Guide of Science Communication in Citizen Science projects and Citizen Science Journalism

NEWSERA
#CITSCI IS THE NEW #SCICOMM

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Topic	Duration	Website
SwafS-19-2018-2019-2020. Taking stock and re-examining the role of science communication	January 1st 2020 - March 31st 2023 (39 months)	**https://newsera2020.eu/**

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Introduction

Taking Stock and Re-Examining the Role of Science Communication was a Research and Innovation Action, from “Science with and for Society” (SwafS), of the European Commission’s 2018–2020 Horizon 2020 Work Programme, with the main goal of assessing science communication and its perception by citizens to construct a knowledge base that will build trust in science and empower citizens through enhanced accuracy of information, more effective communication, and multidirectional knowledge flows between all stakeholders.

As part of the European Commission’s eighth framework programme, Horizon 2020, 8 sister projects were funded for the SwafS-19 calls launched in 2018, 2019 and 2020, CONCISE, RETHINK, and QUEST; TRESCA, NEWSERA, and ParCos; and finally ENJOI and GlobalSCAPE.

NEWSERA's main goal was to analyse and evaluate the complexities of science communication in citizen science (CS). The project was devised around the citizen science communication (#CitSciComm) Labs, a collaborative and participatory space where enrolled CS projects, the NEWSERA Pilots, came together with invited stakeholders from the quadruple helix (4H) model (citizens and society at large, academic scientists, policymakers and industry and SMEs), and science and data journalists as well as other science communication professionals.

Growing with time and with projects, NEWSERA team started an informal role of mentorship of the pilots and adapted the initial CitSciComm Labs methodology

Starting early 2020, and due to the pandemics, the team had to adapt for virtual environments and digital participatory interfaces. This posed an opportunity to enroll more projects, 39 instead of the initial 4 planned, as well as an increase in the number of representative stakeholders involved in the co-creation activities within each lab (up to 140), whilst the labs tool place in a delocalised format in the three countries involved, enabling the activities to be conducted in local languages (Roche *et al.*, 2021).

Growing with time and with projects, NEWSERA team started an informal role of mentorship of the pilots and adapted the initial CitSciComm Labs methodology in order to cover capacity building and training gaps detected. These were focused on cross-cutting and emerging issues that affect science communication in and from CS projects, but also scientific projects in general, related to: participatory and co-design methodologies, impact assessment, ethics and the spread of misinformation, communicating in social media, and, finally, visual storytelling and digital narratives techniques such as the ones covered by data journalism. The development of the project also served to increase social capital - “features of social organization, such as networks, norms, or trust, that facilitate coordination and cooperation for mutual benefit”[1] - within the NEWSERA community itself and its pilots and, it is desirable, in any citizen science project.

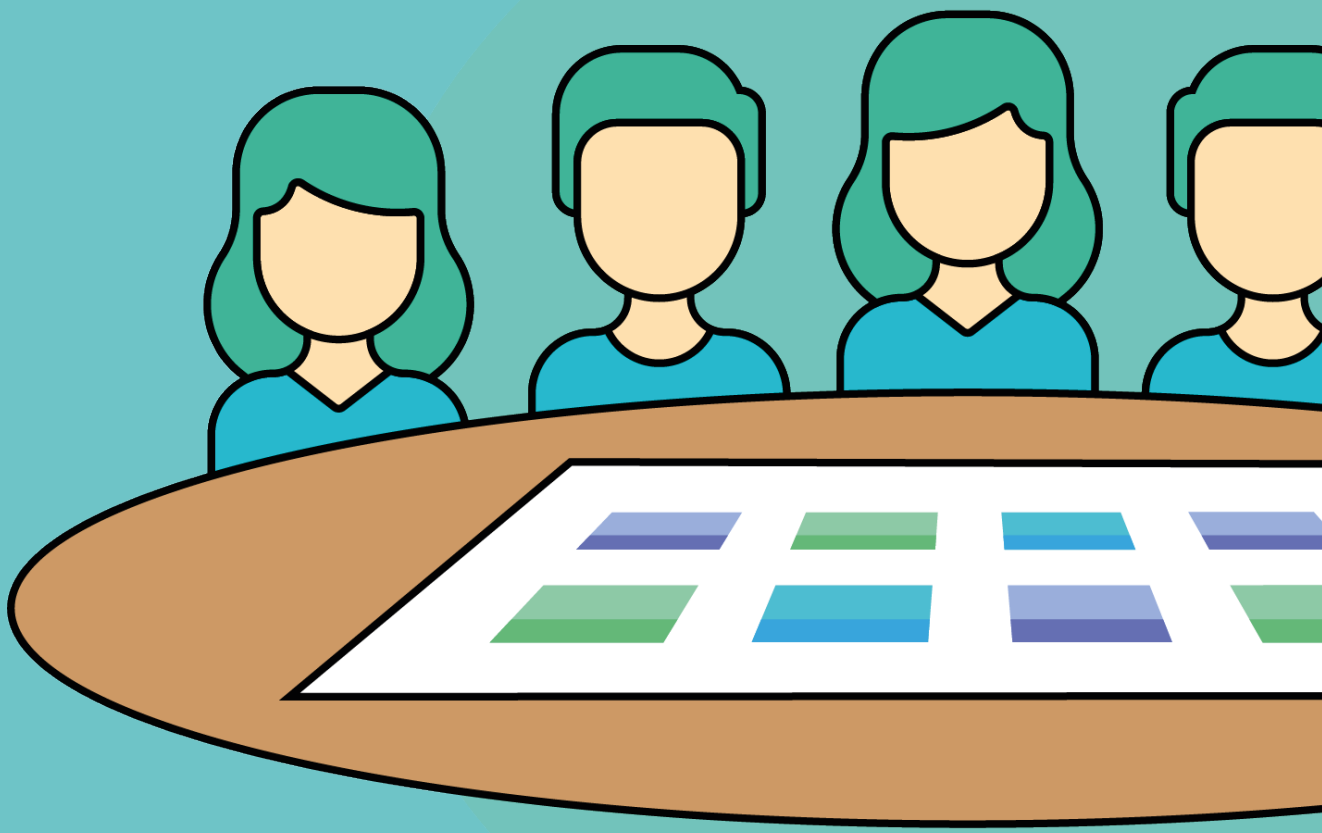
(1) Putnam RD. (1993) The Prosperous Community: Social Capital and Public Life. The American Prospect 13:35-42.

This last issue mentioned was indeed part of our initial plan devised as an independent Lab where we considered proposing and testing the concept of CS journalism (#citscijournalism), where perspectives from both CS and data journalism come together. Using tools and practices that are typical of data journalism, CS-generated data can come alive, enter a shared narrative, prove to be of public interest and, ultimately, find other ways to contribute to public knowledge.

From this experience we have gathered our learnings in multiple documents that we hope can inspire the broader CS and science communication communities. These include five blueprints with and for each of the quadruple helix stakeholders and science and data journalists, policy briefs and finally this guide of science communication in CS projects and citizen science journalism.

Intended as a must-have tool for all those who want to start or rethink their own communication strategies, we hope you find it useful.

Co-design in science communication for citizen science projects



Paving the way for effective communication strategies that reach wider as well as diversified audiences according to each CS project' needs was one of the main goals of NEWSERA. This required 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 intersectionality (Magalhães *et al*., 2022).

To support this process, NEWSERA established the #CitSciComm Labs, where 39 NEWSERA pilots tested on the field the co-design, implementation and validation of communication strategies specifically addressed to each of the 4H stakeholders. NEWSERA pilots worked together with stakeholders' representatives (which could be seen as "end-users" or "co-producers" of CS-generated data and/or research) and science communication experts, as mediators, from the very beginning of the process in order to take into account their needs and mutual benefits. Due to the complex nature of CS projects, an iterative approach supported by continuous impact indicators monitoring was essential, allowing flexibility and adjustments along the different phases of implementation.

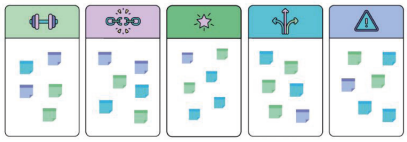
Co-designing communication strategies

NEWSERA co-design methodology for communication strategies specifically addressed to 4H stakeholders involves four main steps: 1 and 2) define project's objectives having in mind both CS project and stakeholder's point of view. On this basis, NEWSERA recommends performing a dynamic analysis of the strengths, weaknesses, wishes, opportunities and threats, where each participant is further encouraged to adopt different perspectives; 3) co-design communication actions and specific tasks; for this, the opportunities previously detected can be transformed into ad hoc communication actions and tasks. Alongside, the channels, communication tools and messages to be explored are defined; and 4) conduct a first screening of specific, measurable, realistic and timely (S.M.A.R.T) indicators which can be further explored. This methodology is extensively described elsewhere (Magalhães *et al*., 2022).

Defining projects' and stakeholders' perspectives as well as objectives

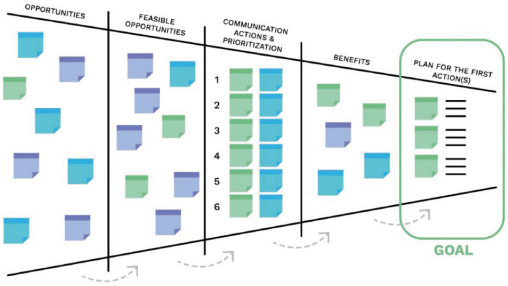
About your CS project: identify **S**trenghts ("what do you have"), **W**eaknesses ("what you don't have"), **W**ishes ("what you want to achieve"). Then brainstorm **O**pportunities that can help fulfill the Wishes and at the same time, detect possible **T**hreats.

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.

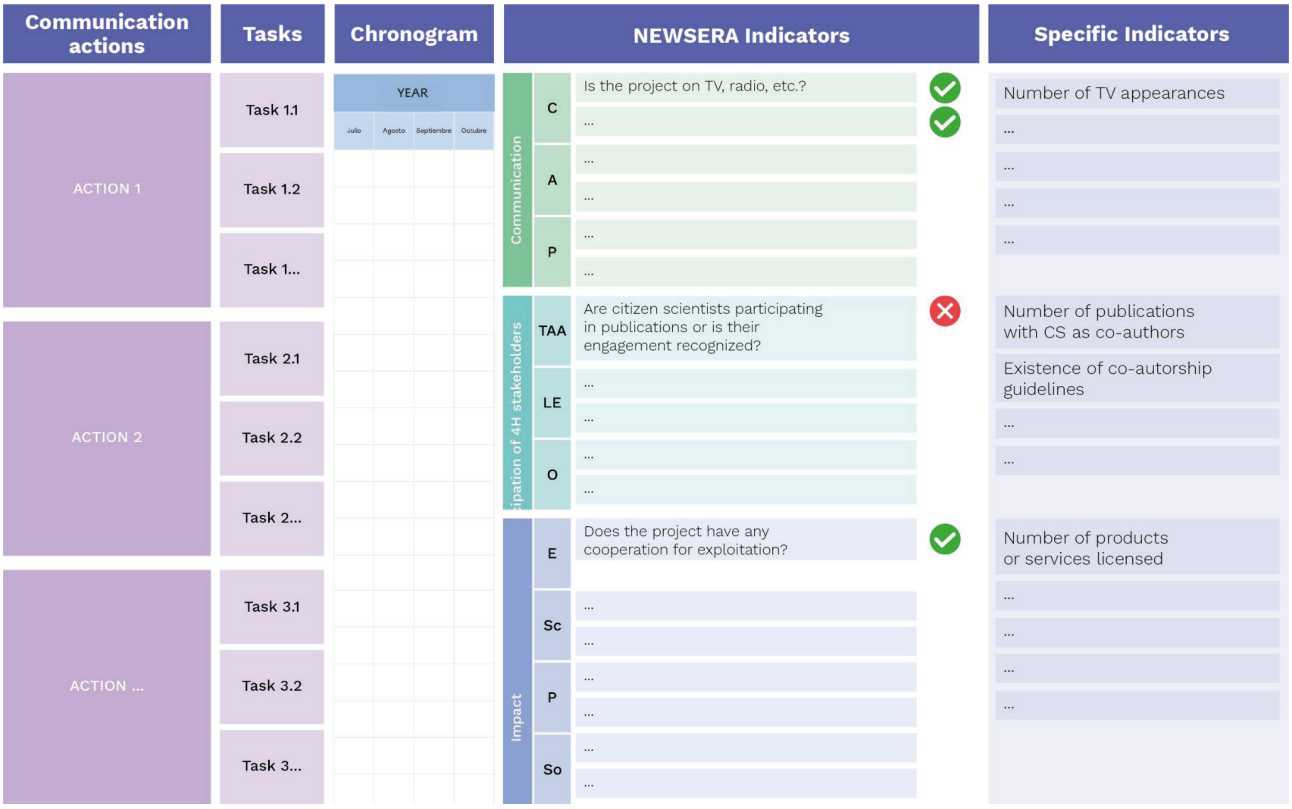
Co-designing indicators for impact assessment

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 projects' objectives (from the ACTION project). Based on this framework model, the NEWSERA Indicators were organised in three key macro-areas, Communication, Participation of quadruple helix stakeholders and Impact), each with three related sub-areas, and specific indicators that can be found elsewhere (Giardullo *et al.*, 2023).

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)

For any given project who wishes to establish communication indicators and monitor impact along time, NEWSERA proposes to:

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 S.M.A.R.T 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.



Tackling misinformation: how to deliver ethically-sound and reliable initiatives

During NEWSERA #CitSciComm Labs we identified several challenges related to communication strategies in and from CS initiatives, amongst which, ethical issues and the rise of misinformation, disinformation and fake news, play a key role in trust relationships not only amongst citizen scientists but in a broader spectrum, other stakeholders and society.

Addressing ethical issues involved in a large number of complex situations and decisions in CS and its communication will have a direct impact in undertaking CS as a reliable source of scientific knowledge for facing emerging societal challenges, informed decision making and social justice. Only sound projects, specifically in the ethical aspects related to processes, data and communication, can lead to excellent science, increased trust between stakeholders, stable cooperation and sustainability of projects and, eventually, to more and better impacts (Pelacho, 2021).

Throughout the development of the project, NEWSERA integrated an ethical dimension in all actions as a cross-cutting approach. Moreover, the participatory processes adopted during the Labs enabled the joint identification of ethical issues and the co-creation of a checklist on good practices on ethical aspects in three main areas defined for science communication (external and internal communication, and community building) to be considered by projects working with CS methodologies, that are shared hereby.

Bad practices to avoid and Good practices to enhance ethical aspects of the communication strategies of citizen science projects

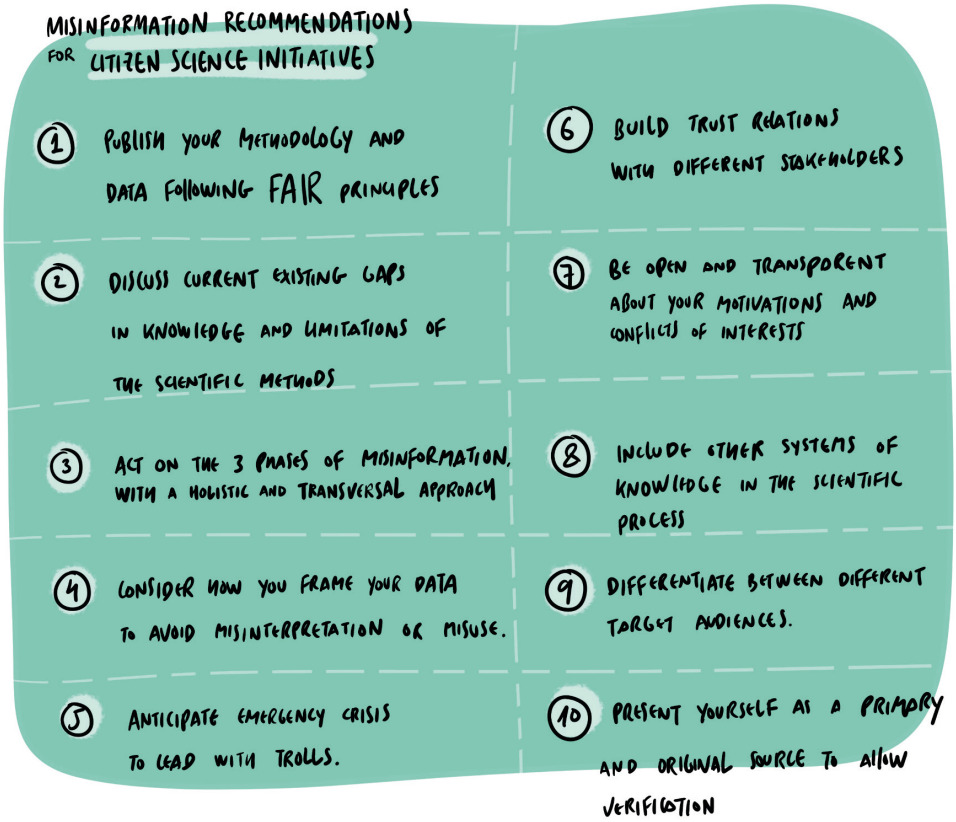
Area	Avoid bad practices	Adopt good practices
EXTERNAL COMMUNICATION	Address "fashionable" topics that may be of more interest to the media than others of more social relevance Publish data in unfamiliar formats or formats that are difficult to use by non-experts	Hold meetings on research results aimed at different audiences Create specific material for journalists Use an inclusive language
	Prioritise scientific publication over other types of publications	Facilitate accessibility: publish in open access press, include subtitles, audio description, captions and easy reading
	Fail to acknowledge the involvement of participants in the research design itself (not just in results), where it has existed	Make explicit the role of the specific groups, including participation lists (prior consent) Promote the visibility and fair recognition of participants

Area	Avoid bad practices	Adopt good practices
	Maintain rigid hierarchies about who participates and who makes decisions about the research Fail to include mechanisms for participants to be part of the research design	Understand and assess the needs of different involved people, the degree and mode of participation
INTERNAL COMMUNICATION	Use privacy as a pretext for reducing access to information	Use direct communication channels (phone, videoconference) together with other channels (in person meetings, forum, blog, instant messaging groups, etc.) Create sectoral messaging groups/ meetings
	Analyse citizens' expectations superficially	Establish and agree on the various functions and roles Define the participants's tasks, as well as functions and constraints in very clear terms
	Fail to identify or acknowledge the existence of conflicts of interest Maintain biases linked to scientific objectives that may conflict with other areas	Explain who creates a project, how and why
COMMUNITY BUILDING	Fail to enhance benefits for participants, such as courses, training, recognition, etc.	Create moments of protagonism, acceptance and overcoming prejudices
	Avoid or minimise problems without the necessary transparency	Enhance the involvement (consultation, active participation, etc.) of stakeholders in the communication of results
	Share only the strengths of the results and not the weaknesses	Be able to produce science recognisable by stakeholders

Citizens involved in CS projects are fundamental to the process of CS research as data collectors and/or producers - or playing other relevant roles across the research cycle - and can also become key players when it comes to disseminating science and educational roles, becoming themselves new actors in the everyday larger community of non-traditional science communicators.

On “Citizen Science as a communication tool in the Post-Factual Era” (Leguina *et al.*, 2023), NEWSERA initiated a reflection on the potential of CS as a science communication tool to tackle misinformation (which in science communication refers to the dissemination of false or inaccurate information that misleads the public about scientific facts and concepts). For this, NEWSERA explored different formats based on training, co-creation exercises, case studies and the **Data4CitSciNews conference**[2], which allowed us to, first, better understand the nature of misinformation on science communication; and secondly, to identify the present and future role of CS in this important ethical issue.

The main output derived from the Ethics and Misinformation CitSciComm Lab, is a decalogue with co-created and externally validated recommendations for CS initiatives on how to use data and information to effectively help tackle misinformation.

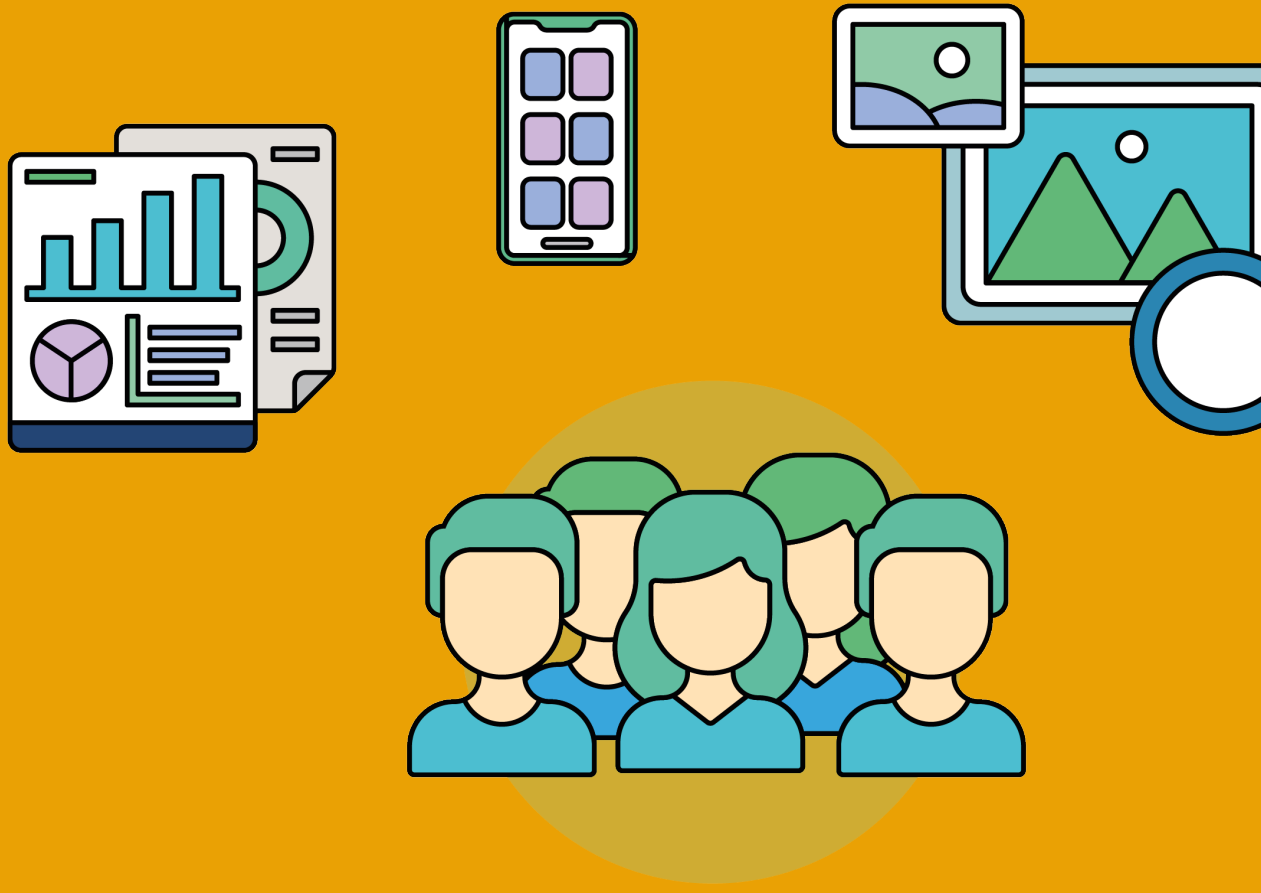


*
FAIR principles (Findable, Accessible, Interoperable, and Reusable)

**
3 phases of misinformation: production, dissemination and consumption

(2) https://newsera2020.eu/2022/11/30/data4citscinews-interconnecting-journalism-and-citizen-science/

Succeeding on social media



Science communication occurs frequently nowadays through social media platforms like Facebook, Instagram, Twitter or TikTok, since large audiences have access to them.

Despite all potential problems with communication in social media (e.g., disinformation or misinformation), CS projects can greatly benefit from their exposure in these media.

The sense of community building is an important point in social media as it allows CS projects to engage with a community that shares the same research interests.
To be able to communicate with social media audiences, CS projects need to make sure the content is of high quality, shareable, concise, easy to read and with no jargon or difficult words.
When sharing content, it is relevant to stimulate curiosity and/or action, while going towards topics of interest.

Here are some tips to communicate CS projects on social media:

- Try to make connections, namely with other CS projects that are on social media. Look for organisations with whom your project can have posts together and profit from their large network
- Only share contents recognized as reliable
- Social media is about interaction, so interact with your community. Don't limit yourself to answer comments but start conversations on common topics of interest
- Sometimes the content can be fun, whilst relevant: that increases the probability of being shared
- The human side is also important, so try to give a personal touch to the content published
- The content should be clear and accessible for everyone, and adapted to each platform
- Use events such as national days or anniversaries to share content of your own project – so keep in mind to plan ahead
- Ask social media users what they think about your project content
- Try to create engagement and opportunities to initiate conversations
- Use hashtags and make the most of them
- Don't forget to fact-check your content, keep your references linked and make your sources visible
- Make use of social media listening tools; we learnt a lot in NEWSERA using Kampal, especially in regards to better understand how communities work
- Analyse the metrics behind your accounts and better target your audiences

Targeting quadruple helix stakeholders – the NEWSERA Pilots experience

The aim of NEWSERA is to show the virtues of CS as an inclusive, broad and powerful science communication mechanism that increases trust in science communication and, in turn, in science at large, while opening up science and innovation to society, raising awareness and educating in science, and reducing the chances of incurring in fake news, by means of promoting critical thinking.

To test this, 39 CS initiatives from Italy, Portugal and Spain enrolled as the NEWSERA pilots in the development of communication strategies, specifically targeting 4H-stakeholders, and science and data journalists. The pilots, together with representatives of the 4H stakeholder groups, science and data journalisms experts and the NEWSERA consortium, participated in the #CitSciComm Labs where communication strategies were co-designed, implemented and validated.

The NEWSERA Blueprints for and with each of the 4H-stakeholders and science and data journalists constitute one of the main outputs of the Labs.

NEWSERA Blueprints deepen on the importance to address the aforementioned stakeholders and mutual benefits for involving them in the co-design of a CS project communication plan. These provide specific examples of targeted communication plans and indicators co-created by the NEWSERA Pilots and stakeholder representatives, with the methodology detailed in "Co-design in science communication for citizen science projects" section of this guide. Furthermore, specific case-studies have been included.

Hereby we include the main recommendations to efficiently engage with quadruple helix stakeholders for wider impact of a CS project, but which could be extrapolated to other types of projects.

Citizen scientists and society at large

- **Identify citizen's groups for your CS project:** it is worth starting at the beginning of any CS project the analysis of the needs, expectations and motivations of the citizens in order to better engage and communicate with them.
- **Foster public engagement:** this will make the process of knowledge creation more open towards the entire society. Co-creating the project with society at large makes you more aligned with societal needs and concerns, fostering the best social capital.
- **Team up with other existing groups:** intercepting potential participants through initiatives on the territory; Creating exchange meetings where every citizen can intervene brings more social robustness to your project.
- **Involve citizens in doing science:** engage citizens as sensors, data interpreters, up to active collaborators in identifying the research problem, setting up research questions and analyse data.

- **Take into account the analysis, project planning and dissemination:** use co-design methodologies to carry out preliminary project analysis by involving citizens to participate in both educational and informational events. Encourage co-production of scientific content, data collection and dissemination tools together with the citizen scientists.
- **Plan the communication strategy beforehand:** use innovative co-produced narrative styles and registers (ironic/emotional communication), sharing updated information and data with defined time frames. It takes time and requires specific dedication, however, it assures that the citizens' voices are heard.
- **Be flexible in times of crisis:** social media can be useful to maintain regular communication, use gamification to ensure a high rate of participation.
- **Practise active listening:** willingness to adopt an approach that gathers input from several citizens addressing marginality and fragility through the use of synergies and virtuous alliances.
- **Address fake news:** citizens can become an evidence-informed network to tackle fake scientific information; society only needs training.

Career Scientists

- **Involve researchers and academics:** present citizen science projects in academic fora (conferences, journals, etc.) beyond the citizen science "bubble".
- **Contact science broadcasters and research centers:** collaborate and identify champions within the scientific community. Co-creating a CS project with scientists can take part in any phase of the research, from ideation and proposal planning to co-creating validation processes.
- **Foster networking with scientists from other disciplines:** collaboration is key to strengthen the transdisciplinary character of CS projects.
- **Pay special attention to communication materials:** do desk research about quality audiovisual and graphic resources, and learn from other disciplines (e.g. sociocultural animation).
- **Make sure to communicate the science within the project:** communicate the scientific features of CS projects to academic scientists. This way the scientific community will understand that CS is real science, and can create a positive spill-over effect in the community.
- **Advocate for higher investment in science dissemination:** not only high quality materials require investment (such as guides, videos or infographics), but also learning new skills require time and resources (e.g. how to undertake presentations). Additionally, inclusive audiovisual materials are costly and require high investments.
- **Show the value of CS projects for greater social impact than a traditional research project:** make sure to leave room for disseminating CS-generated data and promote dissemination workshops.

- **Lobby for greater sustainability of CS projects:** CS ecosystem can be strengthened by many means, from professional networkings, reusing existing experiences and resources, involving citizens from the beginning and in all phases of the research, to advocating to include the CS methodology in traditional research fields.
- **Promote Open Science:** CS can contribute to embrace open science and improve the quality, efficiency, and responsiveness of any research.

Policymakers

- **Timing is crucial:** It is essential to connect with policy agendas and identify the right moment to collaborate with policymakers. To maximise impact, CS projects should take advantage of windows of opportunity throughout the policymaking process, from problem framing to policy analysis.
- **Understand which level and type of policymaker is relevant to your project:** this requires an understanding of the topic studied and the differences between governmental and parliamentary bodies.
- **Boost the potential of CS policy impact:** it is important to communicate good practices in CS and promote it as a utilitarian scientific field. CS is emblematically positioned to address social challenges that matter to people, which can legitimise public policies.
- **Monitoring public policies can be an important phase in a CS project:** it also allows citizens to participate in policy decisions, and increases the general value of public participation.
- **Grasp the attention of policymakers:** elaborate visually attractive materials to present CS results to policymakers. Consider the human and emotional factor as crucial in the engagement. Use the WOW factor to catch their eye.
- **Create alliances with public institutions:** start by asking public institutions which kind of data they are in dire need and build your alliance with them. Create alliances also with the media journalists, specially the local media to produce innovative communication materials to better engage and work on data and indicators formats.
- **Raise institutional awareness for creating Transfer Knowledge Units:** and mediators that can build bridges between scientists and policymakers. It is also paramount to mentor young professionals for network transferring.
- **Advocate to make the CS field a recognized monitoring tool:** create long-lasting institutional support to the CS field. A way to do that is to foster transnational CS projects to grasp the attention of policymakers to better monitor and harmonise transnational social challenges.
- **Consider the multi-level governance model to effectively garner support at all institutional levels:** European, national, regional and local levels. Engage with local institutions from the beginning of your project (e.g. CS project results in local elections programmes). By applying a bottom-up approach from the beginning it is easier to have further policy impact at other institutional and governmental levels.

- **Highlight the economic impact of the CS project:** policymakers are eager to hear how your CS project can impact and scale up the local community in economic terms. Use the power of storytelling to explain how CS projects can avoid economic conflict of interests by answering social and public needs. Use former successful examples to explain that CS projects can economically impact the municipality.

Industry and SMEs

- **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.

Leading the way to citizen science data journalism

During NEWSERA, one of the main stakeholders explored was the media, specifically, science and data journalists. CS-generated data can come to life, enter a shared narrative, and prove to be of public interest when an experienced science and data journalist can contribute to the design, development and publication of an effective and engaging communication product. However, to reach this goal, a fruitful, respectful and productive collaboration between scientists, citizens and journalists, has to be properly managed. (See Blueprint with and for science journalists for more details).

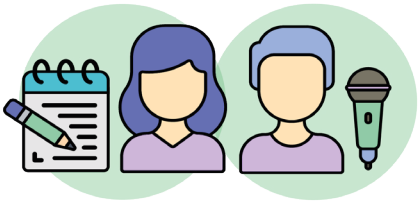
CS projects can greatly benefit from connections with the media, from generating interest and enrolling new citizen scientists, to motivating those that are already taking part and more broadly it will increase its impact, contributing to putting your topic on the agenda and fostering social responsibility and transparency.

This section of the guide is dedicated to a general overview on how to pitch a story, how to transform citizen science-generated data into a news story and finally how to establish and maintain long term relationships with the media.

Pitch your story

Pitching a CS project to a journalist is an important step in promoting the project and raising awareness about its goals and activities. During the CitSciComm Labs, NEWSERA invited science and data journalists to deliver training and work specifically on pitches derived from their projects. As CS projects were from different domains, areas of action, but were also in different phases of development (early mid and end phases, with no data, data being collected or finished analysis), we created different working groups. Based on these experiences we offer some recommendations on how to maximise the chances for a successful pitch to the media.

KNOW THE MEDIA SYSTEM



- Try to understand the news production process (e.g. selection, framing, storytelling) and how the media system works (e.g. impact for the audience, competition in the newsrooms)
- Personal treatment can be key for the news to come out. The press release alone does not work. Remember that you can't do a press release on everything, it has to be about something very important
- Focus on the newsworthiness criteria (Why is this information relevant? To whom? Why now?)
- Define your target audiences, channels to reach them and scope (radio, social media, local press) and build stories with human interest (e.g. personal stories from participants)
- Research and identify journalists who cover topics related to your citizen science project. Look for journalists who have covered citizen science projects in the past or who have an interest in science or environmental issues
- Keep your pitch simple and straightforward, focusing on the most important aspects of your citizen science project. Avoid technical jargon or overly complex language that may be difficult for journalists to understand
- Follow up with journalists after your initial pitch to see if they are interested in covering your citizen science project. Be respectful and persistent, but also be prepared for the possibility that your pitch may not be accepted

FRAME YOUR STORY

- Try to take advantage of (inter)national news that might be related to your project (e.g. health or climate emerging crisis with research on planetary health)
- Explore transversal issues that have emerged in a relevant way over the last years: fake news, data ethics, society's lack of trust in expert knowledge
- Adopt a communicative approach to share project data that respects cultural differences (minorities traditions, gender, etc.)
- Examine your data with a different perspective (interrogate the outliers, might hide a story)
- Offer to provide interviews or additional information about your citizen science project to help journalists develop their story. Be prepared to answer any questions they may have and provide contact information for participants or experts who can speak to the project

DATA BIAS AND VISUALISATION

- Try to identify possible biases on data collection and create strategies to avoid and mitigate them
- Don’t be afraid that by using simpler messages or metaphors you will lose scientific rigour when directing to broader audiences. Data visualisation tools, such as infographies, can be extremely helpful to effectively reach the public in easy and understandable information and deliver key messages without compromising the facts
- Explore new formats to communicate data yourself, for example, through newsletters or podcasts that beyond raising awareness can also engage your audience

How to transform CS-generated data into a news story

During NEWSERA Data Journalism Lab we conducted training activities for the NEWSERA Pilots, some of which open to the general public. One of them focused on how to transform CS-generated data into a news story (**available only in Spanish**[3]).

Hereby we share some of the learnings and tips from our invited experts in order to make the collection of credible evidence and the best use out of data to enhance the story narrative, by presenting information to the public in the form of engaging visual narratives, whilst keeping it understandable, reliable and complete.

Transforming CS-generated data into a news story can be a complex process that requires careful analysis, thoughtful framing, and engaging visuals.

The process could be briefly outlined into:

- **Formulating a hypothesis**
- **Obtaining the data**
- **Cleaning and correcting the dataset arrangement**
- **Analysing the data**
- **Briefing conclusions**
- **Defining the story and the data visualisations**

But what exactly is data visualisation?

Data visualisation is the graphic representation of information and data, combining different elements, such as tables, maps and graphics. It is also intended for users to interact with information and/or data in a way that they could detect atypical data, patterns or specific tendencies.

(3) https://newsera2020.eu/2021/07/16/how-do-you-tranform-citizen-science-data-into-a-news-story-the-1st-citscicomm-data-and-science-journalists-lab/

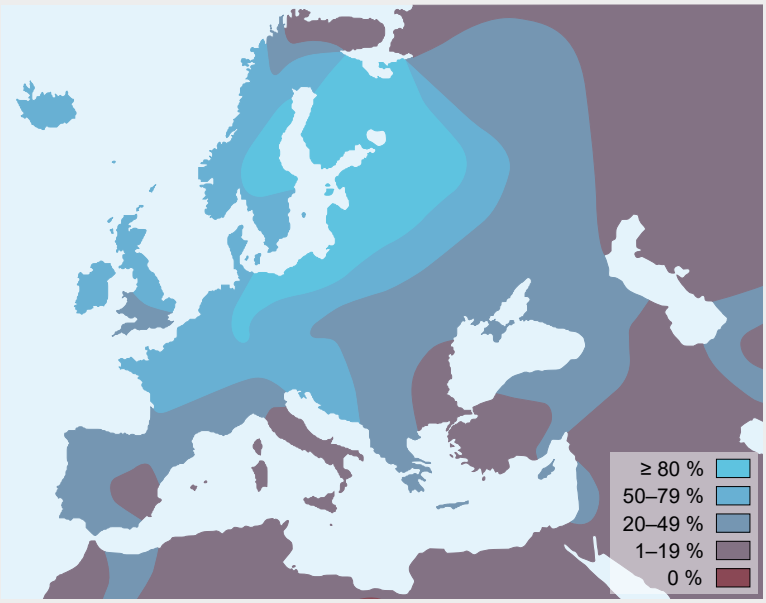
When we think about the process of creating a news story with data visualisations, we would expect that the most time-consuming part is the analysis, but actually 80% of the time is used for cleaning data, so establishing a proper dataset should be worth considering from the early beginning.

Working on data you should also have in mind the following:

- Make all databases openly available and allow people to contribute to their expansion.
- Enhance transparency of data.
- Maintain and share data in a user-friendly way.
- Always add metadata (descriptions of the data).
- The way data is collected and organised might not always be the best combination for analysis.
- During the data cleaning and analysis processes save different versions.
- Make multiple checks to ensure that the analysis is correct.
- Consult experts in the field to avoid making mistakes: What can and cannot be asserted from your analysis?

The corpus of the data visualisation will have three parts: title, body and footer. Keeping it simple and creating a memorable title will allow you to better engage your audience.

CATCH TITLE



Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa.

So, try to focus the news on the analysis and the story, not the data itself, very often behind the data there will be real people. When it comes to the highlights of the story, first, focus on the key concepts, such as one specific graphic, one specific idea, and then use the "interview the data" approach, this is, question your own data, what do they tell you?

For creating powerful and meaningful stories through data you can also:

- Make sure that each graphic can be read independently of the news, as such, it needs to be explained by itself.
- Use intuitive colours, in a simple and striking way - avoid reproducing stereotypes (blue vs. pink related to gender); scales of grey may also be considered.
- Play with typography.
- Choose the best graphic format (consider whether you will present qualitative, quantitative data, categorical, etc.) - static, interactive or dynamic.
- Mobile first- and responsive- design (most people read their news on their smartphones).
- Plan a dissemination campaign through social media.

Open tools are also fundamental for the process. Here you can find some examples used by data journalists in news rooms around the world:

Data collection and analysis:

- **Documenting the Now**: responds to the public's use of social media for chronicling historically significant events, seeking a user-friendly means of collecting and preserving this type of digital content.
- **Open Archive**: store and share critical evidence captured.
- **Movebank Data Repository**: it allows users to publish animal tracking datasets.
- **Tableau**: Visual data analysis platform.

Data visualisation:

- **Infogram** - creates infographics.
- **Datawrapper** - creates maps, charts and tables.
- **Flourish** - scales and manages any kind of interactive content.
- **Rawgraphs** - visual models to visualise quantities, hierarchies, time series and find insights in your data.

How to establish relationships with the media - recommendations

Establishing and maintaining long term relationships with the media is a key step to bringing stories closer to the public that are not only focused on the final results but that can be shared throughout the project, highlighting the process but also the relation and impact with the citizen scientists in their local areas. Moreover, when relationships are established from the beginning, the opportunity to raise new questions from a journalistic perspective can bring new avenues to the investigation, not only in terms of media interest but also scientifically and on social justice.

Hereby we share a set of recommendations:

1. Research and identify key journalists and media outlets that cover topics related to your project. Make a list of their contact information and keep it handy for future outreach.
2. Build the relationship well in advance and not once the project is completed. It is important to allocate allow time and resources to understand each other, to be clear about the expectations, motivations and goals that drive respective actions.
3. Establish a common language that allows both to craft the description of the story and to evaluate its newsworthiness.
4. Maintain the relationship in time: once there has been a contact between the CS project and the journalist, it is useful to share new data, even if they are not ready to be used and published, to discuss together on the next steps and find a timing and an angle that serves both parties.
5. Work to create a setting where there is an exclusive relationship between the projects and the journalists: respect each other's time constraints while at the same time try and identify the elements that render the collaboration a win-win situation.
6. Share the data in an open way: previewing the data is a key step to ideate and design several stories by selecting the most newsworthy ones or the most suitable to a specific media and audience in a certain moment. When the data are in proprietary format and difficult to read and analyse with common softwares, the journalist is basically left out of the chance to understand the story properly and to see which other elements might be needed to complete it.
7. Ideally, the data could go in the direction of becoming a common good: for instance, using the data to organise a hackathon with the project participants, the journalists and even other stakeholders might prove a powerful way to collaborate, co-create, co-design and look into innovative solutions.
8. Not all stories fit the same audience. In general, stories are not reports and journalism is about making a story relevant for people by highlighting those elements that might have an emotional, narrative, empathetic impact on the audience. In addition, relevant stories are often resonating with a broader public interest, be it of political, social, or cultural nature, such as the environmental crisis, the health issues, the humanitarian topics and so on.
9. Make an effort to combine a compelling narrative with rigour. Scientists often feel that their work is vilified if there is not careful consideration of the accuracy and correctness of data, descriptions and explanations. While scientists have to take a step further to improve their communication ability, journalists should make an effort to understand the scientific process, the way data is

produced and validated, and the basic rules of the scientific methodology.

10. Embed a communication expert in the scientific project at the moment the project is designed. Having a data journalist capable of giving feedback and indications on the project scope could lead to collecting additional information that might be strengthening a story throughout the length of the project.

11. Look for opportunities to meet and discuss and learn in informal settings: conferences, science café or after work informal events are usually a great kick-off opportunity to look into future collaborations and, mainly, to get to know someone without being under the pressure of a defined role.

12. The co-production of a journalistic story is a challenge worthy to be undertaken. Being able not to merely exchange information but to work together in selecting data, the pieces of relevant content, the angle to use, the preferred format and the audience to talk to, might prove a winning strategy to give proper recognition to all the expertise involved and to reinforce the collaboration for further stories to come.

13. Provide media training for participants in your citizen science project to help them feel comfortable talking to the media and sharing their experiences. This will also help ensure that any media coverage accurately reflects the goals and activities of the project.

General resources

NEWSERA Blueprints

Citarella MA, Giardullo P, Magalhães J, Guasch B, Perucca Iannitelli C, Leguina L, Elorza A, Lacunza I, Luís C, Navalhas I, Tola E, Pelacho M, Arias R (2023). Blueprint for #CitSciComm with and for citizen scientists and society at large (D4.2) Zenodo.
doi: **https://doi.org/10.5281/zenodo.7752607**

Luís C, Navalhas I, Marín-González E, Magalhães J, Guasch B, Perucca Iannitelli C, Leguina L, Elorza A, Lacunza I, Citarella MA, Giardullo P, Tola E, Pelacho M, Arias R. Blueprint for #CitSciComm with and for Career Scientists (D4.3) Zenodo.
doi: **https://doi.org/10.5821/zenodo.7752637**

Perucca Iannitelli C, Magalhães J, Guasch B, Leguina L, Elorza A, Lacunza I, Citarella MA, Giardullo P, Luís C, Navalhas I, Tola E, Pelacho M, Arias R (2023). Blueprint for #CitSciComm with and for policymakers (D4.4). Zenodo.
doi: **https://doi.org/10.5281/zenodo.7752668**

Magalhães, J, Guasch B, Perucca Iannitelli C, Leguina L, Elorza A, Lacunza, Citarella MA, Giardullo P, Luís C, Navalhas I, Tola E, Pelacho M, Arias R. (2023). Blueprint for #CitSciComm with and for Industry and SMEs (D4.5). Zenodo.
doi: **https://doi.org/10.5281/zenodo.7752705**

Tola E, Magalhães J, Guasch B, Luís C, Navalhas I, Marín-González E, Leguina L, Citarella MA, Giardullo P, Pelacho M, Arias R (2023). Blueprint for #CitSciComm with and for science journalists (D4.6). Zenodo.
doi: **https://doi.org/10.5281/zenodo.7752733**

Guides and online training:

How do you transform citizen science data into a news story?
YouTube link: **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**

Relevant public deliverables 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 democratisation 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.

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

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

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

Pelacho M (2021). Deliverable 7.2 Identifying ethical aspects as a cross-cutting issue in NEWSERA actions (1.0). Zenodo.
doi: **https://doi.org/10.5281/zenodo.5417678**

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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