

# Citizen Science and Collective Participation

Lessons learned from the first edition of the  
environmental citizen science solutions mapping



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Scan and Learn about the Solutions Mapping of Citizen Science:



Ministry of Science, Technology and Innovation Argentina

<https://bit.ly/cienciaciudadanaargentina>



<http://bit.ly/mapeocienciaciudadana>



*Adopto un cuerpo de agua como mi mascota (Adopting a Waterbody as my Pet)*





Citizen science, also known as collaborative science, participatory research or democracy, is basically a way of building knowledge obtained by citizens coming together to understand the issues that affect their quality of life. This tool is perhaps one of the oldest known forms of science, the ancestral knowledge, which has no proper name but belongs to the whole society.

Precisely, the Argentine Ministry of Science, Technology, and Innovation appreciates these activities because they promote a closer relationship between the community and science, in order to generate initiatives aimed at solving their own problems. At the same time, it is a very useful way to awaken scientific vocations, since young people are the most interested in these types of actions. In many cases, this results in a breeding ground for future scientists in the communities where these projects are implemented.

This way of doing science—validated in the world through local, national and international actions—has been able to create invaluable data sources for research requiring a large number of cases. These studies would be impossible or extremely expensive to conduct from a classical research perspective.

On the other hand, this way of doing science is fundamentally federal, since it only requires the community to describe the issue and engage in its study.

The partnership forged between MINCyT and UNDP paved the way for a mapping strategy that identified 30 initiatives in the first phase. This action led to the creation of a federal program to support such projects and, at the same time, a system to identify new experiences open to the inclusion of ideas and stakeholders.

Also, making the mapping available can be of use to different communities that are facing the same issues and have not been able to develop their own tool to analyze them. The information stored can be used to connect these communities and expand collaborative networks.

We are therefore pleased to have this book available, which shows that research is not only done in laboratories but that we can all be part of it. This democratic and participatory way of doing science will surely result in more varied and effective solutions to people's real problems and will help promote federal public policies that improve the quality of life of society as a whole.



**Daniel Filmus**

Argentine Minister of Science, Technology, and Innovation



**Claudio Tomasi**

UNDP Argentina Resident Representative

The United Nations Development Programme (UNDP) in Argentina began working on citizen science based on the conviction of its strategic nature and upon having detected an opportunity. During the lockdown's most severe phase, we conducted a project to measure air quality with cyclists in partnership with the Ministry of Environment and Sustainable Development, the Government of the Autonomous City of Buenos Aires, and Open-Séneca. Cyclists—with special circulation permits—carried low-cost sensors as they went about their usual routes. The data collected provided a baseline against which to compare what would happen later, once circulation was restored. This opportunity confirmed that citizen science can be an innovative tool to address issues that affect people's quality of life. So much so that not only is this project being scaled up in four provinces, but it represents the starting point for mapping other environmental citizen science initiatives.

To this end, UNDP forged a partnership with the Argentine Ministry of Science, Technology, and Innovation, initiating a co-creative solution mapping process. The mapping strategy was jointly designed and implemented, and the first edition was launched in November 2021 including 30 initiatives identified—which led to the development of a federal program on the matter on the agenda—and mapping continues in order to identify more initiatives. Among the many findings resulting from this fruitful collaboration, we should point out that citizen science is what people do in their territories to research and learn more about the world around them. This means that it is not necessary to be a professional researcher to contribute to the knowledge on a subject. Citizen science is based on this idea; reflecting that science is within everyone's reach. The type of involvement may be different, but we get further and learn more when we do it with others.

For all these reasons, we strive to grow this approach in multiple ways. At UNDP, we acknowledge the efforts of the people involved in citizen science, the potential of this approach to understand the changing nature of problems advancing at an ever-increasing speed and to co-create new solutions for sustainable development with the aim of driving inclusive changes that may end up being systemic.

# Executive summary

**Citizen science** is a collective, participatory, and open scientific research project, aimed at building knowledge in a rigorous manner and driven by different types of stakeholders, who do not necessarily belong to the academic spheres.

This approach represents an **innovative tool** to promote development since it helps to: strengthen activism in the territories, influence the inclusion of new issues on the public agenda, promote evidence-informed public policies, facilitate the co-creation of innovative solutions and raise awareness on an issue or underpin behavioral changes.

The mapping of environmental citizen science initiatives was **co-created** between the United Nations Development Programme (UNDP) Argentina Accelerator Lab (Co\_Lab) and the Argentine Ministry of Science, Technology, and Innovation (MINCYT).

The **first edition of the solutions mapping** consisted of **30 environmental initiatives**. The projects were identified based on exploratory interviews with key informants, literature review, and information available in mass media and social media. Each one of them was recorded on a descriptive card. All the information provided was validated by its leaders. The solutions mapping is currently **growing collaboratively**.

The projects mapped illustrate that citizen science can have a variety of expressions, not limited to certain issues, strategies, approaches, products, or Sustainable Development Goals (SDGs). Its richness lies in its **diversity**.

Certain **patterns** emerge from the mapping. Regarding the motivations that drive people to participate in these projects, we believe that environmental issues are linked to people's health and quality of life and that the implementation of citizen science projects is often coordinated, in practice, with educational communities. Other types of motivations are linked to the possibility of recording biodiversity and thus promoting conservation or as a way of pursuing personal interests or claims that involve some type of activism. In terms of data, these projects enable—through specific instruments—to collect data in a participatory manner and increase outreach; they use new technologies and allow access to data. In addition, they are based on collective construction and exchange. Hence, when the approach is local, participating communities are usually part of the research from the very definition stage of the research problem. The projects also often challenge people who are already working in the territories (from fishermen to professional photographers), and they are called upon to participate actively. These types of initiatives also usually include opportunities for exchange between scientists and the participating community.

The implementation of citizen science projects is not free of **tensions and challenges** associated with: trust building processes; diversity of interests that may arise in the same territory/community; the possibility of understanding each other and generating horizontal spaces; the necessary considerations when calling on citizens to collect data; high costs of developing and updating technology; the sustainability of participation; scientific evaluation systems; expectations linked to mediation, and evidence as a factor that does not necessarily ensure the design of informed public policies.

The following **indicators** stand out from the projects mapped in the first edition: i) over 15,000 people have participated or are participating in these initiatives, ii) although there are still no specific promotion mechanisms for these types of projects, the main financing source for the initiatives is the public sector through 3 government science and technology agencies and 8 national universities, and iii) the most recurrent Sustainable Development Goals (SDGs) associated with these initiatives were Good Health and Well-being (21%), Sustainable Cities and Communities (19%), Life on Land (13%) and Quality Education (11%).



This document provides a **table that systematizes the initiatives** included in the first solutions mapping edition so that they can be easily seen as a whole and thus facilitate comparisons.



A number of **insights** emerge and are introduced from the findings: recognizing the interrelationship between environment and quality of life favors a sustained involvement of community participation; involving the community, from the beginning of a project with the formulation of the problem, can be a key factor in sustaining commitment to participation; involving occupations present in territories, prior to citizen science initiatives, can be a way to promote their sustainability; involving the professional scientific community in these types of initiatives could be increased if research evaluation systems include incentive schemes that acknowledge them; involving the public sector in the implementation of citizen science projects can be a way to promote the use of evidence provided by the projects in the design and dynamics of public policies; citizen science can be an tool to favor the advocacy capacity of minorities and diversities; identifying environmental issues can have an effect on environmental awareness, behavioral changes, conservation, etc.; developing these types of initiative can be related to the different types of resources or capitals (social, economic, cultural, human, etc.) that people have in their territories, and citizen science can be a way of promoting intergenerational education.



The **concluding remarks** highlight the importance of (re)opening the discussion on what it means to build knowledge, who can do it and for what purpose, of considering the involvement of professionals from different disciplines in collective and participatory knowledge building processes with other logics, motivations, times and eventually adding a more diverse set of results, and of rethinking who we call specialists; this includes experience-based knowledge, ancestral, emotional and informal knowledge, among others. In addition, citizen science projects can enhance sustainable development research and innovation agendas, through a double “bottom-up” and “top-down” approach and by promoting multiple democratic participation channels. One of the main challenges is the possibility of ensuring their sustainability and growth in Argentina. There is still a long way to go to effectively promote evidence-informed public policies,

the co-creation of solutions that respond to the concerns of the people affected by the problems in order to improve their quality of life, and the collective building of knowledge without leaving anyone behind.



The **annex** on methodology shares a **questionnaire to map** citizen science **projects**, which is open to anyone interested in undertaking this task.



eBird Argentina



**Citizen science** is a way of producing **new scientific knowledge** through a structured project of **collective, participatory, and open** scientific research, driven by **different** types of **stakeholders**, who do not necessarily belong to the academic spheres. In turn, it includes basic or applied science research activities at a local or global level.

According to the degrees of participation, the roles assumed by citizens vary from

- **the identification of a research question,**
- **the collection or analysis of information, to**
- **the co-creation and joint execution of all stages of the study together with the professional researchers.**



# Citizen science can...

## Facilitate the co-creation of innovative solutions

that respond to the concerns of stakeholders or of those affected by certain problems.

## Promote evidence-informed public policies

Become an advocacy tool, promoting evidence-informed public policies. In other words, it can be a source of data for decision-making that affects the quality of life of many people. For example, this collective knowledge building can become strategic to gather a large amount of data in a short period of time when the design of a public policy is being discussed.

## Reinforce activism present in the territories

by serving communities organized around certain claims or concerns (such as water quality, floods, biodiversity, etc.). Thus, it can be useful for framing research questions relevant to the people affected by the problems, without imposing problem definition from the outside, as well as for collecting and analyzing evidence collaboratively.

## Raise awareness of an issue and/or underpin behavioral changes

For example, it helps to identify what we consider natural, such as the amount of waste we generate at home, which may lead us to reflect on our habits, points of view, etc.

## Influence the inclusion of new topics on the local and/or national public agenda

Data visualization and collection can be used to focus society or governments' attention on a certain matter, and to recognize the importance of some issues that have not yet got public notice. Hence, citizen science can also serve to influence the inclusion of new topics on the local and/or national public agenda. This first step is inevitable when addressing a development challenge.

## Promote both a more democratic science and a more participatory democracy

In other words, a science that is not exclusionary when it comes to contributing to collective knowledge building and a democracy with interaction mechanisms and instances to channel citizens' interests, concerns, and proposals into public management are encouraged.





## A co-creative solutions mapping strategy

This environmental citizen science solutions mapping was carried out in a co-creative manner between UNDP and MINCYT.

Solutions mappings represent one of the instances of the UNDP Accelerator Lab Network<sup>1</sup> learning cycles. Its purpose is to identify, make visible and understand how individuals or groups seek to solve or deal with the problems they face in their territories, or to channel the interests that motivate them and the processes developed. Therefore, in addition to the solutions themselves, this practice also seeks to identify shared patterns and emerging insights.

<sup>1</sup> Solutions mappings—within the methodology of the UNDP Accelerator Labs Network—are developed after having explored the trends and opportunities linked to the strategic challenges on the issues to be addressed and, based on the mapped solutions portfolio, feedback is obtained to advance in experimenting with them. The ultimate goal of this cycle is to promote the growth of what works, supported by empirical evidence.

The objectives of the environmental citizen science solutions mapping include:



**Acknowledging** the social importance of participation in citizen science initiatives; covering a wide and heterogeneous range of stakeholders.



**Identifying, characterizing, and making visible** existing initiatives and shared patterns in order to produce inputs for public policies, promoting a bottom-up approach and new coordination possibilities.

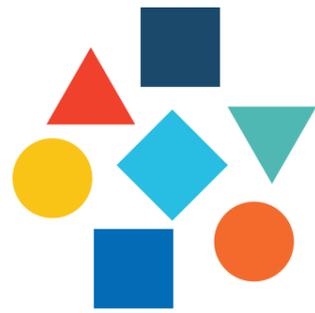


**Promoting** the production of evidence on the initiatives developed in order to create products for different purposes that may result in digital repositories of different types of information, collaborative maps, materials to work in the classroom, among others.



This process began with exploratory interviews with key informants, field experts, who led us to specific leaders or projects to identify the first initiatives. We then conducted a search in gray literature—including technical reports, conference minutes, etc.—and also found new initiatives in the mass media and social media. All of them had something in common: they identified themselves as citizen science projects.

Along the way, we built and iterated the file where we included descriptions of the initiatives, the purpose of which is to systematize the information collected and enable comparisons. In addition to the usual project management fields—objectives, implementation status, time frame, etc.—we added others that were key for us, such as the description of citizen participation, the type of citizen science project and related SDGs. All the information was validated by the leaders of each of the initiatives.



## Diversity of findings

The 30 projects mapped proved that citizen science can have a variety of expressions, not limited to certain issues, strategies, approaches, or SDGs.

These may involve a wide range of projects including people concerned about dengue fever sending photos of mosquitoes and their breeding sites to produce real-time collaborative maps; cyclists carrying low-cost sensors to measure air quality as they go about their usual routes; professional researchers partnering with organized communities to carry out socio-environmental surveys, among other possibilities.

The differences between the mapped projects show that there are initiatives:

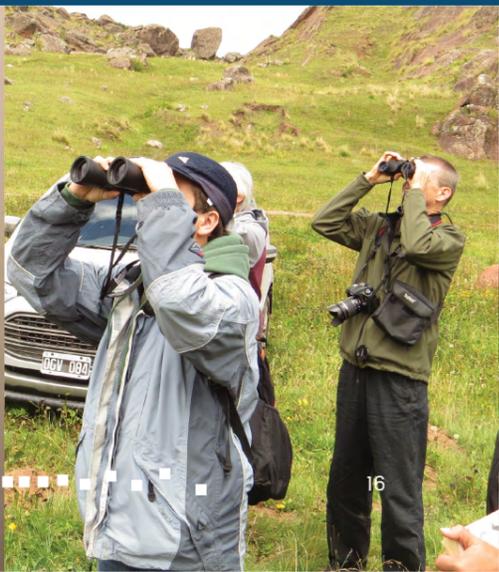




# The experiences are different, the products as well.

There is no standard end product in citizen science initiatives, since they can result in digital repositories of different types of information (photos, audio, films, etc.), collaborative maps, dissemination material to influence on an issue, materials for the educational community, early warning or prevention systems, among others.

Top left to right: *Ballena Franca Austral* (Southern Right Whale) (credit: Stephen Johnson), AppEAR, *Vuela* (Fly), *Experimento participativo de Monitoreo de Calidad del Aire* (Participatory Air Quality Monitoring Experiment), MATTEO, *Censo Forestal Urbano de la ciudad de Bragado* (Urban tree Census in the city of Bragado). Bottom from left to right: *Playas Sostenibles de Mar del Plata* (Sustainable Beaches in Mar del Plata), *Observa-Residuos* (Waste Watch), eBird Argentina, *Conservar Tiburones en Argentina* (Shark Conservation in Argentina), *Geckos, forasteros en tu casa. ¿Estás seguro?* (Non-Native Geckos at home. Are you Sure?), GeoVin.



## Testimonials from the field:

# CoAct Project<sup>2</sup>

The platform *¿Qué Pasa Riachuelo?* (What's up Riachuelo?) (QPR) was born in 2011 as a tool to monitor that the sanitation policy of the Matanza-Riachuelo Basin complies with the court order for environmental restoration and improvement of the population's quality of life. The social mobilization and participation, which made the link between contamination and health visible, played a major role in promoting institutional transformations to clean up the basin.

**Santiago Cané, Environment and Natural Resources Foundation (FARN, by its Spanish acronym)**

CoAct draws on the mobilization and citizen participation experiences in the basin to re-launch the QPR platform with a social citizen science approach that promotes actions towards environmental justice. Identifying and denouncing social and environmental injustice is not enough, but rather the aim is to create tools so that the most affected social sectors can participate in an informed manner in environmental and urban decision-making and influence the course of public policy for the fulfillment of their rights.

**Leticia Castro, Research Center for Transformation, (CENIT by its Spanish acronym), National University of San Martín (UNSAM, by its Spanish acronym) (Argentina)**

The social citizen science approach involves the participation of communities in the scientific knowledge building processes. The social aspect brings these projects into interaction with other pre-existing community initiatives and networks, proposes that community participation be present during all stages of the research process, and pursues, from the outset, social transformation objectives.

**Valeria Arza, Research Center for Transformation (CENIT), National University of San Martín (UNSAM)(Argentina)**

Using this approach and learning from previous versions, QPR's re-launch in 2021 involved, as a starting point, the co-design of the tool together with community stakeholders interested and experienced in socio-environmental issues in the basin. We worked on three issues: relocations and redevelopments, water quality and natural areas. QPR collects data on experiences in relocation processes, observable surface water quality data, status, and threats of the basin's natural areas, among others.

**Marcelo Larrocca Ruiz, Environment and Natural Resources Foundation (FARN)**

QPR helps to link the knowledge produced by communities and organizations in the basin to public policy processes. Along with other public data, land-use planning processes can be informed, temporal and spatial analyses of water quality can be complemented, and strategies to protect natural areas can be adapted or fine-tuned.

**Guillermina Actis, Research Center for Transformation (CENIT), National University of San Martín (UNSAM) (Argentina)**

Sarmiento Popular Library is a centennial institution. It has an astronomical observatory and we have been giving free astronomy classes for more than 30 years. We also organize scientific outreach activities for environmental justice. The environmental education law established the necessary legal framework to make progress in the joint work with other institutions and so we became involved as co-researchers at CoAct. Our perspective is based on neighborhood issues. The joint work with CoAct in the co-design of the QPR platform has been very valuable, as it helped us to carry out concrete field work. We believe that the QPR platform is a great contribution because it leads to reflect and modify the view that each of the neighbors has of the basin's past and present.

**Sarmiento Popular Library Astronomy Group**

<sup>2</sup> CoAct develops tools to organize, systematize, and share the knowledge acquired in the Matanza Riachuelo Basin through a platform and thus contribute to environmental justice.



MATTEO



## Common denominators in citizen science projects

### Motivations

#### Link between environment and health and people's quality of life.

The environmental issue is intertwined with people's well-being; examples include projects related to vector-borne diseases (rodents, mosquitoes, kissing bugs, etc.), environmental monitoring (air quality, water quality, etc.) or disaster risk management (floods, etc.), among others. Hence, some projects or initiatives include, among their components, preventive work or raising awareness of certain issues.



#### Connection between education and citizen science projects.

Many projects are designed with some component that is linked to the educational system, either because they call for student participation (from elementary to university levels) or because they design specific materials and experiences to be used in the classroom. Research development in schools also facilitates the understanding of what it means to do science and shows that everyone can contribute to building knowledge. In addition, bringing the scientific approach to

## Testimonials from the field: GeoVin Project<sup>3</sup>

Chagas disease is currently considered one of the most important socio-environmental health problems in Latin America, with an estimated 7 to 8 million people infected with the parasite (*Trypanosoma cruzi*) that causes it and over 25 million at risk of infection. According to the latest official figures, it is estimated that at least 1.6 million people in Argentina may be infected by this parasite.

One of the main transmission routes of the parasite that can cause Chagas disease is vector-borne—transmission of infectious agents through living organisms—, where triatomine insects (commonly known in Argentina as kissing bugs) are involved. Therefore, one of the main efforts to reduce transmission by this route focuses on locating and reducing the density of these insect vectors. When participatory science approaches the reporting of these insects of public health significance, not only does it contribute to the study of the biology and ecology of these vectors, but it also challenges and involves decision-makers and the community at large to understand and protect their own health. Thus, knowledge is rigorously built in a way that is driven by a wider and more heterogeneous range of social stakeholders, who are not necessarily within the traditional academic spheres.

GeoVin is a project based on open and participatory science that promotes not only the collection of information about the geographic distribution and habitat where triatomines are found in Argentina, but also the contact and communication with the community as a whole to help identify the insects found while connecting with governmental health agencies. Among the main activities that have resulted from the work of the project through the strengthening of inter-institutional coordination, the following can be mentioned: the implementation of the GeoVin App as an entomological surveillance tool across the country, providing the community with an interactive, educational and free tool that promotes awareness of the Chagas disease; the development of educational materials (catalogs, brochures, posters, etc.) based on the results obtained from the project, and the creation of dynamic maps of the geographical distribution of the various species of triatomines present in the Argentine territory.

**Soledad Ceccarelli, Center for Parasitological and Vector Studies (CEPAVE, by its Spanish acronym), National Scientific and Technical Research Council (CONICET, by its Spanish acronym) and National University of La Plata (UNLP, by its Spanish acronym)**

<sup>3</sup> GeoVin measures the distribution of kissing bugs—linked to Chagas disease—through an application (photo/location).

the classroom also seeks to awaken scientific vocations at an early age, by fostering culture and curiosity for science and promoting both critical and creative thinking. The implementation of citizen science projects is, in practice, closely linked to initiatives coordinated with educational communities and has great potential to broaden the social perception of research work.



## Citizen science projects as a record-keeping tool for biodiversity/conservation.

Widespread participation in knowledge building projects represents a real-time means to record the great variety of living beings that inhabit our planet and, either locally where we live or in the territories we occasionally pass through as tourists.

## Activism + Hobby.

Regardless of their professional or non-professional nature, those involved in these types of practices have a genuine interest in open science in general (which includes open access to publications, open data, free hardware for research, open innovation, open educational resources, etc.) or in the citizen approach in particular, as well as in specific issues (such as environmental pollution) or practices (birdwatching or divers collecting data during their recreational outings, etc.). Many of these experiences seek to influence the public agenda through the promotion of claims, visualization of alternative solutions to local problems, among others.

## Testimonials from the field: MATTEO Project<sup>4</sup>

Citizen science allows the participation of a community in all the processes of a scientific research project, regardless of the age of those who make up that community. Therefore, our projects are educational and seek to interact with all levels: primary, secondary, and university (undergraduate and graduate). In total, over 25 years of academic trajectory are connected. Thus, one can see how these boys and girls grow up, being essential participants—throughout their journey—in scientific projects that seek to attack present and future problems, sometimes focused on their own city, sometimes in Argentina, and sometimes on international findings.

These children do not have to wait to be protagonists in science and real change; they can see the impact of their actions today. Even though vocations for the future may arise along the way, we work on their present: what can they do and what do they want to do today? This is the question that citizen science allows us to raise and also to answer, involving children in fundamental solutions.

I would like to share the story of Alfonsina, a nine-year-old girl, to illustrate how important these activities are for children. She was so passionate about her participation in this project that her mother would say “If you don’t behave yourself, the punishment will be that you miss science class.” That same girl collected rainfall data in a place where there are no official measurements and was key to generating information about a flood.

Other experiences show us that older people also play a fundamental role by participating. Vicente, who recently turned 104 years old, joined the project by explaining in detail the hydrological functioning of a lagoon in southeastern Córdoba, Argentina. Bilma, who is 100 years old, provided details of how her father conducted citizen science in a remote part of the countryside.

In short, the message I want to convey is that everyone, regardless of age, can contribute through our participation to build knowledge and have an impact on reality today.

**Carlos Marcelo García Rodríguez, National University of Córdoba (UNC by its Spanish acronym) and National Scientific and Technical Research Council (CONICET)**

<sup>4</sup> MATTEO promotes student participation at all levels in the recording of hydrometeorological information useful for optimal water resources management.



## Data

### Data collection to increase outreach, implemented with specific tools.

Many of the projects, when conceived from the scientific system, focus on citizen participation in a specific stage of the research: data collection. For this purpose, they use or provide specific tools to collect data. They vary according to the proposed objectives: scales to weigh solid urban waste, mobile phones to take pictures of certain species, rain gauges to collect and measure rainfall, etc. In some more complex cases, it involves the delivery of a kit consisting of a variety of collection tools. Among other benefits, community participation makes it possible to extend the scope of the survey in a simple and cost-effective manner.

Collaborative data collection strategies lead to greater scale and speed, more data in more places and in less time. For example, [e-Bird has a database that would have taken a single researcher over 5000 years of sampling.](#)



### Use of new technologies, app development to create collaborative maps or feed databases.

The use of specific applications for data collection is a recurring modality and is used to illustrate the situation in a given area (e.g. water and sanitation) or to collect material recording biodiversity, among other issues. In this type of cases, there is a very strong observational component that is reflected in photographic records, videos, etc. Some applications can work offline so that they can be used in field trips where there is no connection. By providing spatial data, the data can be used to build collaborative maps. Some of them can even trace species movements or migrations, and so on.

## Open access to data.

Projects with digital platforms usually operate in an open manner and allow the downloading of data collected through citizen participation.



## Collective construction and exchange

### Local problems, local definitions.

When the approach is local, participating communities are usually part of the research from the very definition stage of the research problem. Those who deal with problems on a daily basis may be more likely to develop initiatives to understand, measure, anticipate the concerns they care about or the issues they face. In addition, they have context-specific knowledge of local stakeholders, organizations, logics and dynamics.

### Occupations present in territories.

Certain projects capitalize on people who are already doing a task (or could be doing it). Examples range from local fishing communities tagging shark specimens to keep key conservation information, to projects where professional photographers working on whale watching boats share photos of whales to identify the different species observed.

### Exchange opportunities between scientists and the participating community.

Some participation mechanisms involve spaces or platforms where dialogue and learning can take place among different profiles of participants. The most developed ones involve collaborative or co-creation platforms.

## Testimonials from the field: BIOLEFT Project<sup>5</sup>

*My approach to BIOLEFT is based on the search for a group with similar motivations to mine regarding plant breeding. In 2020, I began to participate in digital meetings with an amazing group of people from different disciplines (social, economic, computer science, biology, agronomy, etc.), together with farmers, of course. The latter was what most encouraged me to continue participating, although, fortunately, it is becoming more and more common to find groups with these characteristics. Within the university field, those of us who work in teaching carry out academic, research, management, and outreach activities. In this context, BIOLEFT became part of my driving force to complement my teaching and not lose contact with the reality of some farmers who do not belong to hegemonic groups. Usually, growers who come to BIOLEFT are looking for alternatives to the current agricultural model, which, in my opinion, is in need of major changes. From the green revolution to the present, we have been concerned about reducing hunger in the world through practices that have made great advances in technology, yields and research, but we have neglected our soils and biodiversity, and the percentage of people suffering from hunger and malnutrition is still very high. Farmers participating in BIOLEFT opt for a production that is more observant and less disruptive of ecological processes, that thinks more about the conservation, restoration, and increment of our landscape's flora and fauna diversity; they are farmers who are concerned about the selection and improvement of their own seeds. At the same time, they exchange with each other, always enthusiastic about sowing and harvesting the seeds of their neighbor or colleague and lovingly sharing the results. Anyway, the short time I have been in BIOLEFT, is just a beginning of my participation in this beautiful network.*

**Selva Cuppari, National University of the South (UNS, by its Spanish acronym)**

<sup>5</sup> BIOLEFT is a network for collaborative exchange and improvement of open seeds to offer alternative solutions to the challenges of agriculture, based on collective intelligence and open knowledge, local wisdom and scientific knowledge. A digital platform is modeled on the basis of needs agreed upon by various sectors.



## Tensions and challenges related to citizen science projects

Although citizen science has multiple potentials, collective knowledge building is not exempt from tensions and challenges. This is true especially if we take into account that this approach involves different types of stakeholders—with their own knowledge and value—, for instance, science professionals, inhabitants of communities affected by certain issues, activists, teachers of various education levels and their students, public sector workers, etc. Besides, individuals do not necessarily have the same role in the initiatives in which they participate, nor do they always do it as a part of their main occupation or using their academic knowledge. For example, a professional scientist may lead a specific initiative but become involved in another as a member of an affected community and collect and analyze data in order to have an impact on public policies, or collect data of a field of expertise completely different from their professional career or background as a hobby, among other possibilities.

The following are some of the tensions and challenges associated with developing citizen science initiatives:

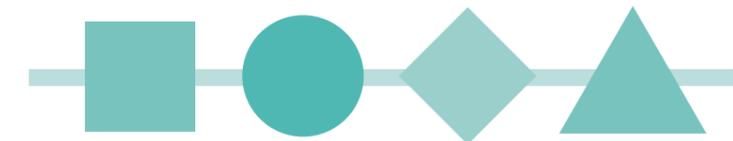


**Trust as a construction process.**

Building trust among the different people involved in the same initiative is a key factor to make the initiative work, especially for the co-creation ones, and a process which demands time and attention, and needs to receive feedback throughout the whole joint research process. For instance, it is logical that the communities that are invited to participate in these types of projects are hesitant when invited by other stakeholders to participate in research projects. Some questions that may arise at the beginning are: Why do they come to this place? What for? What are the interests involved in the project? What will they do with the data? During the process, personalized training, open communication, direct contact and recognition of the value of the contributions of all participants will be key to sustaining the trust built.

### Same territory, different interests: the community as a source of conflict.

People from the same territory or community, or interested in the same topic, do not always share the same technical and political views as regards issues or their possible solutions. Communities are affected by their own conflicts as well, and in their internal structure, there are power asymmetries that should be recognized and can influence the dynamics of the collective process of knowledge building and dissemination.

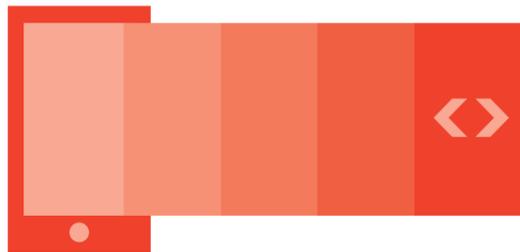


### Understanding and horizontality should not be taken for granted.

The challenge of calling for different types of individuals to share the same space does not mean that all of them will feel comfortable or secure about speaking out. Through this solutions mapping, we have collected various experiences that involve different types and degrees of discomfort with the known practices of one's own role and, therefore, different strategies are being developed to deal with it. For instance, in some cases, science professionals arrive in territories with research proposals that do not fully correspond to the needs and problems perceived by their inhabitants, teachers who may feel intimidated by academic leaders, and so on.

## Individuals are not databases.

When citizens are only called for data collection—a specific research stage—it is necessary to take into account the engagement requirements and the subsequent feedback. This feedback may include customized training, access to systematized information, products based on information gathered by the community and made available to stakeholders involved in the prevention or mitigation of problems, among others. In this regard, considering contributory project participants living in vulnerable situations as volunteers may be problematic and it would be appropriate to discuss the need to provide some kind of material compensation for the time they devote to the initiative.



## A high starting cost: technological development and its updates are expensive.

Many of the mapped initiatives have their own apps—specifically designed to reach their goals—which show many advantages in terms of collecting real-time data (photos, footage, etc.) in different locations, thus allowing to increase data collection. However, programming is an expensive job that requires updates. On the other hand, multiple specific applications “compete” with each other because, for example, space on people’s mobile phones is limited.

## Engagement needs continuous support.

The first stages of a citizen science initiative may spark interest and call for engagement, but keeping it up throughout time—usually for several years—implies different types of strategies which are analyzed by those leading the initiatives. Among them, we can highlight from the professionalization of communication and the exchange with participants to the work with teachers so that they include, within their school programs, citizen science experiences or developed materials, among other possibilities.

## Outside margins: beyond scientific evaluation systems acknowledgment.

Scientists involved in citizen science projects dedicate time and energy to initiatives which are often not appropriately acknowledged by the research evaluation system, unless part of the collected data, for example, is published in an article in a prestigious academic journal. This is true for many projects, but it usually does not reflect all the work done, which is of diverse nature. In addition, research results emerge several years after their conception. For those working in academia, being actively involved in a participatory knowledge building project is time-consuming. It is usually experienced as a professional and socially committed activity that produces much satisfaction thanks to the direct contact with communities and the potential—or even very concrete—usability of the knowledge built collaboratively. However, this activity is still experienced as “swimming against the tide” of the evaluation culture of science and technology employing organizations. Therefore, it objectively represents a high opportunity cost for someone who is beginning a research career within the local scientific-technological system.



## An unexpected role: mediation.

In initiatives with a territorial basis, the interaction between science professionals and communities may entail expectations—community’s expectations—which go beyond research, and for which scientists may not feel entirely prepared to fulfill them. Among these expectations, we point out conflict mediation or the escalation of topics or claims to other public sectors in order to cause some kind of impact.

## The evidence obtained does not guarantee the design of informed public policies.

Having scientific evidence obtained by citizens does not necessarily mean that the public sector will use it to solve a problem immediately or start a process to influence in the design and dynamics of public policies. There are challenges at various levels, whether related to the complexity and dynamics of the political system, trust building among leaders, the initiatives' communication strategies, the timing of political agendas, or the financing difficulties to implement certain solutions, among many others, that can get in the way of the process. This point can be specially sensitive (even exhausting for those involved) in cases when an issue affects people's life quality—particularly vulnerable groups—or the environment in general.

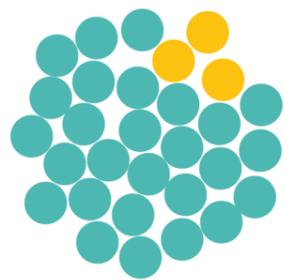
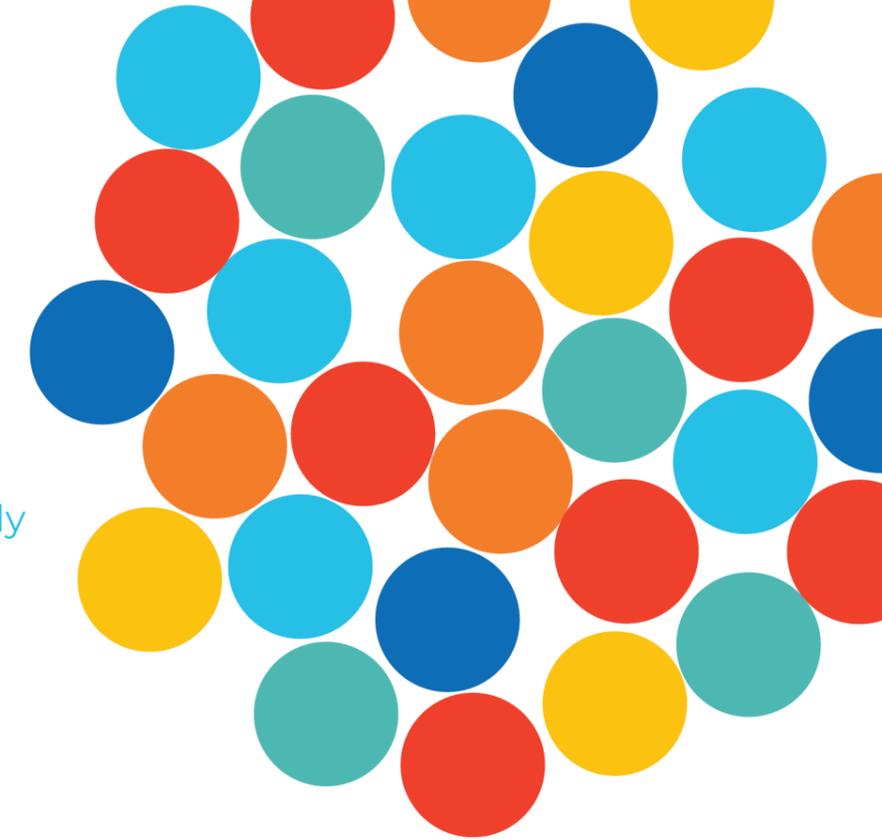
Ultimately, implementing citizen science can entail a path full of challenges for those involved. Those people frequently face a combination of difficulties, making them try diverse strategies as the project moves forward. Everything the identified and mapped citizen science initiatives have achieved until now is done with little institutional support and without the necessary prioritization as regards performance. Promoting this approach also involves cultural changes that do not occur in the short run, from collective process consideration against individual careers in the scientific and technological assessment systems to the inclusion of more participatory mechanisms at different government levels.



*Censo Forestal Urbano de la ciudad de Bragado  
(Urban tree Census in the city of Bragado)*

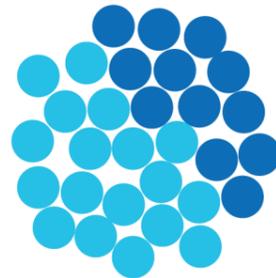
Some indicators from the first solutions mapping edition...

# 30 mapped projects



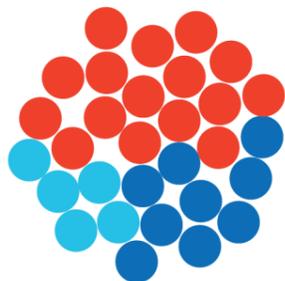
## Implementation

**3** projects have started and closed their "project cycle"  
**27** projects are ongoing  
 12 are between 3 and 5 years old  
 10 have 6 or more years of experience  
 5 were launched at the height of the COVID-19 pandemic



## Scope

**18** projects are developed locally in response to territorial issues  
**12** projects are local chapters of global initiatives



## Project type<sup>6</sup>

**16** projects are contributory  
**5** projects are collaborative  
**9** projects are co-created



## Equipment<sup>7</sup>

**14** projects only require digital technology  
**3** projects use specific equipment  
**13** projects require some combination of both types of equipment

# +15.000 participats

The various research activities of the projects are related to the following tasks:



<sup>6</sup> "Citizen science includes projects designed by scientists in which citizens participate in the collection of data (*contributory projects*), in the collection of data and its analysis (*collaborative projects*), and projects in which citizens participate in all stages of the scientific process (*co-created projects*)."  
 (CREAF, 2019)  
 CREAF (2019). Citizen science. Retrieved from: <https://www.creaf.cat/research/citizen-science>

<sup>7</sup> Digital technology refers to mobile phones, computer with Internet connection, use of a digital application/platform, digital camera, digital voice recorder or GPS; on the other hand, specific equipment refers to binoculars, telescopes, rain gauges, diving instruments, CO2 meters, specific temperature and humidity sensors, scales or thermometers.

<sup>8</sup> Example: citizens participate in the problem definition of 10 projects.



## Organizations

Among the main areas of work of the participating professional scientists are three major governmental science and technology organizations:



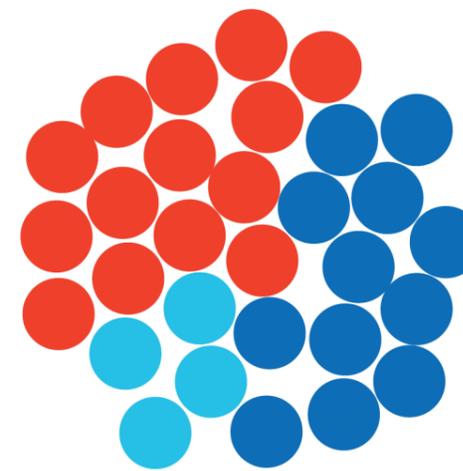
## Funding

The **diversity of sources** reflects the challenges faced by them: due to the **lack of specific promotional instruments** for this type of research approach, their members **use resources from the scientific organizations and universities where they work** (using funds from other research projects in which their researchers participate), **apply for** (and win) **international resources**, or **use their own funds**.



## Disciplines

The diversity of the initiatives is also reflected by the scientific disciplines involved:



14 address 1 major area  
12 address 2 major areas  
4 address 3 major areas



Natural and Exact Sciences



Social Sciences



Engineering and Technology

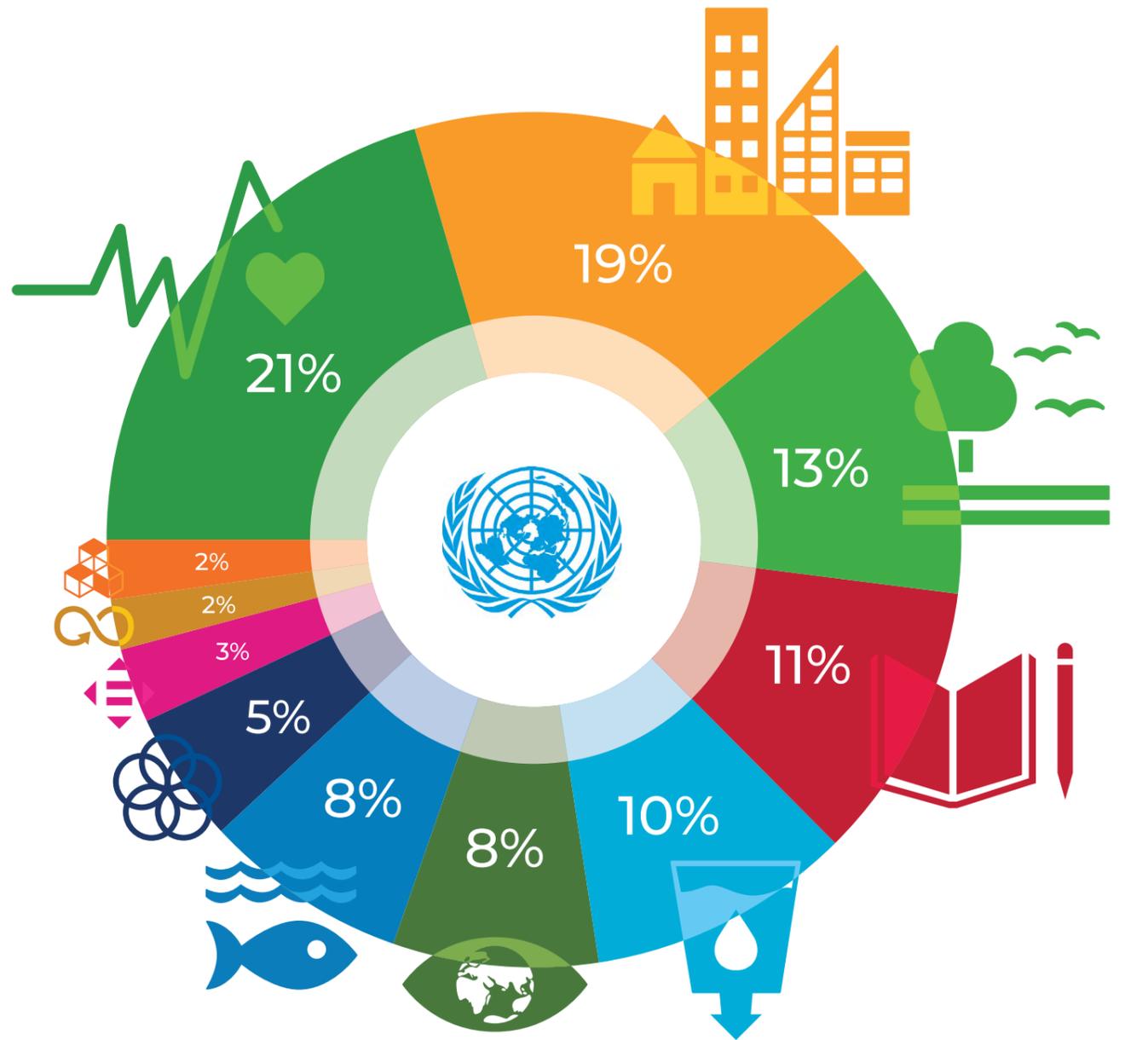


Medical and Health Sciences



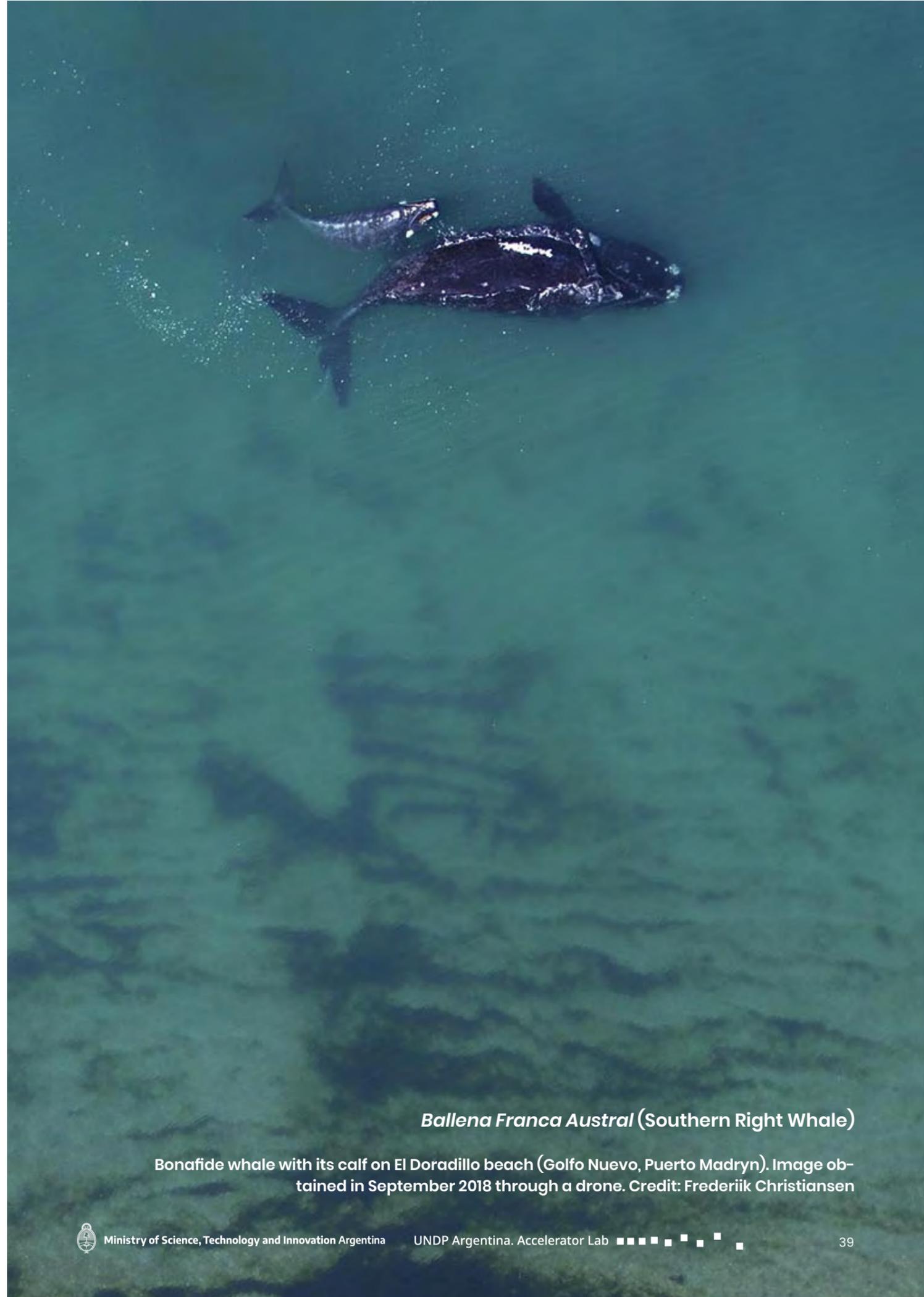
Agricultural Sciences

## Different SDGs addressed<sup>9</sup>



- 3: Good health and well-being
- 11: Sustainable cities and communities
- 15: Life on land
- 4: Quality education
- 6: Clean water and sanitation
- 13: Climate action
- 14: Life below water
- 17: Partnership for the goals
- 10: Reduced inequalities
- 12: Responsible consumption and production
- 9: Industry, innovation and infrastructure

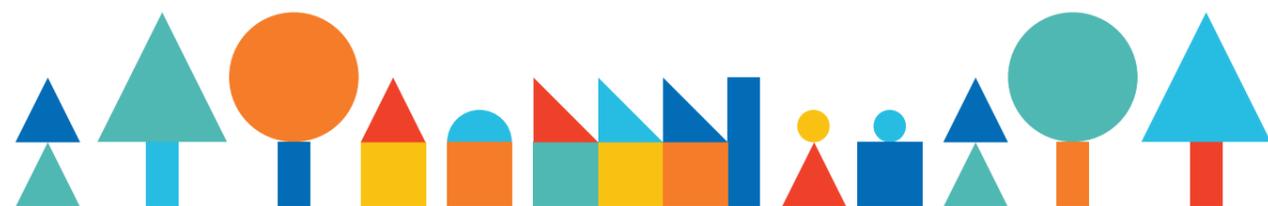
<sup>9</sup> Several initiatives address two or more SDGs. To reflect this variety, the calculation of this indicator was not based on the 30 projects but on the 63 total mentions.



*Ballena Franca Austral (Southern Right Whale)*

Bonafide whale with its calf on El Doradillo beach (Golfo Nuevo, Puerto Madryn). Image obtained in September 2018 through a drone. Credit: Frederik Christiansen

# Systematization of the initiatives



The solutions mapping files contain detailed descriptive information on each (objectives, mode of citizen participation, type of citizen science project, organizations involved, time frame, geographic scope, technological devices/tools, etc.) of the initiatives and their respective contact information. However, the following is a table that systematizes the projects included in the first solutions mapping edition so that they can be easily seen as a whole and thus facilitate comparisons. The categories below are not intended to be exhaustive, but were designed to facilitate the inclusion of sub-groups of certain initiatives with common characteristics and to intentionally accentuate differences.

## Type of solutions

## Initiatives

## Comments



### Environmental monitoring

**Experimento participativo de Monitoreo de Calidad del Aire (Participatory Air Quality Monitoring Experiment):** assesses air quality using sensors carried by cyclists on their usual routes.

**AppEAR:** analyzes the habitat conditions of freshwater aquatic environments, through an application or a website.

**Cyano:** transfers to the educational community concepts related to eutrophication and tools such as the cyanosignal, useful for community monitoring of waters for recreational use and with the objective of preventing water risks.

**MATTEO:** promotes the participation of students from different educational levels in the recording of hydrometeorological information useful for optimal water resources management.

**Playas Sostenibles de Mar del Plata (Sustainable Beaches in Mar del Plata):** develops a set of reliable indicators to evaluate and monitor the coastal zone's environmental conditions, aiming to collaborate in the preparation of a sustainable management plan for beaches used by tourists in Mar del Plata.

**Bonding and technology transfer project for solidarity-based production of CO2 meters:** it contributes to reduce the likelihood of contagion of airborne diseases and to increase the performance of people who share indoor environments by monitoring ventilation.

- These types of projects are associated with the quality of life/health of people in several ways:
  - risk management
  - contamination
- Local communities are involved in environmental issues that affect or concern them.
- Monitoring activities can involve the entire educational community (teachers, students, etc.).

**Citizen Collaboration in Designing and Assessing Sustainable Urban Drainage Systems (COINCIDE: DPLUS, in Spanish):** builds knowledge about urban flooding through the direct participation of the affected community, particularly students from all educational levels, in the recording and monitoring of information and in the proposal of joint solutions.

**El Veril del Banco de Afuera (Outer Bank Reef):** contributes to ocean acidification assessment in the coastal sector of Mar del Plata, through a participatory effort of the area's integrated monitoring (this includes sampling of certain information).

**Cazadores de Crecidas (Flood Chasers):** contributes to water risk reduction through citizen monitoring of floods in rivers and urban basins.

**Adopto un cuerpo de agua como mi mascota (Adopting a Waterbody as my Pet):** proposes adopting water bodies responsibly, taking care of their basin, monitoring the quantity and quality of the water that runs off, keeping their banks clean and reeducating the community.



### Environmental Justice

**¿Qué pasa Riachuelo? (What's up, Riachuelo?):** fortalece la capacidad de monitoreo social de los residentes y grupos vecinales mediante una plataforma de reportes ciudadanos y la incidencia en las políticas públicas ejecutadas en la Cuenca Matanza Riachuelo.

**CoAct** (continues the previous initiative): produces tools to organize, systematize and share the knowledge acquired in the Matanza Riachuelo Basin through a platform and thus contribute to environmental justice.

- Platforms to make visible, systematize, and address community claims.



### Vector-borne diseases

**Caza Mosquitos (Mosquito Catchers):** measures the distribution of mosquito vectors of dengue, zika, chikungunya, and yellow fever through an application (photo/location).

**GeoVin:** measures the distribution of kissing bugs—linked to Chagas disease—through an application (photo/location).

**Mi hábitat, observando con lupa mi barrio (My habitat, observing my neighborhood through a magnifying glass):** it makes young people and families aware of the health risks of garbage dumps, rodents, and parasites in their communities. On that basis, a digital mobile application is adapted to report images and possible preventive measures are addressed.

These types of projects:

- are associated with people's quality of life/health,
- have a strong awareness component,
- aim to produce real-time maps of the vector distribution.

## Type of solutions

## Initiatives

## Comments



### General Biodiversity

**eBird Argentina:** contributes to knowledge building—through a digital platform that collects real-time observations, photos, and sounds—about the distribution and abundance of different bird species, which helps in their care and conservation.

**ArgentiNat.org:** contributes to understanding the distribution, presence and population dynamics of all species in Argentina, using the site or the mobile application.

**EcoRegistros:** identifies species, disseminates scientific research results, and conducts recreational activities.

- They have a very marked observational component where the use of mobile phones prevails. Data can be recorded as photos, audio, etc.
- They are a call for conservation.
- They produce collaborative bases/ maps of distributions, dynamics, etc.



### Focused Biodiversity

**Ballena Franca Austral (Southern Right Whale):** contributes to the right whale catalog (identifying calves and their families, etc.) by means of photos taken by professional photographers on tourist whale-watching boats.

**¿Es araña o escorpión? (Spider or scorpion?):** helps identify and preserve arachnid specimens by means of photographic records and complementary data related to the findings of the respective species.

**Geckos, forasteros en tu casa. ¿Estás seguro? (Non-Native Geckos at home. Are you Sure?):** identifies—through data provided by citizens on an online form and social media—the geographical distribution of some of the exotic gecko species in Argentina.

**Vaquitas (Lady Beetles):** contributes—by means of photographic records and geolocation provided by citizens—to knowing the identity and geographic distribution of Ladybugs in Argentina, while at the same time helps to evaluate the potential impact of an invasive species, the Asian Lady Beetle, and eventually of other exotic species on native species.

**Gaviota Cangrejera (Olrog's Gull):** contributes to the conservation of Olrog's Gulls by taking into account the habitats used by this species and its migratory movements, known thanks to the rings placed on monitored specimens.

**Conservar Tiburones en Argentina (Shark Conservation in Argentina):** promotes the conservation of coastal sharks through sports fishing while releasing conventionally tagged specimens. This helps identify information about their behaviors.

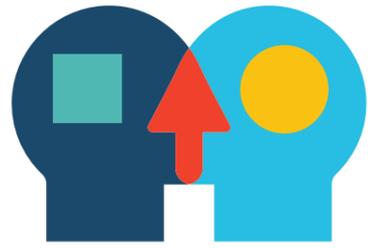
**Tucanes en mi Jujuy (Toucans in my Jujuy):** raises awareness about Toucan biodiversity conservation by monitoring their presence, habitat use and ecology.

- They have a very marked observational component where the use of mobile phones prevails. Data can be recorded as photos, audio, etc.
- They are a call for conservation.
- They produce collaborative bases/ maps of distributions, dynamics, etc.

## Type of solutions

## Initiatives

## Comments



### Collective intelligence

**Grupo CoSensores - Sensores Comunitarios (CoSensores Group - Community Sensors)**: develops technologies that allow organized communities to assess the presence of contaminants in a simple and inexpensive way through participatory research and action strategies.

**Bioleft**: builds a network for collaborative exchange and improvement of open seeds to offer alternative solutions to the challenges faced by agriculture, based on collective intelligence and open knowledge, local wisdom and scientific knowledge. A digital platform is modeled on the basis of needs agreed upon by various sectors.

**Vuela (Fly)**: develops hardware and software tools that can be useful to groups or communities addressing local problems. The team developed a prototype toolkit for doing open science using drones.

These types of projects have a co-creative nature where knowledge is exchanged horizontally.



### Urban

**Observa-Residuos (Waste Watch)**: determines the amount and composition of the household waste of the residents of the Autonomous City of Buenos Aires, Argentina. Participants are asked to segregate and weigh, using a scale provided by the project, the waste generated in a typical week.

**Censo Forestal Urbano de la ciudad de Bragado (Urban tree Census in the city of Bragado)** (Province of Buenos Aires, Argentina): contributes to build botanical knowledge necessary to determine, through citizen participation, the total number of trees in the main city of the district (Bragado), with a view to the future development of public policies.

- Participation is structured around challenging the inhabitants of certain cities.
- Partnership with local governments.





*Geckos, forasteros en tu casa ¿Estás seguro?*  
(Non-Native Geckos at Home. Are you Sure?)



## Insights emerging from the solutions mapping

Acknowledging the **interrelationship between environment and quality of life favors long-term community involvement.** Communities with problems that affect their health or well-being may be more likely to develop initiatives to understand, measure, and anticipate the issues that are relevant to them. Besides, acknowledging the interrelationship between environment and quality of life favors long-term community involvement.

**Involving the community, from the beginning of the problem formulation of a project, can be a key factor in sustaining a commitment to participation.** However, building trust between different groups is not necessarily a simple or immediate process.

Involving **occupations present in territories, prior to citizen science initiatives, can be a way to promote their sustainability.**



**The professional scientific community could be more involved in these types of initiatives** if the research evaluation systems **would adequately acknowledge them**. Incentives may become a key element to ensure that the participatory approach to scientific work grows in a sustained manner within the scientific and technological system.

Involving the **public sector** in the implementation of citizen science projects can be a way to promote the **use of evidence** provided by projects in the **design and dynamics of public policies**. This involvement could also **encourage**—if working with children and adolescents—**scientific vocations** imagined or aspiring to work in public management, promoting different professional profiles.

Citizen science could become an **instrument to favor the advocacy capacity of minorities and diversities** to the extent that it provides them with evidence to contribute to raising issues outside the public agenda. However, having evidence is not enough; it is also necessary to take into account the approach of these communities to decision-makers.

**Identifying** —within environmental initiatives:

- the **environmental footprint** can represent a way to **promote changes** in **environmental awareness or behavior** towards new habits with less impact,
- **natural heritage** can be a way to highlight the **need to preserve it**,
- **changes in environmental phenomena** may represent a way to expose the climate crisis scale.

**Developing citizen science initiatives** can be **related** to different types of **resources or capitals** (social, economic, cultural, human, etc.) **that people have in their territories**. For instance, working with vulnerable populations will involve specific challenges such as the digital divide and literacy if implemented through applications.

**Citizen science can be a way to promote intergenerational education**. Many solutions have an educational aspect, therefore, we can think that by encouraging changes in habits among children and adolescents, other changes can be generated within the household.



Monitoreo nacional de microplásticos costeros  
(National monitoring of coastal microplastics)



# The growth of the solutions mapping: collaborative and beyond the environment

The solutions mapping growth strategy is collaborative, new citizen science initiatives can join by filling in the [form](#)<sup>10</sup>, and is not exclusively focused on environmental projects, but is open to new fields and disciplines.

Each new project undergoes an iteration process to verify that the initiative's objective is building knowledge in a participatory manner and that the information provided meets the requested criteria.

<sup>10</sup> The questionnaire to include citizen science projects into this mapping is detailed in the annex on methodology.

## Testimonials from the field: Anticipating floods Project<sup>11</sup>

*“Anticipating floods” is a multidisciplinary and cross-sectoral project that contributes to the disaster risk reduction associated with hydrometeorological events, through dialogue with territorial and management stakeholders and the scientific-technical sector. We seek to co-construct and strengthen early warning and population-centered community monitoring systems. However, the issue of hydrometeorological or climatic risks is very broad, and we have had the opportunity, on occasion, to coordinate with different stakeholders who have expressed various issues to us.*

*In La Matanza (Province of Buenos Aires, Argentina), we started working with the communities of the neighborhoods located on the banks of the Matanza Riachuelo river and its tributary streams, such as Don Mario, Morales, Dupy, Apipé and others, where the main issue is urban floods due to heavy rains or overflowing of rivers and streams, but in some cases, they tell us that intense winds cause damage, or that, after the water recedes, the houses are very dirty and health and hygiene are fundamental.*

*On the other hand, the community of horticultural growers in the area told us that they were more concerned about the number of cloudy days and the lack of rain than about floods. These growers need clear days and water to improve their crops. In a similar situation, we worked with the beekeeping community of General Rodríguez and Cañuelas, Province of Buenos Aires, Argentina, in the upper basin, where producers are threatened by the wind and not so much by the rain. If it rains, bees do not go out, but if it is windy they get tired, suffer and produce less.*

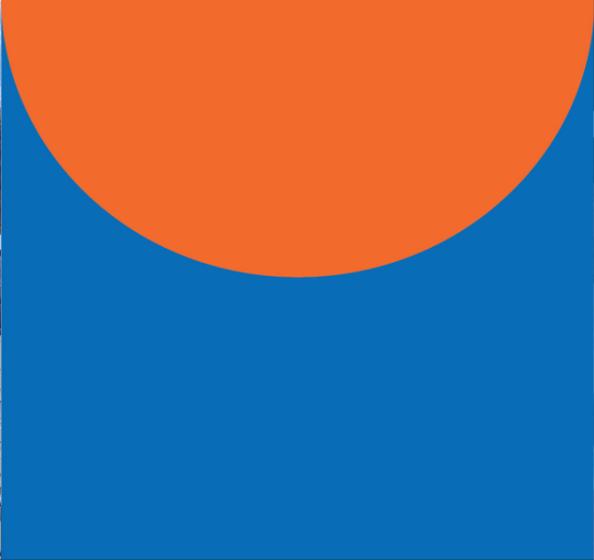
*Therefore, warnings and forecasts must be specific to each case and early warning systems must be built jointly by all the stakeholders involved. The National Weather Service (<https://www.smn.gob.ar/alertas>) provides information on early warnings of storms, rain, wind and snowfall, we seek to retransmit these warnings by improving communication and access to information, and they, in turn, provide territorial information on vulnerable or more exposed areas, walking through the neighborhood. As well as rainfall and river height data from their neighborhoods, through the installation of rain gauges and level rulers, where the National Weather Service monitoring network does not reach. In this way, weather forecasts and hydrometeorological models are also validated and calibrated to make them more effective. The knowledge held by the communities of the different territories is as valuable as the scientific-technical knowledge in these cases.*

**Diego Moreira, Sea and Atmosphere Research Center, National Scientific and Technical Research Council (CONICET), and National University of Buenos Aires (UBA, by its Spanish acronym)**

<sup>11</sup> “Anticipating floods” contributes to disaster risk reduction associated with hydrometeorological events, through dialogue with territorial stakeholders in order to improve the community early warning system focused on the population.



*Anticipando la crecida (Anticipating floods)*



# From the solutions mapping to new actions



Ministry of Science,  
Technology and Innovation  
Argentina

MINCYT aims to promote the development and strengthening of these types of initiatives across the country and to increase their visibility and value in accordance with best practice principles. Therefore, in October 2022 it creates a nationwide program of federal promotion of local citizen science. This program will finance citizen science projects; expand mapping and set up permanent initiatives monitoring, identifying opportunities, challenges and lessons learned at different stages, according to the diversity of participants and methodologies used; promote civil society participation in these types of initiatives; foster citizen science training, participatory research methodologies and other related areas of expertise; and encourage studies and research related to citizen science in Argentina to feed public policies in various areas of intervention.

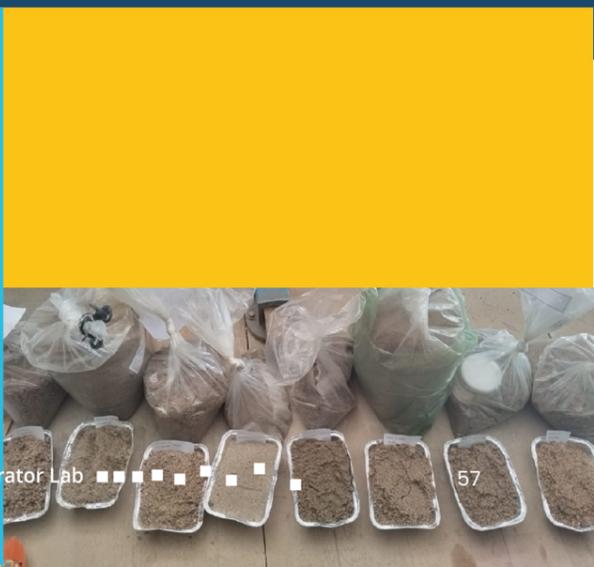
Co\_  
Lab



Argentina  
accelerator  
lab

The Co\_Lab developed its citizen science learning cycle, along with a portfolio of actions that continue to grow with different partners. Its objective is to promote the strategic nature of citizen science in order to acknowledge it as an innovative and inclusive approach, capable of driving sustainable development. It thus works to encourage people, on different places, to get involved in knowledge building processes or to use or design real-time monitoring tools, early detection systems or collaborative maps, among other possibilities, in order to understand and act on what affects their quality of life and the environment.

Top left to right: Asio, *Monitoreo nacional de microplásticos costeros* (National monitoring of coastal microplastics), *Inundaciones: ¿qué podemos hacer?* (Floods: What Can We Do?).  
Bottom from left to right: *Ciencia, educación y desarrollo sostenible local* (Science, education, and local sustainable development), Fresh Air Alert, National University of General Sarmiento (UNGS), MASARE - Sustainable Aggregates Management in Rivers and Reservoirs.



# Concluding remarks

Environmental citizen science solutions mapping in Argentina highlights the importance of (re)opening the discussion on what it means to build knowledge, who can do it and for what purpose. In this regard, valuing citizen science also implies debating the idea that scientific production is limited exclusively to academic articles published in prestigious journals in order to also consider the involvement of professionals—from different disciplines—in **collective and participatory knowledge building processes** with other logics, motivations, times and eventually adding a **more diverse range of results**. It also implies rethinking who we call specialists, including experience-based knowledge, ancestral, affective and non-formalized wisdom, among others. **In short, citizen science represents a way of doing science with a greater plurality of voices.**

These types of initiatives also have the potential to intensify research and innovation agendas linked to **sustainable development**. Interestingly, this interrelationship is **two-way**. On one hand, **“bottom-up”** is when the issues addressed respond to the needs of the people affected by their pro-

blems, either to be researched, worked on with a prototyping “maker” approach, raised by communities, and so on. On the other hand, **“top-down”** is when public sector bodies engage in this approach or join projects to enrich and inform management and decision making.

In turn, these processes generate **multiple channels of democratic participation**. Firstly, because they pave the way towards science democratization where everyone can get involved and contribute to knowledge, either because they know or are enthusiastic about a topic. Secondly, because they encourage public policy democratization by including mechanisms that promote citizen participation and involvement, or their influence on the public agenda.

Despite the potential and tensions regarding the implementation of these projects and of citizen science at large, one of the main challenges is the **possibility of ensuring their sustainability and growth in Argentina**. There is still a long way to go to effectively promote evidence-informed public policies, the co-creation of solutions that respond to the concerns of the people affected by the problems in order to improve their quality of life, and the collective building of knowledge without leaving anyone behind.

# Annex on methodology: questionnaire to add citizen science projects

1. Full name of the person completing the form.

2. What is the initiative's name?

3. Mention briefly your connection to the initiative.

4. Indicate the specific subjects addressed (for example: vector-borne diseases, environmental monitoring, among others).

5. What is the initiative's overall goal? The overall goal should specifically describe what the research seeks to answer and explicitly state the spatial and time frames of the object of study.

6. What are the specific goals or concrete answers of the research? The specific goals should be included in the overall goal and should not be confused with the steps to be taken to develop the proposed research.

7. In which activities of the initiative are the citizens involved? If there are more than one, select all that apply.

a. Problem definition

b. Data collection

c. Data analysis

d. Phenomenon monitoring

e. Solution design

f. Solution deployment

g. Across the project

h. Other/s

i. If your answer was "Other/s", specify which ones.

8. Describe citizen participation. What do the activities carried out by citizens within the framework of the initiative specifically consist of? Keep in mind readers who are not familiar with the project and tell them where citizen participation takes place, how it is carried out and what it specifically consists of, among other aspects that apply to the project.

9. To what citizen science category does the initiative belong to?

a. Contributory project: It is designed by scientists, and citizens participate in data collection.

b. Collaborative project: Citizens participate in data collection and analysis.

c. Co-created project: Citizens participate in all stages of the scientific process.

d. I have questions.

i. What questions do you have?

10. What organizations or stakeholders promoted or are promoting the project? Specify name and role of the stakeholders, name and type of organization. Example 1: Juan Pérez (researcher at CONICET and project director) and María González (elementary school teacher at Escuela N°15). Example 2: Foundation A (non-profit making organization).

11. What is the initiative's current status?

a. Under design

b. In progress

c. Finished

d. Other

i. Specify

12. When did the initiative's design begin?

13. If it is finished or if there is a finishing date, mention it.

14. What is the frequency of execution?

a. One-time only

b. Seasonal (by time of year)

c. According to the demands or approaches to the community/communities

d. Uninterruptedly

e. Other

i. If your answer was "Other", specify a frequency of execution.

15. How much time do you estimate that citizen participation in the execution of the initiative will take (for example days, weeks, months, sustained over time, among other possible answers)?



## 16. Scope of the initiative?

- a. Local (city, province)
- b. National (two or more provinces)
- c. International (two or more countries)

## 17. Specify towns/provinces/countries where the initiative was implemented.

## 18. Indicate the town or province where the initiative was conceived to create an illustrative map.

## 19. How was the initiative developed?

- a. Entirely developed by participants with formal scientific training
- b. Entirely developed by participants without formal scientific training
- c. It has been developed with the collaboration of both scientists and participants without formal training
- d. It has been developed with the collaboration of both scientists and participants with and without formal training
- e. Other
  - i. If your answer was "Other", specify how.

## 20. Could you indicate the numbers of citizens who have already participated in the initiative?

- a. From 1 to 50
- b. From 51 to 100
- c. From 101 to 500
- d. From 501 to 1000
- e. Over 1001
- f. Unknown

- i. If your answer was "Unknown", indicate why.

## 21. Does the initiative have recruitment processes to carry out activities in which citizens participate?

- a. Yes
- b. No

## c. Doesn't apply

- i. If your answer was "Yes", indicate by what means and what type of recruitment processes were used. For example social media, meetings, workshops, congresses.
- ii. If your answer was "Doesn't apply", briefly describes why.

## 22. In case the initiative requires the use of specific instruments or technological tools (for example: mobile phone, online or offline applications, camera, scales, rain gauge, among others), please specify them and indicate what they are used for.

## 23. Has the initiative been replicated (replicability is understood as the reproduction of the initiative in another context or geographic scope)?

- a. Yes
- b. No
- c. Unknown
  - i. If your previous answer was "Yes", please explain how the project is being replicated.
  - ii. If your answer was "Unknown", indicate why.

## 24. Has the initiative been scaled up? Scalability is understood as the ability of the initiative to increase its capacity and activities, either by expanding the number of participants and/or the tools required, among other variables.

- a. Yes
- b. No
- c. Unknown
  - i. If your previous answer was "Yes", please explain how the project has scaled.
  - ii. If your answer was "Unknown", indicate why.

## 25. Do they share or allow access to the initiative's data or the knowledge it produces? It refers to making data freely available and accessible, so that it can be used by anyone.

- a. Yes
- b. No
- c. Unknown
  - i. If your answer was "Yes", indicate with whom they are shared and how.



ii. If your answer was “Unknown”, indicate why.

**26. Have participants received feedback on their activities or results of the initiative?**

a. Yes

b. No

c. Unknown

i. If your answer was “Yes”, indicate what type of feedback they have received and how.

ii. If your answer was “Unknown”, indicate why.

**27. Has the initiative had any linkage with a state agency or government? Linkage is understood as cooperation and/or joint action between the initiative and public sector entities, at all levels.**

a. Yes

b. No

c. Unknown

i. If your previous answer was “Yes”, please indicate which ones.

ii. If your answer was “Unknown”, indicate why.

**28. Specify, if applicable, the type of financing for the initiative (project’s own funding sources, international cooperation funds, institutional funds, etc.).**

**29. Has the initiative been awarded, distinguished or won any local or international contest or competition?**

a. Yes

b. No

c. Unknown

i. If your previous answer was “Yes”, please indicate which ones.

ii. If your answer was “Unknown”, indicate why.

**30. Include any observation or relevant comment about the initiative.**

**31. Indicate project leaders’ name, institutional affiliation and email address.**

**32. Does the initiative have an official web site or social media? If yes, indicate URL.**

**33. To which of the disciplines identified by the Organization for Economic Co-operation and Development (OECD) does the initiative correspond? You can select up to 3.**

**34. Do you identify any of the following Sustainable Development Goals (SDGs) as part of the initiative’s approach? If more than one SDG applies, please select the three main ones (at the most).**

**35. Attach high resolution institutional logo images and citizen participation pictures (avoid collages and screenshots.)**

**36. I authorize the use, exhibition or reproduction by any means of the images and data provided in this form for dissemination purposes. I acknowledge that all the information provided is correct to the best of my knowledge.**

a. Yes

b. No





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