TRANS

lighthouses

MORE THAN GREEN

Lighthouses
of transformative
nature-based solutions
for inclusive communities

Funded by
the European Union

Data Management Plan v1

Lead partner	ATHENA R.C.
Type	DMP - Data Management Plan
Dissemination level	Public
Work package	WP1
Deliverable	D1.2 - DMP - Data Management Plan v1
Due date	10-2023
Version	v1

Project	More than green – Lighthouses of transformative nature-based solutions for inclusive communities
Acronym	TRANS-lighthouses
Grant agreement ID	101084628
Funded by the European Union	Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the granting authority can be held responsible for them.

Lead partner	Athena RC
Type	DMP — Data Management Plan
Dissemination level	Public
Work package	WP1
Deliverable	D1.2
Due date	31/10/2024
Version	1.1
Coordinator(s)	Vicky Dritsou
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Reviewer(s) *(to be acknowledged)*	Steering Committee, irina Castro

Document history

Date	Version	Author	Summary of change
02.10.2023	0.1	Vicky Dritsou	Draft version 0.1
20.10.2023	0.2	Vicky Dritsou	Draft version 0.2
25.10.2023	1.0	Vicky Dritsou	Final version
28.03.2025	1.1	Vicky Dritsou	Authorship form included

Fonts

Raleway	Designed by Matt McInerney, Pablo Impallari, Rodrigo Fuenzalida

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List of acronyms and abbreviations

CERN: European Organization for Nuclear Research
DMP: Data Management Plan
DOI: Digital Object Identifier
EC: European Commission
EEAB: External Ethical Advisory Board
FAIR: Findable, Accessible, Interoperable, Reusable
GDPR: General Data Protection Regulation (Regulation (EU) 2016/679)
HE: Horizon Europe
LKL: Living Knowledge Labs
NBS: Nature Based Solutions
WP: Work Package

Purpose of deliverable

Roles and objectives to other Work Packages

Deliverable 1.2 comprises a comprehensive Data Management Plan (DMP), which outlines the specifics of the data that will be collected and/or generated through the entire span of the project. As it deals with all data deriving from every activity that will be performed in the context of the project, the role of the DMP is transversal to all Work Packages (WP).

Besides outlining the type, format, size, source, and purpose/utility of the data, along with its associated metadata, it also details strategies for achieving findability, accessibility, interoperability, and reusability of information. Furthermore, it defines policies concerning data security, preservation, and ethical and legal considerations related to data sharing and assigns responsibilities to the Data Manager.

The DMP is a living document that will undergo periodic reviews at yearly intervals during the project, specifically at months 18 and 30. These reviews will ensure that the DMP remains fit for purpose both during and after the project, especially as new data accumulate.

Executive Summary

This deliverable is the first version of the DMP of the project. It describes the initial plan on how data that will be collected and/or generated will be shared, archived and preserved throughout the project and also after its end. It contains information about

- the kinds, provenance and formats of the data foreseen to be collected/generated,
- the procedures and guidelines that will be followed to ensure compliance with the Findable, Accessible, Interoperable, Reusable (FAIR) Data Management Principles[1],
- the allocation of resources required to make data FAIR,
- the procedures that will be followed to ensure data security, and
- ethical aspects and how these will be handled.

Data collected/generated will be stored to Google Drive cloud servers using a commercial, non-public license of Google Workspace that meets privacy and security requirements to comply with GDPR. The administrator of the account will ensure that access to the data will only be possible to project team members according to a Data Classification Policy that will organize them into user groups determined by the Steering Committee. The identification of the team members will be ensured by using authentication processes. Also in compliance with the General Data Protection Regulation (Regulation (EU) 2016/679)[2] (GDPR), a Data Region Policy will be set to ensure that data are stored exclusively to servers geographically located in Europe. Deliverables and research results of the project classified as public, as well as all scientific publications deriving from it, will be published to Zenodo open repository to provide open access, using the developed TRANS-lighthouses community..

For the preparation of the DMP the authors have used the Horizon Europe (HE) Data Management Plan (DMP) Template[3] (version 1.1, 01.04.2022). In each of the following sections, a set of questions appear in rectangles at their beginning: these questions derive from the DMP template and capture the information that should be provided within the section each time.

1. Data Summary

Will you re-use any existing data and what will you re-use it for? State the reasons if re-use of any existing data has been considered but discarded. What types and formats of data will the project generate or re-use? What is the purpose of the data collection/generation or re-use and its relation to the objectives of the project? What is the expected size of the data that you intend to generate or re-use? What is the origin/provenance of the data, either generated or re-used? To whom might your data be useful ('data utility'), outside your project?

The main goal of TRANS-lighthouses project is to gather evidence regarding tangible and intangible outcomes of Nature-Based Solutions (NBS) and to reevaluate and reframe the key components involved in creating socially and ecologically just NBS. Rather than being a linear

[1] https://www.go-fair.org/fair-principles/
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016R0679
[3] EU Grants: Data management plan (HE):V1.1 – 01.04.2022. Accessible as a Project reporting template at: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents;programCode=HORIZON?selectedProgrammePeriod=2021-2027&selectedProgramme=HORIZON

process, TRANS-lighthouses emphasizes collaborative efforts in planning and implementing functional NBS, which help address environmental and climate crises, while seeking to engage various stakeholders and expand their areas of influence.

To this end, data will be generated/collected for the following purposes:

- To produce case studies and pilot cases comparable with each other in terms of size, context, morphological characters, uses, and stakeholders involved; and map these cases with those evident in literature and data banks (WP2, WP3, WP5).
- To develop guidelines for rethinking human-nature relationship in NBS and achieve co-creation of NBS; to generate and provide educational materials and research results; to disseminate best practices and foster knowledge sharing (WP4, WP6).
- To perform deep research over assessment and pilot cases and provide data/knowledge sharing, translation and visualization (WP3, WP6).
- To identify the main typologies and models of participatory governance arrangements for co-creation of NBS and exploiting them to map different arrangements, leaderships and joint activities (WP2, WP4).
- To analyze co-creation, facilitated by digital tools and methods, and to quantify the sociocultural values and spatial qualities transferred through online user-driven content management systems (WP1, WP3).
- To analyze and assess human-nature solutions and produce Democracy labs to establish interfaces between science and policies (WP3).
- To design innovative governance systems (WP4).
- To transfer and disseminate knowledge generated previously by assessment cases and within the project's framework in the context of co-governance models (WP2, WP3, WP4).
- To activate Living Knowledge Labs (LKL) and demonstrate -through LKL pilot cases- networks of actors/individuals with specific knowledge and different identities (e.g. civilians, different social and cultural groups, administrative employees, politicians, companies, associations) and their interconnections (WP6).
- To build digital and low-tech tools for implementing the governance models, for running LKLs, for supporting agile co-design, for implementing the pilot cases and for performing evaluations (WP6).
- To map participatory methodologies and tools, and citizen communication strategies; to customize solutions (methodologies, tools and strategies) so as to support the pilot cases, and to provide an NBS communication strategy within the project (WP6).

The project will collect and generate different kinds of data through pilot cases, case studies, interviews, workshops, meetings and seminars. The estimated volume of data that will be collected/generated throughout the project is of the order of 1 TB. Details on the data types, formats and size estimations are presented in Table 1 (in alphabetical order).

Table 1: Expected types, formats and size estimation

Type	Source	Format	Size estimation
3D files	Designs, site documentation	.fbx, .obj, .skp, .dwg	< 100 GB
Audio	Meeting and interview recordings	.mp3, .aac	< 1 GB
GIS data	Geospatial vectors, maps	.shp, .kmz, .las, .laz, .zlas	< 20 GB
Graphics	Photographs, drawings, images, maps	.png, .jpeg, .jpg, tiff, .pdf	< 150 GB
Interactive data	Surveys, quizzes, feedback forms from websites	.html, .json	< 0.5 GB
Presentations	Slides of meetings, workshops and seminars	.pptx, .odp	< 0,5 GB
Remote sensing data	Airborne photos, LIDAR, LANDSAT and SENTINEL images	.las, laz., zlas, .vlr, .jpg	< 150 GB
Spreadsheets	Surveys responses	.xlsx, .xml, .ods. .fods, .csv	< 0,5 GB
Text	Text deliverables, interviews, notes from workshops and seminars, articles, blog posts, guidelines	.doc, .docx, .odt, .txt, .pdf	< 1 GB
Video	Recordings	.mp4, .flv, .avi	< 200 GB
Website	Webpages, posts	.html	< 1 GB

Source: Created by the authors

Data will be produced to a large extent by consortium members throughout the project's duration. Reusability of existing data may also occur, exploiting experiences, practices and toolkits developed in previous and ongoing NBS projects, public bodies and data banks or scientific results present in the literature. The knowledge produced will be disseminated and made publicly available, unless restricted by the General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679), being useful for the NBS and co-governance research community, practitioners, stakeholders, educators and the general public.

2. Findable, Accessible, Interoperable, Reusable (FAIR) data

2.1. Making data findable, including provisions for metadata

Will data be identified by a persistent identifier?
Will rich metadata be provided to allow discovery? What metadata will be created? What disciplinary or general standards will be followed? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.
Will search keywords be provided in the metadata to optimize the possibility for discovery and then potential re-use?
Will metadata be offered in such a way that it can be harvested and indexed?

All data that will be produced throughout the project, unless restricted by GDPR or deliverables considered confidential, will be made publicly available

- at the project's website, and/or
- in the Zenodo[4] trustworthy repository through the TRANS-Lighthouses Community[5], in addition to the European Commission Funded Research (OpenAIRE) Community[6].

Zenodo is an open research data repository produced by the open Scholarly Communication Infrastructure OpenAIRE[7] that supports Open Science . It hosts research data across all disciplinary fields. Managed by the European Organization for Nuclear Research (CERN), all data deposited to Zenodo are securely stored in the CERN Data Centre's cloud infrastructure.

Data/documents submitted to Zenodo will be automatically assigned a unique and persistent identifier (Digital Object Identifier - DOI), thus ensuring their persistent identification and findability. Naming conventions will be followed by agreement among consortium members on a name pattern containing the number and title of the data asset/document, the version number, the date and possibly other indicators. The agreed naming convention will be reported in the updated version of the DMP in month 30 (D1.8 Data Management Plan v2). To further optimize findability and usability, the following Zenodo metadata fields will be considered as mandatory for all project data submissions:

- data type,
- title,
- publication date,
- authors names, accompanied by their affiliation and ORCID,
- description,
- keywords (at least 2),
- access rights,
- license, and
- grant number.

Moreover, the Zenodo metadata field 'Subjects' is highly recommended to be completed by specifying subjects from a taxonomy or controlled vocabulary, e.g. the Unesco thesaurus[8].
The sequence of steps required to submit data to the TRANS-Lighthouses Community of Zenodo is presented in detail in Annex 1.

Project deliverables will also be submitted to the Participant Portal of the European Commission (EC).

2.2. Making data accessible

Repository:
Will the data be deposited in a trusted repository?
Have you explored appropriate arrangements with the identified repository where your data will be deposited?
Does the repository ensure that the data is assigned an identifier? Will the repository resolve the identifier to a digital object?

Data:
Will all data be made openly available? If certain datasets cannot be shared (or need to be shared under restricted access conditions), explain why, clearly separating legal and contractual reasons from intentional restrictions. Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if opening their data goes against their legitimate interests or other constraints as per the Grant Agreement.

[4] https://zenodo.org/
[5] https://zenodo.org/communities/trans-lighthouses/
[6] https://zenodo.org/communities/openaire/
[7] https://www.openaire.eu/
[8] https://vocabularies.unesco.org/browser/thesaurus/en/

If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g. patents), specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.
Will the data be accessible through a free and standardized access protocol?
If there are restrictions on use, how will access be provided to the data, both during and after the end of the project?
How will the identity of the person accessing the data be ascertained?
Is there a need for a data access committee (e.g. to evaluate/approve access requests to personal/sensitive data)?

Metadata:
Will metadata be made openly available and licenced under a public domain dedication CC0, as per the Grant Agreement? If not, please clarify why. Will metadata contain information to enable the user to access the data?
How long will the data remain available and findable? Will metadata be guaranteed to remain available after data is no longer available?
Will documentation or reference about any software be needed to access or read the data be included? Will it be possible to include the relevant software (e.g. in open source code)?

By default, all deliverables considered public and all produced data, including scientific publications, will be made openly available through the Zenodo open dissemination research data repository under the supported Creative Commons Attribution 4.0 International license, unless restricted by GDPR. As already mentioned above, data submitted to Zenodo are automatically assigned with a unique and persistent identifier (DOI). The DOI generated by Zenodo resolves to the landing page of the latest version of the digital object (resource). No specific arrangements are required for utilizing Zenodo as the project's trusted repository.

Restricted data, such as personal data from interviews and survey responses, will only be accessible by the corresponding task leaders and stored in secured folders of a commercial, non-public license of Google Workspace that meets privacy and security requirements to comply with GDPR. The administrator of the account will ensure that access to the data will only be possible to project team members according to a Data classification policy determined by the Steering Committee and by organizing team members into user groups. This classification policy will be explicitly mentioned in the second version of the DMP (D1.8 Data management plan v2). The identification of the team members will be ensured by using authentication processes. Also in compliance with GDPR, the administrator of the Google Workspace account will set a Data region policy to ensure that data are stored exclusively to servers geographically located in Europe. Personal data will only be shared with other partners in aggregated or anonymized form.

The TRANS-Lighthouses project includes participants from 7 non-EU countries, in particular Argentina, Brazil, Chile, India, Kenya, Tanzania and USA. Among these, Argentina and USA (organisations participating in the EU-US Data Privacy Framework) have been recognized by the European Commission as providing adequate data protection[9] wrt. GDPR. For the cases where data privacy adequacy has not been decided by the European Commission, compliance with GDPR will be ensured by contractual agreements between the Project Coordinator and the non-EU participant, in which the latter should confirm adherence to the requirements of GDPR. In case personal data need to be transferred to a non-EU country, the agreement will confirm that this will be performed in accordance with the restrictions of GDPR and with all procedures deriving from it and being described in the current DMP. In case any personal data will be collected/generated in a non-EU country, the non-EU participant will follow the legal procedures of the EU member states. The contractual agreements between the Project Coordinator and each non-EU participant will be included in the second version of the DMP (D1.8 Data Management Plan v2).

[9] https://commission.europa.eu/law/law-topic/data-protection/international-dimension-data-protection/adequacy-decisions_en

Currently there is no apparent need for an embargo time, in order to publish/seek protection of intellectual property (e.g. patents). If such an embargo is eventually required, this will be clearly stated in the second version of the DMP and will be set to the shortest possible interval, so that the data will be made available as soon as possible. No data access committee is required for the data collected/generated throughout the project.

Metadata will be made openly available and licensed under a Creative Commons Public Domain Dedication (CC0), as per the Grant Agreement. The mandatory metadata fields stated in Section 2.1 enable the user to access the data, according also to the FAIR principles, and their availability is guaranteed by Zenodo to be equal to the lifetime of the repository. The same interval stands for the availability of data as well. Finally, as reflected in Table 1, widely available and/or open software tools are capable of accessing and processing these data formats.

2.3. Making data interoperable

What data and metadata vocabularies, standards, formats or methodologies will you follow to make your data interoperable to allow data exchange and re-use within and across disciplines? Will you follow community-endorsed interoperability best practices? Which ones? In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? Will you openly publish the generated ontologies or vocabularies to allow reusing, refining or extending them? Will your data include qualified references[10] to other data (e.g. other data from your project, or datasets from previous research)?

It is evident from the file formats of Table 1 that disseminated data do not require special software, but can instead be accessed by standard and commonly used and/or open source software, supporting data exchange and reusability. Besides the metadata of the file formats, additional metadata deriving from the Zenodo repository will allow for interoperability through supported exports in metadata standards, e.g. Dublin Core[11], DCAT[12] and DataCite[13]. No project specific ontologies or vocabularies are expected to be generated. Instead commonly used schemata will be used, namely Dublin Core, the ISO standard CIDOC Conceptual Reference Model[14] (CIDOC CRM) and the ISO 19115[15] standard for Geographic information. Qualified references deriving from these standards will be used to the greatest possible extent.

2.4. Increase data re-use

How will you provide documentation needed to validate data analysis and facilitate data re-use (e.g. readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, units of measurement, etc.)? Will your data be made freely available in the public domain to permit the widest re-use possible? Will your data be licensed using standard reuse licenses, in line with the obligations set out in the Grant Agreement? Will the data produced in the project be useable by third parties, in particular after the end of the project?

[10] A qualified reference is a cross-reference that explains its intent. For example, X is regulator of Y is a much more qualified reference than X is associated with Y, or X see also Y. The goal therefore is to create as many meaningful links as possible between (meta)data resources to enrich the contextual knowledge about the data. (Source: https://www.go-fair.org/fair-principles/i3-metadata-include-qualified-references-metadata/)
[11] https://www.dublincore.org/
[12] https://www.w3.org/TR/vocab-dcat-2/
[13] https://datacite.org/
[14] https://www.cidoc-crm.org/
[15] https://www.iso.org/standard/80874.html

Will the provenance of the data be thoroughly documented using the appropriate standards?
Describe all relevant data quality assurance processes.
Further to the FAIR principles, DMPs should also address research outputs other than data, and should carefully consider aspects related to the allocation of resources, data security and ethical aspects.

Validation of data analysis and facilitation of data reuse will be achieved through clear documentation. This includes comprehensive readme files in open formats that will accompany datasets, giving detailed information about the methodologies employed, the cleaning procedures applied and providing explicit information on the units of measurement applied.

Public data will be made available under a Creative Commons Attribution 4.0 International license, which is supported by the Zenodo trustworthy repository. They will remain publicly available and reusable by third parties under the same license even after the end of the project, by handing over the community access to the Project Coordinators. No embargo period is foreseen for publishing and patent seeking procedures.

Data provenance will be thoroughly documented in accordance with the recommended standards. More precisely, as mentioned above, we will adhere to established metadata standards and description protocols including Dublin Core and DataCite. Each stage of data generation/collection, processing and analysis will be monitored and recorded, including details such as data sources, collection methods, data transformations, and data processing procedures. This approach will allow us to create a complete record of the origin of the data. Regarding the quality of data and in order to meet high standards of data quality, we will implement data validation and cleaning. In particular, all data will be subject to a thorough validation process before their analysis, with the aim to identify and correct any errors and/or inconsistencies. Systematic data cleaning procedures will be also applied to eliminate any anomalies that could affect the accuracy of the analysis. Regarding quality, we plan to conduct quality control checks throughout the data lifecycle to ensure data integrity, including measures such as outlier detection, cross-validation, and comparison with existing approaches or reference data.

3. Allocation of resources

What will the costs be for making data or other research outputs FAIR in your project (e.g. direct and indirect costs related to storage, archiving, re-use, security, etc.) ?
How will these be covered? Note that costs related to open access to research data are eligible as part of the Horizon Europe grant (if compliant with the Grant Agreement conditions).
Who will be responsible for data management in your project?
How will long term preservation be ensured? Discuss the necessary resources to accomplish this (costs and potential value, who decides and how, what data will be kept and for how long)?

The Zenodo certified repository is free of charge, therefore there is no cost for making data FAIR in the project. Zenodo also ensures long-term preservation of public data, even after the end of the project. Costs for data management activities and for making data FAIR are included in the project management costs (WP1 - Task 1.4) and are covered by allocated resources in the project budget. The cost of the Google Workspace account where all project data (public and private secured by appropriate procedures) will be safely stored is also included in the project management costs (WP1).

The overall responsibility for data management, i.e. the Data Manager of the project, lies with the task leader of T1.4 Data Management, Dr. Vicky Dritsou from ATHENA R.C. Supporting the data management responsible person is the Project Coordinator, Dr. Isabel Ferreira, and a data management team consisting of one person per Work Package, namely Dr. Anya Umantseva

(RUC), Dr. Gerd Lupp (TUM), Assoc. Prof. Georgios Artopoulos (CyI) and Dr. Jules Sekedoua Kouadio (CNRS).

4. Data security

What provisions are in place for data security (including data recovery as well as secure storage/archiving and transfer of sensitive data)? Will the data be safely stored in trusted repositories for long term preservation and curation?

Data collected via desk research, recordings, interviews and survey responses (aggregated and anonymised), together with working documents (texts, spreadsheets and so forth) will be stored to Google Drive cloud servers using a commercial, non-public license of Google Workspace that meets privacy and security requirements to comply with GDPR. The Google Drive will be organized in folders according to the Work Packages, further divided into subfolders for each task. The administrator of the account will ensure that access to each folder will only be possible for project team members that participate in the corresponding task, while also a Data classification policy will be established by the Steering Committee to organize users into groups The identification of the team members will be ensured by using authentication processes.

Also in compliance with GDPR, a Data region policy for the Google Drive of the project will be set to ensure that data are stored exclusively to servers geographically located in Europe. No data centers outside of the EU will be used to store any data of the project.

Access to data collected for administration issues, e.g. financial statements of partners or other sensitive data, will only be permitted to the Project Coordinators according to the legislation and in compliance to the EU Regulations.

As a safety plan, the Data Manager will ensure that all data stored in the Google Workspace resides also offline in a local hard drive that only the Manager can access. This local copy will be updated periodically, namely every 3 months. Upon completion of the project, this local hard drive will be delivered to the Project Coordinator.

5. Ethical issues

Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA). Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?

Legal and ethical issues that can impact data sharing include the EU GDPR on data protection, which safeguards the fundamental rights of EU citizens and guarantees their privacy in the digital age. TRANS-Lighthouses will fully comply with this requirement, while also meet all national and institutional regulations of project partners.

Towards this end, an External Ethical Advisory Board (EEAB) has been established, as described in D7.1 OEI - Requirement No. 1, and will be activated during the first year of the project. EEAB will ensure adherence to the ethical guidelines that will be defined in T2.5. - Ethics, human rights and gender issues in research and participatory processes (D2.1 - Guide on research ethics and inclusive participation for NBS) and according to the highest ethical standards, namely GDPR, The European

Code of Conduct for Research Integrity[16], Horizon Europe Guide on Ethics and Data Protection (2021)[17], Horizon Europe Guide on Ethics in Social Sciences and Humanities (2021)[18]. Project activities that include data collection (e.g. surveys, interviews) will be designed to respect and maintain privacy regulations, as mandated by GDPR. All participants of such activities will be explicitly informed through written documents about the way their data will be handled, the purpose of their usage, who will have access to them, as well as their own rights in their data, while they will be requested to declare their agreement to these approaches through a consent form. No personal data will be collected unless absolutely necessary. In such cases, personal data will be stored in secure servers with access to them granted only to specific persons of the consortium. Further analysis and sharing will be possible only after de-identification and anonymization of personal data.

6. Other issues

Do you, or will you, make use of other national/funder/sectorial/departmental procedures for data management? If yes, which ones (please list and briefly describe them)?

No further procedure is required, national and institutional requirements are covered by the procedures mentioned above in the current document.

[16] https://allea.org/code-of-conduct/
[17] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ethics-and-data-protection_he_en.pdf
[18] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ethics-in-social-science-and-humanities_he_en.pdf

Conclusions

The DMP is a living document that will evolve as the project progresses and as new information on data collection, generation, and handling emerges. Day-to-day data management activities will be carried out following the procedures and methods described in this document, in collaboration with the Project Coordinator, the Data Manager and the Data Management Team indicated above. Two updated and expanded versions of the DMP will be prepared and submitted in months 30 and 42, which will depict the current state of data management within the project.

The Project Coordinator and the Data Manager will jointly ensure that any data management issues which may arise during the project will be handled appropriately and in a transparent and fair manner.

Appendices

Appendix 1. Zenodo upload instructions

Public data collected/generated throughout the project should be uploaded to the certified Zenodo repository that supports the Open Data policy for EC funded research. This includes public deliverables, public data/datasets and scientific publications. These should be uploaded by all team members generating data. To successfully upload data to the TRANS-Lighthouses community of Zenodo, one must execute the following steps.

1. Create an account in Zenodo, which is free of charge (this step is only required if you don't already have an account).
2. Log in to your account.
3. Navigate to the TRANS-Lighthouses community
    - either by clicking on 'Communities' and performing search using the term 'TRANS-Lighthouses'
    - or by directly using in the browser the URL 'https://zenodo.org/communities/trans-lighthouses/'.
4. Click the 'New upload' button.
5. Choose the files that you want to upload.
6. In the 'Communities' box, make sure that the project's community is already selected (you should see the logo and title).
7. It is also required to add the community 'European Commission Funded Research'. You can locate it through the search box and add it by clicking on it. If both communities are selected, data will automatically be uploaded to both of them.
8. Select the type of upload and after filling in the necessary metadata fields, click 'Upload' to complete the procedure.