



ENGAGING CITIZENS IN SOIL SCIENCE:
THE ROAD TO HEALTHIER SOILS



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Short description of the deliverable

Deliverable 7.3 for the ECHO project, titled "Ethics Requirements," serves as a comprehensive guide on ethical conduct within the project. It establishes crucial ethical guidelines, provides a framework for compliance, and acts as a reference for accountability. The document starts with an overview of European ethical standards and the role of ethics in citizen science. It then analyzes the ethical dimensions of each work package in the ECHO project, categorizing key ethical issues and outlining the operational approach for addressing them. The deliverable also includes essential annexes like Information Sheets and Consent Forms, ensuring informed participation and adherence to ethical standards across all age groups.

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Foreword

Soil is a vital, yet often disregarded, resource that supports life on Earth by providing the foundation for agriculture, forests, and various other natural ecosystems. However, soil degradation is a growing concern around the world, and it can have severe consequences for our planet like reduced crop yields, increased greenhouse gas emissions, and decreased biodiversity. The ECHO project aims to prevent this by bringing together citizens and volunteer scientists from around Europe to work towards a common goal of protecting and preserving our soils, thus contributing to the transition towards healthy soils of the EU Mission: “A Soil Deal for Europe”.

ECHO will generate new data on the health status of EU soils, complementing existing soil mapping and monitoring in EU Member States and Scotland, including the EU Soil Observatory (EUSO). The project will develop and deploy 28 tailor-made citizen science initiatives across EU Member States and Scotland, taking into account different land-uses, soil types, and biogeographical regions, as well as stakeholder needs. With 16 participants from all over Europe, including 10 leading universities and research centers, 4 SMEs, and 2 Foundations, under the coordination of the Free University of Bolzano-Bozen, ECHO will assess 16,500 sites in different climate and biogeographic regions to achieve its ambitious goals.

The project aims to engage citizens in protecting and restoring soils by building their capacities and enhancing their knowledge. Citizens will thereby not only actively contribute to the project’s data collection but also promote soil stewardship and foster behavioral change across the EU. The ECHOREPO, a long-term open access repository with a direct link to the EUSO, will make the citizen science data available for exploitation not only by scientists but also by citizens, policy makers, farmers, landowners and other end-users, providing added value to existing data and other relevant soil monitoring initiatives. ECHOREPO will thus provide valuable information about the state of soil health in various regions, and help citizens make informed decisions about land use and conservation.

We believe that the ECHO project will have a significant impact on soil health and citizen engagement across Europe and become an important step towards protecting and preserving our soil for future generations. By working together, we can ensure that our soil remains healthy and productive, and that we continue to enjoy the many benefits it provides.

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Introduction

Purpose of this deliverable

The Deliverable 7.3 *Ethics Requirements* for the ECHO project serves three key purposes:

- **Establishing Ethical Guidelines:** It outlines the ethical standards and guidelines that govern the conduct of the project. This includes details on informed consent, data privacy, participant rights, and the ethical handling of research data. The document ensures that all project activities adhere to the highest ethical principles and practices.
- **Providing a Framework for Compliance:** D7.3 acts as a framework for the project's ethical compliance. It outlines the procedures and practices that must be followed to ensure ethical integrity in all aspects of the project. This includes the responsibilities of project coordinators and partners, the process of obtaining and maintaining informed consents, and the guidelines for data management and participant interaction.
- **Serving as a Reference and Accountability Tool:** The document serves as a reference for all project participants, ensuring that they are aware of their ethical obligations. It also acts as an accountability tool, providing a benchmark against which the project's ethical conduct can be measured and audited. This ensures ongoing adherence to ethical standards throughout the project's lifecycle.

This deliverable begins with **Section 1**, which, in addition to this introduction, reviews the background of European regulation and other ethical standards in European research. It also includes a review of important ethical aspects in citizen science, highlighting the significance of aligning research practices with established ethical norms and the growing importance of citizen engagement in scientific endeavours.

In **Section 2**, we examine the ECHO project from an ethical standpoint, systematically analysing each work package to illuminate the most relevant ethical aspects inherent in each. These aspects are then categorized into six different groups. This section underscores the ethical complexities within the project's framework and emphasizes the need for meticulous ethical scrutiny in each part of the project.

Section 3 delves into ECHO's operational approach concerning ethical requirements. It reviews the roles of each agent involved in the project as well as the work plan itself. This section is pivotal in understanding how ethical considerations are integrated into the project's workflow and the responsibilities of various stakeholders in upholding these standards.

Lastly, **Section 4** methodically discusses each of the categories in which we have grouped the most relevant ethical issues. This section is crucial in providing a comprehensive

understanding of the ethical challenges and considerations specific to each category, thereby facilitating a targeted approach to addressing these concerns.

Additionally, the deliverable includes annexes that encompass essential documents for participant engagement and compliance with ethical standards. The **Information Sheet** in **Annex 1** is designed to inform citizen scientists about their participation in the project, ensuring transparency and informed involvement. **Annex 2** contains the **Informed Consent Form**. **Annex 3** presents the **Informed Assent Form**, specifically aimed at the participation of minors, highlighting the project's commitment to ethical involvement of all age groups. Finally, **Annex 4** includes the **Consent Form for Photography and/or Recording**, ensuring respect for personal rights and privacy in documentation processes.

Background

The EU Regulation and other Ethical Standards in European Research

ECHO, our citizen science project focused on soil health, is committed to upholding the highest ethical standards as outlined in the Horizon Europe Research and Innovation program. This commitment includes adhering to the principles and regulations set within the European Union, such as the European Convention for the Protection of Human Rights and Fundamental Freedoms, as well as the European Code of Conduct for Research Integrity. This code provides a framework for self-regulation applicable to all European research disciplines and settings.

The Code of Conduct emphasizes principles like reliability, honesty, respect, and accountability in research. It calls for high-quality research practices, transparent reporting, respectful treatment of colleagues and participants, and responsibility for the research's broader impacts. This includes best practices in various areas such as research environment, data management, collaboration, and dissemination. Significantly updated in 2017, the Code now addresses modern challenges arising from technological advances, open science, citizen science, and social media. The European Commission recognizes this Code as a cornerstone document for research integrity in EU-funded projects and as a model for institutions and researchers across Europe.

The ECHO consortium has fully acknowledged and committed to these ethical principles by signing the Horizon Europe grant agreement. Consequently, this report does not enumerate these standards and conventions separately. Furthermore, Horizon Europe regulation emphasizes Responsible Research and Innovation (RRI), promoting research and technological development that consider societal and environmental impacts. RRI focuses on addressing societal challenges, ethical research practices, gender equality, science education, and community involvement in research.

For the sake of clarity, we are including here the first ethical principles included in the REGULATION (EU) No 1291/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and

Innovation (2014-2020) and repealing Decision No 1982/2006/EC. This principle is stated on the Article 19, Ethical principles:

1 *All the research and innovation activities carried out under Horizon 2020 shall comply with ethical principles and relevant national, and international legislation, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. Particular attention shall be paid to the principle of proportionality, the right to privacy, the right to the protection of personal data, the right to the physical and mental integrity of a person, the right to non-discrimination and the need to ensure high levels of human health protection.*

Ethics on Citizen Science

Citizen Science refers to the public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources. This approach to science democratizes scientific inquiry, involves diverse communities, and contributes to large-scale data collection and analysis. However, the involvement of non-professional scientists also raises important ethical considerations.

Ethical issues in citizen science are multifaceted and can be categorized into several key areas:

- **Data privacy and security:** Protecting the personal information of participants is a key aspect. This includes ensuring anonymity in data collection and being transparent about how data is used and stored.
- **Inclusivity and accessibility:** Ensuring that citizen science projects are accessible to people from diverse backgrounds is essential. This means making participation possible for people of different ages, abilities, and socioeconomic statuses.
- **Accuracy and reliability:** The integrity of data collected by citizen scientists is often questioned. Establishing protocols for data validation and training volunteers can help mitigate concerns regarding data quality.
- **Informed consent:** Participants should be fully informed about the nature of the research, its aims, potential risks, and benefits. Obtaining informed consent respects participants' autonomy and decision-making.
- **Intellectual property rights:** The contributions of citizen scientists can raise questions about data ownership and publication rights. Clear policies must be established regarding the use of findings and crediting participants.
- **Environmental impact:** Projects involving environmental data collection must ensure that they do not harm natural habitats or species.
- **Ethical review and oversight:** Institutional review boards (IRBs) or ethics committees should oversee citizen science projects, especially those involving sensitive topics or vulnerable populations.

The Role of Guidelines and Frameworks

Several organizations and initiatives have developed guidelines and frameworks to address these ethical challenges. The European Citizen Science Association (ECSA), for instance, provides **Ten Principles of Citizen Science** that include calls for ethical practices. Moreover, citizen science has the potential to influence policy, especially in areas like environmental monitoring and public health. Ethical practices ensure that the data collected through these projects are credible and can be effectively used for policy-making.

The ECHO project from an ethical point of view

We have analysed the tasks outlined in the Grant Agreement from an ethical perspective and identified the following key aspects as crucial for complying with ethical research standards.

For **WP1**, which is focused on identifying citizen science projects for soil monitoring and creating assessment frameworks, several ethical concerns should be considered:

- **E1.1 Respect for intellectual property:** When identifying and collecting information from existing citizen science projects, it's essential to respect the intellectual property rights of the original creators.
- **E1.2 Data privacy and confidentiality:** In gathering information, particularly data that may contain personal or sensitive details, adherence to data protection laws and ensuring confidentiality is crucial.
- **E1.3 Transparency and accuracy in data collection:** Ensuring the collected data is accurate and transparently reported. Misrepresentation or selective reporting of information could lead to biased assessments and outcomes.
- **E1.4 Inclusivity in methodology assessment:** The frameworks developed for assessing citizen science methodologies should be inclusive, considering diverse participant needs and abilities, especially those of underrepresented or marginalized groups.
- **E1.5 Quality control and standardization:** Establishing ethical guidelines for data quality control that are fair and applicable across different methodologies. This includes considering the ethical implications of using various technological support devices in soil monitoring.
- **E1.6 Impact assessment ethics:** In monitoring and assessing both intrinsic and extrinsic project impacts, it's important to consider the potential ethical implications these impacts might have on participants, communities, and the environment.
- **E1.7 Methodology sharing and collaboration ethics:** In sharing methodologies and assessment frameworks with other projects or stakeholders, ethical considerations around collaboration, data sharing, and joint publications should be addressed.
- **E1.8 Feedback and continuous improvement:** Implementing mechanisms to receive feedback on the assessment frameworks and methodologies and using this feedback to make continuous ethical improvements.

Regarding **WP2**, which encompasses the selection of citizen science methods, the development of a toolbox and mobile app, and the validation of the ECHO platform, the ethical concerns shift somewhat in focus:

- **E2.1 ethical methodology selection:** Ensuring that the chosen methods for soil monitoring are ethically sound and do not pose risks to participants or the environment.
- **E2.2 Inclusivity in method selection:** Considering diverse capabilities and access needs to ensure methods are inclusive for all potential participants.
- **E2.3 Tool accessibility:** Ensuring that the tools in the toolbox are accessible, user-friendly, and cater to diverse participant needs, including language and disability considerations.
- **E2.4 Privacy and data security:** Tools must comply with data privacy laws and ensure the security of any data collected or processed.
- **E2.5 App accessibility and usability:** Ensuring the app is accessible to a wide range of users, including those with limited tech skills or disabilities.
- **E2.6 Data protection:** Implementing strong data protection and encryption methods within the app.
- **E2.7 Ethical testing practices:** Ensuring that the testing and validation processes for the platform are conducted ethically, respecting testers' privacy and autonomy.
- **E2.8 Clarity and comprehensiveness:** The instructions for use should be clear, comprehensive, and accessible to ensure users can participate effectively and ethically.
- **E2.9 Feedback mechanisms:** Incorporating feedback mechanisms in the validation process to identify and rectify any ethical issues or user concerns.

The overall aim of **WP3** is to set up and deliver participatory citizen science initiatives on issues relating to soil health across Europe. The following aspects have been identified:

- **E3.1 Informed consent and transparency:** Ensuring that all participants in the citizen science initiatives understand the nature of the project, what their involvement entails, and the use of data collected.
- **E3.2 Data privacy and protection:** Managing and protecting the personal data of participants in compliance with the General Data Protection Regulation (GDPR). This includes securing data collected through various means and ensuring it's used ethically and responsibly.
- **E3.3 Equitable and inclusive engagement:** Addressing the challenge of inclusively mapping and engaging target citizen groups. This involves ensuring that initiatives are accessible to people from diverse backgrounds, ages, and abilities, and that no group is unfairly burdened or excluded.
- **E3.4 Respect for local knowledge and practices:** While developing initiatives across different Member States, it's crucial to respect and integrate local knowledge and practices.

- **E3.5 Environmental impact:** Considering the environmental impact of conducting soil health initiatives. This involves ensuring that the activities do not negatively affect the soil or surrounding environment.
- **E3.6 Risks to participants:** Identifying and mitigating any potential risks to participants, especially in activities that may involve physical tasks. This includes the health and safety of citizen scientists.
- **E3.7 Ethical use of findings:** Ensuring that the findings from citizen science initiatives are used ethically and do not lead to unintended negative consequences for the communities involved or the environment.
- **E3.8 Feedback and redress mechanisms:** Establishing clear channels through which participants can provide feedback, raise concerns, or seek redress if they feel their rights have been violated.

WP4 aims to maximize the value derived from citizen science initiatives by exploring the interest and value of citizen-generated data for end-users, there are several ethical concerns to consider:

- **E4.1 Confidentiality and data privacy:** When identifying and engaging end-users, it's important to maintain the confidentiality of any personal data collected. Adherence to GDPR is crucial.
- **E4.2 Transparency in data use:** Clearly communicating to both citizen scientists and end-users how the data will be used is essential. This includes being transparent about who has access to the data and for what purposes.
- **E4.3 Informed consent including data sharing:** Ensuring that citizen scientists are aware that their data might be shared with end-users and obtaining their consent for the same.
- **E4.4 Bias and representation in data:** Assessing the interest in data use and collaboration must be done with an awareness of potential biases in the data collected by citizen scientists.
- **E4.5 Ethical utilization of information:** In evaluating the usefulness and value of information for different end-users, it is important to consider the ethical implications of how this information is used, especially in making policy decisions or developing guidelines.
- **E4.6 Impact on communities and environment:** When drawing policy implications from data collected on soil health, it's crucial to consider the potential impact of these policies on local communities and the environment. Policies should be developed responsibly, avoiding any adverse effects.
- **E4.7 Feedback and redress:** Providing mechanisms for both citizen scientists and end-users to give feedback on the data use and to address any concerns they may have regarding ethical issues.
- **E4.8 Respect for intellectual property:** Respecting the intellectual property rights of data contributors and ensuring that their contributions are properly acknowledged in any publications or policy recommendations.

For **WP5**, which focuses on establishing an end-to-end data pipeline and a long-term data repository for citizen science, several ethical concerns arise:

- **E5.1 Data privacy and security:** Ensuring the privacy and security of the data collected is paramount. This involves protecting sensitive information from unauthorized access or breaches, especially when integrating with larger databases like European Soil Databases.
- **E5.2 Consent for data use and sharing:** Acquiring clear and informed consent from participants for the use and sharing of their data. This includes explaining how the data will be integrated into larger databases and used in the long term.
- **E5.3 FAIR data principles compliance:** Ensuring that the data management practices adhere to the FAIR (Findable, Accessible, Interoperable, Reusable) principles.
- **E5.4 Interoperability and standardization concerns:** Managing data interoperability and standardization without compromising the quality and context of the original citizen-generated data.
- **E5.5 Transparency in data processing and visualization:** Maintaining transparency in how data is processed and visualized.
- **E5.6 Long-term data stewardship and repository management:** Addressing the ethical considerations in long-term data storage, including who has access to the data, for how long it is stored, and how it is maintained and updated.
- **E5.7 Impact on participants and communities:** Considering the potential impacts of data collection and usage on the communities involved, ensuring that their participation in citizen observatories contributes positively to their understanding and management of soil health.
- **E5.8 Ethical use of advanced technologies:** As the development of participatory platforms and technologies is a key aspect of WP5, ensuring that these technologies are used in an ethical manner, respecting user privacy and avoiding any form of digital exploitation.
- **E5.9 Equitable access and inclusion:** Guaranteeing that the data pipeline and repositories are accessible to a diverse range of users, including those with limited technical expertise or resources.

The objective of **WP6** is to maximize the impact of ECHO by implementing targeted dissemination and communication strategies that support the other Work Packages. In this process, the following ethical concerns have been raised:

- **E6.1 Accuracy and honesty in communication:** Ensuring that all information disseminated about the project is accurate, honest, and not misleading. This includes being transparent about the project's scope, objectives, and the limitations of the findings.
- **E6.2 Respecting participant privacy:** While communicating project activities and results, it's vital to respect the privacy of participants. This involves careful handling of any data or information that could potentially lead to the identification of individual participants.

- **E6.3 Inclusivity in communication:** The communication strategies should be inclusive, catering to diverse audiences across different European regions. This includes addressing language barriers and cultural differences to ensure that the project's information is accessible and understandable to all.
- **E6.4 Intellectual property rights:** Respecting the intellectual property rights of all contributors and partners involved in the project. Proper attribution and acknowledgment should be given in all communication and dissemination activities.
- **E6.5 Equitable access to information:** Ensuring that the project's findings and results are made available to all stakeholders, including those who may not have direct access to digital platforms or scientific journals.
- **E6.6 Avoiding overstatement of results:** Care should be taken not to overstate the implications or applications of the project's findings in communications and publications.
- **E6.7 Ethical promotion and marketing:** Any promotional or marketing activities should adhere to ethical standards, avoiding sensationalism and ensuring that the information is presented in a manner that is respectful and not exploitative.
- **E6.8 Collaboration and respect for other projects:** In establishing connections with other projects and initiatives, it is important to collaborate in a manner that is respectful and acknowledges the contributions of others working in the field.
- **E6.9 Feedback mechanisms:** Implementing feedback mechanisms to gauge the effectiveness of communication strategies and to address any concerns or misunderstandings that may arise from the project's dissemination activities.

Finally, **WP7** focuses on the overall coordination, supervision, and administrative management of the project, there are several ethical concerns to consider:

- **E7.1 Ethical coordination and supervision:** Ensuring that all research and innovation activities are carried out ethically, respecting participants' rights and adhering to scientific integrity. This includes monitoring the quality and timing of deliverables to ensure they comply with ethical standards.
- **E7.2 Conflict resolution and risk management:** Implementing processes to prevent and resolve potential conflicts ethically. This includes managing risks related to ethical issues, ensuring that any risks are identified early and addressed promptly.
- **E7.3 Administrative, legal, and financial management:** Carrying out administrative, legal, and financial tasks with transparency and accountability. Ensuring that all legal and financial activities, including reporting, adhere to the highest ethical standards and follow EU regulations.
- **E7.4 Data management plan with ethical considerations:** Developing and updating a data management plan that includes special provisions for Open Access and adheres to the FAIR (Findable, Accessible, Interoperable, Reusable) data principles. This plan should also consider ethical aspects of data management, particularly in relation to participant data.
- **E7.5 Compliance with ethics requirements and GDPR:** Ensuring that all project activities, especially those involving citizen participation, are compliant with ethics requirements and the General Data Protection Regulation (GDPR). This includes

safeguarding participants' personal data and ensuring their rights are respected throughout the project.

- **E7.6 Liaison with the EU:** Maintaining ethical communication and reporting with the EU, ensuring that all interactions and submissions are transparent, accurate, and in compliance with EU guidelines and requirements.
- **E7.7 Ethical training and awareness:** Providing regular training and updates to all project members on ethical practices, GDPR compliance, and risk management, to ensure everyone is aware of their ethical responsibilities.

To systematically address all these aspects, we have organized the previously mentioned ethical concerns into six categories. These categories will be discussed in detail in the subsequent sections of this deliverable.

Research methodology and intellectual property: it focuses on ensuring ethical research practices and the respectful management of intellectual property. It involves choosing appropriate and responsible research methods and acknowledging as well as properly attributing the intellectual contributions of others in scientific work. This category covers:

- E1.1 Respect for intellectual property
- E1.7 Methodology sharing and collaboration ethics
- E2.1 Ethical methodology selection
- E4.8 Respect for intellectual property
- E6.4 Intellectual property rights

Data privacy and security, data sharing & technology ethics: it deals with the ethical management of data in science, focusing on ensuring data privacy and security, responsibly sharing data while maintaining confidentiality, and addressing the ethical implications of using technology in research, such as consent and data misuse. This category covers:

- E1.2 Data privacy and confidentiality
- E1.3 Transparency and accuracy in data collection
- E2.4 Privacy and data security
- E2.6 Data protection
- E3.2 Data privacy and protection
- E4.1 Confidentiality and data privacy
- E5.1 Data privacy and security
- E5.2 Consent for data use and sharing
- E5.3 FAIR data principles compliance
- E5.4 Interoperability and standardization concerns
- E5.8 Ethical use of advanced technologies
- E7.4 Data management plan with ethical considerations
- E7.5 Compliance with ethics requirements and GDPR

Public engagement & inclusivity and diversity in research: very close to the previous category with no clear boundaries, it emphasizes the ethical importance of involving the public in research processes, promoting inclusivity, and embracing diversity. It focuses on engaging a broad range of participants, ensuring research is accessible and representative of diverse groups, and addressing potential biases.

- E1.4 Inclusivity in methodology assessment
- E2.2 Inclusivity in method selection
- E2.3 Tool accessibility
- E2.5 App accessibility and usability
- E2.7 Ethical testing practices
- E3.3 Equitable and inclusive engagement
- E3.4 Respect for local knowledge and practices
- E4.3 Informed consent including data sharing
- E6.3 Inclusivity in communication

Transparency in communication and dissemination: it focuses on the honest and accurate presentation of research results, ensuring that communication to the public and within the scientific community is straightforward and devoid of misrepresentation.

- E2.8 Clarity and comprehensiveness
- E4.2 Transparency in data use
- E5.5 Transparency in data processing and visualization
- E6.1 Accuracy and honesty in communication
- E6.2 Respecting participant privacy
- E6.6 Avoiding overstatement of results
- E6.7 Ethical promotion and marketing

Ethical impact assessment, feedback and environmental considerations: it covers the evaluation of research projects' ethical implications, gathering feedback on different areas, including environmental impact, and considering ecological sustainability. It involves assessing potential consequences on communities and the environment, ensuring research practices are environmentally responsible and ethically sound.

- E1.6 Impact assessment ethics
- E1.8 Feedback and continuous improvement
- E2.9 Feedback mechanisms
- E3.5 Environmental impact
- E3.6 Risks to participants
- E3.7 Ethical use of findings
- E3.8 Feedback and redress mechanisms
- E4.6 Impact on communities and environment
- E4.7 Feedback and redress
- E5.7 Impact on participants and communities

- E6.9 Feedback mechanisms

Administrative and operational ethics: it encompasses the principles and standards guiding ethical conduct in the management and logistical operations of research. It includes ensuring transparency, accountability, and integrity in administrative practices, legal compliance, financial management, and in the interactions with personnel and participants. It also highlights the importance of ethical decision-making in the day-to-day operations that support and underlie the research activities.

- E1.5 Quality control and standardization
- E4.4 Bias and representation in data
- E4.5 Ethical utilization of information
- E6.5 Equitable access to information
- E6.8 Collaboration and respect for other projects
- E7.1 Ethical coordination and supervision
- E7.2 Conflict resolution and risk management
- E7.3 Administrative, legal, and financial management
- E7.6 Liaison with the EU
- E7.7 Ethical training and awareness

Compliance with Ethical Requirements in ECHO

The roles in the ethics issues

To carry out the tasks related to the ethical matters of ECHO, the following roles have been established.

- **IBERCIVIS as T7.4 Ethical Issues Coordinator:** IBERCIVIS plays a critical role in guiding the project's adherence to ethical standards. They monitor compliance with ethical guidelines, coordinate responses to ethical dilemmas, and ensure that all aspects of the project, from data collection to participant engagement, align with ethical best practices.
- **Ethical Review Board:** This body provides crucial oversight, reviewing the project's methodologies and participant interactions to safeguard ethical integrity. They are responsible for the ethical vetting of project activities and serve as an advisory body on complex ethical matters, ensuring that research is conducted responsibly. This Ethical Review Board covers all the expertise needed, and is composed by:

Table 1 Composition of the ERB

Category	Person	Institution
Research Methodology and Intellectual Property	Alba Peiro	Ibercivis
Data Privacy and Security, Data Sharing &	Oleg Osychenko	QUANTA

Technology Ethics		
Public Engagement & Inclusivity and Diversity in Research	To be decided	AFS
Transparency in Communication and Dissemination	To be decided	PlantPress
Ethical Impact Assessment, Feedback and Environmental Considerations	Francisco Sanz	Ibercivis
Administrative and Operational Ethics	To be decided	University of Bolzano

- **Citizen Science Initiative Coordinators:** These coordinators are pivotal in implementing ethical practices on the ground. They ensure that participants are fully informed about the project, manage the process of obtaining informed consent, and act as the first point of contact for addressing any ethical concerns raised by participants.
- **Partners:** The partners are responsible for upholding the ethical standards in their respective areas of involvement. They contribute to maintaining the project's ethical integrity through their adherence to established guidelines and collaboration with IBERCIVIS and the Ethical Review Board.

The ethics workplan

Each partner will be responsible for adhering to ECHO's ethical principles in each of their daily activities. Presenting ethical issues within a structure divided by Work Packages will facilitate the identification of ethical problems that each partner may face. Nonetheless, Ibercivis will maintain constant communication with each of the partners to see if 1) They are complying with the described ethical principles and 2) there are any unforeseen ethical issues that should be considered.

Special emphasis will be placed on all partners coordinating citizen science activities – see *Table 2 Coordination of citizen science initiatives* - as they will carry out all the engagement tasks of WP3 and must respond to potential ethical issues that arise from each of the participating citizens. Protocols for rapid response to the needs of each citizen will be established. Similarly, a rapid communication channel is set up between all partners coordinating citizen science proposals and Ibercivis, allowing for a swift response to any ethical needs that may arise.

Table 2 Coordination of citizen science initiatives

Countries	#	Coord. partner
Portugal, France	2	SOLUPOTUS
Spain, Slovenia	2	IBERCIVIS
Italy, Austria, Switzerland	3	UNIBZ
Grecia, Cyprus, Bulgaria	3	AFS
Romania, Hungary, Croatia	3	USV

Poland, Czechia, Slovakia	3	PLANTPRESS
Germany, Luxembourg, Belgium	3	UHOH
Scotland, Ireland, Netherlands	3	HUTTON
Denmark, Sweden, Finland	3	UEF
Estonia, Latvia, Lithuania	3	UEF

The Ethical Review Board will meet every six months to review the ethical aspects of the project and establish the need to address new problems based on identified needs or those contributed by the partners or participating citizens. This committee will also resolve issues that may arise day-to-day at the request of project partners. The committee will also establish a training plan for project partners, again based on identified needs.

Lastly, Ibercivis, as the leader of Task 7.4, will coordinate all the agents previously described, ensuring a smooth and coordinated execution of the project's ethical aspects.

Covering all ethical aspects

In this section, we will cover all the ethical aspects previously identified and categorized using the classifications described in the preceding section. We want to highlight that the boundaries between categories can be somewhat blurry and that certain aspects might have been classified under a different category. However, we believe that what is essential is to systematically organize these aspects so that they can be identified and addressed by the consortium partners.

Research Methodology and Intellectual Property

The consortium has created the following best practices for respecting Intellectual Property ECHO academic research work:

- **Understanding Intellectual Property (IP):**
 - IP includes creations like literary works, inventions, designs, symbols, and images.
 - Familiarize yourself with different types of IP: copyrights, patents, trademarks, and trade secrets.
- **Accurate citation of sources:**
 - Always cite the sources of information, ideas, or data that you did not create yourself.
 - Use the appropriate citation style (APA, MLA, Chicago, etc.) as per your field or publisher's guidelines.
 - Utilize citation management tools (e.g., Zotero, EndNote) for efficiency and accuracy.
- **Avoiding plagiarism:**
 - Understand that plagiarism is the presentation of another's work as your own.

- Use quotations for direct copying and paraphrase ideas while crediting the original source.
- Utilize plagiarism detection tools to check your work.
- **Legal use of Third-Party content:**
 - Understand the 'fair use' principle but be aware of its limitations (such as for educational purposes).
 - When in doubt, seek permission for using copyrighted material.
 - Utilize Creative Commons licensed materials responsibly and according to the specified terms.
- **Responsibilities and consequences:**
 - Be aware of both academic and legal consequences of violating IP rights.
 - Keep records of sources, permissions, and licenses for your work.
- **Continuous learning and updating:**
 - Stay informed about changes in IP laws and practices.
 - Regularly participate in workshops and training sessions on IP and ethics.
- **Institutional support and resources:**
 - Utilize your institution's resources like libraries and legal offices for guidance on IP matters.
 - Encourage open discussions about IP challenges and solutions in academic settings.
- **Ethical conduct and integrity:**
 - Promote a culture of integrity and respect for intellectual labour in all academic endeavours.
 - Encourage the sharing of ideas while respecting the rights of original creators.

Data Privacy and Security, Data Sharing & Technology Ethics

This section serves as a complement to the content presented in D7.2, the Data Management Plan (DMP). For a more comprehensive understanding of the information provided in this section, particularly regarding the handling of FAIR data, please refer to this deliverable.

GDPR Compliance

Compliance with the General Data Protection Regulation (GDPR) is a crucial aspect, especially considering the project's scale and its engagement with many EU citizens.

Regarding the geolocation data of the samples, which is classified as personal data, we are committed to maintaining participant privacy in line with GDPR regulations. Techniques like adding noise to the geolocation data will be implemented to protect privacy. This approach allows us to share the data with the scientific community and the wider public, including those outside the EU, while safeguarding participant confidentiality.

Here are some key points ECHO has considered:

- **Data collection and consent:** Under GDPR framework, ECHO will obtain clear, informed consent from all participants before collecting personal data -see next section. This will involve explaining the purpose of data collection, how the data will be used, and ensuring that consent is given voluntarily and can be withdrawn at any time.
- **Data minimization and purpose limitation:** ECHO will ensure that only the data necessary for the project's objectives is collected and that this data is used solely for the purposes specified at the time of collection. This aligns with the GDPR's principles of data minimization and purpose limitation.
- **Data storage and security:** ECHO, within WP5, will implement robust security measures to protect personal data from unauthorized access, alteration, or destruction. This includes secure storage, encryption, and regular security audits to ensure ongoing protection of participant data.
- **Rights of the data subjects:** Citizen scientists participating in ECHO have specific rights under GDPR, including the right to access their data, the right to correct inaccuracies, the right to be forgotten, and the right to data portability. The project will create procedures in place – see next sections - to respond to such requests from participants in a timely manner.
- **Training and awareness:** We will create regular training for all staff in ECHO. Volunteers involved in the ECHO will sign informed consent providing they understand the GDPR requirements and the importance of data protection.

Non-EU countries

HUTTON (UK) is involved with 71 PM in the project, leading citizen science initiatives and storing UK participants' data on EU servers. Data sharing with UK partner may be required.

The European Commission's adequacy decisions enable such transfers without additional safeguards, recognizing countries like the UK for their GDPR-equivalent data protection laws. Nevertheless, informed consent must explicitly mention the possibility of data transfers to the UK, ensuring participants are aware and protections under the UK GDPR are maintained. This approach aligns with the EU's 2021 adequacy decisions, reinforcing data protection without diminishing participant guarantees.

Furthermore, the geolocation data of the collected samples may be considered personal data. However, these data will be adequately protected by adding necessary noise to prevent providing an exact location (neither in position nor in time), ensuring the scientific quality is not compromised and participant protection is guaranteed.

Data Collection and Use

- **Data collection for citizen scientists:** All data from citizen scientists, including personal information, will be collected through the mobile app and the web

platform. These platforms are designed to ensure easy, secure data submission and to safeguard the confidentiality and integrity of the data.

- **Data collection for end users:** The personal data of end users will be collected exclusively through the web platform. This method ensures a centralized, secure approach to data collection, allowing for effective management and protection of personal information.
- **Use of collected data:** The data collected will be used strictly within the context of the ECHO project's objectives. This includes research on soil health, community engagement activities, and other related scientific studies. Again, clear consent will be obtained from all participants regarding the use of their data. The project is committed to transparency about how data is used and for what purposes.
- **Data management practices:** Robust security measures will be in place to protect the data collected via the mobile and web platforms, preventing unauthorized access, alteration, or loss. All data collection and processing activities will comply with the GDPR, ensuring the highest standards of data privacy and rights of individuals.
- **Data rights and accessibility:** The ECHO project fully recognizes and upholds the data rights of participants, in line with GDPR. This includes the right to access their data, the right to rectification of inaccurate data, the right to erasure (or the 'right to be forgotten'), and the right to restrict or object to processing of their data. Participants also have the right to data portability, which allows them to receive their data in a structured, commonly used, and machine-readable format. Clear and accessible procedures will be in place for participants to exercise their rights. This ensures that any requests related to their data rights are handled efficiently and in compliance with legal timeframes.
- **Data accessibility for research and public knowledge:** While prioritizing the privacy and security of participant data, the ECHO project also commits to making non-personal and aggregated research data accessible. This is in line with open science principles, promoting wider public access to scientific findings and fostering a collaborative scientific community.
- **Transparency in data usage:** The project will maintain transparency in data usage, ensuring that citizen scientists and the public are informed about how data is being utilized for research purposes.
- **Ethical considerations in data sharing:** When sharing data with third parties, such as research collaborators or institutions, the ECHO project will ensure that all ethical guidelines and legal requirements for data protection are strictly adhered to. Agreements and protocols will be in place to guarantee that shared data is used responsibly and ethically.
- **Data retention policy:** The ECHO project adheres to a strict data retention policy, which dictates the duration for which different types of data are held. The retention period is determined based on the purpose for which the data was collected, the necessity of retaining the data for ongoing research or analysis, and legal requirements.
- **Secure data deletion:** Once the retention period expires, or when the data is no longer required for the stated purposes, it will be securely deleted. This process

ensures that the data cannot be reconstructed or retrieved, maintaining the privacy and security of participant information.

- **Review and update of retention policy:** The data retention policy will be periodically reviewed and updated to reflect any changes in legal requirements, project objectives, or technological advancements.
- **Participant requests for data deletion:** In accordance with GDPR, participants will have the right to request the deletion of their personal data.

Data Security Measures

- **Data encryption:** ECHO will develop and implement state-of-the-art encryption protocols for all stored and transmitted data, including SSL/TLS for data in transit. It will ensure that the encryption standards (AES for data at rest and TLS 1.3 for data in transit) are up-to-date; these will be regularly reviewed and upgraded as newer standards emerge.
- **Strong authentication and access control:** ECHO will deploy encrypted authentication for system access. In order to minimize access risks ECHO considers implementing role-based access controls (RBAC) and the principle of least privilege (PoLP). Access permissions will be regularly reviewed to ensure they are appropriate.
- **Regular security audits and assessments:** ECHO will schedule regular security audits complemented by continuous monitoring tools.
- **Data backup and recovery plans:** ECHO will implement automated data backups stored securely and develop a comprehensive disaster recovery plan for quick data restoration in the event of loss. The recovery plan will be tested to guarantee that it works as expected in different scenarios, including catastrophic failures.
- **Secure data disposal:** ECHO will adopt and enforce strict protocols for secure data disposal, including digital wiping and physical destruction of outdated storage media. The protocols will be compliant with relevant EU and local regulations including GDPR.
- **Staff training and awareness:** ECHO will provide training materials for staff focusing on data security best practices, phishing awareness, password management, and secure data handling protocols.
- **Up-to-Date security software:** ECHO will install robust firewalls, with updates enabled for all security software.
- **Regularly update systems:** ECHO will establish a routine schedule for updating critical software systems, giving priority to security patches and updates.
- **Incident response plan:** ECHO will develop a cyber-security plan, including an incident response plan and procedures.

Public Engagement & Inclusivity and Diversity in Research

Principles of Ethical Recruitment

The recruitment process in research involving human participants must be conducted with utmost respect for potential participants' rights and dignity. This involves:

- **Transparent communication:** ECHO will outline the purpose of the research, what participation entails, and any associated risks or benefits. We will communicate the goals, methodologies, and findings of the project in an accessible language ensuring transparency.
- **Voluntary participation:** We will ensure that participation in the ECHO is entirely voluntary and free from any form of coercion or undue influence.
- **Inclusivity and diversity:** Efforts will be made to involve various demographic groups, ensuring that the project is accessible to people of different ages, backgrounds, and levels of scientific understanding.
- **Educational outreach:** Through workshops, informational materials, and interactive sessions, ECHO should aim to educate the public about soil health.
- **Interactive communication:** We will establish a two-way communication channel, where the public can ask questions and express concerns, and scientists can share insights.
- **Feedback incorporation:** ECHO will implement mechanisms for public feedback and suggestions, and visibly incorporating this feedback into the project, validates public input and enhances project relevance.
- **Acknowledgment and empowerment:** ECHO will recognize the contributions of public participants to foster a sense of ownership and value, encouraging continued engagement and advocacy for soil health.

To comply with these principles:

- **IBERCIVIS**, as the T7.4 Ethical Issues Coordinator, will ensure these principles are ethically integrated into the project's communication and public engagement strategies.
- The **Ethical Review Board** will evaluate public engagement activities to ensure they align with ethical standards, particularly in terms of inclusivity, transparency, and data handling.
- **The Citizen Science Initiative Coordinators will play** a hands-on role in implementing these principles, directly engaging with the public, facilitating educational activities, informed consents and related documents, and ensuring that feedback from participants is heard and addressed.

Principles of the Informed consent

Informed consent is a fundamental ethical requirement in research involving human participants and therefore, in citizen science projects. The process involves:

- **Full disclosure:** Providing potential participants with all necessary information about the research in a clear and understandable manner. This includes the purpose of the

research, procedures involved, potential risks and benefits, and the extent of confidentiality of data.

- **Comprehension:** Ensuring that participants fully understand the information provided. This may involve using simplified language, visual aids, or other methods to convey information effectively, especially in cases involving vulnerable populations or children.
- **Ongoing Process:** Recognizing that informed consent is an ongoing process rather than a one-time event. Participants should have the opportunity to ask questions and withdraw from the research at any time without any penalty.
- **Special considerations for vulnerable groups:** Implementing additional protective measures for vulnerable groups, such as children, people with disabilities, or populations with limited access to information. This may involve obtaining consent from a legal guardian or using assent forms in addition to consent forms.
- **Data use consent:** Specifically obtaining consent for how participants' data will be used, stored, and shared, in compliance with GDPR.

Protection of Vulnerable Groups and Other Categories of People

As said, one of the principles of the Informed Consent Process is the protection of vulnerable Groups and other Categories of People. This subsection outlines our commitment and specific strategies to protect these groups in the citizen science campaigns and other participative activities.

- **Child participants:** When involving children in the project, we obtain consent from both the child (assent) and their legal guardians. Information is provided in age-appropriate language, and activities are designed to be engaging and non-intrusive.
- **Participants with disabilities:** For those with disabilities, we will try to provide accessible materials and adapt citizen science activities to their needs.
- **Economically disadvantaged participants:** In engaging economically disadvantaged groups, we are careful to avoid any form of exploitation. We ensure that participation does not incur any costs to them.

Ibercivis will be in contact with coordinators of citizen science activities to regularly monitor the necessity of new protocols in case of participation of specific vulnerable groups. All our strategies and interactions with vulnerable groups will be designed to comply with national and international ethical guidelines and legal standards. We will regularly review our practices to ensure they align with the latest regulations and ethical frameworks. We will actively seek feedback from vulnerable participants and their advocates to continuously improve our approach. This feedback will be integrated into our project design and execution, ensuring that our practices remain sensitive, inclusive, and respectful of the rights and dignity of all participants.

Engagement documents

Participants will be provided with two key documents, that will be included in the mobile application and web platform and will be accessible offline if needed.

- **Information Sheets, including:**
 - Reasons for the participant's invitation.
 - The participant's role and tasks.
 - Any potential risks involved in participation.
 - Instructions on how to withdraw from the project.
 - Details on data handling and usage.
- **Informed Consent/Assent Forms:** Available both on the project's platform (mobile and web) and in physical form, to ensure informed, voluntary participation.

A third document will be provided to the coordinators of the citizen science activities, enabling them to request permission from the citizen scientists to take photographs and/or videos during the activities. These coordinators will be responsible for safeguarding these consented reports.

- **Consent Form for Photography/Recording:** This will be used when activities involve taking photographs or making audio/video recordings of participants for the promotion of the ECHO project.

All these documents once approved by the ethics committee of the University of Bolzano will be translated into the 24 official European languages, ensuring accessibility to all European countries in their native languages. A preliminary version of these documents, based on the Participant Informed Consent Form (D7.2), is included in the annexes of this deliverable.

Please note that the documents we are providing for the ECHO project are preliminary versions. They might undergo slight changes depending on the selected research methods. This could involve adjustments in soil sampling techniques (Task 2.1), methods used to assess changes in participants' behaviour and perception regarding soil health (Task 1.4), and the strategies chosen for distributing soil analysis kits to citizen scientists. We aim to refine these documents to align them closely with our evolving research methodologies.

Guardianship of consent forms

The Informed Consent/Assent Form will be stored digitally, as it will be the application and/or web platform itself that records these informed consents. However, in the case of Photography and Recording Consent Forms, to be stored by coordinators of the citizen science activities clear instructions are provided:

Responsibilities of Coordinators of Citizen Science Activities: As a coordinator of a citizen science activity, you are entrusted with the following responsibilities:

- Requesting Permission:

- Prior to any photography or video recording, you are responsible for presenting the Photography and Recording Consent Form to the participating citizen scientists.
- Ensure that the participants fully understand the purpose and use of the photographs/videos, as well as their rights regarding consent.
- **Guardianship of Consent Forms:**
 - Once a participant has signed the consent form, it is your responsibility to safely store and maintain these documents.
 - Keep a well-organized record of all consent forms for future reference and in compliance with data protection regulations.
- **Ensuring Ethical Practices:**
 - Respect the decisions of all participants regarding their consent or refusal to be photographed/recorded.
 - Ensure that photography and recording are conducted in a respectful and non-intrusive manner.
- **Communication with Project Team:**
 - Inform the project team about the consent status of participants, especially in cases where specific individuals should not be photographed or recorded.
 - Coordinate with the project team to ensure proper use of the collected materials in line with participants' consent.

Procedure for Photography/Video Recording:

1. **Present the Consent Form:** Provide the Photography and Recording Consent Form to the participants well in advance of the activity.
2. **Clarify Queries:** Answer any questions the participants may have regarding the consent form and the use of their images/recordings.
3. **Collect and Store Forms:** Collect the signed consent forms before the commencement of the activity. Store the forms securely and maintain confidentiality.
4. **Compliance with Consent:** Ensure that photography and recording are carried out in accordance with the permissions granted on the consent forms.

Transparency in Communication and Dissemination

This section revolves around the integrity and clarity in presenting and sharing research findings. This principle is key in maintaining trust and credibility in the scientific community, end users and with the public. Here are described the general principles that ECHO will follow:

- **Honest presentation of research results:** We will ensure that the findings and conclusions of the research are presented accurately, without distortion or selective reporting. We will avoid the omission of relevant data that could potentially alter the interpretation of the research.
- **Clear and understandable communication:** We will use language and terminologies that are accessible to the intended audience, whether it's the scientific community,

stakeholders, or the public. We will provide context and explanation for complex or technical aspects of the research.

- **Avoidance of misrepresentation:** We will ensure that all statements about the research are truthful and not misleading in any way. ECHO will be cautious not to overstate the significance or potential applications of the research findings.
- **Respect for participant privacy and data confidentiality:** We will safeguard the privacy of citizen scientists and the confidentiality of their data, especially in cases involving sensitive information.
- **Ethical promotion and marketing:** We will promote the research ethically, without exaggerating the results or promising more than what the research can deliver. We will avoid the use of sensationalist or misleading headlines or summaries in any promotional materials.
- **Transparency in data use and processing:** We will be transparent about the methods of data collection, processing, and analysis. We will explain the methodologies used in the research, including any limitations or biases.
- **Accountability and correction of errors:** ECHO will take the responsibility for the content of the communication and being open to feedback and criticism. We will promptly and transparently correct any errors or inaccuracies that are identified post-publication.

Ethical Impact Assessment, Feedback and Environmental Considerations

Citizen science projects inherently involve diverse communities, both human and ecological. Thus, conducting an Ethical Impact Assessment is crucial for ensuring that these projects are conducted responsibly, ethically, and sustainably. This section covers the comprehensive approach to assessing and addressing the ethical implications, feedback mechanisms, and environmental considerations of the ECHO project.

- **Ethical impact assessment and community engagement:**
 - We will engage with citizen scientists early in the activities to understand their needs and concerns. This includes discussions with local leaders, stakeholders, and potential participants.
 - We will conduct thorough assessments to understand the potential impacts of the research on local communities and the environment. This involves evaluating both short-term and long-term effects.
 - We will ensure that all participants are fully informed about the nature of the research, its goals, and potential impacts.
- **Feedback and continuous improvement:**
 - We will implement feedback mechanisms – inside the mobile app and web platform - to gather input from participants and stakeholders throughout the project.
 - We will use this feedback to make continuous improvements in the project. This should be an ongoing process where the project adapts to new information and changing circumstances.

- **Environmental impact and sustainability:**
 - We will evaluate the environmental impact of the project activities.
 - We will implement environmentally sustainable practices in all aspects of the project. This includes minimizing waste, reducing carbon footprint, and choosing eco-friendly materials and methods (further details below).
- **Risk assessment and participant safety:**
 - We will identify potential risks to participants, including physical, psychological, and social risks.
 - We will develop and implement strategies to mitigate identified risks. This includes providing training, ensuring safe research environments, and having clear procedures for handling emergencies (further details below).
- **Ethical use of findings and data:**
 - We will ensure that the data collected is used ethically and responsibly. This includes respecting privacy, securing sensitive information, and using data only for the intended purposes.
 - We will report findings in a manner that is honest and transparent. Avoid misrepresentation of data and ensure that findings are accessible to the community and stakeholders.
- **Feedback and Redress Mechanisms:**
 - We will establish clear procedures for participants and stakeholders to express concerns or grievances.
 - We will ensure there are mechanisms in place to address and resolve any issues that arise, respecting the rights and dignity of all involved.

Environmental impact and sustainability

To ensure a detailed approach to environmental impact and sustainability for our extensive soil sampling project we will create a plan that will include:

- **Localized Environmental Compliance:**
 - With the collaboration of local stakeholders, we will review and adhere to the specific environmental regulations of each of the 27 EU countries and the UK before soil sampling begins, ensuring that our methods are compliant with local laws. Our training materials will guide citizen scientists in these matters.
- **Stakeholder Engagement for Biodiversity:**
 - We will collaborate with local environmental groups and ecologists in each region to understand and mitigate any potential impacts on biodiversity due to our sampling activities. Fragile environments will be mapped, and citizen scientists will be strongly discouraged from sampling in these areas.
- **Training for Sustainable Practices:**
 - All staff and citizen scientists will receive training on best practices for sustainable soil sampling, including handling and disposal of materials and understanding the local ecological context.
- **Sustainability in Sampling:**

- We will use tools and containers made – when possible - from recycled or biodegradable materials and implement procedures to properly dispose of or recycle them post-sampling.
- **Carbon Footprint Minimization:**
 - We will advise our citizen scientists to consider their carbon footprint when traveling to sampling sites-for instance, by selecting nearby locations or avoiding unnecessary trips. We will recommend the use of public transportation whenever possible.
- **Waste Reduction Initiatives:**
 - We will implement a strict protocol for waste management, aiming to reduce, reuse, and recycle materials across all sampling sites.
- **Monitoring and Reporting:**
 - We will conduct reviews of our environmental impact, compiling reports and adjusting our strategies as necessary to improve our sustainability performance continuously.

Risk assessment and participant safety

Our project is committed to prioritize the safety and well-being of participants, ensuring the accessibility of sample sites, and upholding the highest ethical standards:

- **Selection of Soil Sampling Methodologies:** Our approach to selecting soil sampling methodologies is grounded in safety and environmental preservation. We will:
 - Avoid methods that involve hazardous chemicals or dangerous equipment.
 - Opt for techniques that are safe, non-invasive, and environmentally friendly.
 - Provide comprehensive training to participants, ensuring they can safely collect samples.
- **Site Selection for Soil Sampling:** In choosing sites for soil sampling, we are committed to:
 - Training all citizen scientists and other participants on how to select locations that are easily accessible and safe, considering weather conditions and how to schedule sampling activities during optimal conditions.
 - Discourage participants to sample areas that may pose physical challenges or health risks.
 - Informing participants of any specific health considerations or physical requirements for participating in the sampling process.
- **Addressing Social Risks:** Our project acknowledges the potential social implications of our work, so we will be aware of :
 - Ensuring the accuracy and reliability of soil health data before dissemination to avoid causing undue concern among communities.
 - Promoting inclusivity by facilitating participation from all socio-economic backgrounds.
 - Managing expectations transparently, avoiding promises of immediate improvements in soil health post-project, and focusing on the project's scientific contributions and potential benefits.

Administrative and Operational Ethics

Administrative and Operational Ethics in research refer to the ethical principles and standards that guide conduct in managing and operating research projects. This includes transparency, accountability, integrity in administrative practices, legal compliance, financial management, and interactions with personnel and participants, emphasizing ethical decision-making in daily operations. How to solve some of these problems is included in the consortium agreement; however, we will cover some ethical aspects regarding this matter here.

- **Quality control and standardization:** ECHO is committed to upholding high standards of quality control across all research processes, including citizen science activities. This will be achieved through comprehensive training activities and the implementation of effective feedback mechanisms for local leaders, stakeholders, and potential participants. Task 1.4 will focus on creating a monitoring and evaluation framework that defines key indicators to ensure quality throughout the project.
- **Bias and representation in data:** We will actively identify and mitigate bias in data collection, analysis, and interpretation.
- **Ethical utilization of information:** We will use information gathered from research responsibly and ethically, respecting confidentiality and privacy. We will share information transparently with stakeholders while maintaining ethical boundaries.
- **Equitable access to information:** We will ensure that research findings and data are accessible to a wide audience, including those who participated in the research. ECHO will actively work to remove barriers to accessing information, particularly for underrepresented groups.
- **Collaboration and respect for other projects:** We will foster a culture of collaboration and mutual respect with other research projects and teams.
- **Ethical Coordination and Supervision:** The ECHO project has established a division of responsibilities in ethical aspects, which includes Ibercivis as the coordinator of these aspects, the ERB, the citizen science activities coordinators, and the rest of the partners.

References

ALLEA (2023). The European Code of Conduct for Research Integrity – Revised Edition 2023. Berlin. DOI: 10.26356/ECOC.

Council of Europe (1950). European Convention for the Protection of Human Rights and Fundamental Freedoms, as amended by Protocols Nos. 11 and 14, ETS 5. Retrieved from: <https://www.refworld.org/docid/3ae6b3b04.html> [accessed 30 January 2024].

ECSA (European Citizen Science Association) (2015). Ten Principles of Citizen Science. Berlin. Retrieved from: <http://doi.org/10.17605/OSF.IO/XPR2N>.

European Commission (2003). Report from the Commission on European Governance. Luxembourg: Office for Official Publications of the European Communities. ISBN: 92-894-4555-6. Retrieved from: https://ec.europa.eu/governance/docs/comm_rapport_en.pdf

European Commission. (2021). Commission Implementing Decision (EU) 2021/1772 of 28 June 2021 pursuant to Regulation (EU) 2016/679 of the European Parliament and of the Council on the adequate protection of personal data by the United Kingdom. Official Journal of the European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32021D1772>

European Commission, DG Research and Innovation (2012). Responsible Research and Innovation: Europe's Ability to Respond to Societal Challenges. European Union: Publications Office.

Fischer, F. (2012). Participatory Governance: From Theory To Practice. In The Oxford Handbook of Governance. Edited by David Levi-Faur. DOI: 10.1093/oxfordhb/9780199560530.013.0032.

H2020 EU Establishment Act (2013). European Commission. Retrieved from: https://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/fp/h2020-eu-establact_en.pdf.

Haklay, M., Dörler, D., Heigl, F., Manzoni, M., Hecker, S., & Vohland, K. (2021). What Is Citizen Science? The Challenges of Definition. In The Science of Citizen Science. Cham: Springer. ISBN 978-3-030-58278-4. Retrieved from: <https://www.springer.com/gp/book/9783030582777>.

Heigl, F., Dörler, D., Barta, P., Brodschneider, R., Cieslinski, M., Ernst, M., & Ziegler, D. (2018). Quality Criteria for Citizen Science Projects on Österreich forscht | Version 1.1. DOI:10.31219/osf.io/48j27.

Kieslinger, B., Schäfer, T., Heigl, F., Dörler, D., Richter, A., & Bonn, A. (2018). Evaluating Citizen Science: Towards an Open Framework. In *Citizen Science – Innovation in Open Science, Society and Policy*. London: UCL Press. Retrieved from: <https://discovery.ucl.ac.uk/id/eprint/10058422/1/Citizen-Science.pdf>.

Nazarko, L. (2020). Responsible Research and Innovation in Enterprises: Benefits, Barriers and the Problem of Assessment. *Journal of Open Innovation, Technology, Market, Complexity*, 6(1), 12. DOI: 10.3390/joitmc6010012.

OPEN AIRE (2020). University approaches to Citizen Science in the transition to Open Science. (Online workshop). Retrieved from: <https://www.openaire.eu/university-approaches-to-citizen-science>.

Ozolinčiūtė, E., Bülow, W., Bjelobaba, S., Gaižauskaitė, I., Krásničan, V., Dlabolová, D.H., & Umbrasaitė, J. (2022). Guidelines for Research Ethics and Research Integrity in Citizen Science. *Research Ideas and Outcomes*, 8: e97122. DOI: 10.3897/rio.8.e97122.

Pelacho, M., Rodríguez, F., Broncano, F., Kubus, R., Sanz, F., Gavete, B., & Lafuente, A. (2021). Science as a Commons: Improving the Governance of Knowledge Through Citizen Science. In *The Science of Citizen Science*. Cham: Springer. ISBN 978-3-030-58278-4. Retrieved from: <https://www.springer.com/gp/book/9783030582777>.

Resnik, D. B., Elliott, K. C., & Miller, A. K. (2015). A framework for addressing ethical issues in citizen science. *Environmental Science & Policy*, 54, 475–481. DOI: 10.1016/j.envsci.2015.05.008.

Riesch, H., & Potter, C. (2014). Citizen science as seen by scientists: Methodological, epistemological, and ethical dimensions. *Public Understanding of Science*, 23(1), 107–120. DOI: 10.1177/0963662513497324.

Robinson, L. D., Cawthray, J. L., West, S. E., Bonn, A., & Ansine, J. (2018). Ten principles of citizen science. In S. Hecker, M. Haklay, A. Bowser, Z. Makuch, J. Vogel, & A. Bonn (Eds.), *Citizen science – Innovation in open science, society and policy* (pp. 27–40). London: UCL Press.

Scassa, T. (2015). Intellectual Property Issues in Citizen Science. Retrieved from: http://www.teresascassa.ca/index.php?option=com_k2&view=item&id=178:intellectual-property-issues-in-citizen-science.

Scassa, T., & Chung, H. (2015). *Managing Intellectual Property Rights in Citizen Science: A Guide for Researchers and Citizen Scientists*. Washington, DC: Woodrow Wilson International Center for Scholars.

Serrano Sanz, F., Holocher-Ertl, T., Kieslinger, B., Sanz Garcia, F., & Silva, C. G. (2014). White Paper on Citizen Science in Europe. Societize Consortium. Retrieved from: http://www.zsi.at/object/project/2340/attach/White_Paper-Final-Print.pdf.

Shirk, J. L. et al. (2012). Public participation in scientific research: a framework for deliberate design. *Ecology and Society*, 17(2), art29.

Vohland, K., Weißpflug, M., & Pettibone, L. (2019). Citizen science and the neoliberal transformation of science – An ambivalent relationship. *Citizen Science: Theory and Practice*, 4(1), 25. DOI: 10.5334/cstp.186.

Ward-Fear, G., Pauly, G.B., Vendetti, J.E., & Shine, R. (2020). Authorship Protocols Must Change to Credit Citizen Scientists. *Trends in Ecology & Evolution*, 35(3), 187–190. DOI: 10.1016/j.tree.2019.10.007.

Annex 1 – Information Sheet

ECHO - Engaging Citizens in Soil Science: The Road to Healthier Soils

Information Sheet for Participants

Project Purpose:

ECHO - Engaging Citizens in Soil Science is a citizen science initiative aimed at enhancing our understanding and management of soil health. This project seeks to involve community members in scientific research to gather valuable data on soil conditions, contributing to a larger effort to promote healthier soils across various ecosystems.

Reasons for Your Invitation:

You have been invited to participate in this project due to your interest in environmental science, community involvement, or potential contributions to soil health research. Your participation is valuable in helping us gather diverse and extensive data from a wide range of locations and conditions.

Your Role and Tasks:

As a participant, your role will involve:

- Collecting soil samples from designated or agreed-upon locations.
- Recording environmental conditions and any relevant observations.
- Submitting the collected data through our project platform or designated channels.
- Engaging in community discussions and feedback sessions, if interested.
- Filling out pre- and post-participation surveys to assess your level of satisfaction and your perception of issues related to soil health.

Potential Risks:

Participation in this project is considered low risk. However, while collecting soil samples, you may encounter general outdoor risks (e.g., uneven terrain, weather conditions). We recommend taking standard precautions during outdoor activities.

Benefits:

By participating, you will contribute to vital environmental research, gain knowledge about soil science, and become part of a community dedicated to ecological health. This project offers an opportunity to engage in scientific research and contribute to a greater understanding of our environment.

Voluntary Nature of Participation:

Your involvement in this project is entirely voluntary. You are free to withdraw at any stage without any penalty or loss of benefits to which you are otherwise entitled. Your decision to participate or not will not affect your current or future relations with the organizing entities.

Instructions for Withdrawal:



If you decide to withdraw from the project, please inform the project through the project platform. You may also request the removal of your data from the project database, provided it has not been anonymized or aggregated for analysis.

GDPR Compliance:

This project adheres strictly to the General Data Protection Regulation (GDPR). We are committed to protecting your privacy and handling your data with the utmost care and responsibility.

Collection of personal data:

ECHO will collect personal data following the principle of data minimization, ensuring only the necessary information for effective management across different platforms is gathered. This may include contact details to dispatch the soil analysis kit to you. Additionally, some data such as geographical location of soil samples will be requested, used exclusively for scientific research purposes to enhance the precision and relevance of our study. Rest assured, the integrity and confidentiality of your personal data are paramount, in compliance with GDPR standards.

Legal basis for Data Processing:

In our ECHO project, we take the lawfulness of handling your personal data very seriously. The processing of your data is based on two key legal grounds:

- **Your Consent:** We rely on the consent you give us (as per Article 6, paragraph 1, letter a of the GDPR).
- **Public Interest Task:** The work we do is in the public interest (according to Article 6, paragraph 1, letter e of the GDPR). This means that when we process your data, it's not just about the project but also about contributing to something beneficial for everyone.

Use of collected data:

Please be advised that the data collected during this project may be integrated into larger databases for further analysis and utilized for broader research initiatives. To ensure privacy, all personal identifiers will be removed, rendering the data anonymous before it is made available to third parties, referred to as 'end-users.' This anonymization process is designed to protect your personal information while allowing valuable scientific insights to be derived from the aggregate data.

Sharing data outside of Europe:

We want you to know that some of the data you provide, like where you find your soil samples, might be seen by people in countries outside Europe. But don't worry, we've got a plan to keep your information safe. We'll use special tricks like adding a bit of blur to the location details. This way, we protect your privacy by making sure no one can figure out exactly where the data came from.

Personal data may also be transferred bi-directionally between the UK and EU for scientific purposes.

Retention Period of Personal Data:

We keep your personal data safe and sound for a specific amount of time. The plan is to store it for 2 years after the end of project and once this period is up, we'll make sure your data either becomes completely anonymous or is deleted in a way that it can't be brought back. This is our way of ensuring that your information is used responsibly and only for as long as needed for the project's goals.

Data Handling and Usage under GDPR:

All personal data collected will be processed in accordance with GDPR. This includes ensuring:

- Lawful, fair, and transparent data processing.
- Limiting data processing to specific, legitimate purposes.
- Minimizing the data collected to what is necessary.
- Ensuring accuracy of data.
- Limiting the storage period of personal data.
- Guaranteeing the security, integrity, and confidentiality of data processed.

Participants have the right to access their personal data, correct inaccuracies, and request data deletion. For any concerns about how your data is handled, please contact our Data Protection Officer at [contact information].

Contact Information:

For further inquiries or additional information, please contact the project coordinator at [contact information].

Thank you for considering participation in ECHO - Engaging Citizens in Soil Science. Your involvement is crucial in our journey towards understanding and promoting healthier soils.

Annex 2 – Informed consent form

Participant Consent Form

I, [Participant's Name], hereby acknowledge that I have read and understood the information provided in the Information Sheet for the ECHO - Engaging Citizens in Soil Science project. By signing this consent form, I agree to the following terms and conditions of my participation:

Understanding of Project Purpose and Tasks:

- I understand that the purpose of the ECHO project is to enhance our understanding and management of soil health through citizen science.
- I am aware of my role and tasks, which include collecting soil samples, recording environmental conditions, submitting data, participating in discussions, and filling out pre- and post-participation surveys.

Voluntary Participation:

- I acknowledge that my participation in this project is voluntary and that I am free to withdraw at any time without any penalty or loss of benefits.

Personal data:

- I understand that the ECHO project will collect my personal data, such as contact information and geographical location of soil samples, adhering to data minimization principles for project management and scientific analysis.
- I consent to provide necessary personal details for receiving the soil analysis kit and for the scientific use of geolocation data strictly related to my soil samples.
- I am aware that my personal data will be used in compliance with GDPR and will be protected with the highest standards of privacy and confidentiality.
- I am aware that my personal data might be transferred in a bidirectional way between UK and EU for scientific purposes.

Risks and Benefits:

- I understand that the risks associated with my participation are low and primarily related to general outdoor activities.
- I recognize the benefits of participating, including contributing to environmental research and gaining knowledge in soil science.

Data Handling and GDPR Compliance:

- I am informed about the data handling procedures under GDPR and the project's commitment to protecting my personal data.
- I understand my rights regarding data access, correction, and deletion.

Consent to Use of Data:

- I hereby give my consent for the data I provide to be used for the purposes of this research project.

- I understand that my data will be kept confidential, and that any public dissemination of the research results will not include my personal identification.

Contact and Queries:

- I know whom to contact [the citizen science activity coordinator or Data Protection Officer] if I have any further questions or concerns about my participation.

By signing this form, I confirm that I have had sufficient opportunity to ask any questions about the project and my participation in it, and that all my questions have been answered to my satisfaction.

Participant's Name (Print): _____

Participant's Signature: _____

Date: _____

Annex 3 – Informed assent form

ECHO - Engaging Citizens in Soil Science: The Road to Healthier Soils

Assent Form for Minors

Hello! We're really excited that you're interested in the ECHO project, where we learn about soil and how to keep it healthy. Before you start, we want to explain a few things and make sure you're okay with joining us.

What is this project about?

ECHO is a project where people like you help scientists learn more about soil – the dirt and ground we find outside. We collect samples, note what we see, and share our findings.

What will you do in this project?

- Collect soil from places we agree on.
- Write down what you notice about the place and soil.
- Share this information with us.
- If you want, talk about what you find with others in the project.
- Answer some questions before and after you join, so we know how you feel about the project.

For our ECHO project, we'll need to collect a little information about you.

- This is just to know where you've found your soil samples and how to get our special soil testing kit to you.
- We promise to only ask for what we really need and to keep your information safe and private.
- Your parent or guardian has given us the thumbs up to use this information to make the project a success. We won't let it get into the wrong hands.

Sharing data outside of Europe:

- We want you to know that some of the data you provide, like where you find your soil samples, might be seen by people in countries outside Europe. But don't worry, we've got a plan to keep your information safe. We'll use special tricks like adding a bit of blur to the location details. This way, we protect your privacy by making sure no one can figure out exactly where the data came from.
- Personal data may also be transferred bi-directionally between the UK and EU for scientific purposes.

Retention Period of Your Personal Data:

Just so you know, we won't keep your information forever. We'll hold on to it for a certain time – just long enough to do all the cool soil science stuff we've talked about. After that, we'll either turn your details into a secret code (so no one knows it's you) or make them disappear like a magic trick, never to be seen again. This is our promise to use your information carefully and not keep it longer than we need.

Is it okay if you don't want to join?

Yes! It's totally up to you. If you decide to join and later change your mind, that's okay too. You can stop anytime, and it won't be a problem.

Will we keep your information safe?

Yes, we will. We'll be very careful with the information you give us. We won't tell anyone your name or anything that lets people know the information came from you.

Do you have questions?

If you have any questions now or later, you can always ask. We're here to help and want you to feel comfortable.

If everything sounds good and you want to join, please write your name and sign below. Remember, it's okay to say no if you don't want to join.

Your Name (please print): _____

Your Signature (if you want to join): _____

Today's Date: _____

We also need your parent or guardian to say it's okay for you to join. They will fill out their own form.

Thank you for thinking about joining ECHO - Engaging Citizens in Soil Science. Whether you join or not, we think it's great you're interested in learning about soil!

To be filled by Parent or Guardian:

I, [Parent/Guardian's Name], confirm that I have read this assent form and discussed the ECHO project with [Child's Name]. I give permission for my child to participate in this project.

Parent/Guardian's Name (Print): _____

Parent/Guardian's Signature: _____

Date: _____

Annex 4 – Consent Form for Photography / Recording

Project Description:

As part of the ECHO project, we engage in various activities related to soil science, including fieldwork, workshops, and community events. To document and promote our work, we occasionally take photographs and make recordings during these activities.

Purpose of Photography/Recording:

The photographs and recordings will be used to showcase the project's progress, share our findings with the community, and promote soil science education. They may appear in reports, presentations, social media, promotional materials, and educational resources.

Consent and Release Agreement

I, [Participant's Name], hereby agree to be photographed and/or recorded as part of the ECHO project activities.

Use of Images/Recordings:

- I understand that the images/recordings may be used for project documentation, educational content, promotional activities, and other related purposes.
- I agree that these images/recordings may be used without any further approval from me.

Duration of Consent:

- This consent is valid indefinitely from the date of signing unless otherwise revoked in writing.

No Compensation:

- I understand that I will not receive any monetary compensation for my participation or for the use of images/recordings.

Revocation of Consent:

- I understand that I may revoke this consent at any time by providing written notice to the citizen science activity coordinator.

Rights and Ownership:

- I understand that the ECHO project and its affiliates will own the rights to these images/recordings and may use them in any lawful way.

Voluntary Participation:

- My agreement to participate and allow photography/recording is completely voluntary, and I am free to withdraw my consent at any time.

Release of Liability:

- I release the ECHO project, its coordinators, and affiliates from any claims, damages, or liability arising from the use of my image/voice/likeness.

Participant's Information:

Name (Print): _____

Signature: _____

Date: _____