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# Blueprint for #CitSciComm with and for industry and SMES



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# Foreword

*Citizen Science is a process by which citizens are directly involved in research processes. There are a lot of potentialities that Citizen Science offers both to citizens and to the scientific world. This approach allows combining scientific rigour, participation, networking and innovation. I would point out that searching for solutions from areas and actors that, in principle, would be in other scenarios, contributing and creating knowledge collectively, bringing scientific challenges closer to and contextualising the real needs of today's society, and lay down on less fragmentation of knowledge, are some of the potentials citizen science offers both to citizens and to the scientific world. This direct transference of knowledge among non-scientist people, encourages the development of scientific culture in society, its level of interest and participation, generating more responsible and committed citizens. In short, Citizen science is an exercise of collective intelligence at the service of scientific development: Science by, for and with people.*

**Iria Mata, Technician for Educative Programs, Fundación Cotec**

*The validity and experience of Citizen Science projects are more than demonstrated. The results provided complete the picture from a more social and collaborative perspective, reaching evidence that would be unfeasible by other scientific methods. Now all that is missing is the support and recognition of other sectors, such as Industries and SMEs. But more than a challenge, Citizen Science initiatives must perceive this as an opportunity. The question is how to approach it, and in this case, the key is in communication and the basis is in transparency. Building trust in these sectors is not an easy task, but neither is it impossible. Citizen Science initiatives are backed by expertise and data. All that remains now is for them to commit to a clear, long-term communication strategy to achieve greater impact.*

**Adeline Marcos, NCP Cluster 2 Culture, Creativity and Inclusivity - Horizon EU, FECYT**

*The #CitSciComm Labs, specially the one targeting Industries and SMEs constituted an opportunity for citizen science projects to be encouraged to consider and look for new actors, normally outside of their scope, to collaborate, whether by promoting local social innovations, new business models or job opportunities, contributing directly to SDG8 (Decent work and economic growth). Moreover it gave pilots the understanding of communication tools and strategies to better reach different industrial sector ecosystems (such as tourism, recreational and leisure sectors) and how to build relationships based in trust, mutual respect and benefit, providing an added-value to citizen science-generated data but also activate the social responsibility of the companies. Another very important aspect to point out of this Lab is the potential of CS to overcome cross-border challenges involving multisectoral and multidisciplinary approaches and the need for specific funding schemes to address them.*

**Joana Magalhães, Senior Researcher, Science for Change  
Science for Change Partner Leader for the Industry and SMEs  
CitSciComm Lab**

*I always say that **doing Citizen Science is not an easy task**. You need knowledge, expertise, time and resources, and interdisciplinarity is key. As a Chemical Engineer expert in odour pollution, when I first had the idea of using citizen science for its monitoring I thought “I just need an App. Citizens have the best sensor, their own noses. I just need to provide them with a tool to collect their odour perceptions”. And that’s how OdourCollect was born. But I soon realised that the most important thing in a citizen science project is to achieve the engagement of communities. You can have the best App in the world, but without engaged citizens, you have nothing. In fact, a piece of paper is more than enough for data collection (and you better shall consider this as an alternative if you want to be inclusive).*

*Then I started to realise more things. One of the main objectives of the D-NOSES Project was to advocate for a common policy framework to protect European citizens suffering odour pollution, since it is an under regulated issue and the second cause of environmental complaints after noise. But how can we researchers reach policy makers? Which is the right governance level? Our answer was the development of a multi-level governance model that allowed multi-level engagement of European, national and local decision makers. Not an easy task either.*

*And what about industries? Would they be comfortable with an open data model which will point out the potential origin of odour emissions? Would they be willing to trust citizen generated data to identify the situations of maximum impact for their neighbours and act upon them? And what about fellow scientists? Would they rely on a new odour monitoring methodology? Would they trust the produced data sets? All **quadruple helix stakeholders** are part of the problem and also part of the solution, but they **have different interests, agendas, priorities and timings**, meaning that **communication is key** to engaging them all in the process. **And this was how NEWSERA was born.***

*NEWSERA has been working with **39 Citizen Science projects in Spain, Italy and Portugal** for the last three years, co-creating innovative Science Communication strategies to effectively reach quadruple helix stakeholders through our **#CitSciComm Labs**, while developing a useful and replicable **impact evaluation framework**. We have identified a common lack of knowledge in science communication and a lack of resources (I was not alone, our pilots have not been alone anymore), and the NEWSERA team has been naturally evolving towards a mentoring role with the pilots. Specific training has also been offered within the Labs once the need for capacity building was made evident. We have been researching recognition of the practice as part of the solution, something that both Science Communication and Citizen Science share as scientific disciplines, and that we hope*

*will eventually change in the years to come - specially because of the push that the European Commission is giving to public engagement and co-creation in all Clusters and Missions of Horizon Europe, and because we need an active and more informed society to deal with global crisis such as the COVID-19 pandemic or the climate emergency. In addition, we have been exploring two new concepts: **Citizen Science Communication** (including how citizen scientists become science communicators themselves using their own means and channels when actively involved in science) and **Citizen Science Journalism** (as citizen generated data have a huge potential to produce newsable stories of societal relevance, and data journalism tools can help).*

*To compile the main project findings, the NEWSERA team has produced **five blueprints**, one addressed to each one of the stakeholders from the quadruple helix (citizens, academic scientists, the public sector, and industries and SMEs) and one addressed to data journalists, for any citizen science project that has the need (as we had) to reach any of their target audiences for a more effective engagement, and consequently, an increased impact. We hope that our results will be useful for building capacity in Science Communication within the Citizen Science community and beyond, to be able to engage more and more European citizens in science for a better future for all, to produce evidence-informed policies aligned with society, to increase academic recognition and trust of both disciplines, and to engage more industries and SMEs and produce new business models that will contribute to the sustainability and mainstreaming of the practice. You are not alone anymore. We are a community with a common need and we hope that this blueprint will help you shed light in your way.*

**Rosa Arias**  
**NEWSERA Project Coordinator**

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# Target Audience

**This blueprint is addressed for the following target audiences:**

- Citizen science projects practitioners
- Citizen science projects communication managers
- Industries with living labs
- Industries that are trying to incorporate CS in social responsibility practices

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# Summary

NEWSERA Blueprints for citizen science communication (#citscicomm) with and for quadruple helix stakeholders (citizens and society at large, academic scientists, public sector and policymakers, industry and SMES) and science and data journalists is an instrument that can serve a general audience, including those who are planning to start a citizen science (CS) project, those who want to improve and/or rethink their communication strategies in order to increase specific target audiences, or those who want to enlarge their scope of action by involving the different actors of the quadruple helix model and the media.

The road for CS projects establishment and sustainability is long and there are many barriers to be faced. But you are not alone!

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**The road for CS projects establishment and sustainability is long and there are many barriers to be faced. But you are not alone!**

Together with 39 CS projects from Italy, Spain and Portugal, the NEWSERA Pilots, we have tested the NEWSERA methodology for the co-design, implementation, iterative assessment and validation of communication strategies directed to each of the quadruple helix stakeholders and science and data journalists. This was performed through our #CitSciComm Labs, dedicated to each individual stakeholder, consisting of three rounds of workshops, replicated in each of the participating countries, throughout three years.

In this series of five blueprints, NEWSERA brings the learnings of this co-created process together with our pilots, invited stakeholders and science communication experts (NEWSERA Sounding Board) that was complemented with mentoring, capacity building and networking sessions, generating knowledge, recommendations and useful resources.

In this blueprint, dedicated to **industries and SMEs as target stakeholder**, you will find, more in depth, the importance to address this stakeholder, good practices on the co-design of targeted communication plans, elements of co-design, mutual benefits of CS project-stakeholder, and indicators. Furthermore, a description and details of messages, innovative tools, channels and specific case-studies from the NEWSERA Pilots are included.

Finally, we shared a series of recommendations to efficiently engage with quadruple helix stakeholders and science and data journalists for wider impact and ensure replicability of the NEWSERA findings and science communication strategies in citizen science projects and beyond.

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# Introduction

Citizen science (CS) initiatives are changing the paradigm of science communication. Not only the embedded bottom-up methodology considers people's questions and needs, aligning science and society interests, but also allows citizens and other key stakeholders to become data generators and, as such, to become themselves the source of scientific news. Non-experts participation in CS projects also implies the potential to strengthen science literacy and, for these reasons, opening science and innovation to society.

To fulfil these potentials and to achieve societal impact, CS initiatives may face different challenges. Effectiveness and long-term sustainability of a CS project requires the creation and maintenance of a complex ecosystem, in which the participation of quadruple helix stakeholders (citizens and society at large, academic scientists, public sector and policymakers, industry and SMES) (Carayannis *et al.*, 2009) is crucial. When we consider challenges in terms of science communication we can name: using a wide variety of specific communication tools and strategies for each target group, including digital, traditional and face to face activities to increase participation, providing the required continuous feedback to each stakeholder group to maintain engagement throughout project execution, and involving all stakeholders in every phase of the research. Another often neglected aspect is related to internal communication.

Interdisciplinarity, another intrinsic characteristic of CS projects, is also a challenge, and communication among the different disciplines involved can be a key asset for mutual understanding and collaboration. Science and data journalists also play a key role in mainstreaming CS processes and results, and at the same time raising new questions that can shine a light on critical issues, gaps, and potential biases. Ultimately this can increase trust among the whole range of stakeholders and open new opportunities to contribute to public knowledge. All these challenges might be considered also on the other way round: CS can benefit from communication but CS can bring fresh new perspectives for improving science communication.

In NEWSERA, we conducted an analysis of the communication tools and strategies used by 157 CS initiatives, across the European Union (EU), United Kingdom (UK), and Switzerland (Giardullo *et al.*, 2023) portraying the state of the art of CS projects' communication strategies. We found out that most projects still see communication as a dissemination activity, to serve educational purposes rather than exploring it as a tool to involve other potential target audiences, such as those from the quadruple helix model. Moreover, most CS projects, regardless of their stage, keep the potential level of engagement quite low, with citizen scientists' main contribution as data collectors. The lack of strategies with defined target audiences seem to present a

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**this can increase trust among the whole range of stakeholders and open new opportunities to contribute to public knowledge**

repurposed top-down, one-to-many, unidirectional and oriented to a knowledge transfer science communication style, which clearly undermines the very own potential of CS.

Through its #CitSciComm Labs methodology (Magalhães *et al.*, 2022), NEWSERA has analysed and evaluated the complex and multidirectional communication strategies, addressed to each of the quadruple helix stakeholders, and science and data journalists. The activities involved 39 CS projects from three Southern European countries (Italy, Spain and Portugal), the NEWSERA Pilots, for elaborating a new paradigm for science communication. Using a bottom-up approach, innovative strategies have been co-designed, implemented and validated to overcome barriers identified for each stakeholder group, in order to improve the science communication strategies of NEWSERA pilots' and, in turn, the impact of the projects themselves, contributing to the mainstreaming of citizen science.

Through the five blueprints, NEWSERA will share the knowledge, resources and recommendations obtained in the #CitSciComm Labs targeting each of the quadruple helix stakeholders, and science and data journalists.

## TARGET STAKEHOLDER: INDUSTRY and SMEs

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### What do we want to achieve?

How can we increase the level of responsibility of industry and SMEs through improved science communication? How can we demonstrate the benefits of increasing transparency and adopting bottom-up approaches, to include citizens' needs and concerns in industrial innovation processes?

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### What are the challenges?

The private sector is not a common target group for CS projects although CS processes and/or CS-generated data could be a key asset for a company's image and reputation. Moreover, a lack of awareness on business models and exploitation plans can undermine mutual understanding and the potential to integrate CS in the industry and SMEs culture. As well as for other sectors, there is still reluctance towards CS due to lack of trust.

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### Who are the targets?

Private sector stakeholders include industry, private companies, which can be multinational organisations, as well as SMEs and start-ups. This target audience may cover entrepreneurs, research and development, research and innovation, communications departments of SMEs or big companies, as well as Corporate Social Responsibility departments.

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### How did we do it?

The #CitSciComm Lab for and with Industries and SMEs explored and deployed these challenges with the following NEWSERA pilot CS projects: RiuNet, Adopta una Planta, BIOOK, Vivencia Dehesa - from Spain; Lixo Marinho, Censos de Borboletas - from Portugal; Reef Check Italia Onlus, Sea Cleaner - from Italy and provides the basis for this blueprint.

# Good practices for targeted communication plans directed to industry and SMEs

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## 1.

### **Co-designing communication plans, indicators and iterative assessment for impact**

In order to excel in communication, it is fundamental to understand what processes may hinder, challenge, or drive any communication efforts. On this basis it is important to pave the way for effective communication strategies that reach wider as well as diversified audiences according to projects' needs. This requires considering different aspects, such as defining clear objectives, identifying stakeholders groups of potential interest, and selecting key communication channels, formats, messages and actions, as well as other variables, such as inclusivity and gender (Magalhães *et al.*, 2022).

Due to the complex nature of CS projects, an iterative approach and mutual exchange to communication strategies is essential, allowing flexibility and adjustments along the different phases of implementation (participants' recruitment, data collection, analysis, dissemination, etc.), depending on the level of engagement sought and the specific objectives, and during the projects' lifetime (and possibly beyond) (Roche *et al.*, 2020).

To support this process, NEWSERA has established the #CitSciComm Labs, as collaborative spaces, where the NEWSERA pilots worked together with stakeholders's representatives and science communication experts in the co-design, implementation and validation of communication strategies specifically addressed to each of the 4H stakeholders, as target audiences.

So, where to start?

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## **1.A NEWSERA methodology to co-design communication strategies**

### **Setting up the conditions: participants**

In order to establish a new communication strategy from scratch or rethink an ongoing one, it is important to set up the conditions for mutual exchange between the CS project and potential stakeholder (or its representatives). This is a general recommendation based on NEWSERA #CitSciComm Labs. In order to design an effective communication strategy it is absolutely crucial to allocate time and resources for direct confrontation with potential stakeholders. Indeed, a first requirement for a CS science project is to gather participants for a mutual learning exercise: this allows to build a discussion forum for making mutually visible different perspectives to encounter. To this aim, as NEWSERA experience reported, it is essential to invite one or more representatives for stakeholders of interest. The aim is to work together for an approximately 3h session. A further condition to guarantee a proper mutual learning is to bring along science communicators experts, as mediators to help in making synthesis of encounters.

### **Starting the encounter**

Mutual learning can develop through open dialogue about the aims of the CS projects both in terms of expectations about its scientific results and societal impact. Therefore, a CS project leader should be clear about expectations and benefits for all involved parties.

Discussion forums can start with CS project leaders presenting their project, as well as current communication practices, aims and challenges to the other participants. On this basis, NEWSERA recommends performing a dynamic analysis of the strengths, weaknesses, wishes, opportunities and threats, where each participant is encouraged to adopt different perspectives. Using these key areas means to either unpack the communication strategies and to make communication efforts more easy to be redesigned according to their strongholds and the opinions of both stakeholders representatives and communication experts.

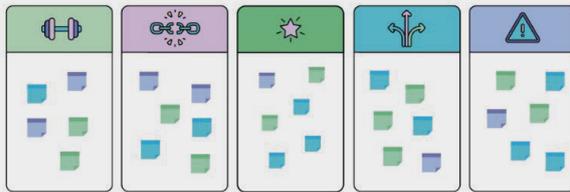
At this point, the information necessary to further segment the target audience can be reached. The group works together to transform the opportunities previously detected into ad hoc communication actions and tasks. Concomitantly, the channels, communication tools and messages to be explored are defined. Afterwards a timeline should be established. Lastly, a first screening of specific, measurable, realistic and timely (S.M.A.R.T) indicators to evaluate the communication actions could be undertaken or planned to be structured in another independent work session. The following sections will illustrate how to carry out activities, and the outcome obtained through NEWSERA pilots thanks to #CitSciComm Labs. The full methodology has been published elsewhere (Magalhães *et al.*, 2022).

## Defining projects' and stakeholders' perspectives as well as objectives



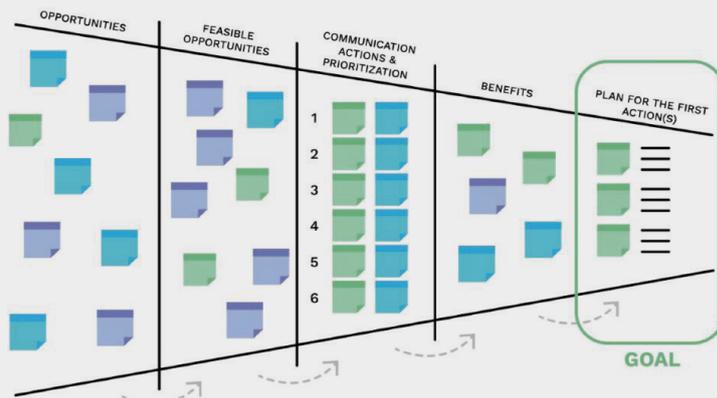
About your CS project: identify **Strengths** ("what you have"), **Weaknesses** ("what you don't have"), **Wishes** ("what you want to achieve"). Then brainstorm **Opportunities** that can help fulfill the Wishes and at the same time, detect possible **Threats**.

## Making a diagnosis of the communication strategies of each project



During SWOT + Wishes analysis, take into account the perspective of your target stakeholder. Also, consider adopting different points of view, have in mind neutral, emotional, optimistic, creative, organisational & judgemental opinions.

## Co-designing communication actions



Chose the most feasible opportunities to involve your target stakeholder. Define possible communication actions, which benefit both the CS project and the stakeholder. Define a communication plan with prioritized and detailed actions and tasks.

## Defining indicators

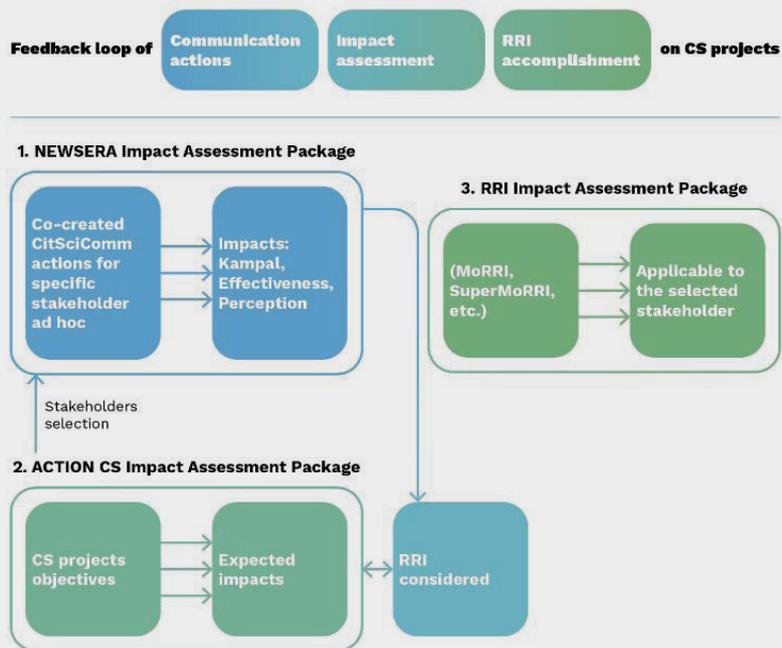


Define S.M.A.R.T. indicators (specific, measurable, realistic and timely) to measure the impact of your actions. Consider achieving societal, economical, political, scientific, educational and environmental impacts.

Figure 1. NEWSERA Methodology in four steps

## 1.B NEWSERA indicators and impact assessment methodology

NEWSERA established a new framework for the impact assessment of citizen science communication strategies (Giardullo *et al.*, 2021) taking into account different dimensions, such as communication, RRI (from the MoRRI and Super-MoRRI projects) and citizen science project objectives (from the ACTION project).



**Figure 2.** NEWSERA Framework for impact assessment of communication strategies in CS projects

Following on this framework model, NEWSERA suggests a set of indicators (NEWSERA Indicators Table), which correspond to three key macro-areas (Communication, Participation of quadruple helix stakeholders and Impact), each with three related sub-areas, as follows.

NEWSERA Indicators		
Communication	Participation of 4H Stakeholders	Impact
Channels (C)	Alignment with target audience (TAA)	Economic (E)
Actions (A)	Level of Engagement (LE)	Scientific (Sc)
Products (P)	Openness (O)	Political (P)
		Social (So)

**Figure 3.** Macro-areas and corresponding sub-areas from the NEWSERA framework of indicators

Furthermore, the comparison that emerged between the analyses of the NEWSERA pilots made it possible to create a flexible roadmap to monitor the effectiveness of the communication strategy used by a CS project, considering quadruple helix stakeholders and science and data journalists, in relation to outputs, outcomes and impact.

So, for any given CS project interested in carrying impact assessment (short, medium or long-term), NEWSERA suggests to plan another working session (approximately 2h) with the following steps:

- 1. Co-create indicators:** organise a co-creation working session by inviting representatives of the stakeholder of interest in order to build indicators taking into account their experience, from which new needs or unforeseen outcomes can be identified;
- 2. Analyze what exists:** look at the existing work plan, including objectives, actions, tasks and chronogram; choose which key macro-areas to submit to analysis and what data are or will be available;
- 3. Select the most suitable indicators:** query the indicators on the NEWSERA Indicators Table, that comply with the SMART rule and which can be feasible for one's project, considering the available economic and human resources; consider including other indicators that are not on the table if these can be more useful.

Communication actions	Tasks	Chronogram	NEWSERA Indicators			Specific Indicators													
ACTION 1	Task 1.1	<table border="1"> <tr><th colspan="4">YEAR</th></tr> <tr><th>Julio</th><th>Agosto</th><th>Septiembre</th><th>Octubre</th></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>	YEAR				Julio	Agosto	Septiembre	Octubre					Communication	C	Is the project on TV, radio, etc.?	✓	Number of TV appearances
	YEAR																		
	Julio	Agosto	Septiembre	Octubre															
Task 1.2		A	...	✓	...														
Task 1...		P	...		...														
ACTION 2	Task 2.1		Participation of 4H stakeholders	TAA	Are citizen scientists participating in publications or is their engagement recognized?	✗	Number of publications with CS as co-authors												
	Task 2.2			LE	...		Existence of co-authorship guidelines												
	Task 2...			O	...		...												
ACTION ...	Task 3.1		Impact	E	Does the project have any cooperation for exploitation?	✓	Number of products or services licensed												
	Task 3.2			Sc	...		...												
	Task 3...			P	...		...												
				So	...		...												

**Figure 4.** Co-design frame to build indicators together with the stakeholder of interest.

# Co-designing communication strategies targeting industry and SMEs

In order to inspire on the co-design of communication strategies, hereby are some of the actions and tasks defined and implemented by the NEWSERA Pilots involved in the Industry and SMEs CitSciComm Lab:

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## RiuNET

1. Identify and map the target audience - prioritise
2. Co-create a training course for trainers according to needs of the companies
3. Consolidate and validated methodology and training material developed; geographical expansion
4. Explore the cross-border potential of the research domain

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## BIOOK

1. Create a communication plan using Theory of Change
2. Define essence, mission, vision and values
3. Define narrative and challenges. Do desk research and look for references.
4. Understand the business model of potential stakeholders and define possible mechanisms for participation
5. Define the main goal and timeline, segment target audience, actions, tasks and indicators
6. Find funding opportunities (crowdfunding, match funding, etc)

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## Lixo Marinho

1. Launch an ideas contest
2. Create workshop addressing the potential of CS to tackle marine debris
3. Participate in events where the business sector and the plastics industry are (eg. Plastic Summit)
4. Explore the cross-continental potential with Africa, CS as an integrating factor in other Portuguese-speaking countries

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## Adopta una planta

1. Create a database of volunteers that can help in different roles and act as ambassadors of CS project
2. Attend networking activities, use platforms such as marketplace to look for new contacts
3. Use Linkedin and volunteers linkedin to reach interest groups
4. Create a database of potential donors, with detailed information of motivations, previous history of donations, segment according to people, foundations, companies, prioritise, maintain and update
5. Focus on promoting a specific product and co-create with participants to adapt to companies considering mutual benefits, create a matrix of services
6. Redesign website and create specific campaigns to gain donations, create a friends club, and seal of belonging

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## Vivencia Dehesa

1. Organise a Bioblitz (define activity, search partners, create a dissemination and crowdfunding campaign)
2. Create an onsite Pilot School (define activity, search partners, create a dissemination and crowdfunding campaign)
3. Use the School to create team building activities (define activity and added value to others available, identify target clients, design a campaign to attract segmented clients)
4. Benchmarking of virtual activities in other natural areas (elaborate material and disseminate through social media)
5. Organise a conference on natural products derived from the area

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**Sea Cleaner**

1. Establish contacts with SMEs producing plastics from pellets, to inform about the problems of accidental or intentional release of first-generation microplastics
2. Design brochures to be distributed in networking events (eg. EU4Ocean for Ocean Literacy Summit, International Clean Up Day, etc)
3. Create the Sea Cleaner label for recycled plastic products or environmentally sensitive production to be used by the industry
4. Look for synergies with other projects (Erasmus+, ERN)
5. Explore collaborations with local media and other opportunities, for example for environmental documentaries

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**Reef Check Italia Onlus**

1. Launch a project with the marine protected area in order to coordinate a nature discovery trail within the park supported by the experience and knowledge of citizen scientists as park guides (Tuscan Archipelago)
2. Participation and promotion of the International clean up day through collaboration both with other diving groups in the area and with companies that have a sustainable production approach towards the environment (For example, water water bottle suppliers)
3. Place a window on the website: Call for reefcheckers thus starting a recruitment campaign of citizen scientists

We hereby also include the selection of indicators used (N= number of projects that have selected the indicator to monitor) by the NEWSERA Pilots, but as aforementioned, the NEWSERA Indicators Table can be used ad hoc according to your own needs and stakeholder of interest.

**Table 1.** Overview of the indicators used by the NEWSERA Pilots, according to their work plan and target stakeholder.

Macro-Area	Sub-Area	Co-created indicator	N
Communication	Action	Does the project have a targeted outreach and communication strategy?	3
		Are citizen scientists involved in communicating, spreading, sharing results?	4
		Number of public meetings/events per year	8
		Does the project use informal and formal communication tools to get connection, upgrade and inform the citizens?	11
	Channels	Does the project have a presence on TV, radio, newspapers or magazines?	7
		Does the project have a presence on digital social networks?	4
		Does the project include innovative means of science communication and popular media (e.g. art)?	3
	Products	Increase in community reach on social media (twitter, fb, etc)	13
		Increase number of followers on social media	7

**Table 1.** Overview of the indicators used by the NEWSERA Pilots, according to their work plan and target stakeholder.

Macro-Area	Sub-Area	Co-created indicator	N	
Impact	Economic	Does the project have any cooperation for exploitation, e.g. with social entrepreneurs?	1	
		Does the project generate any economic impact, e.g. cost reduction, new job creation, new business model, etc.?	2	
	Political	Number of activities/reports related to policies	1	
		Does the project have any impact on political decisions?	6	
	Scientific	Does any cross-fertilization of projects take place?	4	
		Does the project link to experts from other disciplines?	3	
		Does the project collaborate with other initiatives at national or international level to enhance mutual learning and adaptation?	5	
		Number of scientific contributions	4	
		Social	Number of schools (number of teachers, number of students)	5
			Have you had any educational materials and resources derived from the project (e.g. MOOCs) being applied?	1
	Does the project collaborate with local organizations (e.g. in environmental or social fields)?		5	

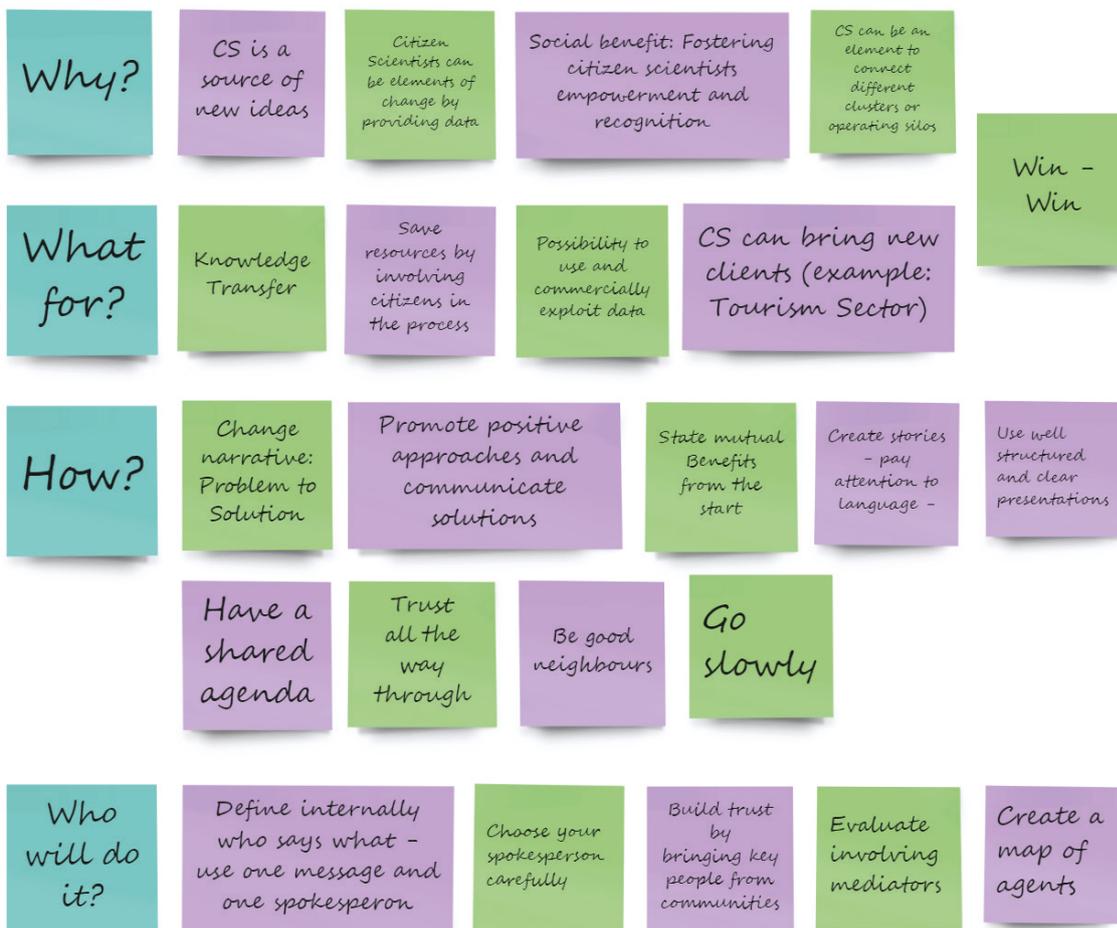
**Table 1.** Overview of the indicators used by the NEWSERA Pilots, according to their work plan and target stakeholder.

Macro-Area	Sub-Area	Co-created indicator	N
Stakeholder engagement	Level of participation	Are the participation options and the degree of involvement diversified? Which levels can people participate in?	1
		Are citizen scientists participating in publications or is their engagement recognized?	3
		Ratio of registered users and active users	3
		General level of engagement	10
	Openness	Are the project objectives and results clearly and transparently communicated?	1
		Does the project have a data management plan, IPR strategy and ethical guidelines?	1
		Is the data handling process transparent? (E.g. do citizens know what the data is used for, where the data is stored and shared?)	2
		Is the generated data shared publicly and under which conditions, e.g. anonymized, metadata, ownership, consent, etc.?	1
	Alignment with target audience	Diversity in project's public meetings composition in terms of Age range	5
		Diversity in project's public meetings composition in terms of Level of education	2
		Diversity in project's public meetings composition in terms of Gender	1
		Diversity in project's public meetings composition in terms of quadruple-helix representatives	4
		Does the project stimulate political and public sector participation (e.g. through participatory meetings, interviews, other means)?	9
		Does the project stimulate academic research participation (e.g. through data/methodology validation, participatory meetings, interviews, other means)?	1
		Does the project seek collaboration with science communication professionals?	3
		Has the project elaborated policy briefs or formats (infographics, etc.) directed to policy makers?	4

## 2. Messages, innovative tools and channels

Hereby we gather a compilation of the description and details of messages, innovative tools and channels NEWSERA pilots have used. Moreover, we included expected outcomes and impacts that communicative actions can have to sustain long term collaborations between CS projects and their specific target stakeholder.

### Messages



## Innovative Tools and channels



## Expected outcomes and impacts

Have industry as a partner

Mutual satisfaction from both sides

Establish long-term partnerships

Industry seeks you instead of the other way round

Generate new ideas/knowledge

Promote culture changes in industrial processes by integrating new practices

Consolidate CS as a viable and economic sector

Put CS under media focus

Spread the message that citizens can become scientists

Local knowledge can contribute to generate scientific results that impact society

Humanize media by talking about the process and people involved in the making of CS

Increase media impact

Improve social perception and involve more citizens in science

CS seen as a vehicle to innovation

Communication of uncertainty is key and that science is about consensus

# 3.

## Barriers and Mitigation Strategies

When addressing each of the 4H-stakeholders, we have found common barriers faced by the NEWSERA Pilots. Hereby we propose several mitigation strategies that can be planned in order to avoid or overcome these.

### Barriers

Industries and SMEs see CS as a science dissemination activity and not as a knowledge-generation activity, and have a lack of trust in CS-generated data.

Due to the nature of different working cultures, CS projects can face prejudices or conflicts can arise between activism and business.

Industries have a variety of needs, whilst CS works much on an ad-hoc basis, it's difficult to standardise and does not come with a prescribed solution.

The pace in work and obtaining results is different.

Lack of legislation and/or norms; Ethics and data protection (GDPR); Conflicts of interest.

There is a lack of awareness of internal communication good practices, often with aggressive tone and constant emailing.

CS projects do not inform periodically of their advances, and most articles in the press focus on results and not on the process nor the uncertainty in science.

### Mitigation strategies

Do pedagogy of CS benefits;  
Give examples of other success cases;  
Establish a network of ambassadors of your own projects to share successful stories;  
Use the media as your allies to demonstrate reliability;

Understand why you want to connect with industries;  
Look for spaces of mutual trust and benefit for your first meeting;  
Plan to invest time in F2F meetings;  
Look for strategic partners and create a seduction strategy;  
Demystify and eliminate stereotypes about industry;

Understand the variety of sectors in industry;  
Focus on their goals;  
Look for the long-term objectives;  
Anticipate drawbacks in order to be able to quickly respond and convince the other part.

Publish intermediate results.

Always declare conflicts of interest.

Use tools such as slack;  
Training in internal communication;

Report periodically to media and give feedback and follow up;  
Declare a legitimate cause for media;  
Establish clear rules of the game;  
Avoid controversy and conflicts of interest;  
Bring to the public arena the debate of uncertainty in the scientific process.

# 4.

## Lessons learnt: NEWSERA Pilot Case studies

In this section we illustrate NEWSERA pilots as case studies, including a brief description, aim, more concrete target audience within their stakeholder group, indicators and best practices. Each case study further develops on their successes and achievements towards their specific stakeholder within the CitSciComm Labs, and overall in the project itself.

During NEWSERA synergies between the different CS projects also occurred and themselves served as inspiration between each other, cultivating an active community of practice that expanded to other local, national and international networks (for example, ECS platform, National associations of CS, the SwafS-19 sister projects, the Spanish Observatory of CS, etc.) and that will surely hold after NEWSERA ends, either independently and/or connected via new initiatives. In each of the blueprints we share some “seed” examples that emerged during the project.

### Project

## RiuNet

### What was this project about?

RiuNet is an interactive educational tool that guides any citizen in the assessment of the hydrological and ecological status of a river. In addition, it is a CS project since it provides scientific data.



[www.riunet.net](http://www.riunet.net)

### Main Goal

Train future trainers from the recreation & Leisure industry sector.

### Target audience

Recreation & Leisure Industry.

### Good example for

Impact, Economic & Scientific.

### Best practices:

RiuNet team is part of an academic research group. The activity itself of monitoring rivers is **time consuming and requires training**. In order to optimise time and human resources limitations, they established connections with companies that offer **open-air leisure time activities**. First understanding their needs and/or requirements, in order to co-create and implement a presential course for **“Train the Trainers”**, on assessment of the hydrological and ecological status of a river. Companies can then offer an activity based on the RiuNet app. They are also considering creating a **virtual space** for gathering feedback, results and doubts that can be used for **iterative assessment** and creating an active community.

## RiuNet - 2014-2022



### **Their feedback on NEWSERA participation:**

*“Making our work plan with experts in other fields (e.g. social sciences, journalists) was enriching. It was interesting to have external and neutral points of view when planning a communication campaign or action strategy.”*

# Sea Cleaner



## What was this project about?

Sea Cleaner is focused on the problem of anthropogenic waste in the marine environment. Citizens are an active part in monitoring and data collection processes, together with professional researchers or trainers.

<https://sites.google.com/view/seacleaner/home-page>

## Main Goal

Launching CS activities for the purpose of scientific research, preparing material for the dissemination of the results to be shared with both the economic actors in the area and citizens. Sea Cleaner offers scientific education and training courses in collaboration with primary and secondary schools.

## Target audience

Plastics Industry, environmental NGOs and National Parks.

## Good example for

Impact, social & economic.

## Best practices

Sea Cleaner acts through a **multilevel approach** with respect to both target and level of action: at the **local/national level**, it has disseminated the **issues addressed** (bioplastic degradation and diffusion of pellet pollution in the sea) using TV, Radio and social channels **towards companies**, as the main target; at the **EU level**, it has presented the outcomes to **policymakers** convened at the **EU Maritime Day**, in Ravenna. In addition, in order to **educate and raise awareness** on the issues dealt with the largest number of researchers, students, teachers, citizens, it has carried out a widespread CS activity by **activating collaborations with other EU projects** (Erasmus+ BluesMed, BlueNights and ERN) and with **established environmental associations** (Legambiente and 5 national parks). Communication achievements, in addition to the restyling of the website and the publication of a Policy Brief, include other format, such as the **exhibition** "Plastic and Us: looking at the marine litter problem from inside the rubbish" as an example of an **innovative return to citizens and businesses of the plastics and microplastics collected during monitoring**.



Pictures from the "Plastic and Us: looking at the marine litter problem from inside the rubbish" temporary exhibition, at the Natural History Museum of the University of Pisa.

## Their feedback on NEWSERA participation:

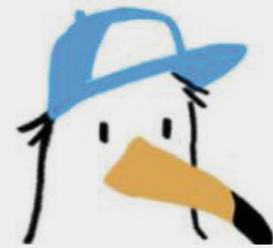
*"Meetings and discussions with other CS projects, journalists and with the NEWSERA representatives were always fruitful and the people involved very helpful."*

## Project

# Lixo Marinho

### What was this project about?

Lixomarinho.app is a platform that allows simple counting and mapping of marine litter on beaches along the Portuguese coast, namely during beach cleaning events, aiming to function as a national observatory for marine litter.



[www.lixomarinho.app](http://www.lixomarinho.app)

### Main Goal

Raise awareness among society to combat marine litter, contributing to the preservation of the oceans, and alert the competent authorities to the urgency in adopting measures to mitigate this serious global environmental problem.

### Target audience

Plastics industry

### Good example for

Economic & Scientific Impact

### Best practices:

Compilation of all data produced in a simple and organised way, so that it informs several society actors, including policy makers, about pollution levels, with the aim of raising awareness and reducing marine litter emissions to the environment, promoting effective changes in the pollution levels on the coast. They focused on a strategy to **establish contacts with Industries and SMEs in order to look for solutions to go for plastics with a lower impact, long life, recyclable and reusable**. The project was **presented in one workshop and a meeting on technology and CS** where more than 20 companies participated, obtaining a stronger engagement with the industry sector, both at **regional and national level**, which was very positive since **there was no connection before**. The **concept of CS was introduced to industries opening opportunities to collaborative work** in the future. From the different interactions with the industry and SMEs sector, one company approached the project to participate in **capacity building events** for companies, whilst one **NGO/company used the app in its outdoor activities**.

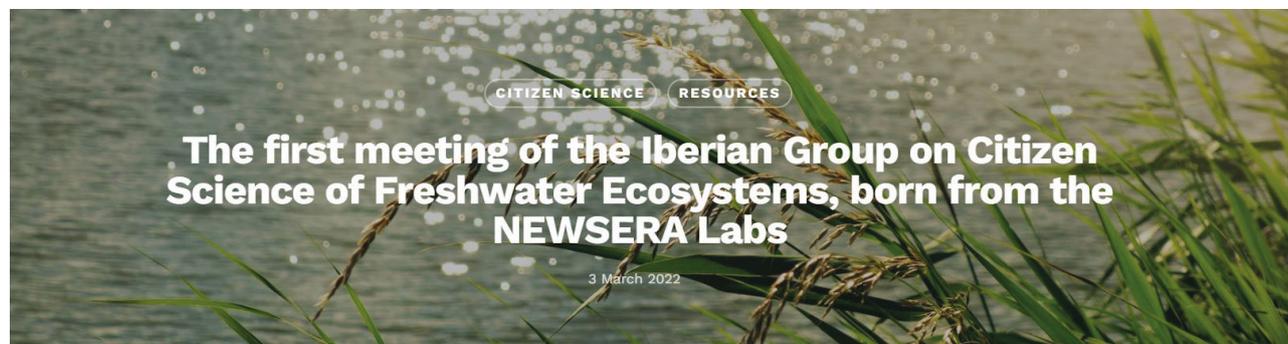


### Their feedback on NEWSERA participation:

*“Very positive, we are a very local and small project with limited resources and we could clearly see some opportunities to better communicate CS and our project to all stakeholders. We shared experiences and best practices that we can (hopefully) implement soon.”*

# Other successful stories from NEWSERA Pilots

## CITIZEN SCIENCE TO TACKLE CROSS-BORDER CHALLENGES



### How did the group start?

Citizen science is becoming a flowering ecosystem, and projects are addressing a multitude of different environmental and social issues. While some issues are inherently local, **others can benefit greatly from cross-border synergies in neighbouring countries: for example biodiversity, climate change, or water ecosystems, that often span across wide territories and are affected by activities in different countries.** That's why projects based in Spain and Portugal decided to meet and discuss common concerns.

The idea of collaborating sparked from the representatives of NEWSERA Pilot projects RiuNet (Spain) and Rios Potáveis (Portugal), together with NEWSERA team members, during periodic mentoring sessions; they detected the clear need of exchanging experiences, validating and upscaling methodologies, and bringing people together around the topic of citizen science for freshwater ecosystems.

After the initial contacts, this need evolved into the idea of creating a group of interest of researchers, managers and educators from Spain and Portugal that are working or want to work with citizen science related to water. This development happened with the **involvement of different entities that work with freshwater ecosystems or citizen science** (or both), namely: Plataforma de Ciência Aberta – Município de Figueira Castelo Rodrigo, Faculdade de Ciências – Universidade de Lisboa, Science for Change and FEHMLab – Universitat de Barcelona.

### The first meeting

Just a few months later, on January 13 2022, the first meeting of the Iberian interest group on citizen science of freshwater ecosystems took place.

It involved the participation of **23 people from 17 projects**, including the ones aforementioned as well as: Observatorio Ciudadano de la Sequía – Universidad Pablo Olavide, Living River – Universidade Nova de Lisboa and Universidade de Coimbra, AquaColab – Universidad de Burgos, Ríos ciudadanos, Projeto Rios – ASPEA, Floodup, Grupo MiraVolta, Projecte Rius – Associació hàbitats, Rios Livres, GEOTA, the Red Càntabra de Desarrollo Rural, eGroundWater-ISEG, Pescadors de Plàstics, and CITAQUA – Universidade de Aveiro, Bioazul.

It was an opportunity for participants from the academia, industry, and citizens and society at large (NGOs) sectors, to get to know each other, introduce the different projects they were working on, and start a discussion on common interests, issues, and opportunities at hand.

**Goal:** Create a community of CS projects at the Iberian level focused on continental aquatic ecosystems. Share present and future concerns.

**Current and future steps:** Create a periodic meeting calendar for working topics, as follows:

- *Data validation and analysis;*
- *Community participation: involvement with stakeholders (citizens, industry, management);*
- *Education;*
- *Communication and awareness;*
- *Financing;*
- *Governance: impact on citizen science;*
- *Joint proposals between projects.*

**Still need to attract other stakeholders:** Public sector and policymakers, representatives from the media sector.

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# The way to go: recommendations to efficiently engage with Industries and SMEs for wider impact

- **Map industries** to understand the different typologies of the private, public and third sector to align the engagement strategies: first, identify the industry typology of your interest; second, map their possible interests in participating and how they align with your CS agenda; third, identify a spokesperson in your organisation and a person of contact from the industry.
- **Establish the game rules:** try to engage your CS project' interest with the vision and mission of the industry. Consider co-creating with them, adapt mechanisms, timings and establish regular feedback.
- **Show successful case studies and evidence from other projects** to generate trustworthy relationships: build up a social capital network to gain credibility, shape services for the industry and ask the scientific community for support.
- **Be proactive.** CS-generated data is valuable: show the added value of CS generated-data to improve products, services, social and environmental capital.
- **Involve industries with social commitment:** engage them from the beginning of your project to build trust and benefit mutual interests. Explain how CS-generated data is reliable and can benefit the industry. Use arguments to convince of the importance of CS, for instance, in rethinking the organisational culture and developing new talent.
- **Plan your actions:** work on your message by explaining the benefits the industry can take from participating in a CS project. Start by looking at the industry's social media, for instance, LinkedIn is the most used platform for professional purposes. Besides, congresses, fairs and other face-to-face activities are a great way of knowing them before sending an email. Last but not least, choose a charismatic spokesperson as a CS ambassador from your organisation.
- **Network with sister citizen science projects:** build up a social capital network to gain credibility and to ensure social impact.

# General resources

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## NEWSERA Policy Briefs

NEWSERA Policy Brief 1  
<https://doi.org/10.5281/zenodo.4837244>

NEWSERA Policy Brief 2  
<https://doi.org/10.5281/zenodo.7752561>

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## Guides and online training

Guide of science communication for citizen science projects and citizen science journalism  
<https://doi.org/10.5281/zenodo.7752525>

### How do you transform citizen science data into a news story?

YouTube link:  
[https://youtu.be/Y\\_lAo321\\_V4](https://youtu.be/Y_lAo321_V4)  
*Invited talks from science and data journalists - only available in Spanish*

### Data4CitSciNews conference

YouTube link: <https://www.youtube.com/live/EwDdfJ7yFoY>  
*Invited talks from scientists, journalists and designers to debate on the state of the art in data journalism, fake news and the concept of citizen science journalism*

### Online workshop on common challenges for citizen science:

communication. Organised by Scivil – Citizen Science Vlaanderen YouTube link: <https://youtu.be/9a700xeWTeQ>

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## Relevant Publications from the NEWSERA Consortium in Open Access

Magalhães, J., Guasch, B., Arias, R., Giardullo, P., Elorza, A., Navalhas, I., Marín-González, E., Mazzonetto, M. and Luís, C. (2022). 'A methodological approach to co-design citizen science communication strategies directed to quadruple-helix stakeholders'. JCOM 21 (04), A05.  
<https://doi.org/10.22323/2.21040205>

*Here you will find our methodology to co-design a CS project communication strategy together with the stakeholder of interest. You can adapt to your own specific case.*

Luís, C., Navalhas, I., Marín-González, E., Magalhães, J., Arias, R., Giardullo, P., Leguina, L. Keeping participants engaged in citizen science projects: the role of science communication strategies. PoS (CitSci2002) 017.

<https://pos.sissa.it/418/017/pdf>

*Here you will find a methodology to discuss with CS project managers, participants, and other stakeholders, the challenges faced in maintaining long-term engagement, specifically focusing on citizens as the main stakeholder target group.*

Giardullo, P., Neresini, F., Magalhães, J., Luís, C., Marín-González, E. and Arias, R. (2023). Citizen science and participatory science communication: an empirically informed discussion connecting research and theory. JCOM 22(2), A01.

<https://doi.org/10.22323/2.22020201>

*Our exploration consisted in a survey involving 157 CS projects around the EU. We found that CS projects tend to communicate through social media mainly reproducing a knowledge transfer mode. This may hinder effective encounters with both participants and potential target audiences.*

Giardullo, P., Arias, R., Leguina, L., Magalhães, J. (2021) Responsible and inclusive citizen science: comparing initiatives and assessing impacts. Tecnoscienza 24, 12, 2

<http://www.tecnoscienza.net/index.php/tsj/article/view/480/294>.

*This paper resumes the variety of notions of participation, citizenship, and democratization of science in CS as they emerged during a panel carried out during the XIII STS Italia Conference "Dis/entangling Technoscience" held in June 2021.*

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## Relevant public deliverables from the NEWSERA Consortium

Giardullo P, Citarella MA, Neresini F, Magalhães J, Arias R, Guasch B, Pelacho M, Luís C (2021) NEWSERA - Report on indicators for impact assessment of science communication in Citizen Science Projects (Deliverable 2.2) (1.1). Zenodo.

<https://doi.org/10.5281/zenodo.5139999>

Leguina, Magalhães J, Tola E, Guasch B, Elorza A, Lacunza I, Arias R. (2023). Citizen Science as a communication tool in the Post-Factual Era. (Deliverable 3.7) (v1.2). Deliverable report of project H2020 NEWSERA (grant agreement No 873125). Zenodo.

<https://doi.org/10.5281/zenodo.7689045>

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## Relevant Publications from our Pilots

Liñán S, *et al.* (2022) A new theoretical engagement framework for citizen science projects: using a multi-temporal approach to address long-term public engagement challenges. *Environ. Res. Lett.* 17 105006

<https://doi.org/10.1088/1748-9326/ac939d>

Garrison H, Agostinho M, *et al.* (2021) Reflections on meaningful and impactful stakeholder engagement in fundamental research. *EMBO Reports* (2021)22:e54000

<https://doi.org/10.15252/embr.202154000>

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## Others

Frontiers Research Topic “Bridging Citizen Science and Science Communication”, with Yaela Golumbic, Alice Motion, Joseph Roche and Joana Magalhães as co-editors

<https://www.frontiersin.org/research-topics/48185/bridging-citizen-science-and-science-communication>

Carayannis EG and Campbell DFJ (2009) ‘Mode 3’ and ‘Quadruple Helix’: toward a 21st century fractal innovation ecosystem. *Inter J Tech Manag*, 46:3-4, 201-234.

<https://doi.org/10.1504/IJTM.2009.023374>

A 10-step guide to writing citizen science project descriptions that spark interest and attracts volunteers - CS Track Project

<https://cstrack.eu/format/news/how-to-write-an-engaging-citizen-science-project-description/>

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## SwafS-19 sister Projects

“Science communication: Empowering citizens in the public discussion of science”-CORDIS RESULTS PACK

<https://cordis.europa.eu/article/id/442429-science-communication-empowering-citizens-in-the-public-discussion-of-science>

Roche J, Arias R, Bell L, Boscolo M, Fornetti A, Knutas A, Kupper F, Magalhães J, Mannino I, Mendoza I, Moreno-Castro C, Murphy K, Pridmore J, Smyth F, Tola E, Tulin M, Weitkamp E and Wolff A (2021) Taking Stock and Re-Examining the Role of Science Communication. *Front. Environ. Sci.* 9:734081.

<https://www.frontiersin.org/articles/10.3389/fenvs.2021.734081/full>

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