PS Lifestyle

Citizen science for sustainability

Report on lessons learned, synergies and activities to build upon, with database of 30 inspiring citizen science initiatives

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Executive summary

Around the world actors from across sectors and stakeholder groups, together with citizens themselves, are working on **changing our ways of living in order to move towards a more sustainable future**. Within this, the topic of how to enable people to live more sustainable lifestyles is gaining increasing attention. It is with this focus that we approach the topic of **citizen science -** primarily described as "the active engagement of the general public in scientific research tasks" (Vohland, K. et al, 2021, p1) - and explore how this method can be used towards achieving **more positive and sustainable lifestyles of citizens across Europe**.

This report is design to provide an overview of the current context of citizen science for sustainability, the emerging innovations in the field, and **what we can learn from the most inspirational examples**, as we design new citizen science initiatives in the context of sustainable lifestyles.

We derive our main findings from desk-based research, development of **30 inspirational case studies of citizen science projects**, and **interviews with 27 stakeholders** who have been involved in citizen science initiatives.

From a review of existing literature, we see that citizen science is increasingly being used in a range of contexts to both engage citizens in societal issues, and gather new types of data. There is particular **potential for citizen science as a method to contribute to a range of sustainability-related topics**, including: environment; planning and land use; smart cities and urban environment; spatial planning and land use strategies; food; housing; mobility; consumption and behaviour change.

From the analysis of the interviews we conducted, we have shared our findings under 4 key elements of citizen science projects: **setting up and reaching out to participants; gathering data from and with citizens; keeping people engaged; and implementing meaningful change**. The key learnings from each are set out below.

<u>Setting up and reaching out to participants</u>

We see that there are several benefits of having a **strong, collaborative network of organisations working together** to support the project to achieve its shared aims. Different partners can support the project in a range of ways: provision of resources/tools/practical help/data, promotion and dissemination of information, policy/decision-maker support, and expert knowledge. Additionally, time is needed to adapt to a common methodology and ways of working between partners, who may be used to communicating in different 'languages'. Municipalities are important actors and therefore valuable to engage in the citizen science process, and there are a number of ways in which they in particular can collaborate, for example, in supporting implementation and follow-on actions. In terms of gathering participants, it is important to understand participants' life circumstances and limitations, cultural values and backgrounds, and to **use a range of methods and tailored communications to reach and engage with different groups**. A key set of stakeholders to involve are local citizens' networks, groups and associations, and collaboration with other organisations can help you to reach participants from a range of

backgrounds and contexts. Greater participant numbers and diversity may be helped by identifying and working with multipliers.

Gathering data from and with citizens

Data collected in citizen science projects can be used for a number of purposes: identification of local risks or issues; use in scientific research; generation of ideas, solutions or actions; understanding of and promotion of sustainable behaviours; decision-making; community building; citizen capacity building; policy use or change; and public data creation. Sometimes the data collected forms a stand-alone dataset and in other cases the data is used to complement or layer upon other datasets. With **advances in technology**, citizen science projects are often gathering more than one type or format of data at once, in the process building up a more detailed picture of each entry. A range of more traditional qualitative data collections (such as surveys and interviews) are being supported by emerging **participatory methods such as gamification**, to gather the necessary data in a fun and accessible way. There is a need to provide user-friendly tools and support all participant groups to use digital tools used in data collection.

Keeping people engaged

One way to keep people engaged is to help citizens to feel ownership of the process, by embedding mechanisms for them to influence the process: **motivation goes up when citizens see the results of their actions**. Organising public events and workshops can help strengthen interaction between different stakeholders and citizens, and **tangible incentives can help to keep people motivated**, such as discount tickets for local leisure facilities, local currency, professional development incentives for teachers and prizes for competition winners. Management of citizen expectations can support ongoing participation, as well as being able to show the spots where concrete and impactful change of existing circumstances is possible.

Implementing meaningful change

The data collected in citizen science projects has the potential to be turned into shared resources with public access. Where citizen science often has awareness-raising as one of its aims, this can easily be turned into ownership of ongoing solutions by citizens. The types of data collected could be **seen as a reliable source of information** which could guide city plans, infrastructure, built environment and green space development in the area. It is important to include some kind of feedback process with citizens, following their involvement in a citizen science project.

A collection of 30 inspirational case studies of citizen science initiatives

Following this analysis, we share **30 inspirational case studies of citizen science initiatives**. For each, we have provided information on the project's location, scale of implementation, level of citizen engagement and topic

area, as well as further detail on: who is involved and how they got involved; how citizens are involved in the collection and use of data; how the initiative is organised; and why we see it as particularly inspirational.

Conclusions, key learnings and top tips

At the end of the report, we provide **conclusions**, summarise the **key learnings** from our analysis and share some of the **top tips** for citizen science projects given by those we interviewed.

Top tips
Set up a clear frame for the project: what is the objective and who should be included. *Do not assume that you know all the answers.* *Listen and welcome feedback of the groups engaged and find time and space in the project to accommodate the inputs given by the citizens, even when they divert slightly from our initial agenda.* *Define from the beginning what success looks like and in some years from now what you want to have achieved.* *Get some feedback and use it.* *Build a strategy in case the project doesn't work as you would like or as you would expect.* *Be honest and open.* *Be sensitive to reflection and iteration throughout the process.* *Make it fun and entertaining.*

TABLE OF CONTENTS

Introduction

An output of the PS Lifestyle project, this report is the result of a multi-faceted, cross-European investigation of the latest examples of citizen science. Specifically, this activity and report have the following three aims:

- To understand the concepts, core principles and latest developments in citizen science approaches, based on the latest examples and hands-on experience from citizen science projects with a focus on sustainability.

- To find inspiring examples of citizen science projects on different sustainability fields from across Europe. From these, we aimed to find out about: motivation and aims of citizen science initiatives; the practicalities of setting up and running citizen science projects, including a particular focus on citizen engagement and participant retention; and the future of citizen science.

- To create a database of inspiring practices in citizen science, in relation to themes and methods connected to the scope of the PS Lifestyle project.

In light of these aims, this report sets out to explore the world of citizen science across Europe and beyond, in a manner which is of use beyond the PS Lifestyle project, for anyone who is interested in the potential of citizen science and the practicalities of setting up and running an initiative. To start with we provide a short overview of the PS Lifestyle project, our methodology and potential of citizen science for sustainability topics. The rest of the report is structured in three main sections, which are designed to be read in any order:

In the **first section**, we explore the **findings of our interviews with people directly involved in the creation and running of 20 inspiring citizen science projects**. Looking towards the future of citizen science, we set out key findings across four main aspects of running a citizen science initiative:

- Setting up and reaching out to participants

- Gathering data from and with citizens

- Keeping people engaged

- Implementing meaningful change

Secondly, we have scoped out some of the **most inspirational examples of citizen science** happening across Europe. We looked for projects which have innovated in both method and content, to help citizens move towards more sustainable lifestyles through citizen science. We have then selected 30 of the most inspiring examples of these which we think provide great concepts, methods, impacts and learnings to form a **database of case study**

examples. While each tells its own story, common threads and themes run through the collection, which provide points of comparison and similarity.

Finally, we reflect on the key findings of the research, and set out the **ways in which we will use these lessons to build upon the work of inspiring examples** as we shape the approach of the PS Lifestyle project's citizen science living labs in the subsequent phases of the project.

The PS Lifestyle project and aims

The European Union Horizon funded **'Co-creating positive and sustainable lifestyle tool with and for European citizens' - PS Lifestyle project** aims to help **close the gap** between climate awareness and individual action, and to **increase citizen participation** in sustainability topics. It does this by **engaging citizens through a digital application** to collect, monitor, and analyse their environment and consumption data as well as co-research, co-develop, and uptake everyday life solutions for climate change.

The project will build a data-driven movement with and for the citizens to enable more sustainable lifestyles across Europe. The ambition of the project is to **engage a total of four million European citizens** - with a particular focus on eight European countries Estonia, Finland, Greece, Germany, Italy, Portugal, Slovenia, and Turkey- in data collection and data sharing through the **PS Lifestyle web application**.

The web-based application will be based on the **carbon footprint calculator 'Lifestyle Test'**, set up by the project partner Sitra in 2017. In the PS Lifestyle project, an improved version of the application will be further developed and contextualised to align with the citizens' local realities in the target regions. This will be done by co-creating a localised version of the application through citizen science labs to understand the local **capabilities, opportunities, and motivations** of the citizens in engaging in more sustainable lifestyles. The PS Lifestyle project will also work with other societal catalysts, including policymakers, businesses, civil society organizations (CSOs), and academia to design solutions based on citizen data.

Post the co-development process in citizen science labs, the project focuses on the wider outreach of the service to **citizens** in the partner locations as well as expanding further into other European countries.

Our methodology

This section sets out the methodology followed for the development of this report and its content. The overall process was led by the CSCP, with active participation of all pilot country partners. It was a multi-step process, with each building upon and linking with the previous. The research process used a mixed-methods approach: desk research, semi-structured interviews, synthesis of key points from research, and analysis into key themes. The process was set out in a guidance document aimed at ensuring a coherent approach across all involved in this activity.

Step 1: Initial scoping of potential citizen science examples to include as inspirational case studies and/or to interview. In this first step we used desktop research to get an overview of interesting citizen science initiatives that we can learn from and that we potentially could connect to with the project.

- Desk research conducted by partners in each pilot country, guided by a scoping template provided by the CSCP.
- Partners filled in information in the scoping template on: general project details, geographical considerations, level of citizen science[1], citizen engagement, and learnings from the initiative.
- Each pilot country inputted at least 8 example citizen science projects from their area into the scoping template.
- This was followed by a discussion between the CSCP and each pilot country in order to select the most suitable project examples to take forward, based on considerations of relevance, inspiration and diversity of examples.

Step 2: Filling in inspiring citizen science initiatives template. In this step the pilot partners took the 4 selected examples from the scoping exercise forward, completing an inspiring initiative template (provided by the CSCP) for each.

- Building upon the information gathered in the scoping exercise, partners mainly used desk research to complete the templates.
- This template gathered more in-depth information on: citizen participation and engagement; data collection and use; organisation of the initiative; points of inspiration; and learnings from the example.

[1] Based on Levels of Citizen Science Participation (Haklay, M., 2013)

- Alongside this, the CSCP followed the same steps to complete templates for European/global examples.

Step 3: Conducting interviews with citizen science experts. Here, the pilot partners each conducted 2-3 semi-structured interviews, reaching 27 individuals in total who had been/are currently involved in running some of the inspiring citizen science initiatives featured in the case study examples.

- The aim of the interviews was to gain more detailed insights into what it's like to practically design, set up, and run a citizen science initiative.
- A set of guide topics and questions provided a framework for the conversations (See Appendix A for full questions). This was designed to go beyond the description of the initiative and its activities itself, towards more of a peer-to-peer exchange, including discussion of challenges, and tips for starting new projects. Topics included:
    - Topic 1: Gaining a deeper understanding of the motivation behind the initiative and what it aims to achieve
    - Topic 2: Learning about the practicalities of setting up and running a citizen science initiative
    - Topic 3: Looking to the future of citizen science
    - Topic 4: Project information for template (only if needed to complete missing information in main template)
- Interviews were conducted in a range of local languages, with English notes of key points being used for the analysis in this report.

For the final part of the process, the CSCP conducted:

- An overview and edit of the inspiring project templates, to reach the final set of case study examples for the database (which were also checked with the projects).
- Extraction of key points from inspiring example templates and interview notes.
- Synthesis of notes according to topic themes (using interview structure) and clustering into sub-themes.
- Analysis of emerging themes from the insights into key lessons learned from the research process (mainly from the interview process, but linked to and building upon the project templates).

The potential of citizen science for sustainability

The development of citizen science as a method

Although the idea of citizen science – primarily described as "the active engagement of the general public in scientific research tasks" (Vohland, K. et al, 2021, p1) – is not new, this practice began to institutionalise in the 1990s, when the role of science in serving the needs of society and empowering its citizens was acknowledged. Citizen science is receiving growing attention from a number of government agencies, research institutions, and other actors. Also, due to the large increase in the number of publications, projects, and funding schemes, the concept of citizen science has gained popularity and has been renowned globally since then (Vohland, K. et al, 2021, p36). Today, there is a number of networks of practitioners in the world, including the European Citizen Science Association (ECSA), Australian Citizen Science Association (ACSA), Global Citizen Science Partnership, and many others. The development of citizen science on the European level has been promoted by the European Union through the funding of citizen science projects and capacity building activities (Vohland, K. et al, 2021, p45).

Until recently, the main application fields of citizen science have been natural sciences and local history (Vohland, K. et al, 2021, p5). However, the scope of areas where citizen science is used has been expanding over to science, policy, education, and wider society in the last years (Vohland, K. et al, 2021, p2). It can be seen as a key tool to generate the data needed to understand and to tackle some of the most complex societal issues, from health to the climate crisis. In this process, technological development plays an important role in broadening and improving methods of collecting, processing, and analysing data (Vohland, K. et al, 2021, p6). An easy access to Internet and emergence of social media further facilitates citizens' involvement in scientific research (Liu, H. et al., 2017). New and emerging innovative approaches, such as gamification, smartphone apps, bots, communicating opportunities with the help of media organizations, etc. are also used increasingly to recruit and retain participants (Leach, B. et al., 2020).

The variety of contexts in which citizen science is used, as well as the diversity of purposes and approaches of this method, gives rise to many different definitions of the term. Vohland et al. provide 34 definitions of citizen science, which focus on various instrumental, descriptive, and normative aspects (Vohland, K. et al, 2021, p45). For example, according to the ACSA, *"[c]itizen science involves public participation and collaboration in scientific research with the aim to increase scientific knowledge* ". UNESCO refers to citizen science as "[*t]he participation of a range of non-scientific stakeholders in the scientific process. At its most inclusive and most innovative, citizen science involves citizen volunteers as partners in the entire scientific process, including determining research themes, questions, methodologies, and means of disseminating results*" (Vohland, K. et al, 2021, p15-18). Some of the most important features are formulated by the European Citizen Science Association as 10 Principles of Citizen Science (ECSA, 2015). These include the different methods and levels at which citizens can be involved, the scientific purpose and feedback and sharing of the data collected.

While we refer to this general concept of citizen science within this report, we acknowledge that it is linked to a wider set of citizen engagement, participation, and data generation practices and structures which may be combined with or form part of a citizen science project. Some of the methods of data collection which we consider to exist under the umbrella of citizen science may additionally be considered methods in themselves, depending on the purpose and context. For example, citizen science is named by the United Nations Development Programme (UNDP) Accelerator Labs and Nesta as one of 15 different collective intelligence methods used (sometimes in combination) in relation to the Sustainable Development Goals, alongside other methods such as: citizen-generated data; combining data sources; computer vision; crowd forecasting; crowdmapping; crowdsourcing; microsurveys; Natural Language Processing (NLP); open data; open source repository; peer-to-peer exchange; predictive analysis; remote or in-situ sensing and web scraping (Peach, K. et al., 2021).

There is no one mould into which all citizen science projects can fit, rather various different spectra along which each project will sit, from geographical scale (for example, hyper-local to global) to organizational structure (on a spectrum including institute-led hierarchical research institute-led to grassroots neighbourhood collective). For example, levels of citizen engagement can vary from individuals merely sensing something, to actively shaping the process, analysis and use of the collected data. A framework for this has been set out in 4 levels in Haklay's Levels of Citizen Science Participation (Haklay, M., 2013 in Sui, D.Z. et al., 2013, p11).

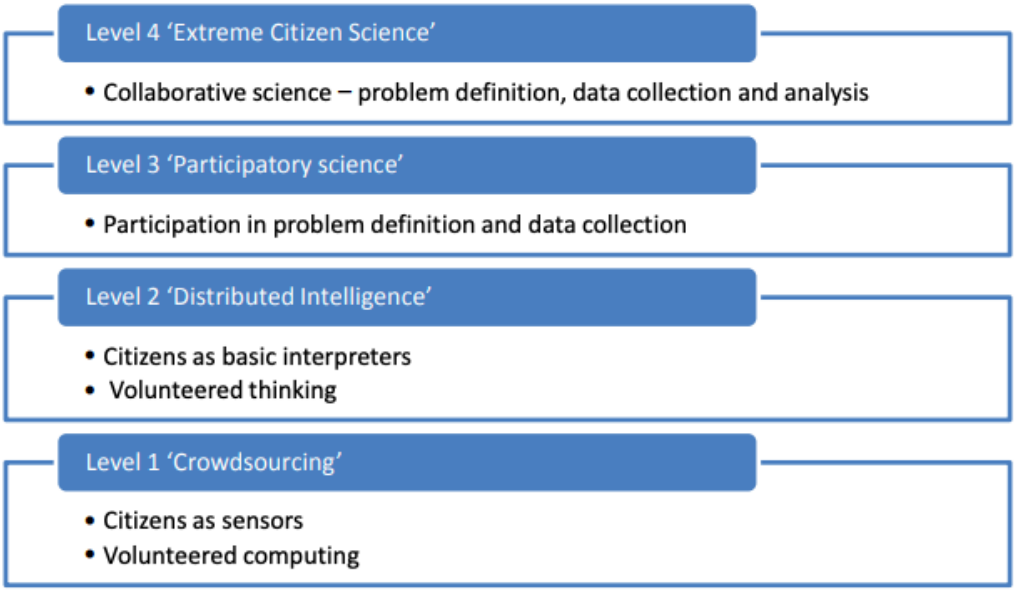

Figure 1: Levels of participation and engagement in Citizen Science projects (Haklay, M., 2013 in Sui, D.Z. et al., 2013, p11).

There are a number of positive impacts generated by citizens' participation in research (Vohland, K. et al, 2021, p9). The benefits of citizen science go beyond the contributions to science, where it helps to increase knowledge foundation and self-reflexivity (Vohland, K. et al, 2021, p10), to offer new research topics, to enable various

evaluation approaches and to prove the relevance of scientific results, etc. (Pettibone, L. et al., 2021). This method also addresses a wide range of important social issues and is beneficial for individual participants as well as for the society as a whole. So, citizen science fosters development of an inclusive society by promoting an open and participatory approach to science and closing the gap between science and society. It enables citizens to participate in developing the society towards sustainability and improving their communities (Vohland, K. et al, 2021, p7). Moreover, through their scientific contributions, citizens can influence political decision-making (Pettibone, L. et al., 2021). Indeed, some researches find the link between a higher level of public participation in research and a higher level of democracy (Vohland, K. et al, 2021, p37 - a Special Eurobarometer survey mentioned in Makarovs and Achterberg 2018; Fig. 3.1).

However, there are also many challenges and unexplored gaps associated with citizen science projects. In the context of growing importance of digital tools, specific groups of citizens are difficult to reach, as they have low digital skills and lack sufficient resources to access tools and materials (Skarzauskiene, A. and Mačiulienė, M., 2021). Another challenge concerns data management, including verifying and evaluating of the data collected by unprofessional citizen scientists (it can have errors and bias) and assuring data security and privacy (Liu, H. et al., 2017). Although citizen science has been receiving more credit amongst academics, policy-makers and businesses, opportunities and values still need to be communicated often (Skarzauskiene, A. and Mačiulienė, M., 2021). Citizens can sometimes be viewed as a threat rather than help, where their contributions are not seen as valuable as other sources of information. However, successful citizen science projects have a big potential to increase collaboration among different society actors and make governance more transparent (Liu, H. et al., 2017).

The potential of citizen science in the field of sustainability

A range of examples is emerging in which citizen science is being used as a tool to drive new research and action in fields related to sustainability. The involvement of citizens provides a range of benefits – through citizen science methods in particular - towards tackling these issues. For example, new types of data can be gathered through inputs from individuals. The insights which participants are able to share about their lifestyles, interaction with spaces or process, and consumption habits offer a rich set of data that cannot be replicated by traditional scientific methods, since it comes directly from their experience in situ and their interpretation of the situation, as they translate it into a data input. An additional benefit for the sustainability field comes in the form of awareness-raising of the citizens who take part, and their experience of being able to create something together to contribute to the development of sustainable solutions. This in turn may encourage increased sustainable behaviours. Across different topics within sustainability, citizen science methods have been used successfully in a range of different ways to achieve these benefits. In this section we refer to a range of projects which are detailed in the later section ’30 inspiring citizen science initiatives’.

From the **environmental perspective**, citizen science tools have been applied not only to map and understand biodiversity in specific areas (Izmir Bio-Atlas), but also increasingly towards a focus on endangered species or

prevalence of invasive species, in order to identify gaps or work towards addressing biodiversity loss. For example, bird studies enable scientists to be able to gather information on the presence of birds in private gardens, and studies which enable citizens to identify invasive plant species can map the spread across an area.

Citizens using environmental sensors – whether placing them in certain locations or carrying the sensors with them in certain circumstances – can enable the collection of live data on a number of factors related to climate, health, and wellbeing, from noise to air pollution. For example, one Greek project, RQuality, brings together air quality data with citizens' daily activities to calculate exposure to air pollution, which in turn can help citizens to plan out their days.

Concerning **planning and land use**, a number of citizen science projects have focused on **smart cities and the urban environment**. For example, by having citizens share their experiences of being in different parts of the city, the urban heat island effect can be mapped to show where the hottest temperatures are occurring (Hotspots in Ljubljana, KlimNet). Another project asks citizens to identify and rate green spaces in the city, which can help with understanding of where the quality of green spaces needs improvement (GREEN SPACES). In some examples, citizens are even given the opportunity to input their ideas for a new physical layout of a space in a platform which combines urban design and citizen participation (Quick Urban Analysis Kit: Citizen Design Science), or collaborate in co-design workshops to re-nature urban neighbourhoods (Prato Urban Jungle).

From a strategic perspective, several examples show citizen science being used as a tool to engage citizens and have their inputs for part of plans for sustainable rural development (RURITAGE), **spatial planning and land use strategies**. In one case, citizen science provided a key tool to enable a large-scale clean-up operation, in which 270,000 citizen volunteers came together with a range of public and private stakeholders to clear illegal waste dumpsites in Slovenia (OČISTIMO SLOVENIJO). Before the day itself, citizens played a large role in contributing to a map of all known illegal waste dump sites across the country, which were then checked and cleared on the day.

When it comes to how people live and consume, projects are emerging that use citizen science as a tool to explore a number of **sustainable lifestyle topics** from **food**, to **housing** and energy low-carbon **mobility** (SharingMi, SharingCities). For example, food-related projects are tackling agroecology (The AgroEcology Caravan) and food innovation within communities (FoodSHIFT 2030) through bringing consumers together with a range of other stakeholders to gather data to work towards more sustainable food systems.

Examples are emerging of apps or platforms through which citizens are given suggestions for different **behaviour change** actions to take towards more sustainable lifestyles, based on the data they input on various actions they take (The Sustainable Lifestyles Accelerator). Another project supports citizens to look at their household devices by completing a "Life Cycle Assessment" (Campus to World). The Program Ekošola (Eco-Schools Slovenia) works on a number of these issues from mobility to food waste through classroom level citizen science projects with school pupils.

Key lessons from citizen science case studies

In this section of the report, we explore key lessons which have emerged from our analysis of the interviews with those actively involved in running current or recent citizen science projects, linking with examples in the inspirational case studies database. We looked for the threads which appeared between projects and across topic areas. This section is structured according to four main aspects of running a citizen science initiative:

- Setting up and reaching out to participants
- Gathering data from and with citizens
- Keeping people engaged
- Implementing meaningful change

All quotes in this section are from interviewees in the interviews conducted with representatives from citizen science initiatives as highlighted above, however, anonymised conform to ethical agreements.

Setting up and reaching out to participants

The first stage in any citizen science initiative includes setting up the project team, deciding on the process, and reaching out to potential participants. Within this, building a network of stakeholders to support the project, and reaching a diverse group of participants are key themes.

Building an effective network of organisations and stakeholders to support the project

One common theme shared across the interview discussions was **the importance and benefit of having a strong, collaborative network of organisations working together to support the project to achieve its aims**. Different stakeholders were included in projects for a number of reasons, for example, for recruitment purposes, to bring in expertise, or to support implementation of results. While many of the reasons given were practical, some projects saw this as having a wider societal benefit with the potential to reach beyond the topic of the citizen science activity – building links, strengthening relationships, and opening up future possibilities. There are many suggestions, examples and recommendations from the interviews, providing inspiration for the further development of existing and emerging methods of stakeholder engagement.

Several initiatives saw the **building and strengthening of networks and relationships between different stakeholders as a key reason to use the citizen science methodology** in itself. For example, through bridging gaps between citizens and municipalities, researchers, companies and civil society organisations. The multi-stakeholder, collaborative approach highlighted by many projects can be integrated from the first stages of project

design, including in the shaping of shared aims and vision. This could additionally support long term shared work on the project and beyond, as well as continued value for everyone involved.

Often, this creation of strong networks was as a means towards another goal – for example sharing and bringing together formal knowledge with citizen experience (in some cases by looking for citizen knowledge to support gaps in scientific aims, but there were also examples in which citizen knowledge or experience is seen as a valuable, and necessary input into social problem solving), or in order to collectively address a local issue from several perspectives.

There is no one ideal make-up of a stakeholder or partner network for a citizen science project. This will of course depend on factors such as the project's scale, aims, timeframe, location and wider context, and the specific tasks or areas of expertise for which input is sought.

Several suggestions were provided by existing projects on how to create a network of organisations which offers good support for a project. As a starting point, projects mentioned the **importance of having shared visions and common goals**. To aide this, one project suggested initially coming together with other organisations working on the topic locally, to discuss the current state and explore future opportunities.

In finding the right partners, a point which came up across the interviews was that **everyone should have something to gain from being involved** – so considering the needs, interests, and ambitions of organisations might help to find the best partners. When everyone shares that sense of purpose, engagement may stay higher, benefiting strong collaboration and trust. Several projects mentioned the importance of having a research or scientific partner in order to support project activities with research know-how and subject expertise, as well as for the legitimacy that universities or research institutions can bring. Each partner will be able to bring something different to the project, with examples shared from resources to use of digital tools or technologies for the collection of data.

> *"This must be a situation with gains to all involved"*

Partner organisations were often seen as critical to being able to reach citizens and create the conditions for a citizen science project to thrive. For example, **partners can support the project in a range of ways**: provision of resources/tools/practical help/data, promotion and dissemination of information, policy/decision-maker support (ideally with commitment to act on the resulting data), and expert knowledge.

In some cases, building such collaborations and networks can be challenging. For example, one project highlighted the difficulty they had in finding the right experts to contribute to the project. Another noted that even if organisations are willing to come together, when it comes to working together, you need to be able to understand that by the nature of the exercise, people will bring different perspectives. Groups may use different languages and ways of communicating, and there might be varied ways of working, timelines and organisational structures and processes which organisations are operating within. As with any multi-stakeholder project, **time is needed to**

adapt to a common methodology and ways of working in order to progress smoothly towards the goals of the project. Close collaboration and even the creation of new local or national networks were seen as key methods to address this kind of issue.

> *"In order to be successful, you need to connect with similarly focused organizations – to multiply the reach."*

A key set of stakeholders to involve are local citizens' networks, groups and associations. One example had used a 'pyramidal' approach – where they reached multiple levels of stakeholders through umbrella organisations. Others suggested going further beyond the local, to include a wider network, for example, other universities, or collaborating with partners with a wide reach. This may help where there is an ambition for wide-scale engagement or dissemination of results.

Municipalities are important actors and therefore valuable to engage in the citizen science process. There are a **number of ways in which municipalities in particular can collaborate in citizen science projects**. From the data perspective, actions and ideas can be gathered and incorporated into plans and services, providing the potential for additional perspectives in processes where citizens might not be regularly involved. For example, based on some examples shared in interviews, geographical data could be used in the development of regeneration plans, or data collected on pollution and traffic could enable forecasting models which could in turn influence optimum public services. On a less localised level, citizen science can support national knowledge gaps. By way of illustration, in a project which gathered biodiversity data, species of national significance were paid special attention, contributing to knowledge on the situation across the country and to the implementation of national databases.

Reaching a diverse range of participants

Before actively reaching out to citizens to take part in a citizen science project, it is important to consider the type of engagement the project seeks to have with participants. One project set out a clear case for designing a citizen science process for participant needs. They emphasized the **importance of understanding participants' life circumstances and limitations, cultural values, and backgrounds**. In addition, they explained how they shaped content of the initiative through understanding what the topic meant to those specific groups before designing engagement strategies, and finalizing the content that would be citizen-facing.

> *"Before starting, go through a process of empathy. Talk to others and understand what they think about the project being designed."*

Throughout the interviews many points were raised about the engagement and inclusion of a wide range of citizens, with their diverse needs and wishes, barriers that they face and things that will incentivise them to take part. Across the organizations interviewed, a whole range of experiences of what works for engaging different groups of citizens were shared.

"Listen to the citizens, show respect, communicate on an equal footing"

Within this there were several common threads. In terms of getting citizens involved, several projects mentioned the use of a variety of **communication channels** (social media as well as traditional media) and methods (online and in person). It was clear that **different methods were used – and necessary - for different groups**.

Many projects aimed to reach diverse groups of citizens; however, some found this challenging, especially where there were additional barriers facing specific vulnerable groups. One project emphasized that this took time, while another revisited their methods and planned a new process or information and support for specific target groups. An additional challenge can come up when specific communities are reluctant to take part in processes due to historic factors causing scepticism of the impact of 'another initiative'. This also links to the **need to build trust and ensure that participants do not feel used**.

"There are always the people who want to be involved in everything but it's a challenge to find the quiet people"

A key benefit of engaging a wide range of partner organisations was the way in which **collaboration with other organisations can help you to reach participants from a range of backgrounds and contexts**. Some examples emphasised the benefits of focusing on engaging with local organisations, like civil society groups which work with a particular demographic or interest group. They may be interested in supporting the project, and may include individuals who have already initiated ideas locally. In terms of participant recruitment, it was suggested that it is important to **identify and work with multipliers,** meaning those key individuals in a community who have influence and interaction with a much wider range of people within the community. Mapping out the key target groups and approaching organisations who work with those groups directly is another method, considering which organisations might be trusted by the community.

"If [trying to reach] immigrants, then you should get organizations involved that already work with immigrants for example language schools."

Key learnings:

- There are several benefits of having a strong, collaborative network of organisations working together to support the project to achieve its shared aims
- Partners can support the project in a range of ways: provision of resources/tools/practical help/data, promotion and dissemination of information, policy/decision-maker support, and expert knowledge
- Time is needed to adapt to a common methodology and ways of working between partners, who may be used to communicating in different 'languages'

- Municipalities are important actors and therefore valuable to engage in the citizen science process. There are a number of ways in which municipalities in particular can collaborate in citizen science projects – supporting implementation and follow-on actions

- It is important to understand participants' life circumstances and limitations, cultural values and backgrounds, and to use a range of methods and tailored communications to reach and engage with different groups

- A key set of stakeholders to involve are local citizens' networks, groups and associations, and collaboration with other organisations can help you to reach participants from a range of backgrounds and contexts. Greater participant numbers and diversity may be helped by identifying and working with multipliers.

Gathering data from and with citizens

The next stage of a citizen science project involves the gathering of citizen data. There is a wide range of methods and tools available to support this process.

The **data collected in citizen science projects can be used for a number of purposes**: identification of local risks or issues; use in scientific research; generation of ideas, solutions or actions; understanding of and promotion of sustainable behaviours; decision-making; community building; citizen capacity building; policy use or change; and public data creation.

There are a range of different methods and tools through which citizen science projects are collecting data for sustainability-related projects. **Sometimes the data collected forms a stand-alone dataset**, for example answers to an ecological footprint calculator and **in other cases the data is used to complement or layer upon other datasets**, for example sharing photos of plant species which are then added to a catalogue.

With advances in technology, citizen science projects are often gathering more than one type or format of data at once, in the process building up a more detailed picture of each entry. For example, the use of mapping as a method has developed to use apps or mapping platforms to invite citizens to not only enter location data for an observation, but to also include additional data such as photographs (such as photographs to verify invasive species in LIFE ASAP), rating (for example giving green spaces a quality score in GREEN SPACES) or urban temperature. In the example of "OČISTIMO SLOVENIJO" (Let's clean up Slovenia) several data sources were combined for the project (citizen reports, official sources and site visit feedback), to create a new digital registry of illegal dumpsites. Additionally, more traditional sensor-based data collection is evolving, for example through citizens wearing portable monitoring devices or live data collection through apps.

"We used the digital… images to initially locate potential illegal dumpsites, marked out the potential locations, checked them on the field. In the internet atlas… volunteers created their own layer of potential locations, and then volunteers checked these locations on the field and created a new layer of confirmed locations."

A range of more traditional qualitative data collections (such as surveys and interviews) are being supported by emerging participatory methods. For example, gamification is becoming a tool to gain inputs on a topic from citizens through a process which is designed to be engaging and fun, while still providing the type of data required by the project (for example in RURITAGE Serious Game living lab), co-creation enables creation of practical solutions and 3D design tools can enable citizens to practically envision a solution that can then be picked up by professional urban designers (as seen in the Quick Urban Analysis Kit). Another format being used in a number of contexts is the competition format, often by means of creative entries by participants on a topic. Alongside this, particularly in the field of sustainable behaviours, citizens are often asked to take part in practical data collection such as calculation of quantities of food waste.

"Through citizen design science, the two actors, a voluntary citizen and a scientist, co-produce data for urban design and do this on a democratic platform. The very inspiring thing here is that, a citizen who has no knowledge of design, uses today's digital or analogue design tools to produce a common language or dialogue with a professional designer"

It is important to make clear what the individual can contribute to the data collection. Several projects highlighted the **importance of communicating in a common, understood language**. Especially in technical projects, care should be taken to ensure that citizens do not feel excluded because of the way in which concepts are communicated. In terms of messaging, one project emphasized that positive messaging which explains also the role of the individual might appeal to more people than a negative framing of ecological footprints.

Digital tools were used by several projects, with some switching to online spaces due to pandemic restrictions. However, many projects emphasized the **need to provide user-friendly tools and support all participant groups to use digital tools** – especially those facing digital exclusion or low digital literacy.

Key learnings:

- Data collected in citizen science projects can be used for a number of purposes: identification of local risks or issues; use in scientific research; generation of ideas, solutions or actions; understanding of and promotion of sustainable behaviours; decision-making; community building; citizen capacity building; policy use or change; and public data creation.
- Sometimes the data collected forms a stand-alone dataset and in other cases the data is used to complement or layer upon other datasets.

- With advances in technology, citizen science projects are often gathering more than one type or format of data at once, in the process building up a more detailed picture of each entry.
- A range of more traditional qualitative data collections (such as surveys and interviews) are being supported by emerging participatory methods such as gamification, to gather the necessary data in a fun and accessible way.
- There is a need to provide user-friendly tools and support all participant groups to use digital tools used in data collection.

Keeping people engaged

In many (but not all) citizen science projects, the aim is for citizens to stay involved in activities beyond a one-off interaction.

A key challenge highlighted was how to keep citizens engaged throughout the project, particularly over longer periods or during challenging wider circumstances (such as during the Covid-19 pandemic). One project in particular emphasized the need for space for citizens to influence the process itself within the structure of the citizen science process. This could take different forms, whether citizens are involved as shapers of the whole project or through simply providing regular feedback.

> *"Ownership and feeling self-efficacy are very important motivators for everyone involved in the citizen science work."*

One way of addressing this is through **helping citizens to feel ownership of the process**. In addition to taking on and adapting to citizen feedback on the process, some projects have gone beyond this, understanding the process not as a transfer of knowledge from, for example, a university to citizens, but the other way around. Transparency can be key to facilitating this feeling of shared ownership of the initiative.

> *"It should always be considered that a citizen science project is always a social and human relations project."*

Two projects specifically highlighted the need to recognize the valuable knowledge and experience that citizens have to contribute. Others noted that **motivation goes up when citizens see the results of their actions**. This can be aided by follow up mechanisms such as newsletters or notifications on a citizen science app.

> *"Every initiative… [within the living lab] started from the idea that the citizen would have valuable words to say in the respective topics"*

In terms of the interaction between stakeholders or partner organisations and citizens themselves, it was suggested that **organising public events and workshops can help strengthen interaction between different stakeholders and citizens**.

Incentives for citizens to take part

One key challenge highlighted across interviews was the task of making it valuable for citizens to take part in a citizen science activity. Several projects spoke of the aspects of their projects which incentivise citizens to take part.

As was emphasized by many of the activities shared – creative activities and gamification were particularly helpful in engaging citizens as they were a new experience and fun for those taking part. Regarding more **tangible incentives, some projects shared examples of discount tickets for local leisure facilities, local currency, professional development incentives for teachers, and prizes for competition winners**. One project noted that these should, however, be used with care – in their case the incentive was so popular that it led to overconsumption behaviours on a project designed to increase recycling! Additionally, some projects had a focus on citizen capacity building as part of the project.

Linked to incentives, a key theme which came up in several interviews was related to **management of citizen expectations.** Some projects emphasised taking care with communications to. Giving citizens a say (especially if it feels like a democratic process) may also raise citizen expectations of both the outcomes of the particular activity and of future involvement of citizens.

A potential strategy to manage this is to focus on a topic that is of interest to the municipality. One project had a municipal strategic document as the result of their joint work. Another advised the **importance of being able to show the spots where concrete change of existing circumstances is possible with impact, not just where it is possible**. Of course, the most effective way of managing this potential issue would be to have a clear understanding between the project, municipality, and citizens of what was within scope (and ideally, a commitment to implementation or at least consideration of outcomes), at the beginning of the project. From the interviews it was shared that issues such as a lack of institutional recognition of the method, or competition in local areas over funding could be addressed by local authorities. In this vein, one municipality set up a fund specifically to financially support citizen science projects to address identified local issues.

> *"The future of citizen science is strongly dependent on the ability to generate returns to citizens for their contribution to the projects, ensuring their sustained engagement. These returns might take the form of feedback on the results achieved by the project, ensuring that the citizens maintain a feeling of ownership and achievement."*

Key learnings:

- One way to keep people engaged is to help citizens to feel ownership of the process, by embedding mechanisms for them to influence the process.
- Motivation goes up when citizens see the results of their actions.
- Organising public events and workshops can help strengthen interaction between different stakeholders and citizens
- Tangible incentives can help to keep people motivated, such as discount tickets for local leisure facilities, local currency, professional development incentives for teachers and prizes for competition winners.
- Management of citizen expectations can support ongoing participation, as well as being able to show the spots where concrete and impactful change of existing circumstances is possible.

Implementing meaningful change

At the end of any citizen science project there is the question of what happens to the data gathered and what change will happen as a result.

Data generated can be used in a number of ways by the community and stakeholders. For example, interviewees highlighted the **potential for creation of shared data or resources with public access**, such as a biodiversity atlas or map of illegal dumpsites. Where this includes a context of citizen behaviour, it could be that this is matched with increased activity of the municipality or other actors. For example, where citizens rate green spaces, they may also start to use the highly-rated spaces more, potentially prompting municipal attention to those lower-rated spaces. **Where citizen science often has awareness-raising as one of its aims, this can easily be turned into ownership of solutions by citizens**, under the right conditions. With municipal support, this could be mutually beneficial and promote stronger collaboration.

Data collected in citizen science projects can be used to support decision-making. One interviewee shared that they thought this **type of data could be seen as a reliable source of information which could guide city plans, infrastructure, built environment, and green space development in the city**. In terms of making this happen, one project had a process whereby the results of workshops were presented to policy makers locally in dedicated meetings, with a view of an expected longer-term cooperation. In another case a region councillor supported the cause with official documents. While the hope is often that policy changes may occur based on data, it can be hard to measure the impact on political discussions – but even the presence of the additional data may boost status of the area or topic. A potential issue raised related to the compatibility of data gathered through citizen science and

official data sources. Finding ways for both sets of data to play a role (if not easily compatible) could have a positive impact.

Regardless of the data use, interviewees highlighted the **importance of some kind of feedback process with citizens, following their involvement in a citizen science project**. Often, they may want to know the impact the project has had, actions that have been taken, or a resulting change in their local area, especially if they have also benefited from increased awareness and willingness to engage in making change happen. Ideas for continuing to show the impact and ongoing engagement with citizens include: including citizen science in management plans for the area, to ensure ongoing activities and data that is returned to citizens; featuring actions taken by local governments in project newsletters as a means of providing feedback to citizens; or approaching it with a circular model – taking care of follow up and going into a new cycle, potentially supported by the municipality.

Key learnings:

- The data collected in citizen science projects has the potential to be turned into shared resources with public access.
- Where citizen science often has awareness-raising as one of its aims, this can easily be turned into ownership of ongoing solutions by citizens.
- The types of data collected could be seen as a reliable source of information which could guide city plans, infrastructure, built environment and green space development in the area.
- It is important to include some kind of feedback process with citizens, following their involvement in a citizen science project.

30 inspiring citizen science initiatives

In this database we have brought together 30 of the most inspiring examples of citizen science projects which work on themes related to sustainability. These can be read as a complete set, or you can focus on specific case studies depending on areas of particular interest. We developed a classification system in order to enable easy navigation through the examples (see Appendix B for the detailed classification information).

In curating our database, we wanted to have a diversity of projects included, in order to be able to highlight different types of approach, project scales, and geographical locations. We looked into over 70 projects in our initial scoping exercise, narrowing these down to the final 30 examples shared here. The projects cover the four main sustainable lifestyle topics which we are most interested in – housing, mobility, food and consumption - but also include others which tackle related topics such as environment, biodiversity, urban development, circular economy and climate change. The database includes both projects which have been completed and those still active, and the level of implementation ranges from local to international. In terms of citizen involvement, most projects looked to reach the general public, but we have highlighted a range of projects which took steps to reach particular target groups including children and youth; older age groups and lower-income citizens. Whilst numbers of citizens engaged varied from under 100 to over 10,000, we have used levels of citizen engagement (see figure 1, p8: *Levels of participation and engagement in Citizen Science projects* from Haklay, M., 2013 in Sui, D.Z. et al., 2013, p11) to give an indication of the type of involvement that citizens had.

Citizen science initiative	Location	Lifestyle area	Level of citizen engagement
AllThings.BioPRO	Estonia	Consumption	3 – participatory science
Garden Bird Summer Diary (Suvine aialinnupäevik)	Estonia	Other: biodiversity	2 – distributed intelligence, 3 – participatory science
UNESCO ASPnet – Associated Schools Project	Estonia	Other: environment	2 – distributed intelligence
Urban Eco Islands	Estonia	Mobility, other: environment, tourism	2 – distributed intelligence, 3 – participatory science
Lahti Living Lab	Finland	Consumption, other: climate change	3 – participatory science

Sustainable Lifestyles Accelerator	Finland and Germany	Mobility, housing, nutrition, leisure and household goods	2 – distributed intelligence, 3 – participatory science
TAMK Living Labs	Finland	Other: land use planning	3 – participatory science
Campus to World	Germany	Housing, consumption, other: energy	2 – distributed intelligence, 3 – participatory science
KlimNet: Network for the design of a sustainable climate landscape (KlimNet: Netzwerk zur Gestaltung einer nachhaltigen Klimalandschaft)	Germany	Other: urban land use, environment, climate	2 – distributed intelligence, 3 – participatory science
New Urban Production (Neue Urbane Produktion)	Germany	Other: sustainable urban production and value chains	2 – distributed intelligence, 3 – participatory science
Hellenic Biodiversity Center (Ελληνικό Παρατηρητήριο Βιοποικιλότητας)	Greece	Other: environmental protection	2 – distributed intelligence
RQuality	Greece	Other: air quality	2 – distributed intelligence
GreenSpaces	Greece	Other: parks, green spaces	2 – distributed intelligence
SharingMi	Italy	Mobility, Consumption, Other – smart cities	3 – participatory science
Prato Urban Jungle	Italy	Housing, food, mobility, consumption	3 – participatory science
AIR-HERITAGE	Italy	Other: air quality monitoring	2 – distributed intelligence
Life ASAP	Italy	Other: invasive species	1 - crowdsourcing

Cidadania Lab	Portugal	Other: Biodiversity, culture, citizen engagement in civic life	3 – participatory science, 4 – extreme citizen science
The AgroEcology Caravan	Portugal	Food	3 – participatory science
Hotspots in Ljubljana	Slovenia	Other: climate change	3 – participatory science
Enough for everyone	Slovenia	Food, mobility, consumption, other: climate change	3 – participatory science
Eco-Schools Slovenia (Program Ekošola)	Slovenia	Mobility, food, other: environmental reporting	3 – participatory science
Let's clean up Slovenia (OČISTIMO SLOVENIJO)	Slovenia	Other: waste	3- participatory science
Izmir Bio-Atlas	Turkey	Other: biodiversity	1 - crowdsourcing
Quick Urban Analysis Kit: Citizen Design Science	Turkey	Other: urban design	3 – participatory science
RURITAGE	Turkey	Other: rural heritage and sustainability	3 – participatory science
IKLIMIN (Turkish Ministry of Environment & Urbanization)	Turkey	Other: climate change	2 – distributed intelligence, 3 – participatory science
Conference on the Future of Europe	Europe	Other: Climate change and the environment; health; a stronger economy, social justice and jobs; EU in the world; Values and rights, rule of law, security; digital transformation; European democracy;	1 – crowdsourcing, 2 – distributed intelligence, 3 – participatory science

		migration; Education, culture, youth and sport; other ideas	
FoodSHIFT2030	Europe	Food	3 – participatory science
Zooniverse	Global	Other: Arts, biology, climate, history, language, literature, medicine, nature, physics, social sciences, space	2 – distributed intelligence, 3 – participatory science

Name of initiative	AllThings.BioPRO
Living area/focus	Consumption
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://www.allthings.bio
Level of implementation	Regional, International
Location	Tartu, Estonia

The initiative

AllThings.BioPRO puts an emphasis on getting citizens involved in the bioeconomy and making their voices heard. The initiative focuses on issues and products which connect with the daily life of citizens and consumers. Possible themes are the creation of growth and jobs, sustainable and circular use of resources or the societal dimension of the bio-based industry in Europe, but also outside Europe where biomass products might impact societies in other countries.

Who is involved and how did they get involved?

The initiative's co-ordinator in Estonia is Tartu Environmental Education Centre. The centre is a regional hub for nature education for children, so their role in project was the co-creation process with children aged 10-14. As a hub it was relatively easy to attract the participants – 10 all-together. There was also a gift certificate in value of 50€ for those who completed the process. Access was open for all.

How are citizens involved in the collection and use of data?

The kids were introduced to the concept of bio-based economy, found touchpoints with the subject in their lives and based on this they went in to ideate and co-create 3 scenarios for a possible game. This could be seen as more of a co-creation and less of a science initiative, however qualitative inputs throughout shaped the outcomes of the process.

A small amount of data was collected from participating children for about consumption habits for educational purposes. In co-creative workshops game scenarios, character development and inspirational cues for visual design were collected and sent for analysis to the core development team. Based on that, the initial sketches were made and second round of feedback took place – all in qualitative manner.

How is the initiative organised?

This initiative is a Horizon Europe project with the project coordinator FNR – Fachagentur Nachwachsende Rohstoffe e.V. Tartu Environmental Education Centre as a local lead was in charge of the aspects involving children in this initiative. The children were given a blank slate for co-creation in the confines of guiding narratives around bioeconomy and serious gaming.

What is especially inspiring about this initiative?

This project is inspiring as it shows: teaching children about circularity and helping them to understand the impact of their consumption choices; co-creation with children aged 12-14; and that a little monetary bonus goes a long way to keep participants (more) motivated.

Name of initiative	Garden Bird Summer Diary(Suvine aialinnupäevik)
Living area/focus	Other (biodiversity)
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Active
Website	https://www.eoy.ee/aed/
Level of implementation	National
Location	Tartu, Estonia

The initiative

Birdwatching enthusiasts are invited to set up a garden birdwatching routine and report all the birds which are breeding in or traversing their gardens. On a dedicated website they can create individual profiles, save the progress of their observations and compare their results with other gardens. In the end of each season project managers compile a report and share the results with participants and the general public. The collected birdwatching data will be stored in national biodiversity databases.

Who is involved and how did they get involved?

Participants are mainly bird enthusiasts amongst the general public. The initiative does not collect that much user data due to GDRP, but for what is known, mainly the users are elderly people living in a private house or people who regularly visit their summer cottages. 2020 was a record-breaking year with 1193 observers from 675 gardens (locations). 213 bird species were observed in the year.

How are citizens involved in the collection and use of data?

Users register with the user portal and are given a personal digital observation diary link. This data is first observed automatically, lowering the input errors, monitored periodically during the season to detect anomalies, and at the end goes through line-by-line analysis before being added to European Breeding Bird Atlas – EBBA2. The data validation is conducted by Estonian Ornithological Society and funded by the Environmental Investment Center KIK.

How is the initiative organised?

Project is run by Birdlife Estonia and funded by Environmental Investment Center KIK. The initiative is a centrally run and governed effort, with a core team of enthusiasts who are mostly scientists in the field. Management is hybrid due to the Covid-19 situation.

What is especially inspiring about this initiative?

This is a great example of an easy and inspiring citizen science task which is very convenient for people with different physical abilities and ages, providing the opportunity to contribute to international knowledge from your own garden.

Name of initiative	UNESCO ASPnet – Associated Schools Project
Living area/focus	Other (Environment)
Level of citizen engagement	2 – distributed intelligence
Status of the initiative	Active
Website	https://bsp.teec.ee
Level of implementation	National, International
Location	Tartu, Estonia

The initiative

The Baltic Sea Project (BSP) is an international network among UNESCO Associated Schools Network (ASPnet). Its main aims are to promote global citizenship, a culture of peace and non-violence, support sustainable development goals, sustainable lifestyles and to enhance intercultural learning with the appreciation of cultural diversity and heritage in the countries surrounding Baltic Sea. The BSP offers different activities for 180 schools around the Baltic Sea. In Estonia 57 schools are involved.

Who is involved and how did they get involved?

In Estonia 57 schools with approximately 2000 school children and teachers from various backgrounds are involved. The participation is open for all who commit to the United Nations Sustainable Development Goals (SDGs) and host related events in their schools during a school-year.

How are citizens involved in the collection and use of data?

This initiative involves citizens through distributed intelligence, as they are all collecting the data. Citizen science is used in this instance as more of a means to an end, that is giving children exposure to various topics related to SDGs.

Project currently runs 6 types of citizen science programs, mainly nature observations and data collection. The most popular one has been a bird-watching program that has drawn over 950 participants. Different local and international apps are used for collecting the data. Specific tasks may also involve paper check-lists. The data is mainly used inside the program framework and for educational purposes.

How is the initiative organised?

The initiative is internationally coordinated and the Estonian main coordinator Tartu Loodusmaja (centre of environmental education) curates locally relevant program elements as they see fit, based on teacher and participant feedback.

What is especially inspiring about this initiative?

This initiative has managed to “get children out into the nature” and boost their interest in nature. This has been a spring-board for many kids to join local nature-related hobby schools or groups. If engaging with children, an action-oriented approach seems to be a winning strategy, even if more complex topics are involved.

Name of initiative	Urban Eco Islands
Living area/focus	Mobility, Other (environment, tourism)
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Completed
Website	https://www.sei.org/projects-and-tools/projects/linnalahedased-okosaared-targa-linnaturismi-sihtkohad/ https://www.hel.fi/helsinki/en/housing/nature/excursions/urbanecoislands/
Level of implementation	Regional, international
Location	Aegna island near Tallinn and Vasikkasaari island in Helsinki.

The initiative

This cooperation between Estonia and Finland, focused on two small islands near to the capital city of both countries. The main goal was to develop two island destinations in the Helsinki-Tallinn twin city into popular smart destinations for sustainable nature tourism. Natural destinations were to be developed without harming the environment (zero damage), despite the increase in the number of tourists, and will be marketed as new smart and ecologically sustainable eco-islands for nature tourism. The project aimed to showcase new smart solutions, new routes, new services / infrastructure, new educational information and new opportunities for tourists to participate in civic education on both islands.

Who is involved and how did they get involved?

The initiative involved local people, tourism sector entrepreneurs and high school students. Approximately 50 people were included from Estonia. The citizen science projects also targeted nature lovers from the area.

How are citizens involved in the collection and use of data?

Citizens formed part of a working group including islanders, authorities and other stakeholder representatives. The aim was to consider different elements such as nature tourism, culture, economic feasibility and community involvement - and to give input to the proposed development strategy for island Aegna, developed at a later stage.

Design and testing of a marine litter training program formed a key part of the Citizen Science process with Aegna. This included data collection on marine litter as well as the involvement of students for educational purposes. The Citizen Science programme for studying marine litter on beaches was tested with high school students on Aegna island.
The programme can be integrated into the school curriculum as the students acquire practical knowledge about the nature, route and sources of marine litter.

How is the initiative organised?

Project was locally coordinated by SEI Tallinn, following project's goals and including various stakeholders.

What is especially inspiring about this initiative?

The initiative provides an example of involving key stakeholders to co-create in a restricted area; bringing sustainability experts in to work on solutions; developing solutions on-site, in practice; and finding an educational angle for the high school students by involving them in gathering (sea litter) in order to illustrate the delicate balances of the ecosystem and external influences on the island. If a real problem needs addressing, it can be a motivator for people to get involved.

Name of initiative	TAMK Living Labs
Living area/focus	Other: land use planning
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://enoll.org/network/living-labs/?livinglab=tamk-living-lab#description
Level of implementation	Local/City
Location	Finland, Tampere

The initiative

TAMK is a living lab set up based on basic idea of involving citizens in the innovation process. They invite citizens, public bodies, organisations and companies to the labs to collectively solve problems and take action together. They do this through processes of co-creation, exploration, experimentation and evaluation. TAMK Living labs is more like an approach and a way of thinking; not such an individual initiative. We have used TAMK Living Labs' case about Kauppi Area's land use and city planning here as an example. Here the aim was involving citizens in urban planning, inspired by a project in Berlin around Tempelholf airport.

Who is involved and how did they get involved?

Approximately 100 citizens and residents were involved in the initiative. Additionally, over 20 employees from the city of Tampere were in the process. There was also an evaluation council that consisted of people who were not otherwise in the project. These members were from the youth council and other civil servants, and they evaluated the plans from a certain perspective. In the particular example of land use planning, the municipality was a key partner in reaching citizens. The living lab ran events to encourage people to get involved and time was taken to make sure that they were reaching out across the relevant communities.

How are citizens involved in the collection and use of data?

It used qualitative methods to gain insights from the citizens, based on their experiences, and the end result was a map. The map will be used as a background material for land use planning and decision-making in the area.

How is the initiative organised?

At the beginning there were open public events, later more exclusive workshops for the people who were already involved. Additionally, there were presentation events to for showing the already made plans for a wider audience. Participants met physically.

What is especially inspiring about this initiative?

The TAMK example shows the value in the process, not just the outcomes. For example, the value of open projects, as well as having a structure for the initiative, but within that, enabling citizens themselves to help shape the process.

Name of initiative	The Sustainable Lifestyles Accelerator
Living area/focus	Mobility, housing, nutrition, leisure and household goods
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Completed
Website	http://suslife.info/ https://susla.app www.climatepuzzle.fi
Level of implementation	International
Location	Finland, Germany, Switzerland, Denmark, Spain, Mexico, India

The initiative

The project goal was to mobilize private households in seven countries (Germany, Finland, Switzerland, Denmark, Spain, Mexico, India) to analyse their material and carbon footprints, and to plan and implement footprint reductions through behavioural change. To guide and support such a transition, the Accelerator provided online and offline tools (and their combination) for footprint calculation, individual road-mapping and experimenting, and sharing experiences for up-scaling. Two rounds of interaction with an increasing number of households took place as part of the project.

Who is involved and how did they get involved?

The target group for participants was private households. Citizens filled in a questionnaire to apply to take part in the project, the selected households were invited to participate. The number of participants varied across pilot countries, for example in the Finnish case, 250 households took part across 14 Finnish municipalities, led by municipalities themselves. Vulnerable groups were not specifically addressed in the process. Participants did not receive monetary incentives to join. However, they learned about their individual lifestyle impacts and potential improvements. Also, households that have already participated in the project in other cities say that their lives have not only become lighter on resources, but also a bit happier.

How are citizens involved in the collection and use of data?

The first way in which citizens participate is through providing information on their lifestyles on the web-app SUSLA. It first calculates the footprint of an individual's lifestyle and, based on this, suggests approaches for a more sustainable everyday life. Based on them, the app testers can create an individual plan when to try out which tips for an environmentally friendly everyday life. SUSLA calculates how many emissions and resources are saved and reminds users by email to keep the good intentions.

In addition to this, citizens can participate in analysing the data and developing individual strategies to improve their lifestyles, through activities in the pilot locations. For example, in Finland, several road mapping workshops were held, in which households and others played a Climate Puzzle to find lifestyle changes and plan a roadmap for their household. The households then tested the chosen actions. In some cases, local companies pitched products or services which could support more sustainable lifestyles during the experiments. Afterwards, workshops were held to discuss results, reflect on any challenges and present suggestions of services and support to help people live sustainable lifestyles. Based on experiences from Finland, we assume an immediate footprint reduction potential of even 25% per participating household, at least 50% by 2030, and a very high potential for scaling up these effects.

How is the initiative organised?

Initially activities were held in person. Additionally, online discussion spaces where participants could exchange ideas with other test users were set up in each country, as well as an international discussion space. An online questionnaire was offered to the participants to leave feedback and suggestions for advancement of the App.

What is especially inspiring about this initiative?

There are lots of interesting ideas which have come out of the Sustainable Lifestyles Accelerator so far. These include: the idea of iterative project setting with an increasing number of households; using a physical puzzle and boxes representing the different aspects of an ecological footprint (like a board game) during the workshops with citizens; focusing on families

as participants, as children motivate parents to change their lifestyles (parents get a guilty conscience, if they act wrongly from the sustainability perspective); and the initial idea to foster communication among the participating households (as a social media platform), which in the long term could lead to a business cooperation (e.g. a person stops using his/her car and participates in peer-to-peer car sharing).

Name of initiative	Campus to World
Living area/focus	Housing, consumption, other
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Active
Website	https://www.h-brs.de/de/ctw
Level of implementation	Local/city, regional
Location	Bonn and Rhein-Sieg-Kreis district, Germany

The initiative

The University of Applied Sciences Bonn-Rhein-Sieg's project "Campus to World" aims to strengthen the transfer of ideas, knowledge and technology of the university in exchange with municipalities, companies, research institutions and citizens. The Campus to World transfer project is funded by the state-federal initiative "Innovative Hochschule".

Part of the project are the "CitizenLabs", where students, citizens and scientists work on scientific, technological and social issues. Interested parties can actively contribute to the research by developing questions, collecting data and, if necessary, analysing and applying it. The results are intended to contribute to the achievement of the SDGs (Sustainable Development Goals). The five CitizenLabs are: Energy and Resources, Environmental Lab, 3D-Printing, Life Cycle Assessment and the SDG-Workshop.

Who is involved and how did they get involved?

The target audience depends on each lab's specific topic. The main participant groups include citizens, school students, companies, municipalities and policy makers. For specific topics, representatives of local thematic clubs or repair cafés are also involved. The number of participants also varies among the labs. For example, over 600 households were engaged in the "Environmental Lab". The citizens are involved through different channels like local multiplicators (they need to be identified first), social media channels (by means of short explanatory videos) and regional mass media. One of the incentives to participate is that citizens learn practical aspects of sustainable behaviour which they can implement to improve their own lives.

How are citizens involved in the collection and use of data?

There are a range of different opportunities for citizens to be involved in data collection and usage across the different labs, including: assessing their household devices; providing soil samples from their gardens to the experts; participating in crowdmapping to identify climate sensitive areas in the city; participating in discussions on how to improve the environmental impact of household devices; co-developing innovative business ideas for the energy sector; and co-developing solutions for climate change adaptation as well as creating, running and analysing surveys.

The data collected is then used and applied in a range of different ways. For example, soil samples are analysed by scientists and are then used to inform international climate models. The results of the household device 'Life cycle assessments' are fed into the co-development of solutions to reduce ecological footprints. Findings from surveys and interviews in the SDG-Workshop were inputted into the crowdmapping tool and discussed with local policy makers.

How is the initiative organised?

Citizen engagement in Campus to World includes both physical formats (e.g. workshops, podium discussions and excursions), online formats (e.g. webinars, podcasts, crowdmapping and an interactive online course for pupils) and the combination of both (e.g. the series of classes for pupils about solar energy).

What is especially inspiring about this initiative?

Campus to World provides inspiration in the way it uses various creative methods of interaction with citizens.

It deals with rather complicated topics for citizen science, such as hydrogen power ("Energy and Resources" lab), and even involves pupils in them. As well as working in c cooperation with the research institutions,

experts from various organisations were invited to workshops to give presentations. Having an intermediary for communication with the city offered additional benefits.

Name of initiative	KlimNet Netzwerk zur Gestaltung einer nachhaltigen Klimalandschaft
Living area/focus	Other: urban land use, environment, climate
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Completed
Website	http://klimalandschaften-nrw.de/
Level of implementation	Regional
Location	North Rhine-Westphalia, Germany

The initiative

The KlimNet project used the concept that, together, land use and climate make "Climate landscapes". The project had both a spatial/landscape and social perspective, in order to gather information and bring local communities together around climate adaptation, learning about the impacts in their own home region and to come up with ideas for action on climate change. The focus of the project was to gather information to identify 'hot spots' in the pilot cities – Bonn and Gelsenkirchen, which could then be applied to other cities in the future. The project used satellite data from the past 40 years and looked at the effects of surface structural changes have had on microclimate, as well as the municipal climate policies. In practice this meant comparing satellite images and seeing 'hotspots' of development and the linked impact on the natural environment e.g. flood plains. The team then combined this scientific data with the practical experience of local actors. The project looked at the impact on vulnerability of citizens and the areas. Through use of role-playing games and other methods, they explored simulation of which measures would be accepted and how.

Who is involved and how did they get involved?

Scientists, local government and citizens came together, with flexible participation. The project was targeted at the general public, but there were some targeted activities for children/young people. 6 public excursions took place and the project linked with existing individuals and groups already active on climate change. Engagement took various forms: crowd mapping, photo workshops, seminars, excursions, green island building and local information points.

How are citizens involved in the collection and use of data?

In terms of data collection, the initiative used the crowd mapping method where a wide range of people are able to contribute data to a geographical map based on their observations and experiences. Any citizen could enter data on areas that were either a 'green' space e.g. trees, meadows etc. or hot spots e.g. concrete. They could click on the place on the city's map and enter keywords, as well as suggesting areas where creative solutions could be found, so as they identified climate change "hot spots", they developed solutions for climate change adaptation.

There was also a Whitsun camp with students, schoolchildren and others in which participants took part in activities visualising future climate-adapted city using scenario methods. These were modelled and then discussed with local politicians, with the aim to create city hot-spot specific solutions.

How is the initiative organised?

The initiative was led by a group of researchers in cooperation with local authorities for the locations, working with citizens through the participatory activities.

What is especially inspiring about this initiative?

KlimNet demonstrated some interesting event formats for networking (crowd mapping, workshops, photo excursions, planting activities and local info points). It also developed a guide with ideas for climate adaptation to ensure the continuation of the work after the project time.

Name of initiative	New Urban Production (Neue Urbane Produktion)
Living area/focus	Other: sustainable urban production and value chains
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Active
Website	https://www.neue-urbane-produktion.de/projekt/
Level of implementation	Regional
Location	North Rhine-Westphalia, Germany

The initiative

The goal is to strengthen regional urban production and its sustainable value chains in three neighbouring cities (Wuppertal, Remscheid and Solingen) through fostering local cooperation and networking. One of the project goals is to establish a transdisciplinary competence centre for new urban production. Another goal is to analyse the relationship between new urban production and neighbourhood innovation as well as to derive strategies and recommendations for action for the new urban production. Citizens are invited to support the creation of this network by entering data into a collaborative online map.

Who is involved and how did they get involved?

General public, including craftsmen, entrepreneurs, urban gardeners and other interested citizens are invited to get involved. Anyone can suggest items for inclusion in the map of urban production facilities. They are encouraged to add in manufacturing facilities that produce or repair goods, or use local resources or value chains to do so, within the area of the three cities.

How are citizens involved in the collection and use of data?

The data entered into the map by citizens is used in the development of the networks of the project, to ultimately strengthen sustainable value chains and urban production in the region. It is also entered into a partner project map "GeoPortal des Guten Lebens" (GeoPortal of the good life), which was also created by a citizen science approach which aims to make places of the good life more visible to people living in the neighbourhood. Citizens and other stakeholders contribute to identification of risks and opportunities of the new urban production during transdisciplinary workshops held as part of the project.

How is the initiative organised?

This project sits under the wider project "Urbane Produktion im Bergischen Städtedreieck – Wettbewerbsfähigkeit, Innovation und Quartiersentwicklung" which is funded by the European Fund for Regional Development and the state of North Rhine-Westphalia. For this part of the project, community initiative Utopiastadt and scientific partners Wuppertal Institute and transzent work together with other local organisations in Wuppertal.

What is especially inspiring about this initiative?

The project is connected to the Utopiastadt initiative, which is an ongoing successful example of an extreme citizen science in itself, through its bottom-up, citizen-led story. When initiatives like this. Are connected, participants may build experience of participating in citizen science and therefore be more interested in contributing to future processes.

Name of initiative	Hellenic Biodiversity Center (Ελληνικό Παρατηρητήριο Βιοποικιλότητας)
Living area/focus	Other: environmental protection
Level of citizen engagement	2 – distributed intelligence
Status of the initiative	Active
Website	https://www.biodiversitygr.org/index.html?lang=en https://www.inaturalist.org/projects/biodiversity-of-greece
Level of implementation	International, national
Location	Greece

The initiative

Hellenic Biodiversity Center is a non-governmental, non-profit organisation, with citizen science as its main function. The basic idea of creating this organization was to be able to involve citizens - and not only scientists - who would be able to participate voluntarily from their place and to gather data under the umbrella of BiodiversityGR. Through the iNaturalist app citizens help to create a large database of all the biodiversity species in Greece. The main goals of this initiative are: conservation of wildlife and biodiversity; observation and recording of biodiversity; rehabilitation of wildlife; and spreading the ecological sensitivity for wildlife and the environment of the country.

Who is involved and how did they get involved?

This initiative targets general citizens and not only scientists. Citizens are able to participate by downloading and using the iNaturalist app. Overall there have been more than 220.000 species registrations, 12.300 species identified and 8.500 participants taking part in Greece.

How are citizens involved in the collection and use of data?

Initially the user has the option to sign in or skip this process and enter as a guest. By doing the later though the ability for texting is not available. Signing in may be achieved via email or 3rd party logging with accounts of other platforms. Citizens who download the app can make their own observations using their phone and upload them to the iNaturalist cloud network. People using the iNaturialist app may take photos or record the specific species they find and upload them to the cloud where they are catalogued and categorized. Furthermore, there is an option to observe a global heatmap where users can see the areas with the most observation activity. There is also a space where citizens can communicate and exchange opinions or even start their own action. Moreover, online lectures and workshops are being held for the enhancement of knowledge with an option to acquire a certificate.

How is the initiative organised?

Participants mostly meet online but as active participants in workshops.

What is especially inspiring about this initiative?

This project shares some interesting insights on engaging citizens in the use of an app. The fact that each person may create their own mission or action, delving deeper into the engagement process, may initiate interesting ideas on the potential for personalised plans. Additionally it shows us the power of the experience of becoming a citizen scientist by recording encounters with other organisms and maintaining life lists; creating useful data and helping scientists and resource managers to understand when and where organisms occur; connecting with experts who can identify the organisms observed; or even holding an event where people try to find as many species as possible.

Name of initiative	RQuality
Living area/focus	Other: air quality
Level of citizen engagement	2 – distributed intelligence
Status of the initiative	Active
Website	https://play.google.com/store/apps/details?id=eu.upcom.uctapps&hl=en&gl=US https://apps.apple.com/gr/app/rquality/id1502392828 https://cordis.europa.eu/article/id/429905-icarus-lights-up-the-path-to-green-cities-with-new-tools-to-monitor-and-improve-air-quality
Level of implementation	Local/city
Location	Athens and Thessaloniki, Greece

The initiative

RQuality is an application that includes a section for calculating the carbon footprint (i.e. the impact of the user's lifestyle on the emission of gases that contribute to the climate crisis) based on the user's lifestyle and choices (transport, energy, food, waste, goods and services) that monitors the levels of air pollution and the exposure to air pollutants and harmful PM 10 and PM 2.5 microparticles. It is designed to list the user/citizen steps and help them to embrace a low-waste lifestyle. The app was created within the European program ICARUS in the framework of HORIZON 2020 under the coordination of the Laboratory of Environmental Engineering EnveLab of the Aristotle University of Thessaloniki. The project technologies were tested in nine cities representative for the whole of Europe: Basel, Brno, Ljubljana, Roskilde, Stuttgart, Thessaloniki, Athens, Milan and Madrid. These are cities of different sizes, with distinct social, cultural, climatic and environmental conditions.

Who is involved and how did they get involved?

Anyone can be involved by downloading the application on their mobile phone. Citizens may use it to be directly protected from high levels of air pollution that can endanger their health. This is especially useful for people with allergies and respiratory difficulties. Local authorities can use the application to improve air quality in cities, assess the impacts of climate change locally and develop new environmentally friendly models of behaviour for citizens and wider social groups.

How are citizens involved in the collection and use of data?

The application records all human exposure data to air pollution based on inhalation rate, as well as the daily activities of the smartphone user, such as waking up, running, standing, etc. Total pollution levels are combined with the air quality index (AQI) and the results are transmitted in real time in the mobile. In addition, the application includes a section for calculating the carbon footprint based on the user's lifestyle and choices (transport, energy, food, waste, goods and services).

Each user has all the information they need to organise their daily activities, as the RQuality app monitors exposure levels for air pollution and ozone (CO, NO2, PM10, PM2.5, SO2 and O3) in real time. For example, if someone suffering from allergies or other respiratory problems wants to go downtown for work, they will now be able to determine the level of pollution at that particular time, in the specific area. They can thus adjust their schedule and choose another activity. App users are also able to participate in campaigns challenging themselves in certain physical activities such as walking or running to win prizes.

How is the initiative organised?

The application is fully online and the recommendations on the user's suggested next activities are based on the application's results on the user's carbon footprint.

What is especially inspiring about this initiative?

"The particularly important information provided by the application not only relates generally to the levels of air pollution in the area where the user is located, but also gives the individualized dose of pollution that each citizen receives. This

information is necessary and has a direct impact on citizen activities and the preservation of the quality of the citizen's health ", says the Director of the Laboratory of Environmental Engineering of the Aristotle University of Thessaloniki, Professor Demosthenes Sarigiannis, who coordinated with his team the creation of the application.

Name of initiative	GreenSpaces
Living area/focus	Other: parks, green spaces
Level of citizen engagement	2 – distributed intelligence
Status of the initiative	Completed
Website	https://greenspaces.gr/
Level of implementation	Local/city, regional
Location	Athens and Thessaloniki, Greece

The initiative

WWF GreenSpaces is a free application - the first of its kind in Greece and Europe - which enables citizens to "build" the largest participatory green map of Greek cities, capturing and evaluating parks using only their mobile phone. It gives everyone the opportunity to evaluate the quality and quantity of greenery, the level of cleanliness and the quality and type of infrastructure that each space has. Aside from the rating of spaces, it helps citizens to find green oases, ideal places for walking or sports, playgrounds, or places for walking with a dog. Users of the app can both record new green spaces and evaluate them.

Who is involved and how did they get involved?

The target group is the general public, and more than 9.000 people have already installed the application in their mobile phones. 1.000+ green spaces have been captured and uploaded on the app in 106 cities of Greece.

How are citizens involved in the collection and use of data?

By downloading the application the participants can: evaluate the green spaces they visit; comment on positive and negative examples of spaces; stay informed about the parks they are interested in; network in the neighbourhood or with others; take initiatives for a green space; and capture a green space and add it in the app. This set of features gathers a range of different types of data which builds up a fuller picture of the green spaces in the area, as well as creating a social experience for the citizen users of the app.

How is the initiative organised?

The participants interact through the application. They can find and evaluate the green spaces other users have already added in the app. The application relies only on citizen participation across Greece.

What is especially inspiring about this initiative?

There are several inspiring aspects of the GreenSpaces initiative: the promotion of the application (they created advertisements in which actors and influencers participated in order to attract citizens); students and teachers were actively involved, especially in the lockdown, in order to use the application and to capture green spaces; the way in which citizens - through the application - asked from the municipality authorities to intervene and improve the degraded parks and green spaces.

Name of initiative	SharingMi
Living area/focus	Mobility, Consumption, Other - smart
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://www.sharingmi.it/ ; https://www.sharingcities.eu/
Level of implementation	Local/city
Location	Milan, Italy

The initiative

SharingMi, in Milan, is part of Sharing Cities, a major international smart cities project addressing some of the most pressing urban challenges facing today's cities such as: energy use; low carbon transport and buildings; and harnessing data for the good of the city. The programme brings together 34 partners from across government, industry and academia to create solutions together. By engaging with the people, Sharing Cities develops participatory mechanisms for the co-design of smart city solutions. Demonstration districts were set up in the 'lighthouse' cities of Lisbon, London and Milan. They implemented collaborative models and, in each city, a digital tool was deployed to actively engage citizens in sustainable behaviours. In Milan the digital tool was supplied by greenApes, where the focus included incentivising behaviour change, energy management, urban sharing and shared e-mobility.

Who is involved and how did they get involved?

Several workshops and activities were held to engage residents in the key-areas targeted in the city of Milan, focusing on the infrastructural interventions and the development of the digital tool. The co-design workshops were attended by 15-25 people, while the testing of interfaces was conducted with 12 participants and held by a co-design agency. The digital tool (a customisation of the greenApes platform) was initially planned for use in the districts addressed by the project, but the use was in the end opened to residents in the whole city. Overall, 2,461 citizens registered, 6,572 best practices and ideas were shared, 123 rewards were claimed and 200,000 mobility actions were registered, till December 2021.

How are citizens involved in the collection and use of data?

The first workshops were planned as open discussions around expectations, needs and pain points of citizens. The final workshop (pre-launch) was delivered to collect citizens' feedback on possible interfaces and functionalities that had in the meantime been envisioned for the digital tool (defined as Digital Social Market).

Pseudo-anonymous data were collected for participants who gave consent by taking part in the assessment questionnaire. In this case the activity data on the app were associated with the answers provided in the surveys/interviews. Data from the app included: activities self-reported on the app; activities detected by the app (e.g. trips by bike or on foot); interaction with content shared by other users; and rewards claimed. Additional data from surveys included: age, gender, education, occupation, "attitude" towards environmental issues, and lifestyle habits. Aggregated and fully anonymised data were provided by the platform to the "scientific" project partners for analysis and use in the project.

How is the initiative organised?

Poliedra - Politecnico di Milano was the leading organization in Milan (technical university of Milan that was deploying the project on behalf of the Municipality); Imperial College of London was leading the research from a scientific point of view; and greenApes was the developer. Workshops were mainly physical (pre-Covid era).

What is especially inspiring about this initiative?

Citizens were engaged via the app in a mix of digital and real-life activities that included gamified challenges, best practices sharing, events, and rewarding dynamics. An "engagement calendar" was built over time, which included the possibility of rewarding attendance at events, interaction with educational content, the completion of quizzes and the creation of topical challenges in specific times of the year (e.g. European Mobility Week, Earth Day…). Local and online eco-friendly shops and businesses were involved in the rewarding scheme.

Name of initiative	Prato Urban Jungle
Living area/focus	Housing, food, mobility, consumption
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://www.pratourbanjungle.it/home1943.html
Level of implementation	Local/city
Location	City of Prato, Italy

The initiative

Prato Urban Jungle is a project that aims to re-nature neighbourhoods in a sustainable, resilience-building and socially inclusive way by creating 'Urban Jungles' - high-densely green re-designed areas which are immersed in the urban structure - that contribute to reduced impacts of pollutants, restored soil, reduced urban heat effects and space for communities. Linking with the City's new Strategy for Urban Forest, the project aims to deliver an innovative strategic urban planning approach that, by engaging stakeholders through an innovative digital platform and governance model, can support more inclusive urban green development in cities.

Who is involved and how did they get involved?

The project selected three areas in the city where the reforestation will happen. The Urban Jungles are co-designed by citizens (areas 2 and 3) and company employees (area 1) through a user-centred approach based on design thinking. Co-creation on one hand engages people, unleashing their full creative energies and winning their commitment by creating ownership. On the other hand, it enables creative problem-solving through 'learning-by-doing' activities. To reach these objectives, the project uses validated co-design formats to foster collaborative creative problem-solving processes. Overall around 100 citizens have been involved so far.

How are citizens involved in the collection and use of data?

The project uses a non-linear design thinking process to involve citizens and stakeholders in the co-design of Urban Jungles, through "Junglathons". The reference format is a design-thinking hackathon, finalized to the resolution of a proposed challenge. Collection of data has been done via: surveys, face to face interviews, interactive workshops and focus groups. Data types gathered include:

- interviews on: the local area; green areas; local needs of inhabitants; interest on sustainability and environment; key aspects that the public authority should address and local urgencies;
- level of digitalization; interest on digital apps; and
- needs and wishes in engagement digital activities; needs and wishes in local engagement activities.

Data gathered through interviews and surveys is stored on the cloud, analysed by the team and results reported in project's documents. The data gathered and analysed provides a base for some of the project's implementation phases e.g. for digital features on project platforms; for engagement activities in town; and for future governance of the new green areas.

How is the initiative organised?

The Municipality of Prato as task leader is the main decision-maker. It appointed a specialized company to organize the participatory process (Co-Design Toscana). Participants of the first 2 sessions (citizens) met in person - the third session (employees) was mainly online, due to the situation with the Covid-19 emergency in that period.

What is especially inspiring about this initiative?

This initiative is inspiring for a number of reasons. It uses an innovative approach to tackle urban infrastructure and design through creative co-design activities, which also collect the required data for implementing changes. The participatory process was proposed in a low-income area with an inclusive approach.

Name of initiative	AIR-HERITAGE
Living area/focus	Other: air quality monitoring
Level of citizen engagement	2 – distributed intelligence
Status of the initiative	Active
Website	https://www.uia-initiative.eu/en/uia-cities/portici
Level of implementation	Local/city
Location	City of Portici, Italy

The initiative

AIR-HERITAGE aims to: improve the knowledge of pollution in qualitative and quantitative terms, in spatial and temporal detail; have tools that can support local authority decisions; and lead to widespread sharing and participation of communities. The project aims to change the way the components of the City of Portici assess and react to air quality issues, reducing the distances and barriers among them. In particular, AIR-HERITAGE aims to have a positive impact on citizens' mobility choices and policy engagement, as well as policy decision making. The project is co-financed by ERDF/FESR.

Who is involved and how did they get involved?

The initiative is aimed broadly at citizens (mainly children and parents) and administrations. It was possible to involve them through a communication campaign and the involvement of local associations. A lot of events, environmental education activities and conferences have been organised, with thousands of participants in total. Over 700 people have already participated in the first citizens' questionnaire. In addition, other individual initiatives were organized such as a pedibus (walking bus), a 1.500 bed sheets air pollution awareness campaign and a biomonitoring campaign. To date, over 200 children have participated in the monitoring campaigns.

How are citizens involved in the collection and use of data?

AIR-HERITAGE foresees the development of an innovative, effective and versatile way of monitoring air quality that is integrated with ordinary institutional monitoring. Through the modelling of the data collected with respect to the context, and the preparation of a decision support tool that can be used by both public administrators and citizens, they will be able to adopt the most appropriate choices and behaviours. Citizens themselves are able to take part directly in monitoring using portable detectors. Local communities, in a complementary and synergic way, will be encouraged to adopt virtuous behaviour. By means of the Monica portable monitoring device it is possible to collect two types of data: the concentration estimates of atmospheric pollutants and the associated individual geographical routes of the monitor. Thanks to the involvement of citizens who wore the device for 2 hours a week, it was possible to reach good level of detail.

How is the initiative organised?

There is a technical working group and then the choices are made by the Steering Committee. The Steering Committee meets 3 or 4 times a year. Then there are several further groups such as the Communication Group.
Due to covid, the meetings are held online.

What is especially inspiring about this initiative?

It's inspiring to see the way in which AIR-HERITAGE has engaged citizens (directly in monitoring using portable detectors); the way it has approached generation of data; the new pervasive monitoring stations network; and the way it affects policy making. Moreover, the initiative looks to define a new level of social cohesion for fighting environmental threats.

Name of initiative	Life ASAP
Living area/focus	Other: invasive species
Level of citizen engagement	1 - crowdsourcing
Status of the initiative	Completed
Website	https://www.lifeasap.eu/index.php/it/progetto/progetto-asap
Level of implementation	National
Location	Italy

The initiative

The Life ASAP project (co-funded by the European Union) addresses the issue of Invasive Alien Species (IAS) with an approach aimed at involving the various stakeholders to reduce the rate of introduction of these species and mitigate the impact on the biodiversity. The project also aimed to raise awareness among citizens by involving them in the use of an app for mobile phones to record IAS sightings, which, at the same time, generated data to be used in the effective management of IAS by public authorities.

Who is involved and how did they get involved?

To engage citizens, a communication, engagement and training strategy was created aimed at creating interest and willingness to participate. The goal was to engage citizens (and administrations) with more targeted actions for certain groups such as children, travellers, hikers, hunters and anglers. 12 bioblitzes were organized involving a total of more than 1000 citizens and several training events were held for a total of about 564 participants.

How are citizens involved in the collection and use of data?

Citizens were encouraged to enter data on invasive alien species sightings (with a focus on species of Union concern). Data was collected through the app that allowed individuals to select the species from a list and upload a photograph. The latter was used by the expert to validate or not validate the data collected.

How is the initiative organised?

Decisions were made collectively. Some activities, such as the organization of events, publicity for the project and training activities were managed by different project partners.

What is especially inspiring about this initiative?

Life ASAP is challenging for several reasons: the project's great organizational complexities, networking, and creative ways to engage citizens. Finally, the inclusion of species of Union concern in the app, and other project activities, have integrated the national databases on these species.

Name of initiative	Cidadania Lab
Living area/focus	Other: Biodiversity, culture, citizen engagement in civic life
Level of citizen engagement	3 – participatory science, 4 – extreme citizen science
Status of the initiative	Active
Website	https://cidadanialab.com/
Level of implementation	Local/city
Location	Aveiro Municipality, Portugal

The initiative

The Cidadania Lab focuses on enabling citizen participation in Aveiro. It does this through creating spaces in which people can meet and learn together, enabling them to know and co-create ways to participate and contribute to city life and the political decisions that affect their lives. This laboratory citizen-built space for learning and experimenting is directed to all: children, young people, and adults; from the most diverse areas of knowledge; officials and leaders of local and central government; groups and collectives; associations and social organisations; companies; schools and academies.

Who is involved and how did they get involved?

The target group is inhabitants of the Aveiro municipality. Some of the initiatives targeted the integration of senior and younger citizens. Four hundred citizens participated in 14 events during a period of three months.

How are citizens involved in the collection and use of data?

A range of different stakeholders are involved and take part in different activities. For example, Itinerant Sessions in Parish Councils follow a cycle of four participatory meetings consisting of online sessions of up to 50 people in four groups of parish councils in the municipality of Aveiro. These are events that are dedicated to the consultation of citizens, identifying concerns, needs, problems and resources. Ideation Workshops consist of collaborative and co-learning exercises to generate responses to and data on the needs and problems of the community and create solution prototypes to be tested in the area. Online or Face-to-Face Sessions aim to share knowledge in a particular field or test prototypes created in the ideation workshops.

How is the initiative organised?

The initiative consists of online and in person encounters. A citizens' group assures the organisation of the initiative with the municipality's financial support through a participatory budgeting initiative.

What is especially inspiring about this initiative?

This initiative is a grassroots movement that developed its activities in both urban and rural environments, engaging a diversified group of citizens in the co-creation of solutions for local challenges. All ten council parishes of the municipality were engaged.

Name of initiative	The AgroEcology Caravan
Living area/focus	Food
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	http://caravanaagroecologica.weebly.com/
Level of implementation	National
Location	Portugal

The initiative

The AgroEcology Caravan (CA) is a participatory project from the MITE2 research group at cE3c, FCUL (Center for Ecology, Evolution and Environmental Changes, Sciences Faculty of the University of Lisbon), aiming to strengthen the relations between farmers, consumers, and researchers committed to agroecological practices - based on applying ecological principles to construct and maintain sustainable agroecosystems. A set of multidisciplinary teams, divided into complementary knowledge, participate in this co-construction within a bottom-up structure. The aims of the initiative are: to establish the concept of agroecology; to monitor and study agroecological experiences; to present and disseminate good agroecological practices; to facilitate participatory processes for public policies that support agroecology in Portugal; to promote resilience between networks and communities.

Who is involved and how did they get involved?

Collaboration with three local radio broadcasters, 15 food producers, and 12 schools was established, for the following initiatives: Farmers Opens Days, in which farmers show and sell their products, a chef prepares food with their products, and an open conversation on agroecological topics is held; Agroecological Vegetable Gardens, where the team collaborates with schools and institutions with vegetable gardens, helping them to use agroecological principles and practices; Agroecological Routes, designed to raise awareness of agroecological experiences occurring in Portugal, mapped through participatory meetings; and the weekly CA Radio Program where agroecology topics and experiences are discussed with guest farmers, researchers, and policymakers.

How are citizens involved in the collection and use of data?

The initiative brings together several people in focus groups to analyse, discuss, propose and share reflections on public policies related to agroecology in a period of public consultation. In addition to mobilizing, aggregating, and strengthening agroecological communities in Portugal, it promotes participatory governance that should contribute to the consolidation of related public policies at a national and European level.

How is the initiative organised?

Participants meet in physical and online encounters. Online interactions were created during the COVID19 restrictions.

What is especially inspiring about this initiative?

The AgroEcology Caravan is a relatively citizen science initiative working on sustainable food. Furthermore, this initiative works with and addresses food producers (farmers) and their relationship with the consumer, which might be hard to reach

Name of initiative	Hotspots in Ljubljana
Living area/focus	Other: climate change
Level of citizen engagement	3 – participatory science
Status of the initiative	Completed
Website	https://vroce-tocke.info/
Level of implementation	Local/city
Location	Ljubljana, Slovenia

The initiative

Summers in Ljubljana are hot and difficult to bear. In the last 20 years, both the average temperature in the city (by 1.2 ° C) and the number of hot days (by 2.6 days) have increased. New measures need to be implemented on how to alleviate the summer heat and adapt the city to higher temperatures. Pedestrians, cyclists and other users of public spaces have the best insight into which parts of the city are too hot. In August 2020, NGO Prostorož invited them to vote for locations that they themselves perceive as hotspots. Measures for cooling down were prepared and handed over to the Municipality of Ljubljana. The HotSpots project was part of the Climate Program of NGO Mreža za prostor, co-financed by the Eco Fund and the Ministry of the Environment and Spatial Planning with funds from the Climate Change Fund.

Who is involved and how did they get involved?

General public, pedestrians and cyclists were involved in the initiative. From the 7th to the 25th of August 2020, citizens marked as many as 699 hotspots. The project reached people via social media: the address to the people was specific – they were encouraged to participate only when a temperature of more than 30° C in Ljubljana was expected. The initiative wanted to build on personal experience. Communication speeches were designed to be playful and relaxed.

How are citizens involved in the collection and use of data?

The free and open-source tool canvis.app was used for the research. The interface had to be very simple, with a good user experience. Citizens were asked to participate by marking hot spots on a map. When combined with heat information, most hot spots identified by citizens overlapped with the heat island of the city. Concrete solutions were also proposed, to counter this effect. All entries were publicly available at all times. Citizens could see other suggestions and read other people's experiences.

How is the initiative organised?

Initiative was carried out by a NGO Prostorož, a non-profit urban studio. Prostorož connects people with public space and people with each other through space.

What is especially inspiring about this initiative?

The initiator/NGO started as a citizen's initiative and is using citizen science principle in most of its projects. It has been very successful building a community in Savsko naselje (part of Municipality of Ljubljana). It is using a good concept for how to work with general public and collecting solutions. Participation in their projects is easy and fun.

Name of initiative	Enough for everyone
Living area/focus	Food, mobility, consumption, other: climate change
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://dovoljzavse.si/
Level of implementation	National
Location	Slovenia

The initiative

The Platform for Sustainable Community Resource Management is an online space which contains information, ideas, tools in order to support the implementation of sustainable community projects by local groups. Enough for everyone gathers together good practices and runs activities to continue to develop the resource and the capacity of local organisations through participatory processes. As part of the sustainable management of community resources, the initiative addresses five key topic areas: spatial planning; food self-sufficiency; energy efficiency and energy supply from local renewable sources; sustainable mobility; and local circular economy and sustainable consumption.

Who is involved and how did they get involved?

Most participants come from civil society organisations. They are taught how to lead the participative process and key elements of sustainable projects. So far 20 project coordinators were trained. Municipalities can join via public calls. So far 11 municipalities joined the initiative. The participants of the initiative meet in person and on-line. Lectures, workshops and site visits are organised. Each year the 'Enough for everyone' conference is organised. In 2021 it had more than 150 participants.

How are citizens involved in the collection and use of data?

The initiative collects good practices and shows them on the map. Anybody can fill in the online template with data on the name of the good practice, topics, location, contact details, short description, links, photo and notes. The submitted data are processed by the website moderator and published if applicable to the purpose. The initiative has to date identified 74 good practices, conducted 26 participatory workshops and prepared 7 project implementation manuals. Through its activities, it provides information and resources to those responsible for the preparation of development documents and the planning and implementation of local community projects. For example, municipalities, as well as independent or organised initiators of community projects. Good practices are also promoted in newsletters and manuals, and in short videos.

How is the initiative organised?

The initiative is run by NGOs Umanotera and Focus. The municipal support program is agreed between Umanotera, Focus and the municipality in question. Usually, it is focused on specific need of a municipality and its inhabitants.

What is especially inspiring about this initiative?

This shows a citizen science project which brings together s different type of data – that of good practices. The organisers have long-term experience on participant's motivation and training. The project is extremely good at bringing together science, local communities and civil society. The initiative includes a very good concept of train the trainer principle. The initiator/NGO (Umanotera) is the author of the first Slovene carbon calculator.

Name of initiative	Eco-Schools Slovenia (Program Ekošola)
Living area/focus	Mobility, food, other: environmental reporting
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://ekosola.si/projekti-2020-2021/
Level of implementation	Local/city, regional, national
Location	Slovenia

The initiative

Eco-Schools is a global programme that gives a framework (7-step methodology) for educational institutions from kindergartens to university faculties. It enables participating institutions to choose their scope of environmental and sustainability activities based on interests and knowledge of students and the local context. Eco-Schools and its projects encourage young people to engage in their environment by allowing them the opportunity to learn about it, raise awareness and get involved to actively protect it. It starts in the classroom; it expands to the school and eventually fosters change in the community. Their projects tackle the local and global environmental issues, raising the awareness, actively engaging the pupils, teachers, students to get involved, research and explore solutions in a variety of environmental challenges such as mobility, biodiversity, circular economy, carbon footprint, waste and energy.

Who is involved and how did they get involved?

The main target group is the children and youth population from kindergarten to high-schools and universities. Implemented through teachers' networks, in 2020 more than 1600 participants took part and in the past 6 years more than 10,000 participants had taken part in Slovenia, as part of a global movement. Specialist schools for children with special needs and mental health conditions are included. The main incentives for participants are the creative artwork competition, seminars and research work competitions, and exhibitions in schools and at partner locations. Additional engagement comes through the journalistic contributions such as videos, articles etc. that are distributed through school and local/regional media and websites.

How are citizens involved in the collection and use of data?

The goals of the Eco-Schools initiatives are not to collect data per se, but to search for data and use it to raise awareness and stimulate behavioural change. Most of the data collection is field work and desk research. For example, in one case this has taken the form of collection of data regarding food and food waste, with engagement of the school community and partners (households) in collecting recipes with traditional food and cooking with no food waste. Best practices were presented each school year in a booklet "Recycled cooking". Linked to this, the project initiated the national "no-waste-food day" in 2021. On the topic of sustainable mobility, one group suggested that they choose a day or week dedicated to sustainable mobility. They chose major recognized locations, such as e.g. shops, shopping centres, and then: analysed and determined which means of transport dominated; identified and searched for data on their CO2 emissions; analysed paths and parking lots; and found out what happens to end-of-life vehicles.

How is the initiative organised?

The mentor for the individual Eco-School introduces the initiative (adapted to the age group and profile of the audience), the goal and proposes possible activities. The classes/clusters of students, under the guidance of the teacher, then develop the project and the activities. The mentor advises and helps the initiative to reach the goal.

The decisions are taken in the group – teachers are the leaders. Young people are encouraged to express ideas and focus areas. Participants meet physically, with the frequency depending on the focus and the goals, roughly 4 times per year. The students/participants/teachers play an active role not only in collection of data, but also in defining the next steps of the project.

What is especially inspiring about this initiative?

The frame of each project is defined and the activities are proposed but are open enough to enable teachers to choose individual activities for their group. It is a project-based working method, with active and creative participation which makes it more engaging for young people. You have to make it fun and interesting, with positive messaging, with actions at the forefront, as well as empowerment of the young generations. It is an example of working together towards a goal, through impact-oriented meaningful actions.

Name of initiative	Let's clean up Slovenia (OČISTIMO SLOVENIJO)
Living area/focus	Other: waste
Level of citizen engagement	3- participatory science
Status of the initiative	Completed
Website	https://www.ocistimo.si/
Level of implementation	National level
Location	Slovenia

The initiative

Let's clean Slovenia in one day! is the largest volunteer project in the history of Slovenia. It first took place on the 17th of April 2010 under the wing of the Ecologists Without Boarders Association. The main aims of the first edition of the clean-up were: to carry out the largest mapping of illegal dumpsites to date; to clean up illegal dumpsites in Slovenia—close to 50,000 by some estimations—as well as hiking trails, mountain routes, areas surrounding schools, settlements, rivers and lakes; to involve a great number of volunteers to participate in the realisation of the clean-up; and to attract all umbrella non-government and environmental organisations, decision makers, relevant individuals and partners to support the project financially or with their infrastructure.

Who is involved and how did they get involved?

There were 120.000 volunteers registered and more than 270.000 volunteers attended the event, which is more than 13.5% of the entire population of Slovenia. The municipal service companies took part by taking away the waste and covering the transport expenses, municipalities by covering the expenses of recycling and disposal to landfills; many companies helped by providing hundreds of trucks which kept transporting the waste for days after the event; Slovenian Armed Forces and Police mobilised thousands of volunteers from their staff; a lot of schools, kindergartens, associations mobilized citizens and took part also.

How are citizens involved in the collection and use of data?

11,394 illegal dumpsites with the total volume of 663,712 m^3 were mapped. More than 2,800 volunteers participated in the mapping, and the number of visitors of the mapping portal was just above 50,000. The mapping was carried out in more steps, on different levels and with different collaborators. Firstly, the mapping methodology and the mapping form were created. Then, using digital orthophoto images (the property of the Surveying and Mapping Authority of the Republic of Slovenia) potential illegal dumpsites were located. After marking out the potential locations the next step was to check them on the field. Using internet atlas Geopedia in which volunteers created their own layer of potential locations, then the same or other volunteers checked these locations on the field and created a new layer of confirmed locations of illegal dumpsites. For areas where method was less efficient (areas that were overgrown with trees and bushes) Slovenian Forestry Service examined the wooded areas. Then events involving volunteers were held, to systematically check the areas that weren't included in the mapping via orthophoto images, nor in the mapping by the foresters. Those areas usually had many illegal dumpsites, being in most cases overgrown. Ordinary citizens also added a large number of entries to the registry. They contributed to the layer of confirmed dumpsites with those sites they already knew of or they discovered incidentally while the project was running. In total, the registry consisted of 11,394 confirmed illegal dumpsites (3,944 dumpsites were entered by foresters and 7,450 by other volunteers).

How is the initiative organised?

The organisational structure of the project was not hierarchical, but concentric. In the centre were two leaders. Their task was to follow everything that was going on, officially representing the project, and taking urgent quick decisions when there was no time to wait for the meeting of the entire leadership group. All together around one thousand five hundred volunteers participated in the organisation of the project—sometimes in close cooperation with the fifty central organisers, sometimes having little touch with them.

What is especially inspiring about this initiative?

This initiative is inspiring in its ability to connect different stakeholders in joint action with results, which were usable and sharable beyond the initiative completion. The registry of illegal dumpsites was in 2012 improved with the update of existing data and inventory of as many new illegal dumpsites as possible. A free number was set up to report illegal dumps and registration was possible online or via mobile phone, for which a mobile application for landfill inventory was developed.

Name of initiative	Izmir Bio-Atlas
Living area/focus	Gathering data on and mapping of the biodiversity (flora species) online map in Izmir
Level of citizen engagement	1 - crowdsourcing
Status of the initiative	Active
Website	https://www.izmirbiyoatlas.org/en/Home?AspxAutoDetectCookieSupport=1
Level of implementation	Local/city
Location	Izmir, Turkey

The initiative

Bioatlas-Izmir is a citizen science project which is coordinated by İzmir Mediterranean Academy of the Metropolitan Municipality of Izmir. The project aims to construct and share the biodiversity map -Bioatlas- of Izmir by gathering bio-data collected by citizens. The first stage of the project focuses on "flora species" and seeks to collect data (in the form of photographs and locations of flowers) with respect to the identification and location of the diverse flora species in İzmir metropolitan city and its surroundings. The project leads to new flora species descriptions, species rediscoveries, formation of flora inventories and range extensions in İzmir. Additionally, the identification of the location of urban flora and mapping of the flora diversity in İzmir is also expected to serve as a reliable source of information which may guide city plans regarding future infrastructure and built environment constructions (such as urban transformation constructions, green infrastructure in the form of green corridors) in Izmir. The project also aims to contribute to awareness-raising among citizens on the preservation of biodiversity and nature.

Who is involved and how did they get involved?

The target groups in this project are causal nature lovers, citizens interested in sustainability, naturalists and professional researchers. İzmir Mediterranean Academy used its network channels (web site, social media channels, and its own magazine) in order to engage citizens in the project. Since the launch of the Bioatlas project and its web platform in 2017, more than 500 citizens have provided bio data to the platform and the number of urban flora species identified and located on the map has increased significantly.

How are citizens involved in the collection and use of data?

Citizens use digital cameras to take photos of flora in their surroundings and upload the images, along with associated information on precise locations and dates to the Bioatlas website. The locations are pinned on the bioatlas map by the citizens. The bio data collected in the web platform is then analysed by experts in order to construct the flora inventory in the region and shared with the public. Additionally, the website and data gathered are being used for research as well as educational and outreach activities by professional and citizen scientists. The website has also received citations in scientific research papers, along with mentions in popular articles.

How is the initiative organised?

The project and the construction of the Bioatlas map is organised by the experts working on the project. In the web site, user friendly functions that provide additional information on flora to users are included. Some of these are: taxonomically updated local and scientific names of flowers along with higher classification for all of the species covered; and information on the species name, exact location and date along with the name of the photographer on each image displayed. So far, the citizens have been involved only through the website. However, in future initiatives, photography workshops and photography training courses will be organized to help participants to develop as photographers and citizen scientists. This citizen science initiative constitutes the first stage of the Biodiversity Atlas –Izmir. Using the same bioinformatics backbone, other citizen science initiatives will be launched covering other biodiversity species such as birds, fish, butterflies, amphibians. Collectively they will form the Biodiversity Atlas – Izmir.

What is especially inspiring about this initiative?

This initiative serves not only for gathering bio data and the construction of the flora map in Izmir, but also for inspiring casual nature lovers or ordinary citizens to cultivate a new hobby in their lives. Through their engagement in this project citizens articulate and develop their connections not only to nature, but also to people with similar values and interests.

In time, this can help citizens to build new skills and experiences in pursuing a more sustainable and meaningful way of life. It will also contribute to the formation of an ecological community in the city.

Name of initiative	Quick Urban Analysis Kit: Citizen Design Science
Living area/focus	Other: urban design
Level of citizen engagement	3 – participatory science
Status of the initiative	Completed
Website	https://qua-kit.ethz.ch/
Level of implementation	Local/city
Location	Izmir, Turkey

The initiative

This is a "Citizen Science Design" initiative, a form of participatory urban design, which combines "Citizen Science" with "Citizen Design". *Citizen Design Science* is a new strategy for cities that aims to integrate citizens' ideas and wishes in the urban planning process in a participatory planning approach[2] Hence this pilot project, implemented in Izmir, aimed to co-create a neighbourhood (Bornova/Minipark) in Izmir by the active designing of citizens living in this district. Citizens (the users) were seen as non-expert designers and creators of simple city models for their neighbourhoods and they did not necessarily interact with the designers. After the citizen data collection, the experts in urban planning interpreted the information for actual planning.

Who is involved and how did they get involved?

This pilot exercise was focused on a park area in the Bornova district of Izmir. The area serves as an open space with a mini park inside, which hosts university students and small businesses and shops. For the purpose of the exercise, only a subsection of the overall area is considered. 20 participants were involved in total: university students; business representatives and citizens living in the neighbourhood. The target group was involved in the project through zoom interviews conducted by the project team. The design scenarios made by the citizens were then analysed by graduate students of the city design department of a University in Izmir, then evolved into a concrete project and then submitted to the local Municipality for implementation.

How are citizens involved in the collection and use of data?

In this project, citizens were involved not only as simple sensors, but they participated in the project through online design scenarios. The project used the *The Quick Urban Analysis Ki*t (qua-kit) software tool developed by Artem Chirkin at the Chair of Information Architecture at ETH Zurich. The project has been developed in collaboration with Johannes Müller from ETH Zurich. In the simple web application, the non-expert designers view an empty layout for a certain neighbourhood and they are requested to arrange this area with different functions (residential, commercial, park etc.) which are indicated by different geometric shapes. For instance, on a micro-scale scenario, the objects of interest are trees, benches and other facilities that are useful for park and open space design. Therefore, the data collected with this tool are not photos or real 3D models but geo data such that geographic evaluation algorithms can easily be applied without doing the stage of image recognition.

How is the initiative organised?

The Qua-kit tool records the spatial configuration - scenarios- submitted by the users. The entire design process is conducted through the online web tool. Additionally, a couple of online meetings and an online interview with the participants were held in order to get feedback for the further development of the project.

What is especially inspiring about this initiative?

This initiative, by strengthening the role of citizens, connects the bottom-up and top-down decision-making processes in urban design. Citizens' competences and experiences can produce better strategies and plans for the regions they live in. Another inspiring aspect is that the participation of people in community design activities can serve as a means of fostering connection and trust among community members and hence serves to the development of social capital and community building in the city/neighbourhood This project is the subject of the PhD Thesis titled "Citizen Design Science in the

Context of Crowd Creative Design Practices-Izmir conducted at Urban Transformation Dept of Izmir Katip Celebi University.

[2] Mueller, J., Lu, H., Chirkin, A., Klein, B., & Schmitt, G. (2018)

Name of initiative	RURITAGE
Living area/focus	Other: rural heritage and sustainability
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://www.ruritage.eu/tag/izmir/
Level of implementation	Regional, international
Location	Izmir, Bakircay Basin Region- Kozak Highland, Turkey

The initiative

RURITAGE is a four-year-long EU-funded rural development research project consisting of 38 partners coming from 14 EU countries, Iceland, Norway, Turkey and Columbia. The aim of the project is to enable rural development and regeneration in the specified rural areas of the partner countries, through the enhancement of cultural and natural heritage in these territories[3]. The regeneration and development actions cover six areas, "Systemic Innovation Areas (SIAs)" with unique heritage potential: Pilgrimage; Local Food; Migration; Arts and Festival; Resilience; and Landscape. The Project envisages a co-creative building process of rural regeneration with the engagement of various local stakeholders (ranging from local authorities, to research organizations, community members and NGO's).

Who is involved and how did they get involved?

The project site in Turkey is called the "Kozak Highland" located on Gediz-Bakircay Basin of Izmir. The region is very rich in historical heritages with a high tourism potential. It is also rich in various local crafts and has a very fertile land where the main income source is agriculture[4]. Various workshops in the form of living labs are conducted with the engagement of numerous stakeholders from the region in order to investigate and identify potential local sources and assets, the major requirements of local people, possible risks associated to issues such as finance and establishment of new business models.

How are citizens involved in the collection and use of data?

The data collected in the project are mainly qualitative in nature. Various stakeholders from the region participated during the co–creation of decisions and activities. Some of the workshops conducted are[5]: Ruritage Serious Games which involve participants constructing various simulations with the help of a serious game kit; Action Plan development Workshops that aim to build relationship and trust among the local stakeholders, with the outcome actions and ideas for inclusion in the regeneration plans; Canvas Business Model workshop developing innovative business models for regeneration; and Round table workshops to define the roles/responsibilities of the key stakeholders in the implementation phase. All these co-creation activities take place at "The Rural Heritage Hub" physical meeting place for the stakeholders and community members.

How is the initiative organised?

The establishment of "Rural Heritage Hubs" in each territory is an important aspect of this project. The Project also involves the Ruritage Decision Support System (DSS) that supports the discovery and identification of possible heritage-led strategies. Through DSS, 'Role Model' rural locations share and transfer their knowledge, experiences and strategies in a participatory process with other rural sites ('Replicators') so that these strategies can be tailored and adapted. The project also involves a web-based mapping approach (Ruritage Atlas) which links Role Models' and Replicator's cultural and rural features[6].

What is especially inspiring about this initiative?

Ruritage recognises the role of cultural and rural heritage as drivers for rural development, placing attention on the role of local communities in interpreting, valuing and managing these heritage assets because local people have a wealth of knowledge and experience regarding the cultural and natural heritages in their region. This process also generates additional benefits such as social learning and enhancement of social capital in the rural sites.

Name of initiative	IKLIMIN (Turkish Ministry of Environment & Urbanization)
Living area/focus	Other: climate change
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Completed
Website	https://www.iklimin.org/en/proje-hakkinda/
Level of implementation	National
Location	Turkey

The initiative

IklimIN - Supporting Joint Efforts for Climate Action Project (2017-2020) – was an EU funded project, where the beneficiary was the Turkish Ministry of Environment & Urbanization. WEglobal acted as the consortium leader. The overall objective of the project was to increase climate change awareness and improve technical capacity of various stakeholders across Turkey as part of the country's efforts to align with EU Climate Policy and legislation. Municipalities, universities and NGOs in Turkey received grants through the project to support their efforts to increase knowledge, awareness and technical capacity of their staff. Overall technical capacity and knowledge on climate adaptation and mitigation knowledge is expected to increase at national and local levels.

Who is involved and how did they get involved?

The target group in this project was mainly the staff of the various stakeholders such as Municipalities, NGO's and Universities across Turkey. Additionally, some high school and university students received training courses. A total of 38 projects were implemented by these stakeholders.

How are citizens involved in the collection and use of data?

The awareness-raising and capacity-building activities implemented during these projects were; climate change awareness surveys; data collection and reporting on greenhouse gas emissions; detailed training courses; focus group meetings; workshops and stakeholder joint meetings; panel meetings for scaling up climate change action cooperation; carbon foot print calculations; national and local symposiums; painting and photography contests for high school students; and climate awareness rising campaigns. Most of the people involved in all these activities are selected among the staff of the Municipalities, Universities and NGOs. The data and information collected during all the activities of the project were both online and face to face. All the information and data collected was used as an input in the preparation of the National Climate Change Communication Plan (NCCP), which is one of the important outputs of the project.

How is the initiative organised?

The initiatives are organized by the various stakeholders (Municipalities, universities and NGO's) who conducted the projects within their institutions.

What is especially inspiring about this initiative?

This is a comprehensive nation-wide project aiming for awareness rising and capacity building for climate action. The project addressed the following stakeholders: metropolitan and local municipalities; local governments, NGO's, national research and consultancy institutions, universities and citizens in Turkey. The project aimed for, on the one hand, empowering stakeholder capacity to act on climate change through education, various workshops and communication and on the other hand to turn the individual potential of stakeholders into collaborative and collective action. To achieve these aims the project involved 3 components namely; Training, Communication and Grant Components.[7]

[7] Enhancing Required Joint Efforts on Climate Action Project, & Talu, N. (2018)

Name of initiative	The Conference on the Future of Europe
Living area/focus	Other: Climate change and the environment; health; a stronger economy, social justice and jobs; EU in the world; Values and rights, rule of law, security; digital transformation; European democracy; migration; Education, culture, youth and sport; other ideas
Level of citizen engagement	1 – crowdsourcing, 2 – distributed intelligence, 3 – participatory science
Status of the initiative	Active
Website	https://futureu.europa.eu/?locale=en https://the25percent.eu/introduction/
Level of implementation	International
Location	European Union Member States

The initiative

The European Parliament, the Council and the European Commission have invited all European citizens to join in a hybrid participatory process discussing challenges and priorities for the future of the European Union. The conference is running until spring 2022, through a process including a multilingual digital platform, decentralised events, European Citizens' Panels and Conference Plenaries. Citizens and representatives from across the European Union are encouraged to submit and discuss their ideas a range of topic areas through these channels, and the three institutions have committed to listening to the inputs and following up on recommendations. Ideas submitted on the digital platform are collected, analysed and fed into discussions in the Panels and Plenaries.

Who is involved and how did they get involved?

The conference aims to engage the diversity of European citizens through the different engagement opportunities. There are special measures in place to ensure the participation of young people, for example with at least a third of each of the European Citizens' Panels being aged under 25. So far there have been 36,748 platform participants and 205,358 event participants from across the European Union.

There are also additional projects which have been set up to feed into the main initiative. For example, 'The 25 Percent project' has been set up by the European Youth Forum, co-funded by the European Union. Working with youth organisations and individual young people across Europe, they are also gathering ideas online and running activities in order specifically to ensure young people's participation and inputs into the overarching process.

How are citizens involved in the collection and use of data?

Qualitative data comes in the form of idea entries by citizens onto the digital platform, alongside the variety of inputs from the physical events. Quantitative data is also gathered through the function of the digital platform which enables citizens to endorse ideas which they support which have been submitted by other citizens, which can be used as a proxy for strength of support of ideas.

How is the initiative organised?

The initiative is a collaborative initiative by the three key bodies of the European Union. The official organisation has also had input from other stakeholders such as civil society organisations. There is also an invitation for more bottom-up involvement of citizens, whereby resources have been provided to support citizens to organise their own events, with an area of the website for people to search for local events.

What is especially inspiring about this initiative?

This initiative provides a current example of a large-scale, multi-component process to which all European citizens are invited and which includes: a multilingual digital platform; decentralised events; European Citizens' Panels; and Conference Plenaries.

Name of initiative	Foodshift2030
Living area/focus	Food
Level of citizen engagement	3 – participatory science
Status of the initiative	Active
Website	https://foodshift2030.eu/
Level of implementation	International
Location	12 European countries

The initiative

FoodSHIFT 2030 is a European Horizon 2020 project which is working with citizens on food systems change and food innovation within communities across the continent. At the heart of their project are nine Accelerator Labs in city-regions across Europe. Through these local citizen-led food system innovations are incubated, and the results and approaches shared in a central project knowledge hub, and the project also supports a peer learning network for cities.

Who is involved and how did they get involved?

Local communities have been invited to join accelerator labs in different city-region locations across Europe, working with a range of stakeholders to address a particular food system topic area. Some locations have specific target groups, for example, young entrepreneurs and schools. They have a strong multi-stakeholder consortium working on the project and representing a range of actors and sectors including local governments, SMEs, NGOs, universities and research institutes and network partners.

How are citizens involved in the collection and use of data?

One of the project's impact pathways is citizen empowerment, and so citizen engagement is core to the way in which the project's activities have been developed. The citizens participate in the labs which follow a design quadruple helix approach to explore how food is produced, distributed, consumed and recycled. The citizens contribute ideas and help develop ideas and prototypes which are tested in the area. They are targeting citizens "that are already or have high potential to become engaged in sustainable food system innovations"[8]. Each of the innovation labs has a specific focus area for which citizens provide inputs on, for example, consumption, health and behaviour within the specific context. One specific citizen science example from their accelerator labs is of 'Kafsimo' in Thessaloniki. Here local school students were involved in collecting data on organic food waste management.

How is the initiative organised?

The initiative is run by a pan-European consortium, coordinated by Kobenhavns Universitet Denmark. However, the citizen labs are run locally in each location, supported by consortium partners. Peer learning is at the core of the project's knowledge sharing.

What is especially inspiring about this initiative?

This project uses design thinking methods to create different processes of citizen engagement. An interesting aspect is the way in which the principals of citizen engagement are then translated into a variety of innovative topic approaches in the different labs across Europe, depending on local context, stakeholders and topic area.

[8] https://foodshift2030.eu/

Name of initiative	Zooniverse
Living area/focus	Other: Arts, biology, climate, history, language, literature, medicine, nature, physics, social sciences, space
Level of citizen engagement	2 – distributed intelligence, 3 – participatory science
Status of the initiative	Active
Website	https://www.zooniverse.org/ https://help.zooniverse.org/getting-started/
Level of implementation	Global
Location	Global

The initiative

Zooniverse is the world's largest platform for "people-powered research". Based on the concept of the value of the "wisdom of crowds", it provides the opportunity for researchers to share their projects on the global online platform. Volunteers can then pick projects from across the sciences and humanities and contribute to the analysis of data. The concept is that through many individuals contributing to projects, together we can enhance societal understanding of a whole range of topics.

Who is involved and how did they get involved?

Zooniverse is designed to be accessible for anyone who wants to volunteer. All they need is access to a computer. They want to reach a diversity of people to have 'wisdom of the crowd', and as such have over 2 million registered volunteers.

How are citizens involved in the collection and use of data?

Citizens volunteer to assist professional researchers on a variety of projects. People do not need any particular experience or qualification to take part and tasks will vary depending on the nature of the project. Generally, tasks may involve, for example, classification of images. Zooniverse facilitates volunteers and research teams to discuss the projects that they are working on together through discussion boards, meaning that there is the opportunity for citizens to contribute beyond distributed intelligence, towards participatory science.

The exact data or data analysis that citizens will do depends on the individual project, but volunteers are able to browse a whole range of topics to find something which interests them. Zooniverse also make an effort to convert citizens' inputs into measurable outputs, such as published research papers and open-source datasets. Data is stored in the Zooniverse database, later combined with responses from other citizens by the project researchers.

How is the initiative organised?

Zooniverse hosts the platform. Anyone can submit a project for inclusion on the platform, setting out the tasks that volunteers will be asked to do (generally in the realm of answering questions about images, or drawing something on images) and uploading any required datasets. These are reviewed by the Zooniverse team before they are made available for volunteers.

What is especially inspiring about this initiative?

This is the biggest collection of citizen science opportunities in the world. It has a huge variety of projects for anyone to volunteer with, and a range of methods used e.g. from gamification to visuals. It is based on the concept that better research is developed when supported by wider citizen involvement.

Conclusions

This piece of research was intended as a process by which to explore the world of citizen science as it exists across Europe and beyond at this moment in time. We wanted to find the most inspiring examples, hear about the real-life challenges associated with setting up such projects, and learn from the people who have innovated to overcome those.

This report aimed to share the highlights of this process with the reader – from an overview of citizen science and the emerging trends in the field, through sharing the methodology of our cross-Europe research process on this particular activity, to exploring the key themes which emerged from our conversations with those working in citizen science projects, to our database sharing the stories of some of the most inspiring examples we found along the way. Some of the key learnings are highlighted in the table below.

Through this we can see the potential that citizen science has as a tool to advance the sustainability agenda, in a way which involves and empowers citizens to be part of the change. Citizen science as a method has unique contributions to make to the field through the bridges it creates between citizens, science and research, and a range of other stakeholders; the particular relevance of the type of citizen-centred data it can collect, to the sustainable lifestyle topic; its applicability to a range of sustainability topics; and its ability to fill gaps with new data and experiential insights.

Key learnings
Setting up and reaching out to participants
▪ There are several benefits of having a strong, collaborative network of organisations working together to support the project to achieve its shared aims ▪ Partners can support the project in a range of ways: provision of resources/tools/practical help/data, promotion and dissemination of information, policy/decision-maker support and expert knowledge ▪ It is important to understand participants' life circumstances and limitations, cultural values and backgrounds, and to use a range of methods to reach and engage with different groups ▪ Greater participant numbers and diversity may be helped by identifying and working with multipliers.
Gathering data from and with citizens

- Data collected in citizen science projects can be used for a number of purposes: identification of local risks or issues; use in scientific research; generation of ideas, solutions or actions; understanding of and promotion of sustainable behaviours; decision-making; community building; citizen capacity building; policy use or change; and public data creation.
- With advances in technology, citizen science projects are often gathering more than one type or format of data at once, in the process building up a more detailed picture of each entry.
- A range of more traditional qualitative data collections (such as surveys and interviews) are being supported by emerging participatory methods such as gamification, to gather the necessary data in a fun and accessible way.
- There is a need to provide user-friendly tools and support all participant groups to use digital tools used in data collection.

Keeping people engaged

- One way to keep people engaged is to help citizens to feel ownership of the process, by embedding mechanisms for them to influence the process.
- Motivation goes up when citizens see the results of their actions.
- Tangible incentives can help to keep people motivated, such as discount tickets for local leisure facilities, local currency, professional development incentives for teachers and prizes for competition winners.
- Management of citizen expectations can support ongoing participation, as well as being able to show the spots where concrete and impactful change of existing circumstances is possible.

Implementing long-lasting change

- The data collected in citizen science projects has the potential to be turned into shared resources with public access.
- Where citizen science often has awareness-raising as one of its aims, this can easily be turned into ownership of ongoing solutions by citizens.
- The types of data collected could be seen as a reliable source of information which could guide city plans, infrastructure, built environment and green space development in the area.

- It is important to include some kind of feedback process with citizens, following their involvement in a citizen science project.

We know that this journey has helped the PS Lifestyle team in our own understanding of the field and our plans as we develop our own citizen science living labs (see below for more on this), but beyond that, we hope that the content of this report will serve as an interesting contemporary overview of what is happening in the citizen science field across European contexts. Many of the tips, ideas and reflections shared from the projects we spoke to may be equally as applicable to a range of citizen participation projects and multistakeholder sustainability initiatives, in addition to hopefully contributing to the development of the next generation of citizen science projects.

We are grateful to each of the brilliant citizen science projects which have not only shared their stories with the public, but have taken the time to speak to us about the experiences they have had along the way. This insight is incredibly valuable and we have no doubt will help and inspire many. To complete this report, we would like to share some final general 'top tips' from the inspirational projects that we interviewed.

Top tips

- *Set up a clear frame for the project: what is the objective and who should be included.*
- *Do not assume that you know all the answers.*
- *Listen and welcome feedback of the groups engaged and find time and space in the project to accommodate the inputs given by the citizens, even when they divert slightly from our initial agenda.*
- *Define from the beginning what success looks like and in some years from now what you want to have achieved.*
- *Get some feedback and use it.*
- *Build a strategy in case the project doesn't work as you would like or as you would expect.*
- *Be honest and open.*
- *Be sensitive to reflection and iteration throughout the process.*
- *Make it fun and entertaining.*

Taking the inspiration forward in the PS Lifestyle project

This research project has provided us with an incredible set of inspiring examples of a whole range of citizen science initiatives. From this we have been able to have an insight into a wide variety of methods for designing, setting up and running projects. As we prepare to develop citizen science living labs in 8 pilot countries across Europe, these learnings will be applied to our own design, building upon the best practice most relevant to each of our geographical contexts, citizen communities and our specific sustainable lifestyle content areas.

Contributors

PS Lifestyle project partners which conducted research

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Appendix A: Interview questions

Section 1: Gaining a deeper understanding of the motivation behind the initiative and what it aims to achieve

- Where did the inspiration for your project come from, and why did you choose the citizen science model?
- Has it been your aim to engage with various citizen groups? How did you achieve this? How do you keep people engaged?

Section 2: Learning about the practicalities of setting up and running a citizen science initiative

- Which type(s) of data do/did you collect? How do/did you do this?
- What is/was the data used for? Has there been a specific measure introduced based on the data you collected, or a citizen behaviour that has changed?
- What is/was the most challenging aspect of the project? How did you overcome it?

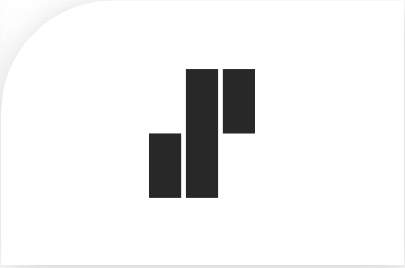
Section 3: Looking to the future of citizen science

- What do you think will help to scale up citizen science initiatives?
- What would your top tips be for someone setting up a new citizen science initiative?
- Section 4: project information for template (only if needed)

Appendix B: Inspiring citizen science initiatives database classification

Classification	Notes
Name of initiative	Where applicable, English translation of project name followed by original in brackets
Location	Where the initiative is run from
Website	Main website relating to the project, where further information can be found
Description	A short description of the aim of the project, topic and the method used to engage citizens in data collection
Topics	The core sustainability topics which the project works on are identified by the following topic categories: • Housing; Food; Mobility; Consumption; Other
Status of the initiative	Here we note whether the project was active or completed at the time of writing.
Level of implementation	Here we have identified the level(s) at which citizens are invited to participate in the initiative: local/city, regional, national, or international.
Levels of citizen engagement	Using the categories proposed by X, we note on which levels citizens are engaged in the project: 1- crowdsourcing, 2-distributed intelligence, 3-participatory science, 4 – extreme citizen science (see p9 for further definition of each level). For any project citizens may be engaged on more than one level depending on the activities.

Project partners



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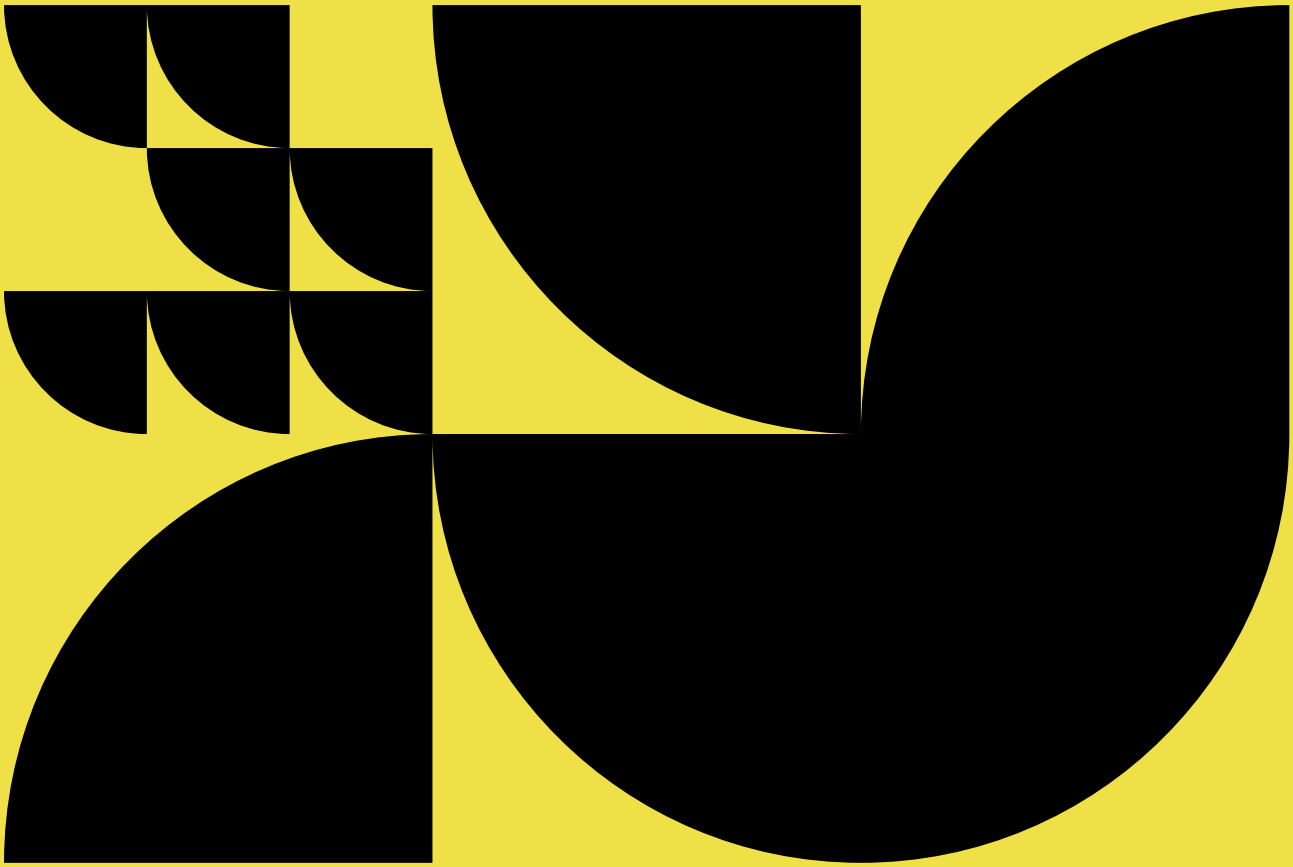

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