



NEWSERA - Citizen Science as the
new paradigm for Science
Communication

Deliverable 7.2 Identifying ethical aspects as a cross-cutting issue in NEWSERA actions

v1.0



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STATEMENT OF ORIGINALITY

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SUMMARY

This deliverable constitutes the report on identifying ethical aspects as a cross-cutting issue in NEWSERA actions. The report deals with the ethical aspects to be identified together with the participants of the pilot projects during the NEWSERA actions. For this purpose, the participatory governance approach is adopted through co-creation processes, which necessarily include aspects of inclusiveness.

The introductory section discusses the context of the set of actions, i.e. the **participatory governance approach** and its relation to ethical issues in citizen science and science communication. Under the participatory governance approach, aspects of the quadruple helix model, co-creation processes, and inclusivity are detailed to contextualise the issue of ethics in citizen science and science communication.

The second section justifies why and how ethics is a cross-cutting issue in the development of NEWSERA; with two corresponding levels in which ethics is understood as a transversal issue in the development of NEWSERA's actions. The first level refers to the correct development of the ethical aspects within NEWSERA, in terms of data management (under the FAIR principle) and in terms of the correct ethical relationship with the participants, from the point of view of personal data protection, informed consents, and all the other aspects already dealt with in deliverables D7.1 (Data Management Plan) and Work Package 8 (compliance with ethical requirements). The second level refers to the actual content of this deliverable, i.e. the ethical issues to be worked on together with the participants throughout the project, in order to co-create guidelines on ethical issues in citizen science projects, most of these issues being related to communication.

The third is the central section of the report. It presents some of the ethical aspects already identified, as a fundamental basis for the co-creation processes carried out during the project with NEWSERA participants, specifically those oriented towards the co-identification of ethical issues and the co-creation of guidelines, usable by NEWSERA participants and adaptable to other projects. The different subsections present information that will be used during the #CitSciComm Labs, specifically on: data quality and integrity, data sharing and intellectual property, potential conflicts of interest, communication in and from citizen science projects. Examples of good practices, gaps and shortcomings are also included.

Among the conclusions is the fact that ethically sound projects achieve higher and better impacts, so it is an important challenge to achieve such ethical soundness.

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1. The participatory governance approach

The Oxford Handbook of Governance offers the following **definition of 'participatory governance'**, by Fisher (2021):

Participatory governance is a variant or subset of governance theory that emphasises democratic engagement, particularly through deliberative practices. Participatory governance seeks to deepen citizen participation in the governmental process by examining the assumptions and practices of the traditional view that generally hinder the realisation of genuine participatory democracy.

In the **context of research and innovation policy**, the European Commission has referred to governance - and in particular the relevance of ethics - at least since **the constitution of the European Research Area, in 2000**. More recently, in the context of the Seventh Framework Programme, with the introduction of the Responsible Research and Innovation (RRI) concept (from academic research), the notion of responsibility has been underlined through a series of agendas and the 'Science with and for Society' (SwafS) scheme extensively developed in the Eighth Framework Programme, Horizon 2020.

In the document "Responsible Research and Innovation: Europe's Ability to Respond to Societal Challenges" (European Commission, 2012), one of the first European Commission (EC) documents on RRI, it is stated that:

Policy makers also have a responsibility to prevent harmful or unethical developments in research and innovation. Through this key we will develop harmonious styles for Responsible Research and Innovation that integrate public engagement, gender equality, science education, open access and ethics.

At the same time, it underlines the notion, already proposed in the **Commission's Report on European Governance** (EC, 2003) on responsibility sharing, in particular **the role of civil society**:

Promoting new forms of governance is by no means the sole responsibility of the European institutions, let alone the Commission. It is the responsibility of all levels of public authority, private business and organised civil society. Good governance - openness, participation, accountability, effectiveness and coherence - is what citizens expect at the beginning of the 21st century.

It is relevant that the report includes not only high-level policy, but **all governance processes**, whether they are carried out by a government, a market or a network, by a family, a tribe, a formal or informal organisation or a territory, and whether they are carried out through law, rules, power or language. It is added that, in the

context of science and innovation, this also implies thinking about the distribution of resources as well as the rules of resource use.

1.1 The quadruple helix model at NEWSERA

The last two decades of evolution in research and innovation policy could be summarised in the debate on the sharing of responsibilities in the management and governance of societies and their resources, including research and innovation activities. The so-called **participatory turn** involves reflection - and action - on this division of responsibilities in which more and more actors have been incorporated into this model, from a linear one, the triple helix (academia-industry-public sector) and subsequently a quadruple helix model in which **civil society is recognised as playing an increasingly important role**. Along with the multiplicity of actors in governance, the **ethical reflection on decisions, their reasons and their consequences** is also multiplying. This also happens in the context of research and innovation.

As it is indicated in the NEWSERA Grant Agreement (GA) (p.133), **launching a citizen science project requires the creation of a complex ecosystem**, in which the participation of quadruple helix stakeholders - interdisciplinary career scientists; the public sector; industry, businesses and SMEs; NGOs, CSOs and society at large - is usually a must.

This poses **a challenge** - GA explanation continues - **in terms of science communication** due to: 1) the wide variety of **specific science communication tools and strategies** to be used for each target group, including digital, traditional and face to face actions to increase participation, and 2) the **required continuous feedback to each stakeholder group** to maintain the engagement throughout project execution, and to involve all stakeholders in all phases of research.

In this complex ecosystem, where there are more and more actors, more possibilities for action and more interrelationships (Fig. 1), communication also becomes more complex: unidirectionality is no longer possible and, if it resists becoming multidirectional, then knowledge cannot flow adequately, generating situations that call, in innovative ways, for the intervention of **more adequate ethical criteria as well as technical tools**.

NEWSERA addresses these issues in all their complexity and in an operational way, in particular the **ethical aspects that permeate research and, in particular, its communication**. In today's society and science, all societal actors have a role to play: science and its communication are no longer the domain of the few. NEWSERA works so that the communication of this science 'of everyone, for everyone and by everyone' is an excellent communication, 'of everyone, for everyone and by everyone'.



Figure 1. Visualization of the network of keywords in RRI-related literature (Nazarko, 2020).

1.2 Co-creation processes

Following the **participatory governance approach** - characteristic of citizen science (CS) - the establishment of agreements and guidelines for ethical behaviour must also be a co-created process whenever possible. Given the ethical requirements within communication following citizen science projects, **a co-creation process is developed with NEWSERA participants by defining ethics criteria for citizen science projects in a bottom-up process.** These ethical requirements are developed in addition to issues related to data protection and the recruitment of participants, which are of mandatory fulfillment not only ethically but by law, in any project involving participation of human beings. Eventually, both the procedure and the results will serve as a **guide for each CS project, with the necessary adaptations.**

1.3 Inclusiveness

Ethical concerns in participatory projects as NEWSERA also apply a highly **inclusive engagement model** including any gender, socio-cultural background,

socio-economic status, literacy level, etc. Specific methods are used in order to meet this inclusiveness approach.

Particularly, the shaping of the #CitSciComm Labs - widely detailed in (D.3.1 “Description of #CitSciComm Labs”) and D6.5 “NEWSERA Events 2” - involves the **participation of diverse stakeholders** who are invited to the Labs and involved in the co-creation process. Each #CitSciComm Lab is configured by different participant profiles. We consider here, as examples, the making of the Labs addressed to ‘Citizens and society at large’ and to ‘Academic scientists’.

Table 1. Participants at #CitSciComm Labs for ‘citizens and society at large’ and ‘academic scientists’

	Citizens and society at large	Academic scientists
CS projects representatives	3-4 citizen science practitioners for each of the NEWSERA pilots per country	
Stakeholder representatives	3 representatives per country that should reflect main societal stakeholders, such as a citizen or community champion already participating in the projects; a representative of an NGOs already aware of what citizen science is; an educator/school teacher; a person not involved at all in Citizen Science	3 representatives per country that should reflect academic scientists belonging to academic institutions (i.e. universities, research centres/institutes), from different research areas and career stages, considering gender balance. Ideally, half of the involved scientists will be already familiar with CS practices (but are not responsible for CS projects) and the other half are not involved in CS nor SciComm practices. All of them should work in similar topics/areas of research of the CS projects selected for this Lab
Sounding Board member	At least 1 science communicator expert per country that will provide his/her expertise, specially in relation to the target stakeholder group.	
NEWSERA representatives	NEWSERA Lab Leaders per country	

The citizen science practitioners are representatives of CS projects, which indicated their interest to participate through the NEWSERA survey in the first months of the project (the survey and its results are presented in D2.1 “Portrait of citizen science communication strategies in EU citizen science projects”).

Diversity in different aspects - methodologies, research areas, bottom-up and top-down approaches, geographical scope of the projects, as well as the variety of profiles and gender balance of the participants - is a **key guideline** for the development of the #CitSciComm Labs and the project as a whole.

2. Ethics as a cross-cutting issue in NEWSERA development

The ultimate goal of Work Package 7 is to embed the ethical dimension in all NEWSERA actions related to the involvement of citizens in research, especially in relation to the perception of science and science communication towards stakeholders in the quadruple helix.

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** scientific, societal, educational, environmental, cultural, economic and policy **impacts**.

The tasks under WP7 (linked to WP8) include **two levels of action**:

1) The **ethical requirements applied throughout the development of NEWSERA** (collected in deliverables D7.1, D8.1, D8.2 and D8.3). The corresponding set of tasks are common to any project that involves human beings during its development, whether it is a citizen science project or not, and with their own features.

2) The **co-creation**, among all participants and the NEWSERA team, **of ethical guidelines for citizen science projects and their science communication practices**. This second level is specific to NEWSERA and is the core of this deliverable D7.2.

These two levels of action are detailed in the following subsections.

2.1 Ethical requirements throughout the development of NEWSERA

As for the first level of action, we consider here the different tasks and deliverables associated with **WP7 and WP8 as well as their relationships**.

WP7 - Ethics and Data Protection strategies in NEWSERA [Months: 1-36]

The purpose of WP7 is to:

- Assess the ethical aspects associated with citizen science research and science communication activities involving data collection from/with citizens and other stakeholders.
- Design the Data Management Plan to allow for FAIR data collection and storage.
- Guarantee Data Protection aspects and define the procedures to identify, recruit and engage research participants.

The Ibercivis partner ensures that each member of the consortium pro-actively discusses and considers all ethical aspects with respect to the activities that will be carried out in NEWSERA incubation, realisation, evaluation and all of its public engagement strands. The ethical standards and guidelines of Horizon 2020 are rigorously applied, regardless of the country in which the research or engagement activity is carried out.

Deliverables corresponding to WP7 are the following:

- **D7.1 Data Management Plan.** [Submitted by M6]. The Data Management Plan ensures that all generated data is FAIR (Findable, Accessible, Interoperable and Re-usable).
- **D7.2 Identifying ethical aspects as a cross-cutting issue in NEWSERA actions.** [The present report]. A report on the ethical aspects co-identified with citizen science participants will be developed, following the participatory governance approach through a co-creation process, and including inclusiveness aspects.

WP8 - Ethics requirements [Months: 1-36]

This work package was added at the request of the Commission with the objective to ensure compliance with the 'ethics requirements' comply with.

Deliverables corresponding to WP8 are the following:

- **D8.1 H - Requirement No. 1** [Submitted by M6]. The procedures and criteria that will be used to identify/recruit research participants must be submitted. Copies of opinions/approvals by ethics committees and/or competent authorities for the research with humans must be obtained and kept on file.
- **D8.2 POPD - Requirement No. 2** [Submitted by M6]. The host institution must confirm that it has appointed a Data Protection Officer (DPO) and the contact details of the DPO are made available to all data subjects involved in the research. For host institutions not required to appoint a DPO under the GDPR a detailed data protection policy for the project must be kept on file.
- **D8.3 H - POPD - Requirement No. 3** [Submitted by M6]. The informed consent procedures that will be implemented for the participation of humans must be submitted. Templates of the informed consent/assent forms and information sheets (in language and terms intelligible to the participants) must be submitted. For children involved in the research, details on how their assent (as a first step in their recruitment) and the consent of the legal representatives (as a second step in the children's recruitment) will be acquired, must be submitted. An analogous procedure will be applied for vulnerable adults.

Since the requested aspects were already included in NEWSERA's WP7 proposal, the deliverables corresponding to WP8 were integrated and associated with the WP7 tasks as shown in Table 2.

Table 2. WP7 tasks and corresponding deliverables D7.1, D7.2, D8.1, D8.2 and D8.3

	2020			2021	
		6M			18M
T7.1 Identifying ethical aspects as a cross-cutting issue			1M - 36M		7.2
T7.2 Data Management Plan		7.1	Data Management Plan		
T7.3 Procedures to identify, recruit and engage research participants		8.1	Report on H Requirement No.1		
T7.4 Requirement for Personal Data Protection (POPD)		8.2	Report on POPD Requirement No.2		
		8.3	Report on H-POPD Requirement No.3		

2.2 Co-creative processes to identify ethical issues in citizen science projects

The **co-creation of ethical guidelines for citizen science projects and their science communication practices** will be developed between all Lab's participants. According to the participatory governance approach, the establishment of agreements and guidelines for ethical behaviour should also be a co-created and bottom-up process as far as possible.

This second level of actions is detailed in section 3.

3. Co-identifying ethical aspects with NEWSERA participants

In their article on “**A framework for addressing ethical issues in citizen science**”, Resnik *et al.* (2015) highlight, alongside the many benefits of citizen science, the need to address ethical issues before projects begin and throughout their development. Among these issues, the authors point out and discuss: (1) **data quality and integrity**, (2) **data sharing and intellectual property**, (3) **conflicts of interest**, and (4) **exploitation**. In one way or another, these issues may also be present in academic science, but with different dimensions in the case of citizen science.

Their research concludes that:

To promote ethical research, **scientists should develop guidelines** for involvement of citizens in research, communicate effectively with participants at the outset of their involvement in research projects, carefully oversee their work, develop appropriate publication practices, take steps to address conflicts of interest, and provide lay volunteers with education and training on the responsible conduct of research.

While agreeing with their analysis of ethical issues, the NEWSERA approach differs in one relevant aspect from the proposal of the authors cited above. **In ethics and communication** (both internal and external), **‘citizens’ can be as competent** (or as incompetent, as the case may be) **as ‘scientists’**. **NEWSERA co-creation processes**, in which all stakeholders have a voice, are necessarily **more comprehensive** than those in which communication is one-way.

The following are some of the ethical issues that Resnik *et al.* (2015) point out as most relevant in citizen science.

3.1 Data quality and integrity

This issue is described by the aforementioned authors, in a summarised and paraphrased way, omitting their references for making the reading easier, as follows. The data collected by citizens may not have the necessary quality or integrity, which could undermine the validity of a citizen science project.

While these difficulties can occur in any type of research, citizen science projects can be more problematic when citizens have not been trained in scientific data management or research integrity. They may make systematic errors that negatively affect data quality, or worse, they may even fabricate or falsify data in an attempt to influence certain results or actions. But again, **this lack of integrity can also occur in academic research**.

It may also happen in citizen science to use techniques for data collection or analysis that have some benefits (e.g. because they are inexpensive or more likely to identify potential hazards), but are somewhat less reliable than other techniques and therefore not preferred by the scientific community.

3.2 Data sharing and intellectual property

There are many aspects that should be considered in this section. Thinking about the effectiveness of the Labs and the co-creative processes for analysing the various projects, we will focus on some of the core aspects: data sharing and intellectual property issues.

Data sharing in citizen science

In the context of knowledge generated in universities, but with the potential to be extended to other research environments, it is indicated from OPEN AIRE (2020) that:

The potential of Citizen Science is high on the agenda in the discussion on the future of academic research. The European Commission's Communication "**A new ERA for Research and Innovation**", published in **September 2020**, states that "[...] the engagement of citizens, local communities and civil society will [help] achieve greater social impact and increased trust in science." Citizens can contribute in diverse ways, ranging from data collection over data analysis to co-designing projects, and thereby bring academic research and its outcomes closer to society.

However, **Citizen Science also accentuates ethical and legal questions about ownership of the research process and outcomes**, and poses challenges in terms of safeguarding research quality. Addressing these challenges and using the opportunities of Citizen Science will require universities to take the lead and consider the place of Citizen Science within their institutional strategies, as well as the support they offer to research staff.

Engaging in inclusive and transparent science, **Citizen Science and Open Science are becoming increasingly intertwined**. Currently, Citizen Science is described by the European Commission as "both an aim and enabler of Open Science".

Regarding the statement "Citizen Science also accentuates ethical and legal questions about ownership of the research process and outcomes" we introduce some relevant and practical considerations to be taken into account during the next workshops at #CitSciComm Labs.

Intellectual Property Issues in Citizen Science

In 2015, researchers Teresa Scassa and Haewon Chung published a broad study that serves as a **guide for researchers and citizens in citizen science projects regarding ethical-legal issues in citizen science**. In their research they discuss

issues of copyright, patent, trademark and trade secret laws, as well as the protection of traditional knowledge, all in the context of citizen science. They point out that there are very similar intellectual property (IP) issues around the world along with important differences in the application of different national laws in specific cases. Indeed, their study focuses on the United States, although with some references to other countries.

It is worth reading Scassa's words on that study (Scassa, 2015), just coinciding with the inaugural conference of the Citizen Science Association, by February 2015.

Our paper, which is meant primarily for an audience of citizen science participants and researchers, develops a typology of CS projects from an IP point of view. We group CS projects into 4 broad categories defined by the type of contribution expected of participants. In some cases the nature and degree of participation makes it unlikely that participants will have any IP claims in their contributions to the project; in other cases, participants are regularly invited to contribute materials in which they may hold rights. We suggest that researchers think about these issues before launching their project with a view to avoiding complications later on, when they try to publish their research, decide to make their data fully open online, or make other dissemination plans. In some cases, the level of involvement of participants in problem-solving or data manipulation may also raise issues about their contribution to an invention that the researchers eventually seek to patent.

Identifying the IP issues is a first step – addressing them is also important. There are many different ways (from assignment of right to licensing) in which the IP rights of contributors can be addressed. Some solutions may be more appropriate than others, depending upon the ultimate goals of the project. In choosing a solution, researchers and project designers should think of the big picture: what do they need to do with their research output? Are there ethical obligations to open CS data, or to share back with the participant community? Do they have particular commitments to funders or to their institutions? Even if research data is made open, are there reasons to place restrictions on how the data is used by downstream users? These are important issues which have both a legal and an ethical dimension.

IP rights in scientific research - the authors explain in their study - are of enormous importance for both institutions and researchers, as their professional development depends in large part on their ability to publish in peer-reviewed journals, or to keep their research confidential until it can be published, or to obtain patents in certain cases. **Citizen science may differ in many respects from conventional science** in that it involves a large number of non-professional participants, **but there are also considerations about IP protection for citizen scientists** with respect to their data, observations, photographs or (interpretative and) inventive capacity.

IP rights must be considered in the **relationships between researchers and their own institutions**, between **researchers and their funders**, as well as between **all of them**. Institutions and/or funders should describe their expectations of researchers' IP in employment contracts or institutional policies incorporated into contracts or funding agreements. In complementary terms, individuals collaborating on scientific projects or in multi-institutional consortia should agree to comply with the IP policies promoted by such consortia. The relationship between the researcher and the citizen scientist is crucial: not only do IP rights need to be managed in relation to participants' **contributions**, but also **their expectations** regarding their rights to access and use the project results. The relationship between researchers and funders, as well as between researchers and end-users of research outputs - be these data, research publications or other materials - must also be defined, setting out how the research results will be shared, with whom and under what conditions. The necessary agreements must also be established between researchers and any platforms used to host results, or with providers of materials such as satellite or drone imagery. **All of these relationships are intertwined** and will be reflected in terms of the **agreements that are made**. Good practice in citizen science is to use **appropriate IP licences** for contributors as well as end users.

However, the aim of their study - the authors continue - is not to provide the specific legal advice that is necessary for specific research with the potential for marketable products, but to **offer some important considerations for IP management, both from the perspective of the researcher and the citizen scientist**. The aim is, on the one hand to ensure that researchers can use data and results in ways that can be controlled, shared or disseminated in ways that best suit the research objectives; and, on the other hand to ensure that the needs and expectations of stakeholders (individuals and communities) with respect to access and use of results are taken into account in time for the planning of IP policies that are appropriate to their interests. This is without losing sight of the fact that such interests will often be associated with societal reasons such as improving social welfare and facilitating scientific progress without any pretence of profit-making or recognition of IP by the contributors.

The authors also stress that awareness of the different IP rights in relation to any research project is required, and that this task becomes even more complicated as the number of participants, the diversity of their contributions and the potential associated uses of the results increase.

In order to facilitate this task, they have compiled a series of **best practices for managing IP in citizen science projects for researchers involved in the design and implementation** of the projects. They have also elaborated a list of specifications for citizen science participants (Box 1) that allows for a characterisation of citizen science, precisely in terms of possible ethical-legal conflicts related to aspects such as authorship rights or intellectual property.

Consider the nature and type of contribution required by the citizen science project

- Are contributions likely to be ones in which you have IP rights (e.g. photographs, written observations, or commentary, inventive activity)? Have you already assigned your IP rights in the content you plan to submit to someone else?
- How does the user agreement/licence address IP issues? Are you satisfied with the terms and conditions?
- Be aware that you should not contribute (and cannot licence the use of) content in which others hold the IP rights (e.g. photographs taken by others).
- What does the user agreement say about how your contributions will be used, shared, and disseminated (e.g. open access publications, data shared with other researchers, or with the public at large)? Are you satisfied with the plans for use?
- What does the user agreement say about how any contributions will be acknowledged in publications, on the website, or in other project output? Are you satisfied with this?
- If you are part of a community-based project, are there clear provisions for how the community may use the project data or publications to address local problems?
- Is the objective of the research project consistent with your expectations? For example, how do you feel about your contribution being part of a proprietary (restricted access) research output?

Box 1. Intellectual Property Checklist for Citizen Science Participants (Scassa and Chung, 2015, p.61)

Authorship in citizen science publications

With regard to intellectual property, the question of adequate recognition in scientific publications should also be considered. Both in professional science, but even more so in citizen science, authorship in publications can be a complex issue involving unfair and ethically incorrect situations from different angles. On the one hand, authorship may be attributed to people who have actually contributed to the research very indirectly, without clearly distinguishing the role of each researcher or contributor. On the other hand, especially in citizen science, active participants, without whom the research would not have been possible, may be omitted without any acknowledgement. The corresponding debates continue to be widely discussed in the literature.

Particularly, the **European Association for the Study of Science and Technology** takes an active interest in publication ethics (<https://sciencetechnologystudies.journal.fi/about>). As it is explained in the website, this includes, but is not limited to **plagiarism, falsification of data, fabrication of results, issues of authorship and other areas of ethical misconduct**. Authorship both gives credit for intellectual work and assigns responsibility. The **ethics of authorship** implies the honesty with which actual contributions to the publication are indicated. Authorship is important for the reputation, academic promotion and grants of the individuals involved, as well as for the strength and reputation of their institution. All those listed as authors must have made a substantial and direct intellectual contribution to the work. The provision of technical services or materials, while they may be essential to the work, are not in themselves sufficient contributions to justify authorship. All those who have made substantial intellectual contributions to the work should be authors. All authors should be involved in writing the manuscript, reviewing drafts and approving the final version. It is added that: **All those who have made other substantial**

contributions should be acknowledged. Contributions that do not involve authorship should be acknowledged separately. These may include a research group, assistance in obtaining funding or technical support.

Some proposals for research in general (e.g. Holcombe (2020) who poses ‘contributorship’ instead of ‘authorship’) are entirely valid for citizen science publications. Others are specific and address situations that only occur in research with citizen science methodologies. Some authors propose a substantial change in crediting citizen scientists in research publications (e.g. Ward-Fear *et al.*, 2020).

As an example of a proposal for solving these issues, Holcombe (2020) considers **CRedit (Contributor Roles Taxonomy)**. This taxonomy includes 14 roles to represent the roles typically played by contributors to research publications. The roles describe each contributor’s specific contribution to the scholarly output. The 14 contributor roles with the corresponding descriptions are presented in the website (<https://casrai.org/credit/>). These roles are the next ones: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing – original draft, writing – review & editing.

3.3 Potential conflicts of interest

The issue of conflicts of interest in citizen science can be **equally or more complex** than in conventional science. We again draw on Resnik *et al.* (2015), summarising the main conflicts they point out, although we do not indicate here the solutions they propose. Again, cross-references have been omitted for ease of reading.

Most of the debate about conflicts of interest in science has focused on **researchers’ financial interests**, such as stock ownership, intellectual property or relationships with private companies. Conflicts of interest raise ethical issues for researchers because they have the potential to bias research or undermine public confidence in science. Although citizen scientists are unlikely to have intellectual property at stake, some may have relationships with private, non-profit political organisations that sponsor research, e.g. an environmental group. Conflicts of interest may also arise when companies fund front groups that claim to engage in public interest research, but which are largely set up by companies to promote corporate interests, or when companies involve workers (or citizens somehow related to the company) in their own environmental monitoring.

On the other hand, many people who collaborate with professional researchers may have **non-financial interests**, such as personal or political interests. For example, citizens and environmental groups that oppose the use of hydraulic fracturing (“fracking”). These non-financial objectives may also affect the **objectivity and reliability** of the research. For example, both opponents and proponents of fracking could distort or even fabricate data collected for a study in order to promote their political agenda.

In some cases, the impact of self-interest may be negligible; in others, it may be substantial. One of the specific problems related to citizen scientists' conflicts of interest is that the principal investigators of a project may have to deal with **hundreds or even thousands of volunteer disclosures**. Managing this number of submissions can be a record-keeping challenge. In addition, it is not easy to share all this information with journals or other parties.

It seems clear that it is the responsibility of all project participants and stakeholders to correctly identify potential or actual conflicts of interest. While, as Resnik *et al.* (2015) point out, resolving these conflicts involves addressing them on a case-by-case basis, **working together with representatives of projects and their stakeholders during the NEWSERA #CitSciCom Labs will facilitate the co-identification of these conflicts** in each project and will also facilitate the work of other projects with similar features. Avoiding conflicts of interest at the different levels, and thus guaranteeing an objective and reliable research, is key to **increase trust in citizen generated data** for its uptake by decision makers, environmental authorities or any other stakeholder, including data journalists.

3.4 Adequate communication in and from citizen science projects

The abundant literature on communication failures in citizen science projects shows - in particular through surveys on motivations for participation - the different types of errors in this regard: lack of feedback from project coordinators, lack of information on the use of data, very unidirectional messages that prevent the creation of communities, or even generate rejection and mistrust because of perceived exploitation of participants.

The analyses and results presented here will serve as a basis for the development of the co-creation activities. These results will be provided to the project participants, not as information that they are supposed to be unaware of, but as a **starting point for co-identifying difficulties and proposing solutions**. In this way, NEWSERA seeks to avoid falling into the common pitfalls of participatory projects by **developing contexts of common deliberation, cooperation and mutual learning**, where all participants benefit.

Corresponding actions will be carried out:

- During the second and third round of Labs, through specific activities, but above all, taking into account the cross-cutting nature of ethical issues throughout each of the CS project pilots and, coherently, through the development of NEWSERA.
- During the training modules for citizen science communication, in particular by presenting good practices, ethical codes, the fight against pseudosciences, with representatives of the NEWSERA pilots.

3.4.1 Co-identifying good practices with NEWSERA participants

During the second round of #CitSciComm Labs, which is planned to start in December 2021, the ethical aspects that have already emerged during the first round, albeit implicitly, will be explicitly addressed. The co-creation methodology will also be fundamental in this aspect, as one of the project outcomes is precisely a set of blueprints for better communication in and from citizen science projects, particularly including their ethical aspects. The participation of all stakeholders together with experts in ethics and science communication - not infrequently citizen scientists and citizen science practitioners themselves - is the key to achieving the co-created processes and outcomes.

We present here, the '**Code of ethics for nature photography**', included in the website of Biodiversidad Virtual (BV) and delivered on paper to each new participant in a BV activity (taking photographs in groups and in specific areas) together with members of the association. We note at least two remarkable aspects: BV takes very seriously all ethical issues related to nature conservation and they rigorously point out the relevant consequences, including legal ones, of possible bad practices; at the same time it is remarkable the use - as they also include in each of their emails and communications - of a friendly and cooperative style to address people who wish to join BV activities.

We have selected this example, among many other possible good practices, mainly for two reasons. Firstly, because it is an example of good ethical practice in different senses: the very publication and dissemination of the code of conduct; the detailed indications - including legal aspects - for the appropriate interaction with the environment for its knowledge and conservation; the information on the treatment of sensitive information, etc.

And secondly, because it corresponds to one of the Spanish Pilots from the 39 projects participating in the #CitSciComm Labs, which will be able to share its experiences of more than 12 years, within the Communities of Practice (CoP) during the Labs (and/or in the training modules). Co-creation, as a key element in NEWSERA's methodology, implies continuous mutual learning, starting by getting to know all the good practices of ethics in science and its communication that are already being carried out in the participating projects.

Code of ethics for nature photography

Important remarks for members of the Biodiversidad Virtual platform
Dear naturalist:

The photography of species in the natural environment must avoid intrusion and must respect their way of life.

The aim is to maintain the environment and let the species develop their activity without causing them stress due to our presence. For this reason, at Biodiversidad Virtual we give great importance to ensuring that the photographs and the approach to the environment are always taken with scrupulous respect for the environment.

The platform is a naturalist meeting place and if any person misuses it, it is their own responsibility. We are not responsible for the acts derived from the attitude of individuals,



although it is within our philosophy to ensure good naturalist practice in the natural environment. Biodiversidad Virtual will provide the justice system and the competent environmental authorities with any information required to document any irregularity that may occur in the environment, as well as any environmental data requested by the State's environmental security forces and corps.

Recommendations for nature photography

- Leave the environment for photography as you found it.
- Do not cut flowers or plants to photograph them.
- When walking on ground with sensitive plant species, avoid stepping on them. Remember that the capture of species is regulated by specific permits managed by the authorities and reference collections must be endorsed by a scientific institution.
- Do not disturb birds in their nests or mammals in their burrows, especially during the breeding season.
- Whenever you can avoid it, do not pick up animals with your hands to photograph them, there are better ways to show the dimensions of a species (comparison with a stick, description in centimetres of its wingspan...). If there is no other choice, remember that a photograph never justifies causing harm to the specimen.
- In protected areas, ask the competent authorities for permission to take photographs.
- Communicate with the entities that manage the reserves, transmitting the details of your photographic captures and informing them of your findings. Share sensitive and interesting species information with the managers.
- If you are going to use a light to photograph nocturnal species in a protected area, you will need a permit: check with the managers. The noise of the generator and the attraction light can cause light and noise pollution that can be harmful to the nocturnal fauna in the area.
- Try to avoid manipulating wildlife with butterfly traps, dippers, nets, traps, etc. in your photos. If you see that a photo does not work today, take it tomorrow.
- It is not necessary to decorate a photo with ornaments or illuminate the specimen under study, take the photo in its environment and without manipulating the habitat: in addition to not disturbing the species, you will provide valuable data on its behaviour and the environment in which it lives.
- Do not use captive models: they do not provide data on the distribution, ethology, phenology or habitat of the species. Photos of captive specimens should not be uploaded to BV.
- Do not manipulate species to keep them still.

For microscopic photography, it is clear that some of the above recommendations do not make sense. Sometimes it is necessary to capture micro-organisms, or to collect a part of a moss or lichen, or spores, etc.

There are many more behaviours that a good naturalist and nature photographer should avoid. We cannot show all of them all here, but if you know of them, please let us know so that we can include them in this list.

Photographs in Biodiversidad Virtual

Each of us may have our own ethics, and it is likely that we all have different views on what is acceptable and what is not when taking photographs of living beings or in the natural environment. BV has a few rules about this, which we ask you to respect when uploading images to the galleries. We will not consider here whether or not it is lawful to obtain an image, as the responsibility lies with the author, but in our project we wish to avoid the following situations:

- We do not accept images of samples in collections without permission or authorisation, which must be stated on the upload form. This includes invertebrates in collections and different forms of dissection or preservation of specimens in liquids. We do not accept images of flora in herbaria. Photos from collections will not be transferred to the Banks, and once identified they can be deleted. For any situation not described above, or when the scientific value of an image so indicates, the Coordinators and the Project Management will assess and decide whether an image is appropriate or not.
- We do not accept images of specimens captured without proper permission or authorisation. An express exception is made for fungi, which can be removed if necessary, but without damaging the mycelium, as well as for lichens. In the case of birds captured for ringing, this fact must be noted. In other similar situations for other groups, it should also be stated that permission is available. In the case of captures to save a specimen that was inside a house, specimens that were in danger and were moved to a safe place, or similar situations, we ask you to explain this in the Comments field. For any situation not described above, the Coordinators and the Project Management will assess and decide whether an image is appropriate or not.
- We do not accept images in which there is evidence of mistreatment of a specimen in order to obtain the photograph. The Coordinators and the Project Management will assess and decide



whether an image is appropriate or not.

BV reserves the right to discard and exclude photographs of users when:

- There are indications that could reasonably lead to believe that the data is false.
- When BV understands that the photographs contain elements that are considered contrary to fundamental rights and public freedoms.
- When they induce, incite or promote criminal, denigrating, defamatory, slanderous or violent actions.
- When they are protected by any intellectual property rights belonging to third parties, without the participant having obtained prior authorisation.
- When they are contrary to the right to honour, personal privacy or personal image.
- When it is a photograph that may constitute advertising.
- When the photograph includes minors without authorisation.
- When the photographs do not comply with current legislation.
- When collaborating with other organisations or collectives in a common project, by ceding part of these images, care must be taken to ensure that these recommendations are fully respected.

In any unforeseen case, the Coordinators and the Project Management will assess and decide whether an image is appropriate or not.

Responsibility in the data, especially in the case of rare, threatened and protected species. Caution in the handling of exact data on species locations.

- Try not to reveal exact details of colonies and rare species in public. Do not give very precise details of the location of a species, especially if it is static: plants, flowers, wetlands, nests, etc. Although most of the people who use the portal are respectful nature lovers, we may be overlooked by people with other purposes: animal trafficking, non-scientific collecting, captive breeding for sale, etc. They may even pass themselves off as innocent naturalists.
- Our system allows us to know approximately where an image was taken with UTM grids of 100 square kilometres. If a researcher requires more exact information about a photograph of yours, he can contact us so that we can put you in touch.
- Be wary of requests for data on rare or protected species from people who do not explain and support their research interest in detail.

- BV collaborates with dozens of scientific institutions and associations: they are the ones who have to exploit the data. Try not to reveal sensitive data on locations to anyone who does not guarantee and demonstrate a proven scientific research, dissemination or conservation project.

- In our project there is zero tolerance for people who damage the environment, traffic in animals, torture animals, capture animals for non-scientific purposes, collect animals for non-scientific purposes, etc. If you observe any behaviour along these lines in any user, please let us know so that we can get in touch with them and compare data. The non-observance of minimum ethical standards in the approach to species may lead to expulsion from the project.

In any case, Biodiversidad Virtual is a platform made up of volunteers and the responsibility for the photos uploaded, the possible damage they may have caused and the laws they may have broken are always the responsibility of the author of each photo, who is the one who must be aware of the applicable legislation.

Our behaviour in the environment and with respect to the species we photograph is subject to legislation and may have legal implications with respect to protected species and areas.

Please, for the good of the project and yours, and above all for the conservation and protection of our rich biodiversity, let us respect at all times the legislation in force in each area and let us treat with caution the data outside the channels of collaboration with scientific bodies and institutions.

Best wishes,

www.biodiversidadvirtual.org

Knowledge, dissemination and conservation of Biodiversity

Box 2. Code of ethics for nature photography. Important remarks for members of the biodiversidad virtual platform. Original in Spanish. (Biodiversidad Virtual, 2009).

It is also noteworthy the explicit mention to ‘tolerance zero’ towards people who damage the environment, traffic in animals, torture animals, capture animals for non-scientific purposes, collect animals for non-scientific purposes, etc.

Another interesting point to remark is the awareness of potential lacks in this ethical code, so BV asks people to inform them about other bad behaviours which can be included in this list.

3.4.2 Co-identifying gaps and shortcomings with NEWSERA participants

As it has been considered in previous subsections “citizen science faces many challenges and must correct and/or prevent bad practices. Though with its own particularities, some challenges are shared with academic science (Resnik *et al.*, 2015)”. *In the context of their proposal on citizen science for a better governance of science, Pelacho et al. (2021), states that:*

In fact, inequitable treatment of participants can take place, as many citizen science professionals have pointed out. Specifically, Vohland *et al.* (2019, p.9) have warned about the need for vigilance ‘against instrumentalization by economical interests or the displacement of state duties to citizens’. There are also concerns about the intentions behind its promotion either by institutional science or by policymakers, for example, with respect to possible cost outsourcing (Resnik *et al.*, 2015). In this sense, Mirowski (2018) explicitly argues against citizen science (and open science), understanding it as a tool exclusively for fostering the economy, encouraged by European policies.

Scientific excellence cannot be separated from ethical considerations in projects, of course with regard to the protection of personal data and the proper recognition of intellectual property, but also far beyond these aspects.

To identify gaps and shortcomings in citizen science projects, the quality criteria defined to identify projects are useful - albeit debatable. As a remarkable example, due to its already long-standing and international scope, we summarise the explanation on the quality criteria developed from the Austrian citizen science platform, which was launched in 2014, provided by Haklay *et al.* (2021).

The authors explain that between 2017 and 2018, the so-called Quality Criteria for Citizen Science Projects in Österreich forscht were developed by the Austrian citizen science community to ensure the high quality of the projects on the platform. The criteria development process was designed in an open and transparent manner. Representatives from 17 institutions collaborated in several face-to-face and online meetings. Feedback loops were held for project developers and the general public. In addition, the international community was consulted through a workshop at the 2nd ECSA International Conference, held in 2018 in Geneva.

This co-creative approach secured - authors continues - the commitment of the Austrian citizen science community to implement the criteria in their projects. To support the implementation process, guidelines and tutorial workshops were installed. The 1-year process led to a set of 20 criteria containing sections on scientific rigour, communication, cooperation, open science, transparency and ethics.

These 20 criteria are shown below in Box 3.

Scientific standard
<ol style="list-style-type: none"> 1. There must be a stated scientific question, hypothesis or goal that can be answered, tested or achieved with the project. 2. The methods must be presented in a field-specific, appropriate and comprehensible way. 3. New knowledge must be generated (e.g. improved understanding of certain relationships), or new methods developed.
Collaboration
<ol style="list-style-type: none"> 4. There must be an added value for all participants, both citizen scientists and professional scientists. 5. The objectives of the project must be unachievable without the citizen scientists' collaboration. 6. Citizen scientists must be involved during at least one project element. Common elements of research projects include: <ul style="list-style-type: none"> • Search for a topic and formulation of research questions • Method design • Data collection • Data analysis and interpretation • Publication and communication of results • Project governance 7. The project definition and objectives are open, clear, easily found and communicated in a generally comprehensible manner. 8. The assignment of tasks must be clear and transparent.
Open Science
<ol style="list-style-type: none"> 9. All data and metadata is made publicly available, provided there are no legal or ethical arguments against doing so. 10. The results are published in an open-access format, provided there are no legal or ethical arguments against doing so. 11. The results are findable, reusable, comprehensible and transparent.
Communication
<ol style="list-style-type: none"> 12. Different interest groups are addressed accordingly. 13. Contact details (e.g. e-mail address, phone number or contact form on the website) are easy to find, in case of questions or feedback. Interaction between project management and citizen scientists must be possible at all times. 14. Citizen scientists receive feedback on the progress and the results of the project. 15. The project results are published in a generally comprehensible manner.
Ethics
<ol style="list-style-type: none"> 16. The project objectives must be ethically sound (i.a. in compliance with human and basic rights). 17. The project must follow transparent ethical principles in compliance with ethical standards, such as obtaining informed consent from participants or the

parents of participating children, among others.

18. Clear information on data policy and governance (regarding personal and research data) must be published within the project, and participants must consent to this information prior to participation.

19. Project management must reflect and consider ethical aspects (e.g. diversity, inclusion, gender equality, reflection on in- or exclusion of specific groups).

Data management

20. Prior to data collection, all projects must have established a data management plan which conforms to the European General Data Protection Regulation.

Box 3. *Quality Criteria for Citizen Science Projects on Österreich forscht (Heigl et al., 2018)*

A more detailed set of evaluation criteria - a total of 25 with 57 specific questions on various aspects of citizen science, including both explicit and implicit ethical aspects - can be found in (Kieslinger et al., 2018). Furthermore, in the corresponding table (chapter table 6, pp. 88-91) the criteria relate to the various principles of citizen science of the European Citizen Science Association (ECSA) published in (Robinson et al., 2018).

4. Conclusions

Reflection and discussion on ethical issues in citizen science, many of them related to communication (outcomes communication, communication between participants with different profiles: organisers, coordinators, sample collectors and analysers, etc.), reveals that there are **many ethical issues beyond the protection of personal data or relationships between open science and IP**, both of which are of critical importance.

Co-creation processes under the participatory governance approach (and for strengthening it) will allow **co-identifying ethical barriers** and **co-elaborating guidelines on ethical aspects** in citizen science as well as its better communication.

Many citizen scientists as well as project coordinators and professional scientists, even those recently involved in these methodologies, may be well aware of these difficulties and barriers; many others may not. NEWSERA's work in this regard will consist - from the second round of Labs onwards - in raising these issues with participants, implicitly and explicitly, in order to obtain, through co-creative methodologies, **useful results for the participating projects themselves** and for other projects and practices **beyond the temporal and geographical scope of NEWSERA**. Ethically sound projects can lead to **excellent science, increased trust between stakeholders and in citizen generated data, stable cooperation and sustainability of projects** and, eventually, to **more and better** scientific, societal, educational, environmental, cultural, economic and policy **impacts**.

Addressing correctly the important ethical issues involved in a large number of complex situations and decisions in citizen science and its communication will support the proper advancement of research and innovation, for facing societal challenges and for the development of appropriate policies in alignment with society. Under this premise, citizen science and science communication can indeed play a relevant role in achieving active citizenship and stronger democracies.

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