

Table 5-2 Identification of the Maasai Mara CO 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	Upande	
	Narok County Government	
	Kenya Wildlife Services (KWS)	The KWS rangers may participate in data collection if a data policy can be agreed with the CO
	Tour operators, lodges	Gamification of data collection, wildlife spotting
	Local MMWCA conservation organizations	Rangers will contribute to observations
	Pastoralists	Some will contribute to observations
CUSTOMERS/BUYERS	Narok County Government	They have a budget for building GIS tools
	Lodges	Lodges could pay for access for their clients (tourists)
	Conservancies	Beneficiaries of Maris, developed for them by MaMaSe (which has come to an end)
POSSIBLE SHAREHOLDERS & INVESTORS	Maasai Mara University, National Museums of Kenya, MMWCA	in-kind contributions
	Philanthropists, foundations, or aid organisations	By means of donations
	National gov. agencies, such as NEMA (National Environmental Management Authority), KWS	

1.3 Product/Service value-add and SWOT analysis

Table 5-3 Incentives (taken from D1.7) for Maasai Mara CO

Citizens	Data Aggregators	Policy Makers
Gain access to information through the CO that can support their core activities (e.g. pastoralists)	Public awareness creation about the local environmental issues	Gain access to datasets through the CO that they need for their organisations core functions
MMWCA can expand their reach (collection of data on wildlife sightings, poaching and human-wildlife conflicts) to other conservancies	Gain access to datasets through the CO that can support their core activities (i.e. National Museums of Kenya, African Conservation Center)	Provide evidence to solicit donations
FoMM: helping communities understand their rights and give them voice	Access to new technology and tools for data collection (i.e. Maasai Mara University)	Improving service delivery to the citizens
Learning opportunities (at schools)		Engage citizens in wildlife conservation, water conservation and climate change
Reporting of incidents coupled with faster reaction by authorities		Communication and collaboration opportunities



Table 5-4 Value-add, Opportunities and Strengths for Maasai Mara CO

Financial Value –add	Social Value-add	Opportunities	Strengths
Museums and all stakeholders have access to new, ‘free’ data	Improved balance between livelihoods and biodiversity	Tour operators/lodges – ‘gamification’ of data collection, supporting corporate social responsibilities, spotting of wildlife ‘assets’ close by	An integrated system based on existing open tools, and that uses open data standards
Pastoralists will have information on best grazing opportunities and market prices for their livestock	Joint decision making between communities and government for sustainable management of environment and tourism	Reduction of conflict between pastoralists and wildlife tourism through actionable data	FoMM: helping communities understand their rights and give them voice
Cost savings by county administrations through a more efficient way of working	Better informed planning, policy development and implementation on the part of national gov. agencies	The Narok County has a budget set aside for GIS tools and very much needs data for better decision making	Improving service delivery to the citizens
Free data and tools for the Narok County for sustainable management	Transparency and accountability of governmental decisions	MMWCA can expand their reach (collection of data on wildlife sightings,	Engage citizens in wildlife conservation, water

of environment and tourism		poaching and human-wildlife conflicts) to other conservancies	conservation and climate change
Access to new technology and tools for data collection (i.e. Maasai Mara University)	Creates a channel for communication and collaboration	Will offer learning opportunities to schools	
		Easier reporting of incidents coupled with faster reaction by authorities	
		Radio is a good means of bringing information to the people	

Table 5-5 Barriers (taken from D1.7) for Maasai Mara CO

Citizens	Data Aggregators	Policy Makers
Concern about possible inaccuracies or biases in data collection	Timeliness of data availability	Quality of data collected by citizens: possible implication of relying on unverified data as basis for policy and decision-making
Low internet connectivity in the area (required to provide offline functionalities), mobile data costs prohibitive and low level of public access to smartphones	Mechanism of hand over of CO to local owner is still unclear	Possibility of losing their ownership of shared datasets
Complexity of technical tools (low general level of public literacy)	Concern about long term sustainability, who is willing to support, help verify data, without being paid.	Possibility of data being misused by others (i.e. hunters) or being used for financial gains --> need of regulations to control the data and material shared on the platform
Lack of community to support the initiative as a whole. Strong mindset that even reporting conflicts is going to add to their costs, as compensation isn't coming anyways	Lack of skilled staff	Possibility of government regulations and internal procedures that might prohibit sharing data or using data from certain sources.
Lack of logistical support to attend the co-design workshops	Needed technical tools	A repository of data collected from diverse and currently 'scattered' sources
Citizens who spend their free time and make costs collecting free data is not a common concept.	Time pressure	
	Budget constraints	
	Lack of logistic support	



Table 5-6 Threats and weaknesses for Maasai Mara CO

Threats	Weaknesses
All public organisations in Kenya suffer from lack of financial resources	Data contributors (e.g. supplying livestock prices) have to be paid. Very few people are willing to collect data for free, still much awareness raising needed on why they would want to do so.
Stakeholders are reluctant to be involved. There is a strong culture of people attending workshops because of allowances being paid.	Poor understanding of environmental issues at county level - on pollution, species extinction, unsustainable practises
Mobile phone coverage in the Maasai Mara area is patchy	Illiteracy among the pastoralists
Complexity of tools and apps	Budget constraints on part of data aggregators
Lack of skilled staff	Uncertain long-term sustainability
Government orgs are not interested in information transparency	Poor quality of data collected by citizens
Possibility of data being misused by others (i.e. hunters) or being used for financial gains --> need of regulations to control the data and material shared on the platform	
Narok County is reluctant to lose ownership of shared datasets	
Government regulations and internal procedures that might prohibit sharing of data or using data from certain sources (data is power)	

1.4 Competition and PESTEL

Table 5-7 Analysis of competitive factors for Maasai Mara CO

Competition from/for	Level of competition
Other COs	low
Other public information sources and portals	low
Public funding and donation sources	high
Time & effort of involved communities	med
Citizens' time	med

Table 5-8 PESTEL analysis for Maasai Mara CO

Political	+ After recent elections, the members of Narok County changed. The team has successfully brought the new members of the County up to speed on the Maasai Mara CO thanks also to support from FoMM and MMU.
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Economic	+ Decision-making is devolved, and county governments are responsible for improving economic development in the regions. - There isn't a culture of voluntary data collection and personal budgets refrain people from embracing such concepts
Social	- Illiteracy will limit outreach of CO
Technological	- Poor GSM connectivity in rural areas + Access to data and information is limited currently
Environmental	+ Climate change and less predictable rain, coupled with overgrazing and deforestation has recently had a big impact on livestock numbers, flooding, destroyed bridges and water availability for farming
Legal	+ Data policy regarding data collection and ownership for the CO is close to being finalised

1.5 Potential Market Expansion

The Kenya Demo Case team has communicated that the tourist lodges and camps have not, to date, been involved as stakeholders. However, they have been engaged and the team's view is that this sector represents a strong customer base for the CO, and that they are likely to pay for access to the CO platform and for their clients to take part in wildlife spotting games (and thus add to the data collection). They have an interest in hosting the low cost weather stations.

Table 5-9 Up scaling potential for Maasai Mara CO

Stakeholder groups		Comment
NGOs and citizen-led groups	Tourism partners i.e. camps and lodges	A promising business model to support the CO
	Base Camp Foundation Kenya	
Policy and decision makers	Department of Agriculture	Sources of social pressure in favour of participation in the CO
	Disaster management department	
	Tour operators	
	Mara elephant project	
Scientists/data aggregators	ILEPA (Indigenous Livelihoods Enhancement Partners)	
	South Rift Land Owners Association (SORALO)	

Table 5-10 Thematic expansion for Maasai Mara CO

Additional thematic area	Likelihood	Comment
Weather observations and forecasts	high	From TAHMO portal (already included in the CO)

Livestock prices	high	From MaMaSe portal (already included in the CO)
Water resources and water levels	high	From MaMaSe portal (already included in the CO)
Climate information	low	

Table 5-11 Geographic expansion for Maasai Mara CO

Additional geographic area	Likelihood	Comment
Kajiado county, including the Amboseli National Park	low	Some partners already work with Amboseli NP
Samburu county with Samburu National Park	med	

The web address of the Maasai Mara CO has been chosen as mara.info.ke, thus geographic expansion to other national parks, will require ‘repetition’ of the platform/portal, e.g. amboseli.info.ke and samburu.info.ke.

Table 5-12 TAM estimates for Maasai Mara (in terms of citizen and tourist outreach)

Country	Region/City	Total number of citizens	Likely outreach of Maasai Mara CO
Kenya	Narok County (Maasai Mara National Reserve) (17,921 km ²)	Population: 850,920 (2009) Lodges: 110 lodges Tourists per annum: 146,900 (2015) ¹¹	≈42,500 (5%) ¹²
Kenya	Kajiado County (Amboseli National Park) (21,293 km ²)	Population: 687,312 (2009) Lodges: 17 lodges ¹³ Tourists per annum: 87,000 (2015) ⁵	≈34,400 (5%)
Kenya	Samburu County (Samburu National Reserve) (20,182 km ²)	Population: 223,947 (2009) Lodges: 9 (tbc) lodges ⁶ Tourists per annum: 8,500 (2015) ⁵	≈11,200 (5%)
Kenya	Other 22 national parks and 14 national reserves		Currently, no other Kenyan park has showed an interest (but they have also not yet been contacted)
National parks in neighbouring countries:			

¹¹ http://www.ieakenya.or.ke/number_of_the_week/number-of-visitors-to-national-parks-and-game-reserves-2011-2015

¹² Personal communication from demo team

¹³ <https://travel.jumia.com/>

Tanzania	17 parks including the Serengeti and the Ngorongoro Crater		
Uganda	28 national parks		
Rwanda	3 national parks		
Burundi	2 national parks		

1.6 Conclusions

The Maasai Mara CO is hoping for budget resources (for hosting and maintenance of the platform) preferably from Maasai Mara University, alternatively from the Narok County for GIS tools, and possible commercial opportunities from paying clients staying at lodges and hotels. However, it also faces a number of threats mainly due to its African context, including a general lack of financial resources, illiteracy and low skills, poor infrastructure (low mobile phone coverage), the danger of illegal hunting, and resistance on the part of governments to be inclusive, transparent and share data.

On the positive side, the Maasai Mara CO has already expanded thematically by incorporating the information collection systems from the MaMaSe project, and thereby also offers weather information, livestock prices, grazing availability and water level and resource information. This offers significant added value to the local pastoralists and farmers. In addition, Narok county's initial concerns about data sharing practices of the CO (regarding wildlife sightings being abused by poachers), is being addressed. A data sharing policy has been developed and has been shared with all stakeholders. Once this data sharing policy is in place (expected before the end of 2019), it will encourage agreement amongst all stakeholders that sensitive information included in the CO has been validated and only shared with the right stakeholders.

The CO will financially benefit the county administration through more efficient working practices, and possibly from tourists representing an important source of national income. From a social perspective, it will also benefit from improved government accountability and transparency, and the involvement of citizens in wildlife conservation. The market expansion opportunities for a CO (or any similar initiatives) that supports sustainable livelihoods and biodiversity management are vast in Africa, and geographical expansion of the platform to include data and information from other counties in Kenya, and possibly beyond, would be relatively easy from a technical perspective. However, it will face the challenges of getting the necessary buy-in from the local government authorities and communities, who are willing to share their data, as well as finding the necessary funds to operate and maintain the platform.

4 Dutch Demo Case - Grip op water Altena CO

In this chapter, we present the market research results for the Grip op water Altena CO, based on information collected up to the end of May 2019.

1.1 CO recap

Grip op Water offers a total package of information and communication on topics related to rainfall and floods. It consists of a knowledge platform with information on local weather and water systems (information on current water levels and ground water levels), actions and tips to avoid damage from pluvial flooding (resilience), and citizens can send in pictures of the effects of heavy rainfall. The platform includes communication channels to facilitate communication within and between stakeholder groups.

In the CO there is an active group of people participating, consisting of citizens, local specialists and members of the nature conservation society (Altenatuur). The municipality and the waterboard are also members of the CO, and they are providing information on projects.

With Grip op Water awareness is raised on flooding and the measures that citizens can take (for example less sealed surfaces in gardens). It is a source of information for citizens on the projects that the municipality and the waterboard are carrying out. It can inspire citizens to take measures on their own property and therefore help decreasing flood damage. It is creating a community of people who are interested in the topic.

At the moment the CO is searching for a way to include the possibility for citizens to submit pictures of the effects of heavy rainfall. This is important information for the municipality and the waterboard to check if they are taking the right measures to prevent future damage and whether the effects are as expected.

The platform for the Grip op water Altena CO was launched in 2018, and can be found at <http://altena.gripopwater.nl/>. The Rivierenland Water Board contributes data on water levels, and HydroLogic provides historical and forecasted precipitation, etc., but in the future also citizens will also contribute with observations.

1.2 Stakeholder segmentation

Table 6-1 The Grip op water Altena core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	Local residents	Avoidance of damage due to excess water by taking recommended actions (e.g. reduced sealed surfaces, improved drainage)
		Shorten communication lines with Rivierenland Water Board (WB) and Altena municipality re water management
		Reporting of malfunctions, bottlenecks and local flooding events
	Nature Protection Association - Altenatuur	Facilitates collaborative planning by WB and municipalities
		Constructive dialogue between all parties

	Farmers	Retrieve and review data on water levels
		Warnings of potential floods
		Reporting of malfunctions, bottlenecks and local flooding events
	Local companies	Identify opportunities to create visibility, increase their network
DATA AGGREGATORS	HydroLogic	To develop new tools to be provided also to other clients Strengthen contact with the Rivierenland WB (existing client)
POLICY MAKERS	Rivierenland Water Board (WB) – Hydrological Dept	Shorten communication lines with citizens re water management
	Municipality of Altena	Increased responsiveness to water system problems

Table 6-2 Identification of the Grip op water Altena 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	HydroLogic	Citizens are unlikely to contribute large amounts of data unless there is a pluvial flooding event
	Rivierenland Water Board (WB)	The WB will publish its water level data on the portal
	Local garden architects and material suppliers	Providing information on how to increase water storage capacity in gardens
CUSTOMERS/BUYERS	Municipality of Altena	Would like to keep the website online
	Rivierenland Water Board (WB)	Not likely to pay for the platform
POSSIBLE SHAREHOLDERS & INVESTORS	Local nature conservation organisation	The CO may be adopted as a new working group of an existing organisation

1.3 Product/Service value-add and SWOT analysis

Table 6-3 Incentives (taken from D1.7) for Grip op water Altena

Citizens	Data Aggregators	Policy Makers
Personal benefits: reduce personal losses caused by flood events or water nuisance	Increase visibility of their products	Save staff time spent on responding to citizen questions and complaints (due to the alerts and info provided to citizens to prevent or deal with floods)

Interest group: promotion of their vision and ideas (i.e. water storage solutions)	Upgrading their tools, applying new tools	Having good tools and usability of tools
Collaborating with others to solve water problems	Engagement of other stakeholders	Opportunity to reach out to more citizens more easily with one central place for water-related information



Table 6-4 Value-add, Opportunities and Strengths for Grip op water Altena

Financial Value –add	Social Value-add	Opportunities	Strengths
Reduction of personal losses caused by flood events or water nuisance	Reduced citizens' frustrations, better understanding of decisions taken by government	Dutch government is promoting increased citizen involvement	Data aggregators can identify possible errors on data sets and improve the organization of data sets
Save the WB staff time spent on responding to citizen questions and complaints (due to the alerts and info provided to citizens to prevent or deal with floods)	Improved communication and collaboration between citizens, the municipality and the water board	One central place for water-related information: opportunity to reach out to more citizens more easily	
HydroLogic gains additional clients and business		Social pressure on governments to participate in the CO from citizen interest groups	
		Stimulate citizens to climate proof their gardens	

Table 6-5 Barriers (taken from D1.7) for Grip op water Altena

Citizens	Data Aggregators	Policy Makers
Citizens are not interested in participating in data collection for the moment	Lack of time and budget	Negative consequences if the information provided by authorities was misunderstood or misinterpreted by the citizens
		WB and municipalities do not work easily together



Table 6-6 Threats and weaknesses for Grip op water Altena

Threats	Weaknesses
Lack of time and budget	Netherlands ranks low on access to government data
Negative consequences if the information provided by authorities was misunderstood or misinterpreted by the citizens	Citizens are not interested in participating in data collection for the moment

1.4 Competition and PESTEL

Table 6-7 Analysis of competitive factors for Grip op water Altena

Competition from/for	Level of competition
Other COs	low
Other public information sources and portals	med
Public funding and donation sources	high
Time & effort of involved communities	high
Citizens' time	high*

* currently citizens of Altena are not interested in collecting data

Table 6-8 PESTEL analysis for Grip op water Altena

Political	+ Less friction between WB and municipalities will improve uptake + Change in political interest in climate adaptation
Economic	- Reduction in economic growth in NL will reduce interest - Taking measures to climate proof gardens requires investment by citizens + Water board has a subsidy programme for citizen initiatives
Social	- Privacy considerations for users sharing observations from their private domain + Water board subsidy conditions require groups of citizens to work together
Technological	+ Increased number of automatic measurement stations improves information availability
Environmental	+ Increased severity of precipitation events
Legal	+ Municipalities are required to perform a climate stress test before 2020

1.5 Potential Market Expansion

Table 6-9 Up scaling potential for Grip op water Altena

Stakeholder groups		Comment
Citizens	Farmers associations, members of agricultural nature association	
	Nature related groups like Meadow bird protectors	
	Citizen interest groups like Brabants Landschap and Stichting RIONED	Sources of social pressure in favour of participation in the CO
Scientists/data aggregators	Add action perspectives and tips to take measures against damage from pluvial flooding	
Policy and decision makers		Dutch government is promoting increased citizen involvement

Table 6-10 Thematic expansion for Grip op water Altena

Additional thematic area	Likelihood	Comment
Water quality		<i>under discussion</i>
River flooding		<i>under discussion</i>

Table 6-11 Geographic expansion for Grip op water Altena

Additional geographic area	Likelihood	Comment
Other 29 municipalities that fall under the Rivierenland WB	good	250,000 inhabitants
Bordering WBs of Zuid-Holland, Noord-Brabant en Utrecht		In the Netherlands, between 1986 and 2009 the total damage from pluvial flooding was €674 million ¹⁴
European cities that have problems with pluvial flooding - London (UK), Rafina (Greece) and Coimbra (Portugal) ¹⁵		

¹⁴ https://ore.exeter.ac.uk/repository/bitstream/handle/10871/17835/J%20Susnik%20et%20al%20Eindhoven_revised_1.pdf;sequence=1

¹⁵ <https://www.imperial.ac.uk/grantham/our-work/impacts-and-adaptation/ipcc-working-group-ii/water-security-and-flood-risk/urban-flooding/>

Table 6-12 TAM estimates for Grip op water Altena (in terms of citizen outreach)

Country	Region/City	Total number of citizens	Likely outreach of Grip op Water
NL	Altena	54,757	2,000 ¹⁶ (3.7%)
NL	Remaining municipalities of Rievernland	≈250,000	9,250 (3.7%)
NL	Zuid-Holland	3.6 million (2015)	133,200
NL	Noord-Brabant	2.4 million (2006)	88,800
NL	Utrecht	1.3 million (2007)	48,100

1.6 Conclusions

The Rivierenland Water Board is keen on making their data and information available to the public. This will benefit them in a number of ways: they will save staff time in responding to citizens' questions and complaints; they see Grip op water Altena as a means to reach out to and involve more citizens (coherent with the Dutch government's new policy). At this stage, citizens are less interested in monitoring water levels, but this might change as they see the possibility of contributing to local water management.

The geographical coverage of the focus region within the Rivierenland area includes the municipalities Aalburg, Werkendam and Woudrichem, which will merge from January 2019 to form the Altena municipality. Besides these 3 municipalities, Rivierenland includes a large area of another 29 municipalities, which would be the next target for market expansion. This would imply geo repetition of the platform (or at least repetition of the front end), such that the local focus of Grip op water **Altena** is not lost.

Then there are the neighbouring Dutch provinces of Zuid-Holland, Noord-Brabant and Utrecht. The economic loss due to pluvial flooding in the Netherlands is enormous, and thus any efforts to improve the management of this risk, should be undertaken by the Water Boards, municipalities and citizens alike. In addition, many cities throughout Europe experience pluvial flooding (i.e. from rainfall), which is expected to become more frequent in response to climate and social changes¹⁷. This will boost the need for such COs.

¹⁶ personal communication from Rianne Giesen

¹⁷ https://ore.exeter.ac.uk/repository/bitstream/handle/10871/17835/J%20Susnik%20et%20al%20Eindhoven_revised_1.pdf;sequence=1

5 Swedish Demo Case - VattenFokus CO

In this chapter, we present the market research results for the VattenFokus CO, based on information collected up to the end of May 2019.

5.1 CO recap

The VattenFokus platform offers information on fresh water quality/water health for Mälardalen region, with data on visual observations, turbidity, and levels of nitrates and phosphate.

The VattenFokus CO supports all stakeholders to collaborate in the governance and management of aquatic ecosystems by collecting data, sharing knowledge, and make data accessible that complements established governmental initiatives. It will provide a collaborative platform for sharing data and making data on causes of stress for water health, more accessible and open.

The VattenFokus platform was launched in 30 October 2017 and can be found at <https://vattenfokus.se/>. Information collected during a number of Water Blitz campaigns, organised in collaboration with FreshWater Watch¹⁸, in 2017 and 2018 is already available on this platform.

5.2 Stakeholder segmentation

Table 7-1 The VattenFokus core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	Eco-village Änggärdet (within Flen municipality)	Information on fresh water quality – in lakes and rivers
	Community living around Dunkern lake (within Flen municipality)	Information on how lifestyle choices impact water quality – in lakes and rivers
	Citizens living in Flen council and surrounding areas.	Information on fresh water quality – in lakes and rivers
DATA AGGREGATORS	Earthwatch Institute	Sustainable water management from a life cycle perspective
	Akvo Foundation	User interaction that leads to improved tools and processes
	Stockholm University (SU)	Gain knowledge and experience in citizen science/citizens observatory
Advisors	Stockholm Agriculture University SLU	

¹⁸ <https://freshwaterwatch.thewaterhub.org/>

	Artdatabanken (The Swedish Species Information Center)	Understanding how other citizen science programmes work and how they can help improve Artdatabanken.
	Ericsson Sustainability Centre	Finding good collaboration partners.
	Stockholm Vatten och Avfall AB (Water and Waste)	
	Håll Sverige Rent (Keep Sweden Clean)	Finding good collaboration partners.
	Lantmäteriet (The Swedish National Land Survey)	Understanding how citizen science can fit into their remit.
POLICY MAKERS	Nyköpings kommun (municipality) water authority	Open monitoring and stewardship of water quality – collaborative governance
	Svenskt Vatten (Swedish Water & Wastewater Association)	National association of 289 municipalities

Table 7.2 Identification of the VattenFokus 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	Earthwatch	They have a global citizen science programme for the sustainability of freshwater - FreshWater Watch ¹⁹
	Akvo Foundation	They have a global data platform used in Sustainable Development Goal monitoring in 70 countries ²⁰
	Stockholm University	Knowledge and process.
CUSTOMERS/BUYERS	Nyköpingåarnas Vattenvårdsförbund ²¹ (Nyköping municipality water authority) in Södermanland county	They currently undertake official water quality monitoring in the region – the results are available through a Water Information System (VISS ²²). <i>Note that these measurements are more accurate than those of the FreshWater Watch kits, but are more sparsely located.</i>
	Stockholm Stad Water authorities	

¹⁹ <https://freshwaterwatch.thewaterhub.org/>

²⁰ <https://akvo.org/capture-and-understand-data-that-matters/>

²¹ <https://www.vattenorganisationer.se/nvvf/>

²² Vatteninformationssystem Sverige - <https://viss.lansstyrelsen.se/>

POSSIBLE SHAREHOLDERS & INVESTORS	Havs och vattenmyndigheten (Swedish Agency for Marine and Water Management).	It is perceived that for Havs och vattenmyndigheten to be interested then the CO has to show some scaling up results first
	Flen Miljö förvaltningen (Municipality Environmental Department)	To recruit once VattenFokus is launched
		To recruit once VattenFokus is launched
	Stockholm Vatten och Avfall	To recruit once VattenFokus is launched
	Commercial sponsors (e.g. Ericsson Sustainability)	To recruit once VattenFokus is launched

5.3 Product/Service value-add and SWOT analysis

Table 7-3 Incentives (taken from D1.7) for VattenFokus

Citizens	Data Aggregators	Policy Makers
Learning how to use new technologies to monitor water quality	Expanding the visibility of the organization and the visibility of the organization's products (technical tools developed for the CO)	Additional data coming from the CO
Supporting the group's cause and activities in promoting environmentally friendly lifestyle	. Gain experience in field like big data, citizen observatories - can create more business opportunities in the future	Build a relationship between citizens and policy makers
Opportunity to get their voices heard	Relation with citizens and policy makers	Recommendations re use or not to use chemicals, fertilizers, etc.
Importance of the online platform as well as physical place	Nyköpingåarnas Vattenvårdsförbund would like to have access to the data coming from the water blitzes, to supplement their sparser official monitoring results.	Gaining first-hand knowledge from citizens about water pollutants



Table 7-4 Value-add, Opportunities and Strengths for VattenFokus

Financial Value –add	Social Value-add	Opportunities	Strengths
Suppliers: Gain experience in field like big data, citizen observatories, which can create more business opportunities in the future	Citizen lead environmental monitoring	Enabling citizens to understand and influence policy makers about sustainable water	Data collection drives through Water Blitzes

		management from a life cycle perspective	
Suppliers: Development of applications for the analysis of data, data aggregation	Importance of the online platform as well as a physical place	Opportunity for citizens to get their voices heard	70 % of Swedish citizens feel they are not doing enough to protect the environment, 36% of Swedish working age population are engaged in formal volunteering
Suppliers: To offer support, training and consulting services	Raising awareness of fresh water quality issues - among citizens and school pupils	Opportunity for policy makers to get close to the community and open up discussions about environmental problems	Part of Earthwatch's global citizen science programme FreshWater Watch
	Facilitating joint discussion and analysis of results and review & feedback of data collection campaigns	To gain knowledge on water quality issues and sustainable freshwater management	
		CO data could be used by official authorities to support their legal measurements and identify problem hotspots.	

Table 7-5 Barriers (taken from D1.7) for VattenFokus

Citizens	Data Aggregators	Policy Makers
Lack of time and financial resources	Need to involve high numbers of citizen participants (critical mass) to generate sufficient volume of data for successfully deploying some of the technical tools	Need to have "results" before being involved
Land owners/Farmers - not comfortable with strangers trespassing on their properties to take water samples	Artdatabanken has doubts about any collaboration with VattenFokus CO as its scope (local) and focus (water quality) is not fully related to the scope of Artdatabanken (national) and focus (biodiversity)	



Table 7-6 Threats and weaknesses for VattenFokus

Threats	Weaknesses
Attitude of citizens – 'I pay my taxes and now it is someone else's problem'	Sweden has one of the lowest rankings for data availability
Public sector in Sweden is slow and fractured. Swedish bureaucracy is poor in collaborating with citizen led projects in general.	National policy makers are waiting on "results" before becoming involved
Need to involve high numbers of citizen participants (critical mass) to generate sufficient volume of data for successfully deploying some of the technical tools	Water quality is not traditionally been perceived as a problem in Sweden. This is slowly changing.

5.4 Competition and PESTEL

Table 7-7 Analysis of competitive factors for VattenFokus

Competition from/for	Level of competition
Other COs	low
Other public information sources and portals	med ²³
Public funding and donation sources	high
Time & effort of involved communities	low
Citizens' time	high

Table 7-8 PESTEL analysis for VattenFokus

Political	- Public sector in Sweden is slow and fractured
Economic	- It is challenging to finance this type of work in Sweden, as water quality isn't perceived to be poor, in relation to other issues.
Social	- Attitude of citizens – 'I pay my taxes and now it is someone else's problem'
Technological	+ Cheaper sensors + 3G/4G coverage + Citizens technical knowledge and availability of smartphones
Environmental	+ Increasing evidence of climate change will lead to more concerned citizens
Legal	- Strict transparency and data privacy laws will impede uptake

²³ Earthwatch's Freshwater Watch, but this is on a global scale whereas VattenFOkus has a local focus. Sweden has a national database of official water quality measurements called VISS (Vatteninformationssystem Sverige) - <https://viss.lansstyrelsen.se/>

5.5 Potential Market Expansion

Table 7-9 Up scaling potential for VattenFokus

Stakeholder groups		Comment
POLICY and DECISION MAKERS	Havs-och Vattenmyndigheten - Sea and Water Authority (highest water authority in Sweden)	Can only be persuaded once useful results are available.
CITIZENS	Buyers of Postkodlotteriet: one of Sweden's largest lotteries	Sources of social pressure in favour of sponsorship of the CO (i.e. this national lottery could fund VattenFokus)
	Naturskyddsföreningen - Swedish Society for Nature Conservation	Sources of social pressure in favour of participation in the CO
	Skargardsstiftelsen - Archipelago Foundation in Stockholm Country	
	Readers of Swedish magazines covering water sports	
	Communities within Stockholm region	The Stockholm region borders on the Mälarendalen region
	Schools	Especially for the next Water Blitz

Table 7-10 Thematic expansion for VattenFokus

Additional thematic area	Likelihood	Comment
Microplastics	low	Detection is expensive
Pharmaceutical residuals	low	Detection is expensive
Micropollutants	low	Detection is expensive

Table 7-11 Geographic expansion for VattenFokus

Additional geographic area	Likelihood	Comment
More communities in Mälarendalen region	high	Community has to show an interest in water quality issues
Communities/municipalities in Stockholm region (e.g. the island borough of Södermalm)	med	Communities have to show an interest in water quality issues (with

		possible involvement of immigrant groups)
UK	med	UK's Environment Agency is participating in Earthwatch's FreshWater Watch, including a Thames Blitz and Bristol Avon Blitz
France, Italy, Netherlands, Poland	low	European countries that currently participate in FreshWater Watch
Romania, Italy, France ,Greece, Bulgaria, Slovenia and Poland ²⁴ (Flash Eurobarometer 344)	low	Countries with citizens that are concerned about water quality issues, however these citizens have to join or form activist groups on this issue

Table 7-12 TAM estimates for VattenFokus (in terms of citizen outreach)

Country	Region/City	Total number of citizens	Likely outreach of VattenFokus
Sweden	Dunkern town within Flen municipality (Södermanland county)	16,812 (2017)	3% (based on the 50 people from Änggärdet & Dunkern who took part in the Water Blitz)
	MälarenDalen region (excluding Stockholm county)	1.1 million (2011)	33,000 (3%)
	MälarenDalen region (including Stockholm county)	3.2 million (2011)	96,000 (3%)

5.6 Conclusions

The strengths of VattenFokus are many, including the high environmental awareness of Swedish citizens (and number of volunteers to take part in measurement campaigns), a strong drive from politicians to involve citizens in environmental stewardship, and that it is part of EarthWatch's global citizen science initiative on freshwater monitoring. Its social value is strong since it offers a collaborative platform (involving citizens and decision makers), making data on water quality more accessible and open (to the public) and for the sharing of knowledge on best practises. The biggest threat it faces is being able to attract a critical mass of 'users', as well as to start showing sufficient results to attract the Stockholm and even national authorities.

Simple geographic expansion of the data collection area to other communities in Sweden seems relatively easy. Although VattenFokus, has started with a local focus (Dunkern lake in Södermanland county), unlike

²⁴ Over 80% of citizens in Romania, Italy, France , Greece, Bulgaria, Slovenia and Poland think their water quality problems are serious

some other COs in this project, it was not conceived with only a local focus in mind. As part of FreshWater Watch, it potentially has a much wider geographic scope.

Recently, the Nyköping municipality water authority (Nyköpingåarnas Vattenvårdsförbund), which includes the Dunkern Lake region²⁵ has become aware of VattenFokus and is interested in the data collected by citizens in the region. Although these measurements are not as accurate or detailed as their official measurements (for the national implementation of the WFD), they are, and will be, more numerous in number and locations. As such, they could be used to substantiate their smaller number of measurements and to identify pollution hotspots that they might have missed in their sparser measurement campaigns²⁶. The support and/or adoption by this local/regional water authority will go a long way towards persuading other local/regional authorities, and perhaps even the national authorities, of the value of VattenFokus' crowdsourced data.

²⁵ Nyköpingsåarnas Vattenvårdsförbunds area of coverage:

<https://www.vattenorganisationer.se/nvvf/modules.php?name=Content&op=showcontent&id=1942>

²⁶ Water control programme, tests 2009-2022. Page 26: <https://www.vattenorganisationer.se/nvvf/downloads/25/arsrapport2019.pdf>

6 Zambian Demo Case - Zambian Community Based Natural Resources Management (CBNRM) CO

This chapter has not been updated from the previous version of the market analysis. In this sense, minimal changes have been introduced and the section remains practically the same as it was the last time it was delivered.

It should be noted that at the end of 2018, a proposed resolution was accepted by the General Assembly of the Zambia National Community Resources Board Association in Lusaka, for the creation of a National CBNRM Observatory for Zambia. Consequently, the Zambian CO has expanded from a regional system for the Silowana complex (previously called the NitiLuli Silowana CO) to a national system. This report reflects and updated analysis of this national CO with respect to the analysis for the NitiLuli Silowana CO presented in D3.1 and D3.2.

This represents a very positive step forward for project's establishment of a CO in Southern Africa. This already covers the geographical upscaling potential identified in D3.1 for NitiLuli. However, due to this expansion of remit and other internal complications in Zambia, the development of this CO is lagging behind the other GT 2.0 COs, and the validation of its functional design is still in the process of being defined.

6.1 CO recap

The Zambian CBNRM platform will provide the virtual space for a "permanent community meeting" of local communities, government agencies, NGOs and donors, improving coordination between government agencies and donors, and giving communities more influence in decisions affecting their lives and livelihoods. Initially the core information will concern wildlife observations for all four regions (comprising 90 districts) within Zambia, especially those that include game management areas (of which there are 72 in total).

6.2 Stakeholder segmentation

Table 8-1 The CBNRM CO core stakeholders and their requirements

Core stakeholders		Needs
CITIZENS	VAG (Village Action Group)	Insufficient CRB attention to VAG concerns and information needs.
DATA AGGREGATORS	WWF Upande	A project that will deliver tangible benefits accountable and responsive to community needs, funding restrictions and logistical challenges To digitise the 'event books' for Zambia
	TAHMO	
	DNPW (Dept. of National Parks and Wildlife)	

	CBNRM Forum (Community-based natural resources management)	
	YCT – Young Conservation Trailblazers	
POLICY MAKERS	Council, District, National Assembly Government Departments (DNPW, Dept. of Forestry, Water, etc.)	In Zambia (as in Sesheke West, Silowana), there is inadequate information, transparency, coordination and communication between different governance levels
	CRB (Community Resource Board)	Lack of involvement of CRB in planning and implementation of programmes
	House of the Chiefs	Lack of involvement of the chiefs in the planning and implementation of programmes

Table 8-2 Identification of the CBNRM CO 'market forces' group

'Market Forces' group		Comments
SUPPLIERS	WWF	Compilation of the data into wildlife database
	TAHMO	Weather information
	VAG	Data collection (wildlife spotting, reporting human wildlife conflicts, etc.)
CUSTOMERS/BUYERS	Dept. of National Parks and Wildlife (DNPW)	
	Department of Forestry	
	Department of Fisheries	
	Department of Meteorology	
POSSIBLE SHAREHOLDERS & INVESTORS	CRB	Through resource revenues (under wildlife law), and from future community forestry
	Zambian government	Through various departments and the government's SMART Zambia initiative.
	International donors, e.g. WWF	But not only WWF, other players are also expected to contribute

6.3 Product/Service value-add and SWOT analysis

Table 8-3 Incentives (taken from D1.7) for CBNRM CO

Citizens	Data Aggregators	Policy Makers
Protecting legal rights of citizens to local resources	WWF gains from better coordination between projects	More effective wildlife conservation by DNPW
Reduction in broken promises by projects and officials and subsequent citizen frustrations		Improving government transparency
Reduction in hunger and poverty		Conservation to create local jobs (e.g. eco-tourism)
		Reduction in abuses of power
		Reduced mistrust created by misconduct



Table 8-4 Value-add, Opportunities and Strengths for CBNRM CO

Financial Value –add	Social Value-add	Opportunities	Strengths
More effective wildlife conservation by DNPW	Reduction in abuses of power and corruption	Conservation to create local jobs (e.g. eco-tourism)	Better coordination between donor projects
Avoiding loss of valuable resources (crops and wildlife)	Government transparency	5-6 government laws (on wildlife, forestry, fisheries, water, etc.) all concern community-based natural resource management – local CRBs will likely expand thematically to include these	Part of government development to implement the KAZA TFCA (Trans-frontier Conservation Area) treaty obligations
Generate revenues for locals from natural resources	Villagers are involved in decision-making	Possible scenario tool for CRB's (for revenue generation)	

Table 8-5 Barriers (taken from D1.7) for CBNRM CO

Citizens	Data Aggregators	Policy Makers
Many districts in Zambia are remote, sparse populated with depleted fish and cattle resources – i.e. resource-strapped	Operating in a low-tech environment	Forestry Dept will lose ability to create revenues from illegal felling in protected areas

Many districts in Zambia are poorly developed with only a few tourist lodges and mainly subsistence farming	GSM coverage is low	Village chiefs do not support more transparency



Table 8-6 Threats and weaknesses for CBNRM CO

Threats	Weaknesses
Many districts in Zambia are remote, sparsely populated with depleted fish and cattle resources – i.e. resource-strapped	DNPW will lose some control over VAG/CRB activities
Many districts in Zambia are poorly developed with only a few tourist lodges and mainly subsistence farming	GSM coverage is low
Forestry dept will lose ability to create revenues from illegal felling in protected areas	Village chiefs are reluctant to make changes
Operating in a low literacy and low-tech environment	

6.4 Competition and PESTEL

Table 8-7 Analysis of competitive factors for CBNRM CO

Competition from/for	Level of competition
Other COs	low
Other public information sources and portals	low
Public funding and donation sources	high
Time & effort of involved communities (VAGs)	high
Citizens' time	med

Table 8-8 PESTEL analysis for CBNRM CO

Political	+ Constitutional changes from 2016 (empowerment assembly leaders) + Implementation of community-based management for forestry and water
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Economic	<ul style="list-style-type: none"> + Development of donor funding + Success of KAZA related activities in stimulating local economic activities + Investment in local infrastructure (road conditions and accessibility) - Continuous offering of timber concessions without community consultations
Social	<ul style="list-style-type: none"> ± Attitude and action of the Chiefs + Development of role of VAGs in local communities - North-east/south-west political divide affects collaboration between central and local governments ± Relationship between WWF and communities in project area (resolution of recent controversy) + Supported by fact that the social boundaries for the CO communities are coherent with the cultural units (game management areas follow boundaries of traditional chiefdoms)
Technological	<ul style="list-style-type: none"> - Poor mobile phone coverage in many rural areas + Increasing adoption of smartphones + Increased exposure to ICT technologies + Adoption of open standards for existing databases to allow integration of different data sets
Environmental	<ul style="list-style-type: none"> + Impact of agricultural practises on soil conditions (move towards conservation agriculture) + Development of fish stocks and forests + ZamCom connection – catchment management and water availability from the Zambezi + Climate change in combination with landscape management as a key precondition to fulfil restocking of GMA (game management area)
Legal	<ul style="list-style-type: none"> + Legal framework – CO as permanent virtual village level meeting + Legal mandate of CRB (community resource boards) currently being expanded into forestry and water management (should increase the need for this platform) + Up scaling of various forms of local committees (as in creation of new CRBs for other communities) for water and wildlife across Zambia

6.5 Potential Market Expansion

Table 8-9 Up scaling potential for CBNRM CO

Stakeholder groups		Comment
Citizen-led groups	All relevant CRBs across Zambia	Can be sought through collaboration with National Association of CRBs
Policy and decision makers	DNPW	Interface with SMART Zambia system

	Ward Development Committees	
	Community Forestry committee	
Scientists/data aggregators		Other conservation projects in the region (e.g. BENGO, extension agent books)

Table 8-10 Thematic expansion for CBNRM CO

Additional thematic area	Likelihood	Comment
Agriculture	low	By involving the Ministry of Agriculture
Land use	high	By involving the Ministry of Lands and Natural Resources

Table 8-11 Geographic expansion for CBNRM CO

Additional geographic area	Likelihood	Comment
Other countries in Africa with CBNRM policies	high	Countries that are implementing devolved government structures to local/chiefdom level
Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA) ²⁷	med	Update for use by partner organisations in the KAZA TFCA region
Namibia, Zimbabwe, Malawi, Botswana	med	Also use 'Event books/logs' system Parts of Namibia, Zimbabwe and Botswana fall under the KAZA TFCA

Table 8-12 TAM estimates for CBNRM CO (in terms of citizen outreach)

Country	Region/City	Total number of citizens	Likely outreach of CBNRM CO
Zambia	All CRBs that border on national parks or include game management areas (54 out of a total of 63 CRBs)	Unknown	(5%) ²⁸
KAZA TFCA	Covers the southern border area between Zambia and Angola,	≈2 million (Mogende, 2016)	100,000 (5%)

²⁷ The largest of the TFCAs – involving Angola, Botswana, Namibia, Zambia and Zimbabwe

²⁸ personal communication E. Pfeiffer

	Namibia, Botswana, Zimbabwe (519,912 km ²)	
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6.6 Conclusions

The NitiLuli CO was initiated since the Silowana Plains area (that includes the Sioma Ngwezi National Park) of southern Zambia is remote, sparsely populated, poorly developed and resource-strapped. Many donor/development aid projects are being undertaken in this area, but they are poorly coordinated. WWF would like to rectify this. However, it was recognised by the General Assembly of the Zambia National Community Resources Board Association, that many other CRBs face similar problems and thus a proposal was passed to expand NitiLuli to a national Community Based Natural Resource Management CO at the end of 2018.

The Zambian government is trying to devolve decision-making and giving villagers and the CRBs (community resource boards) more say in the management of their land and wildlife resources, with the goal that the local communities will benefit from an increased share of wildlife revenues coming from the DNPW. Recent laws are mandating more responsibilities to the CRB, from the current one on wildlife management, to forestry, water and possibly agriculture.

The CBNRM CO faces a huge opportunity in that it could support the objectives outlined above. This national CO includes many conservation areas, some of which are part of a growing programme of Trans Frontier Conservation Areas in Southern Africa with significant resources. However, many of Zambia's conservation areas are threatened by a general lack of local resources and infrastructure (GSM coverage) in the area, and some local opposition. Having said this, citizen participation is high for NitiLuli and, if this is the case for the other CRBs in Zambia, the national CBNRM CO could have a positive impact on hundreds of thousands of villagers. Besides, improved revenues reaching the poorest of villages, the social value-add of better coordination between the different community levels and improved transparency of decision-making will be significant.

7 The Land Use/Land Cover (LULC) Mapper

7.1 Description

The OSM (Open Street Map) Land Use/Land Cover Mapper web service is a standard web service to enable worldwide mapping and improve accessibility to land-use mapping and consistency of time-series of land use maps. It is developed by IHE, Coimbra University, Heidelberg University, Upande, CREAf, and VITO.

It provides easy access to LULC maps for any place in the world. The maps are consistent in number of classes and definitions and a quality layer is provided. The map is a product of multiple available data sources so gaps caused by data poor areas and clouds can be filled.

This basic functionality will be available free of charge (as per the OSM products), while different spatial, temporal and thematic resolutions can be made available as an extra paid service. In addition, consultancy can be offered regarding the development and offer of specialised indicators.

The LULC Mapper is useful for numerous applications because it gives easy to use and interpret information with flexibility in spatial, temporal, and thematic resolution. It is targeted for use by urban planners, policy makers, private sector land investors, scientists, research institutes, and other research projects.

7.2 Customers

Potential customers	Gains	Pains
Policy makers	Easy access to LULC data, time series and related indicators	Lack of consistent, actual LULC data
Planners	Easy access to LULC data, time series and related indicators	Lack of consistent, actual LULC data
Researchers	Access to GIS data for analysis, modelling and development of new tools	Lack of consistent, actual LULC data
Citizens		Lack of consistent, actual LULC data

7.3 Product/Service value-add and SWOT analysis

Table 9-4 Value-add, Gains and Pain relievers for the LULC Mapper

Value –add	Gain creators	Pain relievers
The OSM Land-Use Mapper will provide consistent and actual LULC data	Policy makers/planners: • lower costs of production for LULC maps,	In-house production of consistent LULC maps is expensive and time consuming.

	<ul style="list-style-type: none"> • faster and easier availability of LULC data 	
	Researchers: global consistency in LULC products	Consistency in time is difficult.

Table 9-6 SWOT analysis for the LULC Mapper

Strengths	Weaknesses
The most important strength is global coverage with consistency, as this does not currently exist.	The choice of algorithms and processing to obtain the maps may influence the quality of the LULC data.
Opportunities	Threats
Added value by providing data at different spatial, temporal and thematic resolutions.	Similar services might be developed soon
Added value by providing consultancy around the product.	Customer's trust in the service might be a challenge in the beginning
Flexible choice of indicators derived from the LULC maps is also a market opportunity.	

7.4 Competition and PESTEL

Table 9-7 Analysis of competitive factors for LULC Mapper

Competition from	Description
OSM LCLU maps developed by Heidelberg University (UHEI) (http://osmlanduse.org) and the University of Coimbra (https://vqi.uc.pt/vqi/osm/osm2lulc/)	These existing services have been combined into a hybrid OSM Land-Use mapper
CORINE Land Cover	The CORINE Land Cover is a pan-European dataset which is only updated every 5 years
Copernicus Global Land Service (CGLS) - http://land.copernicus.eu/global/	Not updated frequently, are inconsistent in thematic classification and quality and do not use all available data to produce the best maps. Also their thematic classification (nomenclatures) cannot easily be translated from one to another, limiting their use for many purposes.
Global Land Cover USGS + UMD products - https://landcover.usgs.gov/glc/	
Globeland30 - http://www.globallandcover.com	

Google Maps	Google maps offers street maps layered on satellite images (optional) mainly for navigation purposes. It does not offer any land use or land cover information (only what can be discerned by eye).
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Table 9-8 PESTEL analysis for the LULC Mapper

Political	+ The uptake of the service will be improved when the need for environmental information increases. Also, urbanisation, energy transition, climate change issues increase the need for actual LULC maps and derived data. - National data policies and access to the internet can potentially impede the uptake of the service.
Economic	+ Economic growth likely to increase the uptake of the service, because it will create more need for LULC data and affordable value-add services. + Such a free service is not so sensitive to an economic downturn.
Social	- In order to use the service, local communities will require internet access ± acceptance of governments of open data collected by citizens, mixed with other data sources, is important for the uptake. + In Africa, reliance on government's own LULC data collection schemes have been lacking
Technological	+ Technological developments in LULC data collection will improve the service, as long as they can be incorporated in the algorithms to improve the LULC data by using multiple sources.
Environmental	+ Climate change, population growth, urban sprawl, agricultural production, etc. all are related to LULC changes. Deriving good maps and indicators are essential for decision making at different levels.
Legal	- In some African countries, LULC data is considered sensitive information.

7.5 Potential market and business model

The unique selling point (USP) of the OSM LULC mapper is that it provides easy access to LULC maps for any place in the world. The maps are consistent in number of classes and definitions and a quality layer will be provided. The map is a product of multiple available data sources so gaps caused by data poor areas and clouds can be filled. This standard mapping service will be made available free of charge – following the encouraged-to-contribute, free-for-citizens philosophy of OSM. As such, it does not face significant competition – the other research-based, publicly funded global land map GIS systems (e.g. CORINE, Copernicus Global Land Service, Global Land Cover USGS) are not updated that frequently and are limited in the flexibility of their nomenclatures (thematic categories).

It is unlikely that policy makers and spatial planners in Europe will use the OSM LULC mapper extensively, as they have access to up-to-date cadastral maps provided by national or private mapping agencies. However, in Africa for example, the public or governmental maps have not been updated for many years, and most governments are lagging far behind Europe in moving to digital GIS maps as well as digitising

the geo-information they collect. Thus, such a freely-available OSM LULC map is of great value to policy makers and spatial planners in many Africa countries.

The total addressable market (number of potential customers) for the LULC map is based on OpenStreetMap (OSM) user statistics. We have assumed that these communities, since they are already familiar with OSM and using it for navigation purposes, that they could also make use of the OSM LULC mapper to give them a richer mapping environment (in terms of information layers).

Customers	Number of potential customers	
	Africa	World-wide
Policy makers, planners, researchers, citizens	≈600 ²⁹	≈5,000,000 ³⁰

As mentioned previously, the basic/standard OSM LULC mapping functionality will be made available free of charge. However, additional customisation & consultancy will be offered as a paid service. The latter could include different spatial, temporal and thematic resolutions, or different thematic categorisations (nomenclature). The charge for online automatic customisation will be around 500 € per product, while the consultancy that goes hand-in-hand with this customisation will be charged at 850 € per day. At this stage it is unclear which organisations or companies would be interested in offering such services.

1.1 Conclusions

At this stage the OSM LULC mapper is still a prototype. Because of the complexity of linking the different components and lack of verification data, we expect that there will be a working prototype which includes all components by the end of the Ground Truth 2.0 project. This, however, is not yet a marketable product. Future initiatives should be able to operationalize the prototype and create a marketable product, based on the information in this document.

²⁹ https://www.openstreetmap.org/stats/data_stats.html

³⁰ <https://osmstats.neis-one.org/?item=countries>

2 The GT2.0 Methodology

2.1 Description

Within GT2.0, a co-design methodology has been developed for the setup of Citizen Observatories or other complex projects that involve multiple and diverse stakeholders in the creation of joint solutions. Co-design is a methodology for social value creation related to complex processes and the creation or strengthening of local relationships. The GT2.0 co-design methodology will be made publicly available as one of the GT2.0 outcomes, targeted at donors or public authorities that are involved in these types of complex projects.

The co-design methodology provides credibility to participatory processes and community-based data collection. Since the methodology is designed to be flexible while maintaining quality control and detailed guidance for its application is provided, it will increase the chance of success to achieve the envisaged change and increase the potential impact of projects.

2.2 Customers

The Ground Truth 2.0 methodology for co-designing citizen observatories for sustainability serves to help set up locally relevant and sustainable citizen-based monitoring schemes. This allows local ownership of the resulting processes, a change in power relationships and improved decision-making in natural resource management. The methodology is useful in, and adaptable to different geographical contexts, social settings and to different thematic issues and can also be used for setting up other complex projects (not just COs). It approaches co-design as an iterative process consisting of a series of ‘interaction moments’ with key stakeholders. Starting with a blank page regarding the purpose or scope of the future observatory, a clearly laid out sequence of steps facilitates collective identification of challenges, objectives and requirements, while actively supporting community-building as part of the process.

Customer segments and their jobs	Gains	Pains
Donors/funders <ul style="list-style-type: none"> - fund bankable projects that deliver sustainable results - channel funding to address societal challenges & local demands - account for the use of their funding & return on investment 	<ul style="list-style-type: none"> - locally relevant & sustainable project outcomes with measurable impacts (re. societal needs/local demands) - improved predictability of project outcomes 	<ul style="list-style-type: none"> - projects don't deliver local/societal value/impact - uncertainty about project outcomes - lack of sustainability of project impacts beyond project funding
Public authorities <ul style="list-style-type: none"> - comply with obligations to involve the public in service provision 	<ul style="list-style-type: none"> - support/participation of local stakeholders in decisions regarding public goods; - ways to reach out to, and involve, citizens "full circle" (not just lip service participation) - create social value that was jointly agreed (buy in for problem definition and final decisions) 	<ul style="list-style-type: none"> - uncertainty/inexperience with participatory processes means their participation efforts may have adverse effects - data gaps affect credibility of decisions - lack of local buy-in for decisions regarding public goods - the public doesn't accept the problem definition of the authorities
Civil society organisations (CSOs) <ul style="list-style-type: none"> - address societal challenges & local demands - deliver results to build/strengthen reputation (ensure delivery/success) 	<ul style="list-style-type: none"> - locally relevant & sustainable project outcomes with measurable impacts (re societal needs/local demands) - full circle delivery on beneficiaries' needs (not just requirements collection without follow up) - improved predictability of project outcomes 	<ul style="list-style-type: none"> - projects don't deliver local/societal value/impact - uncertainty about project outcomes - 'competition' with other projects for beneficiaries' time - lack of sustainability of project impacts beyond project funding
Project teams/managers <ul style="list-style-type: none"> - design & implement projects in complex social/multi-stakeholder settings - deliver results to build/strengthen reputation (ensure delivery/success) 	<ul style="list-style-type: none"> - structured but also flexible way of working in various contexts and projects - locally relevant & sustainable project outcomes with measurable impacts (re. societal needs/local demands) - straddling donor and beneficiaries' demands 	<ul style="list-style-type: none"> - difficulty in inventorying and combining/manoeuvring individual and collective needs - difficulty of measuring/demonstrating impacts of projects - difficulty of generating sustainable impacts beyond project lifetime

2.3 Product/Service value-add and SWOT analysis

Table 10-1 Value-add, Gains and Pain relievers for GT2.0 methodology

Value –add	Gain creators	Pain relievers
credibility for the participatory processes of public authorities	<p>Public authorities:</p> <ul style="list-style-type: none"> - agreed problem definition and greater chance of consensus on decisions relating to public goods 	<p>Public authorities:</p> <ul style="list-style-type: none"> - guidance in how to run participatory processes that deliver meaningful results (not just 'tick the box' type participation) - additional data enhances evidence base for decisions - joint problem definition which leads to greater buy in for decisions relating to public goods
strong local buy-in	<p>Donors:</p> <ul style="list-style-type: none"> - project outcomes are defined, measurable and 'monitorable' yet locally driven/bottom up to ensure max. impact <p>Public authorities & project managers:</p> <ul style="list-style-type: none"> - range of local stakeholders involved in process and in joint knowledge co-creation, so that proposed solutions have stronger basis 	<p>Donors:</p> <ul style="list-style-type: none"> - greater chance of sustainability of project impacts due to joint problem definition and co-design of solution - greater accountability of solution providers to meeting identified needs of involved stakeholders <p>Public authorities:</p> <ul style="list-style-type: none"> - overcome lack of buy in for problem definition and decisions
higher likelihood of achieving envisaged changes and impacts compared to other approaches	<ul style="list-style-type: none"> - involvement of a range of local stakeholders in the process and in joint knowledge co-creation, so that proposed solutions have stronger basis for success 	<ul style="list-style-type: none"> - agreement on problem definition - joint involvement of local stakeholders and solution providers in developing a solution
strengthened relations with their stakeholders	<p>Public authorities:</p> <ul style="list-style-type: none"> - working together from problem definition to solution creates and strengthens relations 	<p>Public authorities:</p> <ul style="list-style-type: none"> - establishes more lasting relationships with their stakeholder base through creation of trust and understanding of each other's roles and positions during the process

Table 10-2 SWOT analysis for GT2.0 methodology

Strengths	Weaknesses
Flexibility: useful in and adaptable to different geographical contexts, social settings and to different thematic issues and can also be used for setting up other complex projects (not just COs)	Comprehensive approach, requires skilled facilitators that are sensitive to multi-stakeholder dynamics/cultural issues/power plays etc.
Opportunities	Threats
Vast interest among CS and CO community of practitioners in the GT2.0 methodology	Simpler 'copy cat' approaches that claim to deliver the envisaged results cheaper/more easily and as such undermine the credibility of the GT2.0 co-design methodology.
Huge interest from the donor community in rendering the co-design of capacity development interventions which are actually feasible, within allocated project time and budget, and with impactful results.	

2.4 Competition and PESTEL

Table 10-3 Analysis of competitive factors for GT2.0 methodology

Competition from/for	Level of competition
Simpler 'copy cat' approaches that call themselves 'co-design' but actually involve stakeholders in more limited ways, and during few phases of project design	High because there are many, and the claims made re co-design are great. The difference of the GT2.0 Methodology only becomes evident once the co-design process is carefully considered.
Co-design methodologies for monitoring schemes such as the Making Sense project ³¹ approach	These methodologies are more limited in nature as the focus is primarily on data collection.

³¹ <http://making-sense.eu/>

Table 10-4 PESTEL analysis for GT2.0 methodology

Political	± Elections can affect the implementation process via turnover of key stakeholders in public office (positively or negatively), hence the results that the GT2.0 methodology delivers and therefore can a) compromise its reputation or b) enhance its reputation.
Economic	- Public authorities: Budgets allocated to implementing the GT2.0 methodology maybe reduced owing to elections (new priorities), general budget cuts, etc. - Recession may mean that people are less ready to volunteer to environmental issues and hence to GT2.0 methodology implementation.
Social	- Generation divide, e.g. younger generations no longer interested in public accountability, participatory processes. - Cultural norms may clash with GT2.0 methodology principles, if not implemented carefully/sensitively.
Technological	+ Advances in ICTs may be seen to deliver superior results (decisions) compared to public participation, hence impede uptake of GT2.0 methodology. + Further diffusion of ICTs in developing countries may help speed up uptake of GT2.0 methodology as implementation of citizen-based data collection and access to online platform will be easier. + Advances in sensor technologies may result in data richer COs and hence strengthen the position of COs and therefore demand for them (and the GT2.0 methodology).
Environmental	+ Environmental disasters may spark huge interest in community-based monitoring and longer term set ups for institutionalising these - hence for ways in which COs can be set up sustainably which is where the GT2.0 methodology comes in.
Legal	+ Depending on regions, yes, legislation and regimes that support public participation in public decision making, which will work in favour of uptake of GT2.0 methodology.

2.5 Potential Market Expansion

The USP of the GT2.0 methodology is that it is a design methodology for the setup of Citizen Observatories or other complex projects that involve multiple & diverse stakeholders. It offers the following advantages:

- A methodology for social value creation related to complex processes and the creation/strengthening of local relationships.
- Provides credibility to participatory processes and community-based data collection.
- Adaptable to different geographic contexts, socio-economic & political settings and thematic issues.
- Flexible while maintaining quality control and providing detailed guidance.
- Provides a higher chance of success of the envisaged change and higher impact.

In essence, it offers a common global methodology that can be applied to local environmental concerns.

The customer groups of donors/funding bodies and public authorities have similar requirements for the Methodology, and thus no market segmentation (based on user requirements) is required for the moment. In particular, the target is change or process managers within these organisations, or consultants to such organisations, who are specifically interested in delivering value from research projects.

The total addressable market for the Methodology is substantial, given its wide applicability for setting up complex projects in the context of developing social innovations (addressing societal needs involving society), in international cooperation and for developing sustainable solutions more generally.

We have approached the analysis of the TAM from a number of angles. The number of citizen science campaigns has been estimated from the ECSA (European Citizen Science Association) membership and world-wide. We have also considered the membership of ECLEI³² (Local Governments for Sustainability) to reflect the potential interest from local public authorities with a strong urban environmental agenda. We have also included NGO/CSO numbers since a subgroup of these organisations will be interested in local environmental stewardship activities and require a clear demonstration of impact and social return on investment for the projects that they support/fund.

We recognise that there are some might be overlaps in our customer groups (leading to double counting), but this is compensated by the underestimation that comes from counting organisations rather than the number of projects they might manage.

Customer groups	Number of potential customers	
	Europe	World-wide
Citizen science campaigns, project organizers and CO	≈ 100	E 500 ³³
ECLEI members	≈ 160	E 1,750 ³⁴
CSO/NGO	≈ 2,120	E 11,690 ³⁵

A website will be created with the aim of publicising the Methodology, and where the methodology guidelines will be made available – either in a report or in an interactive format (similar to that of Strategyzer³⁶ for their BMC).

An initial idea for the business model for the GT2.0 methodology is that it will be made available free-of-charge under some kind of copyright, for example, a Creative Commons licence³⁷ held by IHE. However, financial revenues can be obtained from consultancy services towards complex project implementation to support the implementation of the GT2.0 methodology. A typical hourly rate for such consultancy services is 100 €/hr and it is estimated that around 250 hours will be required per project.

³² www.iclei.org

³³ Mostly in USA, Australia and Africa

³⁴ <http://www.iclei-europe.org/>

³⁵ <https://esango.un.org/civilsociety/>

³⁶ <https://www.strategyzer.com/>

³⁷ <https://creativecommons.org/>

2.6 Conclusions

The GT2.0 Co-design methodology is complex to apply but offers projects, with a strong social perspective, and their funding bodies significant benefits regarding sustainable outcomes and impacts, societal value, as well as citizen buy-in and participation.

The Co-design methodology clearly has the advantage of having a large potential market, and thus market uptake could be significant and grow rapidly. The challenge is for IHE to raise awareness of this new methodology and to clearly demonstrate such benefits to a broad range of potential customers. Initially this can be done by publicising the successful application of the methodology in the GT2.0 project. This message should be targeted at funding bodies, public authorities and CSOs through academic conferences and citizen science fora.

Another advantage for users/customers is that the Methodology guidelines will be made available free-of-charge, with an acknowledgement of source being the only condition of use. This should go a long way to stimulating market uptake and its implementation. However, the cost of consultancy to support users in their implementation of this methodology is estimated to be around € 25,000. Such consultancy is not essential for the application of the co-design methodology, but we foresee that many users will require such support, at least initially. This is not insignificant amount, which will need to be included in the calculation of the overall costs of a project. Ideally, this ‘other cost’ should be included upfront in project proposals – with justification to convince the funding organisations of the substantial advantages offered by this Methodology.

3 The Quality control tool

3.1 Description

The Quality tool developed within the GT2.0 project is a tool designed for evaluating data quality in citizen science projects and reporting data quality indicators.

The Quality control tool is a web portal where you can compute overall quality indicators for a collection of observations exposed as an Open Geospatial Consortium³⁸ SOS (Sensor Observation Service) or WFS (Web Feature Service). It can also highlight individual observations that have lower quality in order to examine them. The resulting indicators can be shared with other users of the portal. Thus it is a standard (application and domain neutral) way to compare results from data collection, and to give insights in the quality of the data that is collected, and thereby increasing trust in the data. It is targeted to data aggregators in projects where citizen science or in situ sensors are used to collect data.

The tool is developed by CREAf and ALTRAN who will be running and maintaining the service.

Potential customers	Gains	Pains
Wide range of users of citizen science data	Improved documentation on data quality	Poor reliability of data collected by citizens
Citizen science campaigns, project organizers and data aggregators	The quality of the data allows the data aggregators to assess whether the data is fit for purpose, as well as further use of the data	Poor reliability of data collected by citizens
Projects that generate spatial data	Improved documentation on data quality	Uncertain reliability of data collected

3.2 Product/Service value-add and SWOT analysis

Table 11-1 Value-add, Gains and Pain relievers for the Quality Control tool

Value –add	Gain creators	Pain relievers
An easy-to-use way of assessing the quality of the data.	Data aggregators can easily assess if the data is fit for purpose, as well as for other possible uses	Uncertainties related to not knowing the quality of the data and not being sure that the data is valid for a purpose

³⁸ <http://www.opengeospatial.org/>

Table 11-2 SWOT analysis of Quality Control tool

Strengths	Weaknesses
Easy to use	Requires that the data is available as an OGC SOS or WFS service.
CREAF is in a good position to present this tool at OGC for a and through the GEO working group on CS (thus raising awareness) since they are members of these groups	Low awareness of the availability of this tool.
Opportunities	Threats
Many new or existing Citizen Science (CS) projects can benefit from this tool.	Not much data is currently available as an SOS or WFS, and thus the potential market for the Quality tool is limited.

3.3 Competition and PESTEL

Table 11-3 Analysis of competitive factors for Quality Control tool

Competition from/for	Level of competition
Manual checking of the data quality (which is time consuming and costly)	low

Table 11-4 PESTEL analysis for Quality Control tool

Political	+ If governments want support open data policies, CS data will need to be verified and quality checked before release. -No regulation re CS data currently exists
Economic	+ Lack of money in public administrations for research will encourage the use of citizens as data providers, and thus the uptake of citizen science projects
Social	+ Citizen's willingness to participate in citizen science as a result of greater awareness of the environmental challenges facing us all -Without training, citizens might not provide entirely accurate information.
Technological	-Lack of adoption of standards that will impede access to the data that for analysis
Environmental	(not applicable)
Legal	+USA has a law recognizing the use of Citizen Science for public administrations - Europe lacks a similar law

3.4 Potential Market Expansion

The requirement for a quality assessment tool has been emphasized by some FP7 or H2020 projects in the past but a generic tool for general use was missing. The USP of the Quality control tool is that it can analyse any data coming from any interoperable CS project, i.e. that use SOS and WFS standards.

For the moment the tool is open source and available free of charge. CS projects can set up the tool in their website/data platform to offer both OGC SOS data access and data quality assessment. Having said that, CREAf can accrue revenues from customisation of the tool and for consultancy on how to set up an OGC SOS for their clients. To this end, they can use MiraMon open software (<http://www.miramont.cat/USA/Prod-NavegadorServidor.htm>), which was produced by CREAf. This software is free of charge, but a MiraMon server costs around €2,200 to install on the clients' platform.

It is estimated that as start-up costs, clients will require 3 hrs of consultancy for installation of the Quality tool, and 25 hrs for customisation. In addition, clients will face 5 hrs per year in operating costs (for updating and debugging of the software).

CREAf is a non-profit organisation and has a consultancy rate of €50/hr.

Customers	Number of potential customers	
	Europe	World-wide
Citizen science campaigns, project organizers and data aggregators	≈ 100	E 500 ³⁹

The number of potential customers for the Quality tool has been estimated from the ECSA (European Citizen Science Association) membership - as this reflects the number of organisations that are interested in implementing CS projects and campaigns. Among this group, the current use of SOS is low, but it is estimated that the uptake of SOS standards/servers will increase rapidly (exponentially) over the next 5 years. As a result, CREAf have estimated that the number of clients/customers world-wide for their Quality tool will start off with very few (3 in total) in their first year of operation, increasing to 90 by the end of year 5.

3.5 Conclusions

The toughest competition faced by the Quality Tool is that of the incumbent, which is manual checking of the data quality. Even though manual checking is more time consuming and costly than it would be with the Quality Tool, customers are likely to be resistant to change initially. A second factor that will limit the market uptake of this tool is the fact that the current use of OGC's interoperable Sensor Observation Services (SOS) is low. In addition, few potential customers are aware that such a tool exists as it has only just been developed. To overcome this lack of awareness, CREAf will need to publicise this tool as widely as possible in the CS fora of GEOSS and OGC. Thus, only a small number of early adopters of this new technology are expected, but growth in market uptake is expected to be exponential over the next five

³⁹ Mostly in USA, Australia and Africa

years. Furthermore, CREAf could boost their number of clients by an offering of a single bundled product comprising the SOS and the Quality tool in one package.

4 Overall Conclusions

4.1 Conclusions re COs

Although each GT2.0 CO has its own purpose and involves its local community, a number of common themes have emerged across most or all of the demo cases analysed to date. During the CO analysis, all demo cases have recognised the significant social value of the COs, so it is important to consider the non-profit approach as potential business model. These have been presented in D3.3 – Sustainable business models.

In many cases the social value proposition lies in the CO offering a ‘communication channel’ between decision makers and citizens, a way to improve government transparency, easy access to public data, and improved citizen engagement in local environmental stewardship activities. Although these might outweigh the financial value-add, quantifiable financial benefits (such as cost savings) are expected in some demo cases. These are further elucidated in deliverables D1.11 - Initial validation and socio-economic Impacts Report, and D1.12 – Updated validation and socio-economic impacts report.

Government authorities in some shape or form are involved as key stakeholders in all the GT 2.0 COs, either as data suppliers or ‘customers’. This brings up two issues. Firstly, to gain governmental support for such initiatives, the authorities will need to gauge the impact that the COs will have on the public (level of public good), as well as the number of citizens that will be targeted. Secondly, all governments have limited resources and thus the COs will have to ‘compete’ with other social programmes for public support and funds. In general, the ‘mission’ of a CO should match one of the priority goals of their governmental ‘customer’, to achieve this end. Fortunately, this already applies to the COs, since the relevant governmental bodies were part of the co-design process and thus their requirements in this regard have, to some extent, steered the design of the CO.

In a number of COs (Meet Mee Mechelen, RitmeNaura and the Zambian CBNRM), support is sought from higher levels of government, e.g. from national or regional funding schemes. Therefore, the ‘customer’ stakeholders are not the same governmental entities as those represented in the core stakeholder group, all be they both governmental stakeholders. In these cases, the higher public body still needs to be ‘convinced’ of the value of the CO, either by a demonstration of the results/outcomes of the CO, and/or the involvement of a critical mass/number of citizens engaged or targeted. In the case of the regional NitiLuli Silowana CO, buy-in by the CBNRM association resulted in the geographically expansion of the CO to a national system for Zambia.

The majority of demo cases have a smaller, local focus i.e. municipal (Meet Mee Mechelen, Grip op water Altena), or regional (VattenFokus, RitmeNatura, Maasai Mara CO) target groups. For this reason, the initial outreach has been analysed in terms of number of citizens participating and/or “using” the CO. On the other hand, for many of the COs, geographic expansion can be achieved by ‘repetition’ of the CO (community and platform) for another town/city/area. This has in fact been illustrated by the addition of a new CO for Antwerp, albeit with another thematic focus (heat stress in the city).

Even for ‘geo replication’ of the COs, considerable cost savings (by the suppliers) can be achieved through reuse of the software, tools and apps. The IT backend (data collection & analysis) could even be shared, but the user interface or front-end should show access for only Altena, for example, to ensure the local focus is not lost. Whatever, technical solution is chosen, the capital investment costs will be far less to establish a second, third, etc. CO. Having said that, new target geographical areas might need some customisation of the CO if the core stakeholders require new features or tools.

The two demo cases in Africa face similar, ‘typical’ African challenges that do not necessarily apply in Europe. They face a general lack of resources and infrastructure, and a reluctance on the part of some decision-makers to share data or for more transparency. On the other hand, the ‘need’ for programmes that will benefit citizens, and help to relieve poverty by better, ‘combined’ management of natural resources (such as wildlife), is so much greater than in Europe.

In this report, we have investigated the social value add for each of the COs and, where applicable, the financial value-add. This will be further elaborated through the WP1 study on socio-economic impacts for the COs⁴⁰, as well as in the final deliverable from WP3 - D3.4 (Exploitation Roadmap)

For a traditional business model, the financial value add can be calculated by estimating how much the customer is willing to pay for a product or service. This is based on the accepted economic construct that the only meaningful concept of value is that it arises from the interaction of demand and supply in markets. In other words, something is valuable only if someone is willing to pay for it. However, this has been a challenge to apply to the COs, where the key stakeholder group of citizens expects the information to be free of charge for them as they have gathered the underlying observations/data. Instead, the citizens are expecting the public authorities to foot the bill for this ‘public good’ service.

The concept of ‘market supply and demand’ can be applied to the social field according to the Stanford Social Innovation Review (Mulgan, 2010). The author suggests that we should ‘view social value as arising from the interplay of what [he] calls effective demand and effective supply.’ Where:

‘Effective demand means that someone is willing to pay for a service or an outcome, and that “someone” may be a public agency, a foundation, or individual citizens. Effective supply means that the service or outcome works, is affordable, and is implementable. [He] uses the qualifier “effective” because social problems will always invite simple supply and simple demand. But to measure social value, the supplies and demands must be effective in the senses described above.’

He recognised that in some fields, the links between supply and demand are mature (e.g. people are willingly paying taxes for policing, schools, national health system, etc.). In these cases, analysis of the social value is not difficult, because the links between what funders want and what providers know they can offer is clear. For other social issues the links are missing (e.g. because the need is not a priority on either side), or both sides of the supply-demand equation may be murky or complex (because the supply side is fragmented, or the social values of the demand side/public are varied).

Despite these challenges, a number of methodologies are being developed to measure social value, and in WP3 we have chosen to follow the methodology of Bhatt and Hebb [17] for Measuring Social Value. This will be reported in D3.4 (Exploitation Roadmap) where we have applied appropriate social value metrics to progress towards sustainability recommendations for the COs. This information was obtained through face-to-face interviews with a wide range of beneficiaries (stakeholders) of the COs, to better understand the value to them of the long-term impacts of the COs. This ran in parallel to the more commercially based analyses for the GT 2.0 enabling methodologies and tools.

4.2 Conclusions re GT2.0 methodology and tools

In this deliverable, we also included an analysis of the commercial opportunities for the GT2.0 products, i.e. the co-design methodology and tools (e.g. OSM land use/land cover mapper and data quality tool).

⁴⁰ D1.11 Initial validation and socio-economic Impacts Report, due March 2017 and D1.12 Updated validation and socio-economic Impacts Report, due Aug 2019.

Unfortunately, the OSM LULC Mapper is not yet sufficiently mature to be a marketable product. In contrast the Quality Tool is ready for market and the Co-design methodology will be made available by the end of 2019. Both these products have a significant potential market and will be made available free of charge, with the option for implementation support at a cost (depending upon the number of consultancy hours required). The competition for both these products is the incumbent – either in terms of manual processing (Quality Tool) or existing co-design methodologies. The challenge CREAf and IHE both face is that these new tools are largely unknown, and it will require considerable promotion and awareness raising in the field of CS and beyond. Having said that, both these organisations are leaders in their fields and are very proactive in academic conferences, CS fora and associations (ECSA, GEOSS working groups, CSEOL⁴¹, etc.).

The strongest opportunity for these tools lies in the expected rapid growth in the number of CS and CO projects. The EC started out with funding five small CO projects⁴² under FP7, which have expanded to four large scale demonstration projects, one of which is GT 2.0, and the Doing It Together Science (DITOs)⁴³ network. In general, community based projects (such as CS and CO) are proving to be a new trend in environmental monitoring and information systems, and the expectation is that funding agencies will become more and more interested in commissioning these types of projects, that have a focus on demonstrating impact related to social value creation and the creation/strengthening of local relationships.

⁴¹ Citizen Science Earth Observation Lab for ESA

⁴² <https://ec.europa.eu/easme/en/news/have-you-heard-about-concept-citizens-observatories>

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10. Annexes

I. Methodology: Associated tables

Market/Stakeholders segmentation:

Table 0-1 The core stakeholders and their requirements

Core stakeholders	Needs
CITIZENS	
DATA AGGREGATORS	
POLICY MAKERS	

Table 0-2 Identification of 'market forces' group

'Market Forces' group	Comments
SUPPLIERS	
CUSTOMERS/BUYERS	
POSSIBLE SHAREHOLDERS & INVESTORS	

Product/Service value add and SWOT analysis:

Table 0-3 Incentives (taken from D1.7)

Citizens	Data Aggregators	Policy Makers



Table 0-4 Value-add, Opportunities and Strengths

Financial Value –add	Social Value-add	Opportunities	Strengths

Table 0-5 Barriers (taken from D1.7)

Citizens	Data Aggregators	Policy Makers



Table 0-6 Threats and weaknesses

Threats	Weaknesses

II. Template and database for Demo Case leader's interviews

III. Exploitation questionnaire for the demo teams

Questionnaire for the demo cases re exploitation of CO platforms

The aim of this questionnaire is to start exploring the issues concerning the exploitation of the COs that will be developed during GT 2.0. (i.e. towards the end of the project or after the project has been finalised). We recognise that at this early stage, some questions may prove difficult to answer. Thus, we would like the demo teams to brainstorm these issues in a group, and provide a single, collated response. There may be overlaps with issues that have been raised the Stakeholder Analysis and co-design compendiums, but here we are trying to tease out the essentials. Please give your best guess answers when you are in doubt.

Which demo case do you represent?

- Belgian demo case
- Dutch demo case
- Spanish/Catalan demo case
- Swedish demo case
- Zambian demo case
- Kenyan demo case

Value Proposition Canvas

The objective of this section is to do a preliminary analysis following the Value Proposition Canvas for the demo case in question. Please try to avoid 'orphans' - e.g. gains or jobs without a related stakeholder. Use the outcomes from your user requirements analysis and your updated Central Challenge statement as the starting point to

'CUSTOMER JOBS' - what are your core CO stakeholders trying to get done in their work or in their lives?

Long answer text

What are the GAINS (outcomes and benefits) that your core CO stakeholders want to achieve?

Long answer text

What are the potential PAINS (negative outcomes, risks or obstacles related to their jobs)?

Long answer text

What PRODUCTS or SERVICES will your CO offer them? (e.g. the CO itself, wholly or partly, an enabling technology, or environmental information)

Long answer text

GAIN CREATORS - what value add or benefits will your core stakeholders accrue? (this could also include cost savings or avoidance)

Long answer text

Business opportunities

Here we are trying to get a better understanding of where the commercialisation opportunities lie. Is it from the CO itself - as a whole or partly - or from one of the enabling technologies, or from the environmental information

As the partners of the CO, where do you see the business opportunities to be at this stage?

Long answer text

Initial exploration of Willingness to Pay

Try to step outside of your community and envisage your core community members as the 'customers' of your CO. These questions might be particularly difficult to answer at this stage, but please try to give at least your best

In your opinion, which of your community members would, most likely, pay for or fund your CO/your product/your service?

Short answer text

Do you know if they have the budget/a budget line for this?

- Don't know
- Yes
- No
- Maybe

Do you foresee that other community members could contribute financially as well? Please name them.

Long answer text

Do you foresee community members subscribing to your CO/your service (e.g. for an annual fee)? If so, which community members?

Long answer text

Market perspectives

In this section we would like to start exploring the potential success of your CO on the market for environmental mapping services. Here we should consider the competitive environment that these services will face - be they from other information sources or simply the status quo. These can also encompass the internal strengths and weaknesses of the COs, as well as the external opportunities or threats that they may face. For example, a resistance to operational changes on the part of the target communities, or the concerns about the quality of citizen sources data, could be obstacles. First to market could be an opportunity, but will be challenging. Meeting the unmet demand in a niche market is good, if the niche market is substantial in size. Please be as broad as

Do you foresee any disadvantages/weaknesses of your CO/your product/your services?

Long-answer text

External environment

A PESTEL analysis is a framework or tool used by marketers to analyse and monitor the macro-environmental (external marketing environment) factors that have an impact on the potential market uptake of, in your case, the COs/the products/the services (your offering/s). Again, please be as broad as possible in the scope of your

Image title



offering/s? (such as political stability, changes in environmental policy, citizen involvement schemes, etc.)

Long-answer text

What economic factors might improve or impede the uptake of your offering/s? (such as economic growth, interest rates, exchange rates, etc.)

Long-answer text

What social factors might improve or impede the uptake of your offering/s? (including any cultural aspects, environmental consciousness, age distribution, and emphasis on information transparency, etc.)

Long-answer text

What technological factors might improve or impede the uptake of your offering/s? (e.g. improvements in remote, autonomous sensors)

Long-answer text

What environmental factors might improve or impede the uptake of your offering/s? (mostly inherent to GT 2.0, e.g. climate change will create demand for many of the COs, but does anything else spring to mind?)

Long-answer text

Are you aware of any current laws (local, regional or national), or foreseen changes in the law, that might improve or impede the uptake of your

Long-answer text

IV. Exploitation questionnaire for the GT2.0 outcomes/products

Questionnaire for the exploitation of GT 2.0 tools/methodology

The aim of this questionnaire is to start exploring the issues concerning the exploitation of the project outcomes that will be developed during GT 2.0. (i.e. towards the end of the project or after the project has been finalised). We recognise that at this early stage, some questions may prove difficult to answer. Please give your best guess answers when you are in doubt.

Which GT 2.0 output are you representing?

- OSM Land Use Land cover Mapper
- Methodology
- Data Quality Check tool

Clearly describe the product/tool that you will be offering

Your answer

What are the unique selling points of your product/service?

Your answer

Who is your product/service aimed at? (please identify the target potential customers, and/or customer groups)

Your answer

What is/are the KEY value-add or benefits that your product/serve services will offer these customers? (costs savings are also relevant here)

Your answer

What model do you foresee for how your customers will pay for your product/service? (e.g. licensing, subscription, consultancy)

Your answer

Could you please estimate the ideal pricing of your product/service - even if roughly.

Your answer

Are you aware of any current similar (or substitute) product or service on the market?

Your answer

Value proposition canvas

The objective of this section is to do a preliminary analysis following the Value Proposition Canvas for the product/service in question. Please complete these questions for each of the 'beneficiary'/customer/stakeholder target groups (i.e. citizens, data aggregators, process managers, decision makers, etc.) and try to avoid 'orphans' - e.g. gains or jobs without a related stakeholder.

What are the GAINS (outcomes and benefits) that your customers want to achieve?

Your answer

What are the potential PAINS (negative outcomes, risks or obstacles related to their jobs)?

Your answer

GAIN CREATORS - what value add or benefits will your customers accrue? (this could also include cost savings or cost avoidance)

Your answer

PAIN RELIEVERS - what pain will your product/service relieve on the part of your customers?

Your answer

Market perspectives

In this section we would like to start exploring the potential success of your product/service on the market. Here you should consider the competitive environment that these products/services will face - be they from other information sources or simply the status quo. These can also encompass the internal strengths and weaknesses of the products/services, as well as the external opportunities or threats that they may face. For example, a resistance to operational changes on the part of the target communities could be an obstacle, while the concern about the quality of citizen sources data, is an opportunity. First to market could be an opportunity, but will be challenging. Meeting the unmet demand in a niche market is good, if the niche market is substantial in size. Please be as broad as possible in your scope of responses.

What do you see as the advantages/strengths of your product/service on the market?

Your answer

Do you foresee any disadvantages/weaknesses of your product/service?

Your answer

What market opportunities do you foresee for your product/service?

Your answer

What market threats do you foresee for your product/service?

Your answer

External environment

A PESTEL analysis is a framework or tool used by marketers to analyse and monitor the macro-environmental (external marketing environment) factors that have an impact on the potential market uptake of your product/service. Again, please be as broad as possible in the scope of your responses.



PROFESSIONAL
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What political factors might improve or impede the uptake of your product/service? (such as political stability, changes in environmental policy, citizen involvement schemes, etc.)

Your answer

What economic factors might improve or impede the uptake of your product/service? (such as economic growth, interest rates, exchange rates, etc.)

Your answer

What social factors might improve or impede the uptake of your product/service? (including any cultural aspects, environmental consciousness, age distribution, and emphasis on information transparency, etc.)

Your answer

What technological factors might improve or impede the uptake of your product/service? (e.g. improvements in remote, autonomous sensors)

Your answer

What environmental factors might improve or impede the uptake of your product/service? (mostly inherent to GT 2.0, e.g. climate change will create demand for many of the COs, but does anything else spring to mind?)

Your answer

Are you aware of any current laws (local, regional or national), or foreseen changes in the law, that might improve or impede the uptake of your product/service?

Your answer
