CitiMeasure

Using citizen measurements to create smart, sustainable, and inclusive cities

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

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Acronyms

AAWA	Alto Adriatico Water Authority
CS	Citizen Science
CSISTA	Citizen Science Impact Story Telling
EC	European Commission
EEA	European Environmental Agency
EU	European Union
JRC	The Joint Research Centre (JRC) of the European Commission
MSFD	Marine Strategy Framework Directive
PGRA	The official Flood Risk Management Plan (PGRA) of the Brenta-Bacchiglione catchment
QR	Quick Response
UN	United Nations
VMM	The Flemish Environment Agency
WHO	World Health Organization

1 Executive Summary

This report presents four case studies of citizen science initiatives that can be considered as good practices for improving environmental monitoring and management in urban areas. This includes (1) the case of CurieuzeNeuzen that produced a large set of comparable air quality data in Flanders, (2) Marine Litter Watch that contributed to both data gathering and behaviour change regarding plastic pollution in coastal areas, (3) Brenta-Bacchiglione Citizens Observatory that created a change in flood risk management policies and practices in Northern Italy, and (4) the D-NOSES project that stepped towards fostering digital inclusion in citizen science initiatives, as well as policy change regarding odour management. A storytelling approach was adopted to collect and share information about these cases. The report is concluded with a reflection on the lessons learned from the selected case studies, and their relevance for the CitiMeasure working groups.

2 Introduction

2.1 ABOUT CITIMEASURE

Citizen measurement (or citizen science) initiatives contribute to a sustainable transition in European cities. By using an array of tools and instruments, citizens can play a role in measurement and monitoring of indicators on air quality, temperature, soil moisture, biodiversity, or risk management, among other environmental areas. Citizen measurement initiatives also can foster communications and interactions among stakeholders and contribute to the democratisation of science and policy.

The CitiMeasure project (2021-2023) aims to bring together the experiences and expertise of European cities, organisations and networks in implementing citizen science initiatives (in the form of guidelines, toolbox, web-platform, Apps, etc.). The project builds upon the lessons learned from the Dutch City Deal Working Groups, a network of stakeholders working on the broader area of smart cities, which includes the topic of citizen measurement initiatives. The City Deal has been working closely with the Dutch Ministry of Interior and Kingdom Relations for over a year. CitiMeasure builds upon these experiences and will use those to develop and pilot three 'instruments' namely:

1. An instrument that allows the outputs of different city measurement initiatives to be compared.

2. An instrument that safeguards the digital inclusivity of city measurement initiatives (maximising the opportunities for participation of interested individuals and communities).

3. An instrument that connects information to behaviour change and policy.

There is a 4th (Strategy and Oversight) working group that focuses on providing strategic direction and ensuring cohesion of activities across the three Instrument Sub-Groups, and the project in general.

CitiMeasure will also raise awareness of the importance of citizen measurement initiatives and capitalise on the results and tools of similar citizen science projects by creating an online European Knowledge Centre with a repository of good practices.

2.2 PURPOSE OF THIS REPORT

The purpose of this report is to showcase four case studies of citizen science initiatives that can be considered as good practices for improving environmental monitoring and management in urban areas. The selected case studies are considered based on major contribution to data collection, their impact on behaviour change, triggering change in policy, or positive impact on digital inclusion.

Although all of the identified case studies have contributions to more than one of the aforementioned aspects, in our selection we mainly focused on their contribution to one aspect.

2.3 STRUCTURE OF THE REPORT

This report is structured as follows. Section 3 provides a background on the selected approach of this report that is the use of storytelling for reporting on the impacts of the selected cases. The criteria followed for selection of the cases, as well as the methodology for capturing and reporting information about the selected cases are described in Section 4. Section 5 is dedicated to presenting the impact stories of the four selected case studies. The report is concluded in Section 6 with reflections on the lessons learned from the selected case studies, and their relevance for the CitiMeasure working groups.

3 Background

Citizen science is a fast growing and dynamic field. The number of citizen science projects is constantly increasing, and the diversity of initiatives in terms of topics, approaches, tools and results is simply overwhelming. This raises the question of how to best capture and share best practices and lessons learned from citizen science initiatives? Project reports, scientific publications, policy briefs, and presentations in conferences and project meetings are among the most commonly used methods of sharing such information. However, these methods have a lot of limitations, and in most cases designed to appeal to a very specific, and often specialized, group of audience.

Storytelling is a method that can help promote understanding of an approach, direct attention, and trigger emotions within a broad range of audience (Burns et al., 2003; Wilson, 2002; Richter et al., 2019). For centuries, stories have been used to describe events, share ideas, and communicate key messages in a way that attracts the attention of the reader. Certain fields such as education and science communication have used narratives as a tool for conveying messages and sharing ideas since a long time ago.

Experts in the field of citizen science have recently started using storytelling as a powerful tool for a variety of purposes. Richter et al. (2019), analysed the different applications of storytelling in the field of citizen science and concluded three major categories of such application, namely, storytelling as the core research objectives of a project, stories as a tool to implement different phases of a project, and stories as a tool for communication about the project. Hecker et al. (2017), identified different communication applications of stories in citizen science that include connecting people's needs, expectations and values to project objectives, retaining stakeholder engagement by telling stories about advancements in the project, and reaching a wider audience by publishing stories on social media. Moreover, stories have also been applied to capture and share the impact of citizen science initiatives. For example, the Impact Community of Practice in the WeObserve project developed an approach called CSISTA (Citizen Science Impact Story Telling Approach) that is designed to help capture and communicate governance impacts of citizen science initiatives (Wehn et al., 2021).

Good practices in the field of citizen science are identified based on both the processes that they follow and the results that were produced. This is directly linked to the impact of initiatives in advancing methodologies for setting up and running successful citizen science projects, and the results that these initiatives produce. In this report we employ a storytelling approach to introduce four case studies of citizen science initiatives that are considered as good practices for improving environmental monitoring and management in urban areas.

4 Methodology

The methodology followed in this report includes three distinct steps. First, the criteria for selection of the case studies of good practices were defined. In the next step, an impact inquiry instrument was developed that allowed for a systematic information gathering about the cases. Subsequently, the information collected about each case was used to write an impact story of the case, in a summarised and accessible format.

4.1 SELECTION OF THE CASE STUDIES

Citizen science is a fast growing and dynamic field. There are hundreds, if not thousands, of initiatives that fall within the various definitions and terminologies that are used to describe citizen science (Eitzel et al., 2017; Haklay et al., 2020). For example, in an attempt to create an inventory of citizen science initiatives, JRC listed 503 initiatives that are relevant for environmental policy (Bio Innovation Service, 2018). Among these projects there are quite a few examples of successful initiatives that are worth mentioning, and this makes selection of only four initiatives a difficult task. In order to create the short list of four projects for the purpose of this report, a number of selection criteria were considered. The most important criterion was the relevance of the main achievements of the selected cases for the topics in focus of the CitiMeasure working groups, i.e., comparability of results, digital inclusion, and behaviour and policy change. Moreover, in our selection we aimed for diversity of the initiatives in terms of thematic focus and geographic location. Finally, the priority was given to the initiative that have been previously identified by the citizen science practitioners and/or the European Commission as good practices in the field. The four selected case include (1) the case of CurieuzeNeuzen that produced a large set of comparable air quality data in Flanders, (2) Marine Litter Watch that contributed to both data gathering and behaviour change regarding plastic pollution in coastal areas, (3) Brenta-Bacchiglione Citizens Observatory that created a change in flood risk management policies and practices in Northern Italy, and (4) the D-NOSES project that stepped towards fostering digital inclusion in citizen science initiatives, as well as policy change regarding odour management.

4.2 DEVELOPMENT OF AN INQUIRY INSTRUMENT

This instrument is designed to help capture the impact stories of the case studies on the topics. In terms of structure and content, this instrument builds on the CSISTA Impact Inquiry Instrument[1] that was originally designed to capture the governance impact stories of citizen science initiatives, as a part of the activities of the Impact Community of Practice (CoP) of the WeObserve project. The details about the approach and the CSISTA Impact Inquiry Instrument were recently published in a paper in the Journal of Environmental Management (Wehn et al., 2021).

Certain modifications and additions were necessary to make the Impact Inquiry Instrument 'fit for purpose' and to help capture and communicate good practices of citizen science related to the topics in focus of CitiMeasure. Most importantly, the nature of the impact, or the central point of the story needed to be much wider, and cover the topics in focus of CitiMeasure, rather than only on governance impacts. In terms of the terminology used, and for simplification of the rather plural concepts used in the CSISTA Impact Inquiry Instrument, we only used the term 'citizen science', to cover both concepts of citizen science and citizen observatories. Several other language and structural modifications, e.g., changes in the categories of geographic scope were necessary to make this tool consistent with the content of the CitiMeasure landscape review reported in D1.1. The final product

[1] https://zenodo.org/record/4543603#.YSyACI4zaUk

is an Impact Inquiry Instrument that was used for collecting information about the four case studies in this report. The final Impact Inquiry Instrument is presented in Annex 1.

4.3 APPLICATION OF THE INQUIRY INSTRUMENT

The CSISTA approach includes three steps for developing an impact story (Wehn et al., 2021). Figure 1 provides a visual summary of these steps.

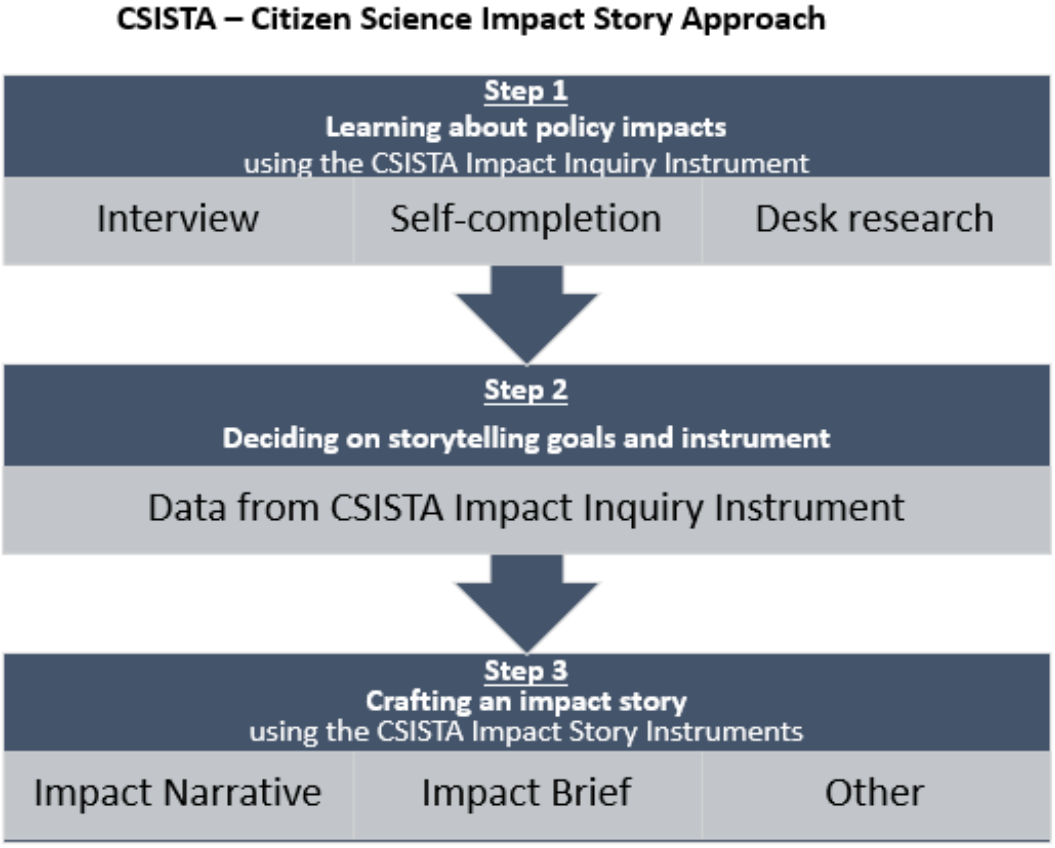

Figure 1 Recommended steps and instruments of the CSISTA approach

Source: Wehn et al. (2021)

Step 1 is learning about the impact of a citizen science initiatives by applying the Impact Inquiry Instrument. There are three suggested starting points (or sources of information) for this learning exercise that include desk research, interviews, and self-completion of the instrument by the coordinator or a team member of the project. We choose to use the desk research approach mainly because there was already a wealth of information available about the selected case studies.

In the 2nd step, a decision needed to be made on the storytelling goals and the type of instrument used. The goal of this report is to showcase the good practices of citizen science initiatives and the audience for this report is expected to be citizen science practitioners, staff members of city administration, or members of organisations that work with cities and have an interest in the topic. Due to the diversity of the expected audience, we chose to use the Impact Brief format that consists of a number of pre-defined building blocks and has a straightforward and easy to follow format that is suitable for a diverse audience. Similar to the content and structure of the Impact Inquiry Instrument, we revised the building blocks of the impact brief proposed by Wehn et al. (2021), in order to improve the flow and readability of the impact briefs. The following structure was used across the four stories.

CitiMeasure Impact Brief building blocks

- Story title
- In a nutshell (Project name, Topic; Location; Duration; Initiator(s); Stakeholders)
- Project image
- The challenge
- Why does it matter?
- The action
- In numbers (Participants; data points; [other project dependent items])
- The impact
- References (Link to the CS initiative website, references, and outputs)

The 3rd and the final step was to craft the impact stories (briefs). In order to do this, information from several sources were combined. In terms of the language used, jargon and technical terms were deliberately avoided to increase the readability of the stories.

5 Case studies of good practices

5.1 STORY 1: PAINTING THE COLOUR OF THE INVISIBLE TOGETHER! THE CASE OF CURIEUZENEUZEN

IN A NUTSHELL

Project name: CurieuzeNeuzen

Topic: Air quality (NO2) monitoring

Location: Antwerp/Flanders

Duration: Two measurement campaigns in 2016 and 2018

Initiator(s): Initiated by University of Antwerp, De Standaard and the Flemish Environment Agency, and supported by three research organisations, (VITO, HIVA and Kariboo)

Stakeholders: Citizens, research organisations, local authorities (Flemish Environment Agency), Media (De Standaard)

The challenge

Roughly 12.5% of Flemish people live in the area where concentration of Nitrogen Dioxide (NO2) in the air exceeds the safe level defined by WHO. This includes both urban and rural areas, e.g., narrow streets and crossroads in cities, as well as busy centres of villages. In the region of Flanders, this problem is most prominent in two largest cities i.e., Antwerp and Ghent, with Mechelen and Ostend in the next rankings. The city centre of Antwerp has the highest average concentration of NO2 among the cities in Flanders [1].

Why does it matter?

Since Nitrogen dioxide (NO2) is not visible to the eye, if not monitored well, the environmental and health-related damages that it can cause can go unnoticed. Increasing levels of NO2, linked to increased use of polluting means of transport, has resulted in growing concerns about its harmful effects on lungs. Reduced lung function, inflammation of the airways, increased asthma attacks, and greater chance of hospital admissions are among these harmful consequences.

The action

In its first phase, CurieuzeNeuzen aimed to create an accurate map of NO2 levels for the city of Antwerp, using a participatory and inclusive approach. Due to the successful outreach programme of the initiative more than 2000 volunteers participated in this exercise. In terms of the participation method, this was a 'passive' form of participation. Volunteers would install a standardised and simple measurement device (in the form of a tube) on a volunteer's house window that was facing the street, using a stand similar to real estate boards. In order to reduce errors in observations, two passive sampling tubes (Palmes diffusion tubes) were used at each location. The mean concentration of NO2 in the air at each location was measured over a period of one month. The quality control and calibration procedure included comparing the collected data by citizens reference monitoring stations that were operated by the Flemish Environment Agency (VMM). The accuracy of the method, the success of the initiative in reaching out to a large crowd, and a detailed picture of the NO2 levels that was pained using this approach resulted in a scaled-up project at the

Flanders level: the CurieuzeNeuzen Vlaanderen. This larger initiative that started in 2018 was successful in engaging almost 53,000 people, out of which 20,000 locations were selected based on scientific criteria, and to have the best spatial coverage. The huge success in engaging people was, among other things, because of partnership Standaard, a major Flemish newspaper, that could reach out to many in Flanders. [2,3]

In numbers

- CurieuzeNeuzen Vlaanderen attracted almost 53,000 people, out of which 20,000 participated in the project and provided data. [1,2]
- Participants were mostly families, with 967 schools and some companies and organisations also participating. [1]
- 96% of the measurements had sufficient quality to be displayed on the results map. [1]
- 89% of the data points passed a secondary and stricter quality control, and were used in the further statistical analysis [1]

The impact

CurieuzeNeuzen helped Flanders paint the colour of an invisible, but nonetheless harmful problem. With the help of citizens, a huge amount of data about NO2 levels in both cities and rural areas of Flanders were collected. Moreover, in this process, CurieuzeNeuzen succeeded in raising awareness by bring citizens closer to science and allowing them to be a part of mapping a real problem in their living environment. CurieuzeNeuzen Vlaanderen was both a big step forward for science, and a great example of increased confidence in citizen science. By defining simple to follow procedures and collecting quality data. the project disproved the common assumption that data produced by citizens is unreliable. CurieuzeNeuzen was identified by the European Commission as one of the best practices in citizen science for environmental monitoring [1, 2, 3]

One of the main impacts of the data collected by CurieuzeNeuzen was for improvement of Atmosys, the official regional model that is used to assess air quality in Flanders. The large dataset collected by citizens helped to model more accurately the 'street canyon effect', that is basically concentration of pollutants in often narrow, poorly ventilated, and full-of-traffic parts of the city. As a result, a better estimate of citizens' exposure to NO2 concentration in different parts of Flanders is available that can be used as a basis for recommendations to change policy and decision makers [2]

In a study, CurieuzeNeuzen Vlaanderen monitored behavioural changes in terms of choice of transport in three groups of people including 20,000 participants in the project, 33,000 people who expressed interest, but were not selected to participate, and a reference group of 1,000 other citizens. The majority of people wo were involved and interested in the project, reported changes in their behaviour towards using cars less, but among the members of the reference group, no change in behaviour was observed. [2]

References

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[2] (EEA) European Environmental Agency (2019), Assessing air quality through citizen science. Copenhagen: EEA. Available at: https://www.eea.europa.eu/publications/assessing-air-quality-through-citizen-science

[3] EC (European Commission). (2020). Best practices in citizen science for environmental monitoring. Commission Staff Working Document. Available at: https://ec.europa.eu/environment/legal/reporting/pdf/best_practices_citizen_science_environmental_monitoring.pdf

5.2 STORY 2: TOWARDS PLASTIC-FREE EUROPEAN BEACHES: THE CASE OF MARINE LITTERWATCH

IN A NUTSHELL

Project name: Marine LitterWatch

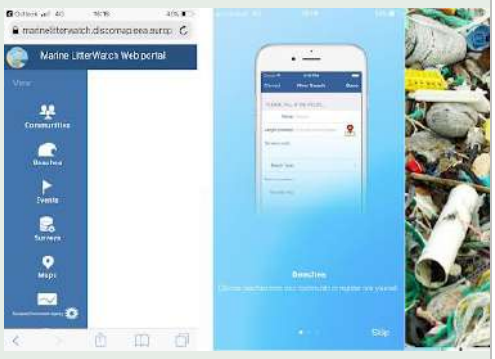
Topic: Marine litter monitoring

Location: Beaches and other stretches of coast inside or outside urban areas in Europe (Doesn't include litter at sea or in rivers)

Duration: 2014- ongoing

Initiator(s): European Environment Agency (EEA)

Stakeholders: The EEA, NGOs, business and industry, coastal communities (e.g., local sports club, scouts), schools, universities, expert communities, public authorities and more



The challenge

According to the Plastic Soup Foundation, 311 million tonnes of new plastic was being produced each year back in 2014, and it was predicted that this figure will increase by two-fold in 20 years. Although only a fraction of this figure ends up in the ocean, this amounts on average to 8 million tonnes of plastic per year. The main reasons that plastic litter ends up in our coasts, seas and oceans are unsustainable consumption and production of plastics, poor municipal waste management practices (including litter management), and the lack of public awareness about consequences of plastic pollution. Monitoring the plastic life cycle has been a challenge, and due to the dynamic nature of this cycle it cannot be easily monitored using traditional means. [2,3]

Why does it matter?

It takes hundreds of years for most forms of plastic to degrade, and in their current form before degradation, plastics can cause health problems for the wildlife at the sea and inland. When plastics end up in the sea, it is carried along by currents and slowly degrades into smaller pieces that are known as microplastics, which can cause serious health problems for humans and animals. Marine litter is a global problem that starts locally. It increasingly threatens human health, marine environment, and other forms of life on earth. Without monitoring and reducing marine litter, we cannot have healthy seas and coastal areas. [2,3]

The action

Marine LitterWatch engages communities in both monitoring and clean-up events. Through this initiative, members can organise events, collect data, upload data and view collected plastic litter data. In other words, Marine LitterWatch includes three main components including organised groups (the 'communities'), the Marine LitterWatch mobile application, and a database. Communities can organise both clean-up and monitoring events on beaches, but quite often an organised event has both purposes. A dedicated web-platform also exists that allows the communities to manage their events and data in an easy way. The list of the items used in the Marine LitterWatch app is based on a harmonised list of items for Europe that is inline with the categories of the Marine Strategy Framework Directive. The data is accessible through EEA´s website [1]

In numbers

- More than 1,600 monitoring and clean-up events organised by volunteer groups [1]
- Almost 700,000 items were found by volunteers along the beaches and coastal stretches [1]
- Top 10 most common items found during the monitoring and clean-up events correspond to almost 60% of the total marine litter include cigarette butts and filters (18%), plastic pieces 2-50 cm (8%), polystyrene pieces 2-50 cm (5%), glass or ceramic fragments (5%), plastic cup/lids (5%), cotton bud sticks (4%), shopping bags (4%), crisps bags (4%), strings and cords (3%), and drink bottles (3%) [1]

The impact

A generic framework for a 'good environmental status' of European coasts and seas by 2020 was provided in the Marine Strategy Framework Directive (MSFD), and Member States were required to monitor the state of the seas and take appropriate steps to reach or maintain this 'good' status by 2020. Nevertheless, for solving such a complex and global issue, legislation is not enough, and everyone needs to contribute. It is therefore vital that all citizens are aware of the problem and contribute to reducing it. More data is needed to properly assess and understand the extent of the coastal plastic pollution problem and citizens are well-situated to help with monitoring the coastlines and beaches. The data produced can help authorities to better track, and plan for reducing the problem. At the same time, and equally important, citizens and coastal communities learn more about the types and sources of marine litter. This increased awareness and understanding is needed for change in behaviour towards more sustainable, responsible, and environmentally-friendly behaviour by individuals and communities. The project Marine LitterWatch was successful in both filling data gaps and engaging citizens with the topic of Marine litter. This initiative contributed to more than 1,600 monitoring events, most of which were action oriented and included clean-up campaigns. [1,2]

This case has been identified by the European Commission as a 'good practice' for achieving the objectives of the Marine Strategy Framework Directive, 'good environmental status' of Europe's seas by 2020', and more specifically its 10th descriptor i.e., marine litter [2]

References

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5.3 STORY 3: SAVING LIVES AND SAVING MONEY DURING FLOOD EVENTS: THE CASE OF BRENTA-BACCHIGLIONE CITIZENS OBSERVATORY

IN A NUTSHELL

Project name: Brenta-Bacchiglione Citizens Observatory

Topic: Flood risk management

Location: The Brenta-Bacchiglione catchment, the Veneto Region (that includes cities such as Padova and Vicenza), Northern Italy.

Duration: October 2012 to present

Initiator(s): The WeSenseIt project partners

Stakeholders: Citizens and Civil Society groups, the Regional and local Civil Protection Agencies, Municipalities, Environmental Agencies, Irrigation Authorities; and other stakeholders

The challenge

The Brenta-Bacchiglione region is one of the areas in Italy that is prone to rapid flash floods. This is because of the mountainous landscape of the region; however, climate change is expected to result in more incidents of flash floods in the area and makes it increasingly difficult to predict and prepare for such events. Major cities such as Vicenza and Padua and towns including Longare, Torri di Quartesolo and Montegaldella are among the population centres most affected by flash floods. For example, a major flash flood in 2010, affected 130 communities and about 20,000 individuals in the region of Veneto. One of the most affected cities was Vicenza, where almost 20 % of the metropolitan surface area was flooded. [1,3]

Why does it matter?

Flooding is a long-standing issue in the Brenta-Bacchiglione catchment. Preparedness of both authorities and citizens before, during, and after a flood event is crucial for saving lives and reducing the economic losses resulting from such events. The EU Flood Directive on Flood Risk Management explicitly asks member states to map the flood extents, assess the risks to people and assets, and take adequate measures to reduce the flood risk. Citizens can contribute to increased resilience of their living environment by participation in citizen science initiatives that are relevant for flood risk management efforts. Brenta-Bacchiglione Citizens Observatory is an example of such initiatives that aim to increase the resilience of the region by strengthening the communication processes both before and during flood events. [3]

The action

The Brenta-Bacchiglione Citizens Observatory was first initiated as a case study of a European-funded project called WeSenseIt. Alto Adriatico Water Authority (AAWA) was a partner in WeSenseIt and led the development of this initiative. After the end of the funding period of the WeSenseIt project (2012-2016), with the support of AAWA, and funding from the Ministry of the Environment, the initiative continued its activities.

The initiative focuses on water level monitoring by trained volunteers. This is done by submitting (on demand) water level readings on gauges that have QR identification codes. In addition,

observations related to blocked water ways can be submitted by volunteers. In order to make sure the observations have sufficient quality, all volunteers must have a relevant background (e.g., civil, and hydraulic engineers, geotechnic experts, and citizens with agronomic and forestry backgrounds), need to participate in two training sessions, and pass an exam, before being able to participate in the initiative. When needed, e.g., in case of a heavy rainfall event, AAWA contacts the volunteers and asks them to provide observations in specific locations. Participants will be paid for proving the observations. The reimbursement rate is 75 €/day (including insurance costs) for a minimum of 3 hours participation per day. More than 40 trained volunteers are involved in the Brenta-Bacchiglione Citizens Observatory. In addition, more than 500 citizens have been involved in training as a part of pilot tests, and they are now more familiar with proper measures in different phases of a severe flood event. [3]

In numbers

- More than 40 trained volunteers [1,3]
- More than 700 status reports and 1,660 images about water levels, river conditions, and the status of water infrastructure (e.g., levees and bridges) were submitted [1]
- More than 500 citizens were involved in pilot, received training about different phases of flood events, and provided feedback on the process [3]
- The annual benefit of this initiative in terms of avoided flood damage is estimated to be more than €137 million [1,2,3]

The impact

Before the pilot case of Brenta-Bacchiglione Citizens Observatory in WeSenseIt, flood risk management practices in the catchment were predominantly structural measures. However, during the WeSenseIt pilot, the value of the initiative for improving early warning systems, models and on-the-ground flood risk management practices was proven. This triggered a change in the official Flood Risk Management Plan (PGRA) of the Brenta-Bacchiglione catchment, which was the inclusion of citizen science initiatives as an official prevention measure to reduce the flood risk in the Brenta-Bacchiglione catchment. A cost-benefit analysis and risk assessments by AAWA showed the substantial monitory benefit from running the Brenta-Bacchiglione Citizens Observatory for flood risk management in the catchment. This is approximately €137 million of damage avoided per year, which equals avoided damage of 45 % as compared to a 'business as usual' scenario. Both monetary and social benefits of this initiative convinced the Ministry of the Environment to fund the development of a scaled-up citizen science initiative at the district level. The case of Brenta-Bacchiglione Citizens Observatory is among the few cases that has a tangible, and already materialised, policy impact. This case has been identified by the European Commission as a 'good practice' for the implementation of the Floods Directive (2007/60/EC) and specific local measures as a part of the PGRA. [1,2,3]

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5.4 STORY 4: CREATING A MAP OF SMELLS IN THE AIR: THE CASE OF D-NOSES

IN A NUTSHELL

Project name: D-NOSES

Topic: Odour pollution

Location: 7 European, and 3 non-European case studies (in Africa and South America)

Duration: April 2018 - September 2021

Initiator(s): The D-NOSES project partners, coordinated by Fundación Ibercivis

Stakeholders: Citizens, industries, local government, (odour and citizen science) experts

The challenge

Despite being the second largest cause of environmental complaints (after noise), odour pollution is one of the least regulated environmental pollution all around the world, including in Europe. Globally, approximately, 30% of environmental complaints correspond with odour pollution, but except for countries like Germany and the Netherlands, odour pollution in other (European) countries is under-regulated. In addition, odour is a difficult topic to monitor using conventional methods, and quite often the source of odour pollution is difficult to identify. [2,3]

Why does it matter?

Odour is linked to several health problems such as burning sensations in the eyes and throat, as well as breathing problems. It is also associated with headaches or feeling such as dizziness or nauseousness. Over a long period of time, odour pollution can affect mood, as well as levels of anxiety and stress.

The action

The D-NOSES project applied quadruple helix approach and engaged four groups of stakeholders, namely, citizens and Civil Society Organizations, authorities, industry and SMEs, and academia) in the co-creation of an adaptable local approach for odour monitoring with the help of citizens. Collection of real-time odour observations was done using smartphones and the OdourCollect App. Collected information are processed and displayed on a global map called the International Odour Observatory. [1,2]

In numbers

- 10 Pilot cases
- 450 communities affected by odour pollution were identified in nine countries, 222 of which are in Europe [4]
- 1000+ App downloads

The impact

The D-NOSES project succeeded to create technological, methodological and policy related impacts. More specifically the project had an impact on advancing the methods and techniques for odour monitoring. It helped advance knowledge and methods of inclusive participation in citizen science

projects. Moreover, D-NOSES triggered policy discussions about odour pollution at the national and international levels. These impacts are further elaborated in this section.

D-NOSES is one of the first examples of the application of citizen science for odour monitoring. The participatory method developed in D-NOSES is easy to adapt in different context and this helps the scalability of the approach. This complements existing odour monitoring techniques and allows members of the general public to help monitor this locally relevant issue and be a part of the solution for reducing odour pollution. [1]

D-NOSES used an inclusive engagement model. The model started with desk research that leads to fieldwork and ethnographic research. This allowed for an in depth understanding of existing communities, and identification of more affected, but less vocal groups. Co-creation workshops were organized to ensure ownership of the project and receive inputs for the design of the tools. Special attention was given to balanced participation of different age groups, and representation of both female and male participants. Lessons learned from applying the D-NOSES inclusive engagement model shows that simple explanations of complex (scientific) content, offering multiple methods for participation, attention to language issues, and freedom to choose different levels of commitment are key for engaging diverse participants. Nevertheless, D-NOSES engagement experience showed that ensuring inclusivity in citizen science projects requires substantial time and financial resources that need to be considered before the start of the projects. [1]

D-NOSES advocated introduction of odour pollution into policy agendas at local, national, and international level. The project managed to provide input for several regulatory processes in Chile, Portugal, and Uganda. In addition, the D-NOSES project manged to attract the attention of the European Parliament and organize an event with the title “Revisiting Odour Pollution in Europe” hosted by the European Parliament Intergroup on ‘Climate Change, Biodiversity and Sustainable Development’. The meeting is planned in October 2021 and aims at bringing together policy makers, representatives from industries, communities, and scientists to share their perspective on the issue, discuss the main challenges of regulating odours, and share recommendations for an improved odour management policy framework, based on the lessons learned by D-NOSES. This case has been identified by the European Commission as a ‘good practice’ of linking odour observations to local and international odour policies [2,3]

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[3] https://ebcd.org/events/online-event-revisiting-odour-pollution-in-europe/

[4] Balestrini M., Creus J., Errandonea L., Arias R., Salas Seoane N. (2018) Map of odour issues and priorities. Multilevel engagement plan for stakeholders and communities, D-NOSES, H2020-SwafS-23-2017-789315

6 Concluding remarks

Review of the four case studies coved in this report yields a number of lessons learned that are relevant for the CitiMeasure Instrument groups.

Forward thinking in terms of inclusion, comparability of results with 'official' observations, and expected impacts on behaviour and policy processes is vital for success of citizen science initiatives. The cases of CurieuzeNeuzen and D-NOSES showed that simplified scientific processes that connect well to local issues, and don't heavily depend on digital skills, increase the chance of inclusion of diverse parts of the society, and comparability of the results. At the same time a thorough understanding of social context, using the right communication channels, and actively trying to reach most affected (but perhaps the least heard) community members is essential for increasing inclusivity. Successful cases such as CurieuzeNeuzen, Marine LitterWatch, and Brenta-Bacchiglione Citizens Observatory included the authorities from the beginning to ensure acceptability and comparability of outputs. Presence of representatives of cities, academia, and civil society organization in CitiMeasure working groups is an opportunity to share experiences and learn from success and failure of several initiatives such as the four covered in this report. Furthermore, change in behaviour and policy are among the more long-term and less observed or measured impacts of citizen science. Nevertheless, clear communication of the results of the initiatives, and translating those results into targeted messages for policy makers and the public can advance the understanding about challenges and trigger those long-term changes.

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Annex 1 - CitiMeasure Impact Inquiry Instrument

CitiMeasure Impact Inquiry Instrument

Good practices of Citizen Science initiatives

Background on CitiMeasure Impact Inquiry Instrument

CitiMeasure focuses on the application of citizen science in creating more smart, sustainable, and inclusive European cities. Specific areas of interest in CitiMeasure include efforts that help increase *interoperability* and *comparability* between different citizen monitoring projects and outputs, foster *digital inclusion* (i.e., maximize the opportunities for participation of interested individuals and communities), and support *change of behaviour* and *inform policies* through data insights. As a part of the activities in CitiMeasure, four case studies of good practices related to these topics were identified. This instrument is designed to help capture the impact stories of the case studies on the topics. In terms of structure and content, this instrument builds on the WeObserve Impact Inquiry Instrument[2] that was originally designed to capture the governance impact stories of citizen science initiatives. Certain modifications and additions were necessary to make the Impact Inquiry Instrument 'fit for purpose' and help capture and communicate good practices of citizen science related to the topics in focus of CitiMeasure.

[2] https://zenodo.org/record/4543603#.YSyACI4zaUk

DESCRIPTION of the Citizen Science initiative (CS)	
Impact story title	*Imagine the impact of this case is going to be published as a short story. What would be the title of that story?*
Initiative name	*What's the name of the CS initiative?*
Start & End Date	*What's the start & end date (if applicable) of the CS initiative?*
Aim	*What's the aim of this CS initiative?* *What's the main activity involving participants (e.g. Image classification, in-situ data collection, etc.)?*
Geographical scale & location	*What's the geographical scale of the CS initiative?* ❏ *City* ❏ *Sub-national* ❏ *National* ❏ *Macro-regional* ❏ *International* ❏ *Other - please specify* *What is the exact geographic location of the initiative?*
Stakeholders	*Who are the main stakeholders involved?* ❏ *School(s)* ❏ *Youth association(s)* ❏ *Resident groups* ❏ *Civil society group(s)* ❏ *Scientists* ❏ *Local authorities* ❏ *National policy makers* ❏ *Other - please specify*
Initiator(s)	*Who initiated the project?*
Sponsor	*Has the CS initiative received any financial support? If yes, please describe.*
Are you…?	*As the user of this template, what is your own role in the CS initiative?* *Tick as many as applicable:* ● *Citizen scientist involved in the CS initiative* ● *Coordinating team member of the CS initiative* ● *Policy maker involved in the activities of the CS initiative* ● *Scientist involved in the CS initiative* ● *Other - please specify:*
Website	*Link to the CS initiative website, as well as outputs (e.g., reports, publications, etc.)*

IMPACT DETAILS	
The challenge	*Briefly describe the issue that the CS has been trying to tackle:* 1. *What issue is the CS trying to solve?* 2. *How long has this issue been a problem?* 3. *Who is affected by this issue?* 4. *What statistics or data ('official data', Citizen Science data, etc.) show the scope of the problem?* 5. *Where is the problem taking place? (geographically, demographically, etc.)* 6. *What are you aiming to improve? (what, with whom and by when)* 7. *Why are you tackling it now?* 8. *Why did participants want to take part in the CS activities?*
The impact story	Guiding questions: ● *In which of the following thematic areas did the CS initiatives trigger the most change? And how?* a. *Interoperability and comparability between different citizen monitoring projects and outputs* b. *Digital inclusion (i.e., maximize the opportunities for participation of interested individuals and communities),* c. *Change of participants (or the wider public) behaviour* d. *Inform policies through data insights* e. *other - please specify* ● *Was this change planned or unexpected?* ● *Why did these changes come about?* ● *Is this change being measured? (e.g., statistics, interviews, specific measurement tools, etc.).* ● *How have the changes been perceived by different stakeholders?* ● *Who was involved in making the changes happen?* ● *Who was not involved or left the project? Please elaborate.*
Quote	*If applicable, please mention a quote from a participant that highlights something important, funny or an emotive aspect of the change process leading to the impact.*
Visual resources	*Are there any interesting photos or infographics that can help illustrate the story?* *What data visualisations relating to the story are available?* *Please add any links:*
3 Keywords	*What are the three key words that summarise this story from the stakeholders' perspective?*

CHALLENGES (Optional)	
Challenges	*What challenges or risks did the initiative faced during the design, implementation and evaluation phases that resulted in this impact? Was the initiative able to overcome these challenges? Please add details.*
Policy-related restrictions	*Did the initiative encounter any policy, legal and/or regulatory restrictions? Was the initiative able to overcome these restrictions? If so, please add details*
Further change needed	*What change/s at any level (e.g., organisational, political, etc.) would improve your CS initiative's ability to achieve further/other positive impacts?*
Next Steps	*What are the next steps for the CS initiative?*

WIDER IMPACTS (Optional)	
Measuring Impact	*What internal tracking or monitoring processes does your CS initiative have in place to identify outcomes/impacts/results of its activities?* *Has there been a cost/benefit analysis? Please add details if applicable.*
Policy Recommendations	*Do the CS initiative outcomes include specific policy recommendations? If yes, what are they?*
Other impact	*What other impacts do you (fore)see your CS initiative or study having (e.g., economic, educational, social, etc.)?*
Link to UN SDGs Framework	*Which SDGs are most relevant to the CS initiative?* • *GOAL 1: No Poverty* • *GOAL 2: Zero Hunger* • *GOAL 3: Good Health and Well-being* • *GOAL 4: Quality Education* • *GOAL 5: Gender Equality* • *GOAL 6: Clean Water and Sanitation* • *GOAL 7: Affordable and Clean Energy* • *GOAL 8: Decent Work and Economic Growth* • *GOAL 9: Industry, Innovation and Infrastructure* • *GOAL 10: Reduced Inequality* • *GOAL 11: Sustainable Cities and Communities* • *GOAL 12: Responsible Consumption and Production* • *GOAL 13: Climate Action* • *GOAL 14: Life below Water* • *GOAL 15: Life on Land* • *GOAL 16: Peace and Justice Strong Institutions* • *GOAL 17: Partnerships to achieve the Goal* *Has the initiative identified an SDG Target or Indicator to align with?*
Link to other international frameworks	*Does the CS initiative have a link to any other international frameworks (e.g., Paris Agreement, Sendai Framework for Disaster Risk Reduction, etc.)?*