

Mid-Project Data Management Plan Update



**Eco
Ready**

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¹ PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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Summary

This document contains the Mid-project updated Data Management Plan for the ECO-READY RIA HE project, addressing the implementation of the FAIR principles which will cover the lifecycle of data and deliverables produced during the project. The mid-term DMP describes the implementation of the plan presented in Version 1 of the DMP, at the current stage of the project lifecycle. The DMP of the ECO-READY project is developed based on the Horizon FAIR Data Management Plan (DMP) template provided by the European Commission and recommended to be used on voluntary basis.

Disclaimer

This publication has been produced within the ECO-READY project which has been funded by the European Union Horizon Europe Research and Innovation Programme under grant agreement n° 101084201. The views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Research Executive Agency. Neither the European Union nor the Research Executive Agency can be held responsible for them.



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1 Data Summary

The project involves data collection, including personal data and metadata in the context of survey participants for Life Cycle Assessment (LCA) in WP1, the stakeholders engagement tasks (WP2), the implementation and monitoring phase of the Living Labs (WP3), as well as metadata from accessing the Observatory database and utilizing the toolset (WP4). All processing of personal data will be conducted in accordance with the provisions of: a) the GDPR (Regulation (EU) 2016/679)¹²⁹, b) the Universal Declaration of Human Rights and the Convention 108 for the Protection of Individuals with Regard to Automatic Processing of Personal Data, and c) the national laws applying its provisions, including those governing the acquisition of valid consent. Data managed during the project will be processed only under the following preconditions which need to be met: (i) When the data subject has given her/his consent; (ii) When the processing is necessary for the performance of or the entering into a contract; (iii) When processing is necessary for compliance with a legal obligation; (iv) When processing is necessary in order to protect the vital interests of the data subject. Personal data managed within ECO-READY will be anonymized and stored in a form which does not permit identification of users. ECO-READY will establish a data management framework that guarantees security of collected data from potential abuse, theft, or loss. Research data that will be collected and/or generated by the project will be -in principle- made open and offered to the Open Research Data Pilot, in which ECO-READY declares its intention to participate. This Data Management Plan DMQP (D7.2) details what data the project will generate (i.e. content, type, format, volume), which standards and methodologies will be used for data collection and management, whether and how they will be exploited and how they will be made findable, accessible, interoperable and reusable (FAIR). The first version of the Data Management Plan is submitted by the project leader (CZU), and will be continuously updated until the end of the project. Management of research data will be done in accordance with the related soft law instruments governing scientific research, such as the European Code of Conduct for Research Integrity, the Guidelines to rules on Open Access to Scientific Publications & Open Access to Research Data in Horizon Europe, and the Guidelines on Data Management in Horizon Europe. The ECO-READY project partners must process personal data under the Agreement in compliance with the applicable EU, international and national law on data protection (in particular, Regulation 2016/67916). They must ensure that personal data is:

- processed lawfully, fairly and in a transparent manner in relation to the data subjects
- collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes
- adequate, relevant and limited to what is necessary in relation to the purposes for

¹ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.119.01.0001.01.ENG



which they are processed

- accurate and, where necessary, kept up to date
- kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the data is processed, and
- processed in a manner that ensures appropriate security of the data.

The ECO-READY project partners may grant their personnel access to personal data only if it is strictly necessary for implementing, managing and monitoring the Agreement.

ECO-READY will collect and use different types of data. Primary data will include qualitative data derived from interviews with experts, Delphi surveys, consumer surveys, and inputs collected during specific events (stakeholder working group meetings, workshops and capacity building events). Quantitative data will include satellite data and geoinformation on land use and land use change, as well as environmental DNA (eDNA) metabarcoding.

The Observatory database will combine field real-time data deriving from the living labs as well data from high-resolution images (when necessary), UAV orthophotos (hyperspectral or multispectral), and data from third-party sources such as Copernicus, EU Sentinel missions, USA Landsat missions, etc.

Molecular approaches based on environmental DNA (eDNA) metabarcoding have been chosen because they allow to generate large amounts of data, improving current biodiversity assessments and are able to simultaneously determine species distributions, ecologically important patterns of species diversity and detect novel species. We are planning to conduct a meta-analysis based on the Global Biodiversity Information Facility (GBIF) records and checking regional geographical fit with species lists in available literature. Hence, we could compare the Next-Generation Sequencing (NGS) identified species and test their geographical fit by registered coordinates².

The secondary data will be collected as outcome of the Structured Data Review, in order to outline the food social-ecological system at a European level; data will be searched in the scientific literature, in the EU project reports, but also in National projects, in EUROSTAT database and in other sources.

Taking into account the importance of data management, the second version of the data management plan is presented in this document. This document will be updated in month 48 (D7.5) as part of Task 7.4. This task will ensure the proper handling of data that is collected within the project. Data will be stored in a separate data usage tracker that allows to document meta data (e.g. the type of data, origin), its storage place and the parties granted to it. This will also specifically include if the data is intended for publication as open access data. The owner of the data, i.e. generally the source of data will have a veto to ensure that no industrial confidential data will be released to the public.

² https://www.gbif.org/occurrence/map?has_coordinate=true&has_geospatial_issue=false

2 Update on FAIR data

Through the integration of advanced data management technologies and adherence to the FAIR principles, the ECO-READY project aims to create a robust framework for data exploitation. This framework will not only enhance the usability of the data collected but also empower stakeholders to make informed decisions regarding food security, climate change, and biodiversity, ultimately contributing to a more sustainable future. The data management strategy emphasizes the principles of findability, accessibility, interoperability, and reusability (FAIR), ensuring that the collected data can be easily utilized by stakeholders. Below is a brief description of the activities and references related to data collection, handling, and storing within the project.

2.1 Implementation of FAIR principles in the context of the co-creation workshop (WP4).

The ECOREADY User Requirements Co-Creation Workshop, held on March 13, 2024, brought together a diverse type of stakeholders to collaborate on shaping the future of the ECO-READY Observatory platform and app. The workshop, conducted online via the Zoom platform, provided an interactive environment for engagement and dialogue, allowing participants to share their expertise, perspectives, and aspirations for the Observatory's development. Throughout the thematic sessions, participants explored key aspects including user needs and cases, data visualization, features and functionalities, and community interaction. Each thematic session held rich discussions, generating valuable insights and recommendations to inform the project's approach.

In the context of the co-creation workshop, several standards and methodologies have been employed for data collection and management, with a focus on ensuring that the data is findable, accessible, interoperable, and reusable (FAIR):

Standards and Methodologies Used for Data Collection and Management:

Participant Engagement and Co-Creation Methodologies: The workshop utilized a World Café format to foster open dialogue and collaboration among stakeholders. This methodology encourages informal discussions and collective brainstorming, allowing for diverse inputs to shape the development of the ECO-READY Observatory.

Interactive Platforms: Tools like Zoom, Miro, and Mentimeter were used to facilitate virtual engagement, enabling participants to share insights in real-time. These platforms support collaborative document creation and feedback collection through interactive whiteboards and questionnaires.

Structured Feedback Collection: A series of pre-defined thematic questions guided discussions, covering aspects such as user needs, data visualization, features, and community interaction. This structured approach ensured comprehensive coverage of critical topics relevant to the Observatory platform.

Post-it Note Feedback on Miro: Participants utilized a digital Miro board to provide feedback in an organized manner, with color-coded notes for different stakeholder groups

to facilitate analysis.

Normalization Process for Data Consistency: To address challenges in engaging all participants equally, a normalization process was implemented for the feedback collected, ensuring that measurements across various questions are on a consistent scale. This process supports comparability and analysis of the feedback gathered during the workshop.

Data Exploitation:

Analysis and Reporting: The insights and feedback collected during the workshop will be analyzed to inform the development and refinement of the ECO-READY Observatory platform. This analysis will identify key user requirements, preferences, and priorities, guiding the technical and functional specifications of the platform. The results will be compiled into a comprehensive report that documents stakeholder contributions, key takeaways, and recommendations for the project's next steps.

Stakeholder Engagement: Ongoing dialogue and collaboration with stakeholders will be emphasized, ensuring that their insights continue to shape the project as it progresses. This engagement is crucial for maintaining relevance and responsiveness to user needs.

Ensuring FAIR Principles:

Findable: The data collected during the workshop, including feedback and insights, will be cataloged and indexed in a manner that allows stakeholders to easily locate it. This may involve creating a dedicated repository or database where all workshop-related documents and feedback are stored, complete with metadata for easy searchability.

Accessible: The data will be made accessible to stakeholders through an open-access platform or shared drive, ensuring that users can retrieve the information without barriers. Access rights may be defined to safeguard sensitive data while enabling transparency and collaboration among participants.

Interoperable: Data formats and standards will adhere to established protocols that facilitate interoperability across different systems. This may involve using common data formats (e.g., CSV, JSON) and ensuring that the data can be integrated with other tools and platforms relevant to the Observatory's objectives.

Reusable: The collected data will be documented with comprehensive metadata, including descriptions of the data's context, methodology, and intended use. This documentation will support data reuse by other stakeholders and researchers, allowing them to build upon the findings from the workshop in future studies or projects.

2.2 Implementation of FAIR principles in surveys (WP2)

WHITE conducted an EU-wide survey, along with desk research, to identify factors influencing consumers' sustainable behaviour. The resulting analysis provides valuable insights that aid with WP2, WP3, and WP4 tasks, as well as contribute to the development of consumer-driven resilience strategies.

Standards and Methodologies Used:

Crowdsourcing Platform: The survey utilized Prolific, a paid crowdsourcing platform, to ensure wide representation among EU consumers.



Random Sampling: A random sampling approach was applied to ensure diversity from all 27 EU member states.

Pre-screening Criteria: Participants were pre-screened based on their familiarity with survey processes, requiring a minimum participation in 20 studies and a contribution approval rate of at least 90%.

Survey Structure: The questionnaire included nominal and ordinal scales, collecting data on familiarity, willingness to pay a premium, purchase intention, and purchase behaviour (among other factors).

Data Management:

Data Cleaning: After collection, a thorough cleaning process was conducted to remove incomplete or disqualified responses, leading to a final sample size of 2,785 responses from the initial 3,130 participants.

Statistical Analysis: Descriptive statistics and regression-based methods such as Path Analysis were employed to analyze relationships among variables.

Data Exploitation

The insights derived from the survey aim to inform policies and practices regarding sustainable food consumption, contributing to understanding consumer behaviour patterns in the EU context.

FAIR Principles:

Findable: Data collected is aggregated and anonymized, ensuring participants' privacy while being accessible in published reports.

Accessible: Results are reported in public deliverable (D2.1) and will be uploaded to the project's website.

Interoperable: The use of standardized scales and measures allows for compatibility with other datasets in sustainable consumption research.

Reusable: The data, once aggregated, will be made available for further research on sustainable consumption behaviors and practices.

AUTH designed and led a Delphi survey with four focus groups implemented virtually, dedicated to an EU macro-region and covering all biogeographical regions.

Standards and Methodologies Used:

Delphi Method: This structured communication technique involved multiple rounds of questionnaires to gather expert opinions and achieve consensus on issues related to sustainable food systems.

Panelist Selection: Participants were categorized into four groups: Policymakers, Practitioners, Civil Society Organizations, and Consumers, ensuring a broad representation of perspectives.

Iterative Rounds: The study was conducted in two rounds, allowing participants to revise their opinions based on aggregated feedback from previous rounds.

Data Management:

Statistical Analysis: The Interquartile Range (IQR) and Median were used to assess consensus and agreement among panelists, with non-parametric tests applied for further verification of results.

Confidentiality: Email addresses were collected solely for invitation purposes, ensuring participant anonymity throughout the study.

Data Exploitation:

The findings will contribute to the creation of resilient food systems by identifying stakeholders' challenges and needs, as well as providing actionable insights for policy improvements.

FAIR Principles:

Findable: The results have been made available in a public deliverable (D2.1), ensuring visibility for interested parties.

Accessible: The Delphi study results will be shared through the ECO-READY project website.

Interoperable: The methodological rigor and structured findings facilitate comparative analysis with other studies in sustainable consumption.

Reusable: The consensus-driven results will be documented and made available for future research, supporting ongoing discussions in the field of sustainable food systems.

In summary, both surveys adopted comprehensive methodologies for data collection and management, ensuring that insights are robust, actionable, and aligned with the FAIR principles to enhance the usability of the findings for future research and policy formulation.

2.3 Implementation of FAIR principles on data collection by the Living Labs (WP4)

Data Collection

Diverse Data Sources: Data will be collected from diverse sources, including IoT devices within Living Labs, external databases, and user inputs. This information is crucial for real-time assessments and forecasts. The observatory gathers data from multiple sources, including sensors deployed in Living Labs, which provide critical environmental data. This includes readings on soil moisture, temperature, and precipitation, essential for understanding agricultural conditions.

Data Formats: The project anticipates receiving data in various formats, such as JSON and MS Excel files for structured data, text formats, and potentially CSV, TIFF, and PDF files, although the practicality of these formats will be evaluated for compatibility with the system.

Event-Based Data: The fundamental unit of data ingested by the system consists of events, which are defined as discrete pieces of information recorded at specific points in time. Each event is time stamped and includes relevant attributes, e.g. in a precision agriculture scenario it could contain sensor identification data, metrics like temperature or humidity, etc.

API Integration: Data input is facilitated through a RESTful API, where users or external systems can send raw data. The API involves authentication and authorization mechanisms to ensure input and output is performed from authorized entities.

Data Ingestion Process: The system uses the aforementioned RESTful API to facilitate the ingestion of data, ensuring that it can handle various data formats such as JSON, CSV, and text files. The backend utilizes technologies like Apache Kafka for real-time data streaming and management. Upon data submission, the API acts as a Kafka producer, directing the incoming data into designated topics. Kafka consumers listen to these topics and store the data in Cassandra, which serves as the primary storage solution for the observatory.

Data Handling

Data Processing Frameworks: The project employs a combination of Apache Kafka, Apache Flink, and ksqlDB to manage data processing. Kafka serves as a message broker, facilitating real-time data streaming, while Flink handles complex event processing and real-time analytics.

Real-Time and Batch Processing: The architecture is designed around a Lambda-like structure, allowing it to process both real-time and historical data. This enables the observatory to deliver timely insights and analysis based on current environmental conditions.

Data Transformation: The observatory incorporates advanced data transformation techniques, allowing for real-time analytics and predictions. For instance, users can request statistical operations such as mean and sum on specific data attributes, enabling comprehensive analyses of agricultural trends.

Metadata Management: A dedicated metadata keyspace within Cassandra organizes and manages metadata related to users, organizations, projects, and collections. This structured approach enhances the efficiency of data retrieval and analysis, providing insights into the relationships between different data entities.

Data Storage

Long-Term Storage Solutions: Processed data are stored in Apache Cassandra, which provides a scalable and flexible schema for efficient data management. This allows for easy querying and retrieval of data, essential for supporting the observatory's functions. Apache Cassandra is utilized for long-term data storage due to its high scalability and fault tolerance. The data schema in Cassandra includes keyspaces, column families, and rows, allowing for efficient organization and retrieval of large datasets.

Structured Data Schema: The observatory employs a well-defined data schema that organizes data into distinct organizations, projects, and collections. This hierarchical structure facilitates better data management and ensures that each organization's data remains isolated and secure.

Data Aggregation and Historical Analysis: Users can request custom data aggregations, either historical or real-time, through the API. The observatory supports complex querying options, enabling users to analyze trends and draw insights from historical data.

Searchable Depository: The indexing mechanism further functions as a searchable depository that indexes metadata and products of the ECO-READY Observatory, allowing users to efficiently navigate and access relevant data. This feature is crucial for stakeholders needing quick access to information on food security, climate change, and biodiversity.

Security and Compliance



User Authentication and Authorization: The observatory employs Attribute-Based Access Control (ABAC) to manage user roles and access to data, ensuring that only authorized users can view or manipulate sensitive information.

Data Security Measures: All user data is securely stored and transmitted using encryption protocols. Regular security audits are conducted to protect against data breaches, ensuring compliance with data protection regulations such as GDPR.

User Feedback Mechanisms: The observatory includes features for users to provide feedback, report issues, and suggest improvements, enhancing the platform's usability and responsiveness to user needs.

FAIR Principles Implementation

Findability: Each data entity will be indexed and tagged appropriately within the Searchable Depository, enhancing search efficiency. Metadata will be created to capture essential information about data entities, making them easier to locate.

Accessibility: Data will be made accessible through a user-friendly interface that supports various querying capabilities. Users can retrieve data through a RESTful API, ensuring they can interact with the data easily. The observatory will include features for users to filter and customize their data queries, supporting real-time and historical data access.

Interoperability: The system will ensure interoperability with other relevant platforms and standards, facilitating data exchange and integration with external tools. It will include well-known formats that are used from reputable external sources such as Eurostat and ArcGIS, ensuring comprehensive and accurate data usage.

Reusability: Data will be structured in a way that allows for easy reuse in various contexts, such as policy-making, research, and community engagement. The observatory will provide comprehensive help resources and tutorials, assisting users in understanding and utilizing the data effectively. Customizable features in the mobile app and dashboard will allow users to tailor the data according to their specific needs, enhancing the potential for reusing the data across different applications.

Through the integration of advanced data management technologies and adherence to the FAIR principles, the ECO-READY project aims to create a robust framework for data exploitation. This framework will not only enhance the usability of the data collected but also empower stakeholders to make informed decisions regarding food security, climate change, and biodiversity, ultimately contributing to a more sustainable future.

2.4 Implementation of FAIR principles on modeling for future scenarios of food resilience (WP1)

In WP1 we modelled future scenarios for food resilience, a key component of Task 1.4 within the broader project framework, built upon the key drivers and storylines influencing food security (Task 1.3) and the 'Living Labs (LLs) scenario modelling workshop'³. The scenario modelling quantified the potential impacts of a selection of these scenarios with

³ Co-creation and Training Workshop for Scenario Development', 27-28 June 2024, The Hague, the Netherlands.

economy-wide characteristics on food security, environmental sustainability, and economic performance. Here, we outline the methodology used for modeling future scenarios, focusing primarily on the MAGNET model and its integration with other methodologies such as Life Cycle Assessment (LCA) and intermediate models.

Standards and Methodologies for Data Collection and Management:

Modeling Frameworks: The primary modeling tool is the MAGNET model, which is a multi-regional, multi-sectoral applied general equilibrium model tailored for agri-food analysis. This model uses the GTAP (Global Trade Analysis Project) database for economic data. Intermediate models are employed to assess specific impacts, such as climate change on agricultural yield, providing localized insights that feed into the broader MAGNET model.

Scenario Development: Scenarios are developed through a structured, four-step foresight modeling approach, which includes identifying focal issues, selecting scenario logics, describing scenario storylines, and analyzing implications. This process involves stakeholder engagement, particularly with Living Labs that contribute regional insights and data.

Data Sources: Data is sourced from existing databases (e.g., GTAP for economic data, IPCC-based Shared Socioeconomic Pathways for global trends) and insights from Living Labs, which provide localized data on agricultural practices, climatic conditions, and socio-economic factors.

Indicators and Measurable Inputs: Specific indicators are identified for each Living Lab project, which reflect local challenges and opportunities. This includes economic indicators, environmental metrics, and social aspects such as labor availability.

Exploitation of Data:

Modeling Outputs: The outputs from the MAGNET model and LCA will be used to generate insights for policy recommendations, sustainability assessments, and strategic planning. These outputs will inform further analysis in subsequent work packages of the ECO-READY project.

Interactive Dashboards: An online interactive Power BI dashboard is developed to visualize the results, allowing stakeholders to explore different scenario comparisons and indicators. This tool is intended for use by Living Labs, researchers, and policymakers.

Case Studies: The document presents case studies that illustrate the application of the modeling frameworks and the practical implications of the findings. These studies help in validating the model outputs and exploring specific scenarios in depth.

Making Data FAIR:

Findability: Data will be cataloged and indexed in a way that makes it searchable. The use of standardized metadata will help in locating datasets relevant to food resilience and sustainability.

Accessibility: Data will be made publicly accessible through online platforms (e.g., Power BI dashboard) and potentially through repositories that allow stakeholders to retrieve the datasets and results generated from the models.

Interoperability: The methodologies adopted, including the integration of MAGNET with LCA and other intermediary models, ensure that data can interface with other datasets and tools. Standardized formats and protocols will facilitate this interoperability.

Reusability: Data and models will be documented adequately, including methodologies, assumptions, and limitations, to ensure that other researchers and stakeholders can understand and reuse the data for future studies or applications.

3. Update on allocation of resources

A template was distributed to be completed by the Living Labs of project ECO-READY. The purpose of the template was to collect and understand the data and output requirements for each Living Lab. An example of the filled template is given in Annex 1 of this document. The data are going to be stored in the ECO-READY observatory, which can cover a wide range of scenarios. The Living Labs have already started sending data to the WP4 team, responsible for the development of the Observatory that are stored in the data infrastructure currently being developed by WP4. An overview of the data requirements and the collection plan is given in the table below.

Table 1. Current data input planning with Living Labs

Task No	Input requested from LLs	Request Date	Due Date	Input dependencies
T4.1	Completion of the Living Labs data template, which outlines the data that are going to be provided by each LL, providing information about their schema, license, etc.	M18 (LL Kickoff)	M19 (Jun '24)	Responses were used in Task 4.1 to craft the requirements and technical design of the ECO-READY Observatory. These specifications are to be used further in Task 4.2 for the development of the Observatory.
T4.2	Data and mostly scenarios that are going to be added in the Observatory. Ideally, we would need screenshots of existing insights or mockups of how the LLs envision the visualization and map depiction of their data and outputs.	M19 (Jun 2024)	M23 (Oct '24)	Responses will be used for the (specific) design and development of the dashboard metrics and interactive map depictions. The dashboard and map are going to be further assessed and updated in Task 4.3.
T4.2	Data schema (a description of the format) for the data that are relevant to the	M22 (Sep '24)	M24 (Nov '24)	Responses and data will be used to populate the infrastructure of the Observatory, which are essential

Task No	Input requested from LLs	Request Date	Due Date	Input dependencies
T4.1	Completion of the Living Labs data template, which outlines the data that are going to be provided by each LL, providing information about their schema, license, etc.	M18 (LL Kickoff)	M19 (Jun '24)	Responses were used in Task 4.1 to craft the requirements and technical design of the ECO-READY Observatory. These specifications are to be used further in Task 4.2 for the development of the Observatory.
T4.2	Data and mostly scenarios that are going to be added in the Observatory. Ideally, we would need screenshots of existing insights or mockups of how the LLs envision the visualization and map depiction of their data and outputs.	M19 (Jun 2024)	M23 (Oct '24)	Responses will be used for the (specific) design and development of the dashboard metrics and interactive map depictions. The dashboard and map are going to be further assessed and updated in Task 4.3.
	Observatory. The main challenge is to determine which data are relevant and provide sample data.			for the working prototype of Deliverable 4.2 (due M26 of the project)
T4.3	Geographical locations (e.g. parcel numbers) and crops of the farms applying traditional farming.	M22 (Sep '24)	M24 (Nov '24) (and per season)	This data will be used to develop remote sensing solutions for monitoring food security related metrics. T4.2, T4.3, D4.2 and D4.3 are related to this data.
T4.2	Specification of the access rights for the data LLs will share.	M22 (Sep '24)	M23 (Oct '24)	This information is related to T4.2 and T4.3 (D4.2 and D4.3). Moreover, T5.4 and D5.3 depends on this information.

4. Update on data security

The ECO-READY project employs a robust infrastructure to ensure secure access and data management across its digital observatory. This infrastructure is designed to address the needs of various stakeholders, including policy makers, farmers, researchers, and citizens,



by providing secure and reliable access to essential data related to food security, climate change, and biodiversity.

Secure Data Transmission with HTTPS

All communications and data exchanges of the ECO-READY infrastructure are made through the secure HTTPS protocol. This protocol encrypts data transmitted between the users and the observatory, protecting sensitive information from potential interception or unauthorized access. By ensuring that all data exchanges are secure, the project enhances user trust and data integrity.

Key-Based Authorization System

The observatory implements a key-based authorization mechanism at project level that manages access to its various modules and data entities. This system employs three distinct types of API keys, which define the level of access granted to users:

Master Key: This key provides full access to all functionalities within a project of the observatory (e.g. a Living Lab), including the ability to manage user accounts and access sensitive data. It is primarily intended for organization administrators responsible for overseeing the system.

Write Key: Users with this key can input data into the relevant project, enabling collaboration and data management. It allows researchers and other authorized users to contribute data, which is crucial for ongoing research and insights.

Read Key: This key restricts access to view-only, ensuring that certain users can analyze information without the ability to modify it. This is particularly valuable for stakeholders who need to access data for decision-making but should not alter the underlying datasets.

Role-Based Access Control

To further enhance security, the ECO-READY observatory employs Attribute Based Access Control (ABAC), which categorizes users into distinct roles based on their needs and the nature of their engagement with the platform. There are three primary roles defined within the system:

Admin: Administrators possess full control over the observatory, including the ability to perform critical tasks such as user management, data aggregation, and system configuration. They are responsible for ensuring that only authorized personnel can access sensitive information.

User: Typically researchers affiliated with organizations such as Living Labs, users have both read and write access to their specific projects. This role fosters collaboration among researchers and enables them to utilize the full suite of tools and data available within the project scope.

Guest: This role is designated for external stakeholders who require access to public data. Guests can view information without the ability to modify it, ensuring that sensitive data remains protected.

Data Security Measures

In addition to the aforementioned access controls, the ECO-READY project implements several security measures to protect user data and ensure compliance with regulations such as the General Data Protection Regulation (GDPR):

Data Encryption: All user data is securely stored and transmitted using advanced

encryption protocols. This protects against unauthorized access and ensures that sensitive information remains confidential.

User Privacy Policies: The observatory has established strict privacy policies that govern data handling and user consent. This ensures that personal information is collected and processed in compliance with regulatory standards.

Regular Security Audits: Routine audits and assessments are conducted to identify potential vulnerabilities and ensure that security measures are effectively protecting the system against threats.

All in all, through the integration of HTTPS for secure data transmission, a key-based authorization system for controlled access, and stringent data security measures, the ECO-READY project establishes a resilient and secure infrastructure. This infrastructure not only protects sensitive information but also enables stakeholders to access, analyze, and utilize data effectively, fostering informed decision-making and contributing to the overarching goals of the project in addressing food security, climate change, and biodiversity challenges.

5. Update on ethical aspects

5.1 Recruitment of participants to data-gathering events

Participants in the various events that will be planned will be recruited as follows: Participation will be by invitation, based on their roles, and will be given opportunities to decline at any time during participation, accompanied by a destruction of any data collected. The project team will actively endeavor to achieve a fair gender balance at events, and representative samples overall. Participants will be fully informed, in advance, of what information will be gathered; and how it will be processed, stored, and disseminated. Where participant tracking is involved, this will be fully explained to each participant and a written consent will be required. All persons involved in the project will be made aware that they are taking part in a research project and will be fully informed of their rights and the potential risks that the data processing may bring. The informed consent will follow the guidelines of each local Ethics Committee and GDPR and an appropriate explanation of the aims, methods, anticipated benefits, potential hazards, and any other aspect of the study which is relevant to his decision to participate will be included. The research does not involve children or adults unable to give informed consent. There are no exclusion criteria. It will be ensured that procedures and criteria do not result in discriminatory practices or unfair treatment. Copies of ethical approvals for the collection of personal data or the respective notifications (depending on the type of personal data that will be collected and according to the national data protection legislation of each participating country) by National Data Protection authorities will be submitted to the European Commission.

5.2 Ethics principles of the projects funded via the FSTP

The ECO-READY project engages stakeholders in its Living Labs' activities. Specifically, humans participate in providing requirements and validating the solutions, meaning that no experiments will be conducted on them. This involvement is necessary for testing, evaluating and validating the tools to be developed in the project. The research adheres to ethical principles, and applicable international, EU and national law, satisfying all relevant compliance requirements for each specific activity. It ensures respect for individuals and human dignity, fair distribution of burden and research benefits, while at the same time protecting the values, rights and interests of all research stakeholders. The consortium performs its research activities in line with The European Code of Conduct for Research Integrity. Moreover, in task 5.4 Development of an Ethical Infrastructure, an ethical framework adapted to the specificities of the Observatory will be developed, aiming to reduce ethical risks and their inherent consequences, especially in relation with policy recommendations.

All participants of the Living Labs, like the rest of the project activities, have the right to obtain the erasure of personal data relating to them and the abstention from further dissemination of such data according to the GDPR. They will be informed about this right in the information sheets. Applications for erasure of data will be carried out without delay. In case the personal data has been made public, the consortium will take all reasonable steps, including technical measures, to inform third parties which are processing such data, that a data subject requests them to erase any links to, or copy or replication of that personal data. A procedure for exercising the right to be forgotten and to erasure is described in *Section 5.2 Ethics, Data Protection & Confidentiality of ANNEX 4 - Applicants' Guide in Deliverable 3.1*. As described in *Article 9 - Data protection, in ANNEX 4 - Contract template in Deliverable 3.3: The contracting parties have the obligation to abide by the Regulation (EU) 2016/679 (General Data Protection Regulation - GDPR) of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data*.

5.3 Appointment of Ethical Board

The Ethical Board (ETB) consists of external independent experts appointed by the Executive Board (EB). The Ethical Board's (ETB) main purpose is to provide independent ethical expertise to ensure the project's activities respect the Do No Significant Harm (DNSH) principle as defined in the "EU Taxonomy" in Regulation (EU) 2020/852. The ETB will advise and assist the EB and ECO-READY partners in understanding and appropriately addressing the ethics issues raised by their activities, and to report independently to the Commission. The Ethical Board have produced General Ethical Guidelines (D7.2) to be followed by all the project members. This deliverable is the responsibility of the Coordinator. The ETB advises on ethical issues connected to research in ECO-READY, and



providing guidelines to be implemented by the Executive Board. Members of the ETB are appointed and steered by the Executive Board. The current ETB members include:

- Professor Petros Ieromonachou, PhD. Associate Dean, Research & Knowledge Exchange and Chair of the Ethics Committee at the University of Greenwich Business School, London, UK <https://www.gre.ac.uk/people/rep/faculty-of-business/petros-ieromonachou>
- Professor Barry O'Mahony, PhD. Dean, College of Business, Abu Dhabi University, UAE <https://www.adu.ac.ae/about-adu/our-leadership1/leadership-team/professor-barry-o-mahony>
- Professor Spyridon KOUTROUBAS, PhD. Dean, Faculty of Agricultural & Forestry Science, School of Agricultural Development, Democritus University Thrace, Greece <https://agro.duth.gr/en/author/skoutrou/>

As stated in *D7.6 General Ethical Guidelines*, upon selection (based on evaluation) and prior to the signatures of the FSTP sub-grant agreements, selected proposals have gone through an ethics review from the Ethics Board to identify potential ethics considerations. This process is depicted in *ANNEX 4 of D8.1 POPD - H - OEI - AI - NEC -Requirement No. 1*.



Annex 1 Example: ECO-READY Living Labs data and output requirements collection



ECO-READY Living Labs Template_Observatory

This document is a template to be completed by the Living Labs of project ECO-READY. The purpose of the template is to collect and understand the data and output requirements for each Living Lab. The data are going to be stored in the ECO-READY observatory, which can cover a wide range of scenarios. Please fill all relevant information and try to be as detailed as possible. Feel free to add figures, links or anything else. And, of course, feel free to write down any comments/suggestions/ideas for the observatory.

PROBIO (CZ)	
Living Lab Description	Living lab PROBIO will be collecting in situ data with IoT stations. The living lab focuses on pioneering and continuous development of organic farming practices. The key challenge within the living lab is to ensure food security under the impacts of climate change in one of the warmest and driest regions of the Czech Republic through organic farming.
Data Description	The living lab collects in situ data for each product through IoT sensors together with remote sensing data.
Data Schema & Variables	Each field/product includes the following variables: Meteorological Data (AgData) • Air Temperature (°C) • Atmospheric pressure (hPa) • Humidity (%) Soil Data (AgData) • Soil Temperature (°C) • Soil Moisture (%) Satellite Data (GeoPard) • Biomass Index • Chlorophyll Content Index • Water Content Index • NDVI Yield data (on farm data collection + regional data): • area planted (ha) • area harvested (ha) • yield in plant production (t/ha) Animal production (AgData + on farm data collection : • Average daily gain (ADG) in weight (kg/day) • Feed Conversion Ratio (FCR) (kg feed/kg weight gain) • Mortality Rate (deaths per period) • Incidence of diseases or health issues (number of cases)

	• Temperature and humidity in the pig housing (°C, %) - south and north side comparison. Open data from INTERSUCHO (regional level): • Prediction of drought intensity - 10 day overview. Maps showing a daily updated forecast of daily precipitation totals for the next 10 days. ◦ Detailed comparison of five models. Daily updated drought intensity maps for the next 9 days based on 5 forecast models. • Prediction of soil saturation - 10 day overview. Maps showing a daily updated forecast of relative soil saturation for the next 10 days. ◦ Detailed comparison of five models. Daily updated soil saturation maps for the next 9 days based on 5 forecast models. • Long-term forecast - Forecast for 2 months. The maps show a long-term drought forecast updated once a week. ◦ Forecast for 6 months ◦ The maps show a long-term drought forecast updated once a week. • Drought deviation from the usual state in the period 1961 - 2015 • Soil moisture deficit [mm] • Relative condition of field crops (PP) and grassland (TP) • Estimated effects of drought on yield of major crops • Impacts on forests
Data Volume & Throughput	The data are expected to be collected from 4 (plant) + 1 stations (animal) with the following frequency: • Meteorological and soil data: every 60 minutes • Satellite data: daily • Animal production data: typically weekly or monthly Each data event is approximately 1-2 KB. Historical satellite data spans the past years with daily records. Data from the open sources will be collected based on the source data collection mechanism (see INTERSUCHO). Data volume is expected to be similar.
Data Example	To be clarified, but expected to be in a standard formats of IoT stations (SigFox/LoRaWan/NB-IoT)
Output/Scenario Description	The collected data are used for monitoring in situ meteorological data and optimizing agricultural practices. Outcomes can be used to determine the optimal vegetation period, crop winterhardiness, repetitive water or temperature stresses, soil carbon sequestration, critical heat stress of the pigs, and potentially storage sensors. The data will clarify the adaptation of crop rotation to the local environment. This specific crop rotation is suited to arable, arid and erosion

	threatened sites. There are 60 000 ha with similar conditions in the region and this scenario could be replicable.
Output Queries & Variables	Basic queries are: ● Temperature (°C) - min., max., avg. ● Humidity (%) - min., max., avg. ● Rainfall (mm) - Cumul. rainfall for selected period ● Leaf Wetness - The leaf wetness sensor shows how moist the leaf area is on a scale of 0 to 20, where 0 value means dry and 20 means wet. Leaf drying progress can be monitored on the graph. (0 = Dry, 20 = Wet) ● Wind (m/s) - Average, Max. More advanced queries could include: ● drought stress (days) - days since the last significant rainfall ● sum of temperatures for certain period of time ● check if temperature goes above/below certain temperature ● remote sensing of soil crust formation
Output Volume & Throughput	The output data size is expected to be around 1-2 KB per query result. Frequency of queries: ● Real-time monitoring: every 30 minutes ● Predictive analysis: once per day
Output Transformations & Models	Key transformations and models: ● Outlier detection and removal ● Time-series forecasting for temperature and soil moisture ● Aggregation of historical data for trend analysis A forecasting model with a one-week horizon is used for planning purposes.
Visual & Other Output	Data and results could be integrated into the ECO-READY dashboard and interactive map. Users could have access to both raw data and visual summaries. Export functionality could be available for aggregated data.
Access to Data & Output	The raw data should be available to the Living Lab researchers and to any other researchers upon request. All other aggregated data and outputs should be openly

	available to everyone via the dashboard and the interactive map (and the mobile app, if need be).
Technical Information / Current Usage	To be clarified based on the selected 3rd party data provider.
Comments / Suggestions	All the IoT and satellite data are 3rd party data and their use has to be further clarified.