



D14.3

Data Management Plan I

NTUA

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Project Information

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TITLE	SENSING ENDOMETRIOSIS ON PORTABLE AUXILIARY DEVICES
GRANT AGREEMENT No	101130516
START DATE OF THE PROJECT	01/09/2024
DURATION OF THE PROJECT	48 months (2024-2028)
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TOPIC	HORIZON-CL4-2023-RESILIENCE-01-33 - Smart sensors for the Electronic Appliances market (RIA)
WEBSITE	https://sensopad.eu/
COORDINATOR	National Technical University of Athens (NTUA)
PROJECT OVERVIEW	To significantly reduce the diagnosis time of endometriosis (ED) through innovative, non-invasive detection technologies, thereby empowering women with early, accurate, and accessible diagnostics that improve health outcomes and reduce healthcare costs.

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Abbreviations

DMP	Data Management Plan
FAIR	Findable, Accessible, Interoperable, Reusable
ED	Endometriosis
GDPR	General Data Protection Regulation
DoA	Description of the action

Table 1: Abbreviations

Executive Summary

This document presents Deliverable D14.3 – Data Management Plan I, developed as part of Work Package 14 (WP14), Task 14.6, “Data Management Plan,” for the SENSOPAD Project. Its objective is to establish a concise and practical framework for managing research data throughout the project’s lifecycle and after its completion, while ensuring full compliance with Horizon Europe’s Open Science criteria and the General Data Protection Regulation (GDPR).

This document represents the first version of the Data Management Plan (DMP) under Deliverable 14.3, submitted in month 18 (M18). It provides an initial summary of the project’s research outputs related to the term data assets, such as datasets, publications, and other scientific materials that are created throughout SENSOPAD. The main purpose is to supply partners with detailed instructions and methods for managing research data in accordance with the EU Horizon Schema best practices. It contains:

- *Data Management Approach* – SENSOPAD will follow a structured methodology for managing data at all stages of the project.
- *Data Management Operational Processes* – Describe the methods and tools that will be used to gather, store, process, share and preserve data throughout the project.
- *Data Management Principles* – Ensure that all project data adheres to the FAIR (Findable, Accessible, Interoperable, Reusable) principles and Open Science EU Horizon requirements.
- *Legal and ethical Requirements* – All project activities should respect and follow the participants’ rights and conform to the ethical requirements of Horizon Europe Principles.
- *Resource Allocation* – Explain the infrastructure, tools, and roles of the stakeholders engaged in data governance.

The Data Management Plan is a living document and evolves as the project progresses. The next update will be in M36 (D15.2 – Data Management Plan II) and finalized by M48 (D16.2 – Data Management III). The updated document will include more specific information about the datasets, improved data governance mechanisms, and an assessment of FAIR principles’ compliance. By maintaining strong data management procedures, this deliverable will reinforce the project’s commitment to data transparency, integrity, and long-term accessibility in accordance with EU Horizon Europe criteria.

At this stage of the SENSOPAD Project implementation, corresponding to the Research and Development Phase, Deliverable D14.3 constitutes the Initial Data Management Plan, capturing the baseline governance arrangements and the practical workflows agreed within the consortium. During the first 18 months, emphasis has been placed on regular coordination meetings and direct alignment with partners, with shared minutes and work package presentations serving as the primary mechanism for consolidating data handling decisions, rather than relying exclusively on asynchronous and impersonal exchanges. As the project progresses into its Validation Phase, the consortium will move to DMP Phase II, refining procedures and controls based on the concrete datasets generated and the validation activities that will follow.

1. Introduction

The SENSOPAD Project aims to revolutionize endometriosis (ED) care by tackling the longstanding challenges. ED's early detection is often underdiagnosed due to its asymptomatic nature, pivotal for improved health outcomes and reduced healthcare costs. SENSOPAD introduces two pioneering ED sensing systems: sensoPAD, seamlessly integrated into sanitary pads, and sensoMFgFET, a portable Point-of-Care (POC) device. SensoPAD comprises three Biological Processing Units (BPU) - BPU-1, BPU-2, and BPU-3 - ensuring continuous monitoring. BPU-1 combines an electrochemical sensor with RFID, while BPU-2 merges a chemical-based fuel cell with an electrochromic cell. BPU-3, an energetically autonomous unit, synergizes BPU-1 and BPU-2 capabilities for seamless monitoring. SensoMFgFET, a POC device, utilizes microfluidic systems and bio-conjugated gFET with RFID functionality, capturing specific DNA SNPs from the menstrual fluid as early ED indicators. Both devices are complemented by a user-friendly mobile application enabling real-time data acquisition and analysis. An advanced cloud platform integrated with AI enhances diagnostic accuracy. This innovative approach shifts the paradigm in ED detection, empowering women, clinicians, and healthcare systems. SensoPAD detects biomarkers, providing insights during menstrual cycles. If concerns arise during its use, users transition to sensoMFgFET at clinical points, combining at-home convenience with clinical precision. SENSOPAD aims to reduce ED diagnosis time from eight years to days, enabling early treatment, preventing symptom deterioration, optimizing infertility care, and streamlining healthcare journeys. Integrating SENSOPADs with a mobile app and AI-enriched cloud platform ensures accurate, cost-effective diagnostics, detecting silent instances of ED, and signifies a paradigm shift, fostering informed, proactive, and inclusive healthcare decisions for women worldwide.

The primary goal of SENSOPAD Task 14.6 and this deliverable is to develop a research data management strategy during and after the project. Specifically, this deliverable outlines data governance, ensuring that all collected and processed data types adhere to FAIR principles to make data Findable, Accessible, Interoperable and Reusable. Furthermore, it will adhere to the General Data Protection Regulation (GDPR) and follow Horizon Europe's latest best practices for Open Science. This deliverable will also detail the methods used for long-term data preservation, curation, and exploitation, as well as protocols and processes for sharing data, where applicable, making data openly accessible on EU-associated platforms.

The DMP provides SENSOPAD partners with a strategic framework concerning the fundamental practices that guide data collection, processing, and management throughout the project lifecycle. The deliverable provides an in-depth examination of the project's data management policy, ensuring a structured, compliant approach to information processing and governance. This deliverable systematically records data collection, generation, processing, storage and management of project data. The first version will be issued in M18, with subsequent updates in M36 and finalization in M48. The document will align with data-heavy deliverables (e.g., data modelling, AI/ML models, data analysis) by complying with the DoA on processing according to FAIR Principles and applicable quality standards.

2. Data Summary

2.1 Brief Description

To make the most of both the existing and generated data, SENSOPAD will build a DMP that covers the whole project-data lifecycle. The initial effort will focus on the identification and categorization of all data while selecting the relevant metadata standards to describe it. The next step will determine data accessibility at different levels and potential routes for exploiting the datasets. Viability will be ensured by setting procedures for who can access specific datasets and map out how to share data safely, and focus on the long-term storage optimisation and adherence to legal and ethical requirements.

Every partner will have a specific role in delivering based on the plan, with clear roles and responsibilities, as each one will be responsible for evaluating if a dataset can be made open access or if it needs to stay protected based on legal and ethical constraints, including Intellectual Property Rights (IPR) and dissemination limitations linked with the source of data. The project's overall approach includes a General Data Overview, describing the data assets based on origin, type, format, purpose, size and intended use of all data. The SENSOPAD will adhere to the FAIR Principles to maximize data quality and utility:

- **Findable:** Data discovery will be facilitated through organised metadata, uniform naming conventions, search keywords and version control where needed.
- **Accessible:** The strategy will define how and where data will be made available, the tools and software required for retrieval, e.g., repositories, as well as any necessary usage restrictions.
- **Interoperable:** Integration across different systems by adopting standardized metadata vocabularies, technical formats, and methodologies.
- **Re-Usable:** Maintain long-term utility and accessibility by clarifying license terms, upholding data quality and planning for future storage availability.

To support the DMP's correct implementation, the strategy will also cover:

- **Ethical Oversight:** Potential concerns will be addressed throughout the entire data lifecycle, from initial collection to final sharing.
- **Resource Allocation Management:** Partners provide the specific infrastructure and tools needed to efficiently handle and store project data.
- **Data Security:** Rigorous measures to protect information integrity and confidentiality of data through standardised security protocols.

Moreover, operating under an “as open as possible” policy, SENSOPAD utilizes Horizon Europe's recommended platforms such as Zenodo and OpenAIRE. This will ensure clarity and consistency among partners on how project data will be managed, as SENSOPAD will provide datasets and the project's deliverables through these channels. The framework established through Task 14.6 enables precise data tracking across all systems, ensuring due diligence in ethics compliance and open science principles. Some of the dataset categories that will be collected during the project will be Consortium Records, such as internal project management details, partner information, and documentation of collaborations; Research data will include findings and data collected from lab experiments, surveys, and data analysis;

Development Data collected, Packages, Software, models, algorithms, and other technical outputs; Demonstration Activities related data, which will be generated through pilots, case studies, validation actions, and all documents related to project deliverables, reports, presentations, and administrative work.

By creating and maintaining this structured framework, the project ensures that project data remains secured, organized, and aligned with FAIR principles, complementing long-term usability and value. In line with open science requirements, each partner will complete a dedicated questionnaire (see Annex) developed for the DMP reporting and updating based on the DMP Horizon Template and FAIR principles. This enhances the project outputs and datasets generated according to the latest best practices of the European Commission on open science guidelines. The goal is to develop a project footprint where all data schemas and assets are properly identified, assessed and managed.

2.2 Data Collection, Types & Usage

2.2.1 General

To facilitate the necessary input from all the involved partners, a dedicated questionnaire was created using Google Forms, based on the structure and guidance of the Horizon Europe DMP Template (as presented in the Annex). The questionnaire focused on the core elements of data management concerning data collection, types, format, size, intended use and overall utility. Several examples were provided by the partners to specify their responses, which are presented throughout this deliverable. The following section examines FAIR Practices in order to give guidance on how data will be made findable, openly accessible, interoperable and reusable, in line with the latest open science trends and practices. The final sections focus on allocation of resources, followed by a section concerning security measures that partners plan to follow and conclude with ethical aspects of data handling and sharing.

2.2.2 Research output data collection, types, origin & usage

The information provided by the partners shows a clear picture of the diverse data landscape within the project, as the consortium plans to generate a wide range of research outputs, such as scientific datasets, models, experiment results, consortium-related datasets and packaging demonstrators. This reflects the multidisciplinary work that will be carried out in the project across different members of the consortium.

The purpose of data collection/generation, as reported by partners, will be focused on scientific outputs such as data collected for assessing water absorbance of SAPs, to support the user-centric design of SENSOPAD and sensoMFgFET devices. Other research data collected will derive from experiments for the preparation of the inks and the gFET chemical modification and optimization of the analytical feature of biofuel cell-based electrical sensors, although certain activities will also involve physical items or mixed formats depending on experimental needs.

As reported, most of the data collected will be research data, and the type of datasets will be mainly experimental. The project will collect:

- **Reports & Deliverables:** Information and reports tailored to the project's specific objectives, around the SENSOPAD sensor, survey and interview results (qualitative, quantitative) and general presentations and project reports.

- **Experimental/Measurement Data:** Datasets will be raw and processed, like measurement data on SAPs water absorbance, SEM images, graphical representations, AI-analysed predictions, etc.
- **Specific Data Types & Formats:** Generated from analysis on specific data formats further analyzed in the next subsection.
- **Project-related Data:** Data collected from packaging demonstrators, samples taken from the population of interest, lists related to companies/networks etc.

Hence, most partners will collect text and numeric data, followed by audio visual and instrument-specific data. Minor cases will be simulated and discipline-specific.

2.3 Data Size, Formats & Usage

The origin of the data will be mainly observational and experimental, with the latter to be a clear winner among the answers of participants. This data will originate from weighing SAP samples, inks' characterization and gFET sensing parts. Data deriving from characterisation equipment like optical microscopy, Raman spectroscopy, Probe station, Fourier transformed infrared spectroscopy, etc. Some observational data will be sample-specific results which will vary based on the sample's origin (e.g. blood donor), real-world user experiences, etc.

Most of the datasets will be growing, meaning that new data may be added without affecting old ones, or fixed, meaning they will never change after collection, based on partners' feedback. The volumes of data collected and the storage they will occupy are mainly small to moderate. Responses indicated expected size less than 1GB, with many cases to a few MB per experiment quantity. In case a lot of video footage is collected and used, the size will increase. Some respondents stated that this information is not yet available and will be reported in upcoming versions of this deliverable. Certain specific estimation for the total size of the data some specific partners will collect ranged from 1-8 GB, while other stated it is difficult to estimate as the number might vary based on internal factors, like number of microscopy images/videos taken per experiment etc.

2.3.1 Data Formats

SENSOPAD is expected to generate the following types and formats of data:

Data Type	Format	Description
Project Related Data, partner details, contact lists, networking activities	.xlsx, .csv, .pdf, .txt, .docx, .ppt, .jpeg, .png	Details regarding project partners, dissemination activities, and attendee registries
Scientific Data collected/analyzed	.csv, .xlsx, .sql, .db, .dbf, .xml, .m, .mat, .pssession	Raw or processed data collected through research and resulting datasets produced after analysis
Survey data and questionnaire responses	.csv, .xlsx, .json, .xml, .pdf, .docx	Primary data sourced from research participants, stakeholder feedback, target groups' answers, and simulation results

Scientific publication & reporting	.pdf, .ppt, .docx	Academic articles, research papers, white papers, and deliverables generated throughout the project and reported via Zenodo
Data collected from pilots/demonstrators	.csv, .xlsx, .tiff, .jpeg, .ppt, .pdf, .dwg, .wav, .mp4	Data collected from demonstrators, testing sites, and experimental trial outcomes
Dissemination activities and presentation materials	.pptx, .pdf, .mp4, .jpeg, .docx	Training material, video recording of meetings, slides presentation, webinars
Stakeholders' engagements	.mp3, .mp4, .txt, .pdf, .jpg, .png, .docx, .ppt	Recording material of interviews, focus groups, trainings and data collection through use cases
Ethical Compliance documents	.docx, .pdf, .txt	Documents related to GDPR, ethics and legal compliance

Table 2: SENSOPAD's Data Formats

3. FAIR Data

SENSOPAD is committed to following the responsible data management of EC guidelines, utilizing FAIR principles (Findable, Accessible, Interoperable, and Reusable) as the core strategy of SENSOPAD for all research data generated. This framework ensures that research outputs will be easily located, understandable, and reusable throughout the project's duration and beyond its completion. By integrating FAIR principles across every stage of the data lifecycle (as presented in Figure 2), the consortium will strengthen the transparency of research outcomes.

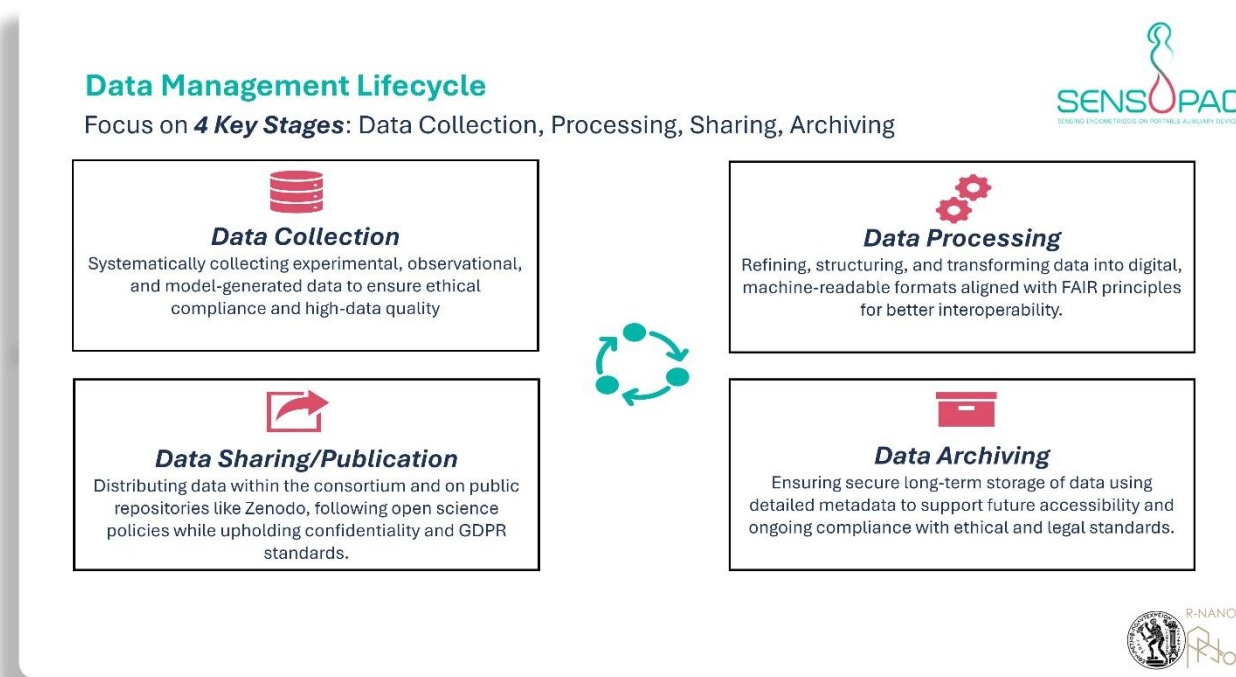


Figure 1. NTUA DMP FAIR Methodology

The project's Open Science Strategy will rely on the alignment with established initiatives, particularly based on several platforms supporting the OpenAIRE network. A key element is Zenodo, which is an open-access repository operated by CERN that integrates with OpenAIRE. Zenodo *i)* ensures long-term preservation of the project material; *ii)* acts as a dissemination tool that assigns persistent identifier (DOI) for each uploaded dataset and makes it visible through OpenAIRE's European-wide research graph; *iii)* ensures that the outputs can be discovered by researchers, industry actors and policy stakeholders across various disciplines and platforms.

The integration between Zenodo and OpenAIRE will form an ecosystem where the DMP will be synchronized with research outputs and new versions will align with datasets and project publications, automatically harvesting and indexing these materials, gaining maximum visibility and reusability. A dedicated Zenodo community (Annex) has been created by the DMP Leader (NTUA) to ensure that all research outputs remain well-organized, systematically archived and trackable. This curated digital space will house datasets, public deliverables, reports and relevant documents, concluding in:

- **Quality control:** Each submission to the community collection is reviewed before becoming publicly visible to ensure accuracy and consistency
- **Long-term preservation:** Zenodo's hosting arrangement guarantees stable and long-term access to deposit outputs in repositories
- **Visibility:** New entries are easily discoverable through OpenAIRE, increasing citation potential and outreach value

Before externally releasing data, it will be managed within the project's internal collaboration environment, primarily SharePoint, which provides secure storage and controlled access. To safeguard sensitive or pre-publication material, appropriate security measures will be implemented, including two-factor authentication (2FA), password protection, and role-based user permissions.

Prior to public dissemination, research data will undergo essential pre-processing and quality assurance procedures, including Anonymization/Pseudonymization, when personal or sensitive information is involved; Conversion into open, standardized formats to ensure long-term usage; Metadata enrichment, following FAIR-aligned plans, to facilitate discovery and interoperability; Documentation, including user instructions and context-related information like README. files, so that external users can understand and reuse the dataset correctly. If needed, additional secure-sharing tools can be used to exchange data between partners for sensitivity purposes, to ensure compliance with legal and ethical requirements.

3.1 Making data findable, including provisions for metadata

The project prioritises data findability by systematically creating Persistent Identifiers (PIDs) that will be used to describe datasets and research outputs. PIDs, such as DOI and URL, are crucial for unique object identification and to ensure that outputs are accessible even if a web address changes. PIDs will be assigned via platforms like Zenodo or through publicly available journal publications. Adherence to the Horizon DMP Template, including the use of specific project identifiers, is a common practice and will be shared among all partners.

To achieve findability, the project will focus on the creation of robust metadata for each dataset, incorporating rich README files. Metadata is data that describes the information of research outputs in the form of physical or digital objects in a machine-readable format. Metadata will be used to enrich the experimental dataset and advance findability, throughout the span of the growing dataset, regardless of the collection process. The focus will be on descriptive metadata, especially for title, authors, creators,

keywords etc. Additionally, metadata from the sensoPAD will be created from the sensoMFgFET and the device through the PoC and transmitted to the cloud platform where they will be stored according to partner input. Other scientific data sets will contain data collection dates, instruments used, transcription details, pseudonymisation and processing steps, as well as researcher names and where it can be accessed. All these will follow social science practices and where suited the .txt or .xlsx. Files will accompany datasets in Zenodo. Most partners stated that there isn't any metadata standard that is commonly used from the datasets and a few stated that they will use Data Documentation Initiative (DDI) to guide variable naming, codebook structure and dataset documentation. In case where no established metadata standard exists, partners will create metadata that includes Material ID, Ingredients ID, water absorbance capacity, descriptive elements related to the instruments, and also analytical reports. Some generated metadata will also live in GSEMI's cloud storage, and access will be provided upon request on a case-by-case basis.

A dedicated DMP repository will serve as the central reference point for all public datasets and research outputs generated. By integrating Zenodo and OpenAIRE, it will vertically improve the visibility of research outputs across several open-access platforms. Additionally, every publication shared via Zenodo and OpenAIRE will include the DOI of the published journal, ensuring proper referencing and seamless integration with other research repositories.

To support partners in complying with FAIR and Open Science practices consistently, the Data Coordinator will provide a practical guidance document. This guide will cover how to structure and enrich metadata, properly organize datasets internally, and follow Open Science policies. It will also include step-by-step instructions on how to upload datasets, publications, and project-related on Zenodo. For project outputs that are not a dataset such as software and/or scientific publications, appropriate data descriptors, such as a README file, shall be available to provide the relevant information as already has been reported by partners. The responsible team member to ensure that metadata standards are followed will be assigned to scientific coordinators, project managers, software team leaders, SENSOPAD Coordination team and finally, the NTUA data coordination team.

The project will commit to ensure that all research outputs are fully documented, easily discoverable, and consistent with Open Science goals. To guarantee data version control and traceability, as said, SENSOPAD will leverage Zenodo's built-in DOI versioning feature when needed. This functionality allows for dataset updates while retaining all previous versions, thereby maintaining complete historical integrity. It also facilitates accurate citation tracking for publications and establishes a clear, structured record of all public deliverables. By combining the abovementioned, a structured storage system, persistent identifiers, and explicit Open Science guidance, SENSOPAD ensures that all research outputs strictly adhere to the FAIR principles. This approach will not only satisfy Horizon Europe's requirements but also significantly enhance knowledge sharing and the project's overall contribution to the broader research community.

3.2 Making data accessible

To make data accessible, SENSOPAD will ensure that it can be retrieved online through stable, well-established protocols and stored in systems that support long-term preservation and secure sharing as mentioned in upcoming chapter.

3.2.1 Repository Strategy

The project will use a multi-layered system for data management, combining secure internal storage with collaborative and open-access platforms to ensure organization, traceability, protection, and long-term accessibility.

- Data will be stored on a combination of partners' internal systems, like office computers, hard drives, institute data storage systems and a common SharePoint cloud workspace
- The SharePoint environment will provide a structured internal system where files receive unique URLs, making sure that datasets are unambiguously referenced, organized, traceable, and easily discoverable by partners
- Zenodo will be utilized, in addition to these internal and project repositories, for long-term preservation and broader scientific accessibility.

Zenodo offers free storage and retrieval, ensuring research data remains publicly available without financial barriers. It also supports DOIs and rich metadata (both generic and discipline-specific), significantly enhancing the visibility, citability, and interoperability of datasets with other research systems. Finally, by depositing data in Zenodo, SENSOPAD aligns with the FAIR principles, promoting future reuse and broader scientific engagement.

These platforms facilitate the entire data workflow, allowing partners to upload datasets, run quality checks, document updates, and validate information prior to external sharing. Sensitive or personal data will be subject to strict protection measures, guided by ethical and regulatory requirements set by Horizon Europe, and alongside confidentiality, will be safeguarded through controlled access rights, encryption, secure logins, and GDPR-compliant workflows.

3.2.2 Data

The decision on which datasets will be made openly accessible in SENSOPAD is still early and being refined among partners, as it will be agreed upon jointly within the consortium. This section will be updated once those decisions are finalised in the DMP update. As a rule of thumb, SENSOPAD will support open access wherever possible, according to GDPR and Open Science, while looking to encourage transparency, collaboration, and wider reuse of the research results. However, open access is not guaranteed for all datasets, as in certain cases, data access restrictions will apply to protect intellectual property, confidentiality, contractual obligations and regulatory compliance. The consortium can also disclose data that is relevant to proprietary technologies, industrial processes and other commercially sensitive information. The consortium also reserves the right to restrict access to specific datasets due to legal, contractual, or voluntary obligations as outlined in the GA and DoA and safeguard IPR and comply with Non-Disclosure Agreements (NDAs) where necessary. Finally, data access will be subject to limitations primarily when the information originates from third parties that have their own proprietary rights and confidentiality agreements, or when the data includes personal information requiring protection under GDPR and relevant ethical guidelines.

As stated by partners, datasets are planned to be shared with no restricting conditions using Creative Commons Licenses, while others stated that they will add restrictions on reuse and other embargos that will be further analysed in the next Chapter. Reasons for disclosing datasets are mainly the sensitivity, or human subject data, while other issues have to do with GDPR, industry-related, protection of know-

how and confidentiality concerns. Many datasets will only be shared between the consortium for security reasons and research data will not be made openly accessible data but in a processed form or with an embargo of over five years. Some specific measures involving human participants will be pseudonymized or anonymized, stripped of identifiers and shared in aggregated format. Early disclosure of these datasets could compromise novelty and IP protection as they might be potentially patentable outcomes. Publicly accessible data will be shared under Creative Commons Attribution license (CC BY 4.0) via Zenodo.

Most datasets will be available after the data have been analysed and/or published, while other after corrected for errors, or processed based on GDPR. According to Zenodo's long-term preservation policy and any dataset not prohibited to accessed during the project's lifespan will be provided in accordance with the relevant legal and ethical requirements. Some partners also stated that they will store the datasets after the project's end, on office computers and external hard drives, or the university's databases and they will actively maintain and monitor the entity plans for future commitments. Open access will also be deferred until any IP considerations are resolved in accordance with the European IPR Helpdesk guidelines.

3.2.3 Metadata

A detailed description concerning metadata has already been presented however, concerning accessibility, all generated metadata will be openly available under a public-domain license, allowing free access without prior authorization. Zenodo facilitates broad interoperability with other research systems and repositories by enabling automatic metadata harvesting via the OAI-PMH protocol or retrieval through the REST API. Furthermore, half of the partners indicated that they plan to provide metadata, mostly descriptive, even if the associated dataset is not openly shared. In most cases, metadata will not need to contain details on how to access the dataset, and they will remain permanently accessible in Zenodo through the DOI record. To support traceability, metadata will document authorship, contributors, and the dataset's history, as well as the Horizon Europe grant information, including the project name, acronym, and funding number.

3.3 Making data interoperable

To achieve data interoperability, SENSOPAD will ensure that information generated across the project can be accessed, exchanged and reused without losing context. In this principle, SENSOPAD will rely on widely accepted formats for both data and metadata to enable seamless interaction between various systems implemented. Most of the partners stated they don't plan to use a standard vocabulary or a standard schema for metadata. In cases where partners will use a schema, it is proposed to use DataCite or DDI as proposed by certain, with mandatory and recommended fields. Zenodo uses .json schema as an internal metadata representation and provides exports to several popular formats, like Dublin Core. As said before, the OAI-PMH protocol ensures that datasets can be exchanged and reused between researchers.

Furthermore, SENSOPAD will enhance interoperability by adopting open, non-proprietary file formats tailored to the type of dataset. For example, experimental/raw data will typically be stored in .csv, while modelling or computational results may be .xlsx and textual documentation of reports can be .pdf. In case of databases and markup format .xml, .sql, .db will be used and datasets will provide qualified

references with other outputs, for example, a dataset will include DOI links to source databases, and related publications used for validation. By following these principles, the project's research output will be interoperable and aligned with FAIR and Horizon Europe Open Science standards.

3.4 Increase data re-use

The NTUA will oversee all matters relating to data governance, ensuring that SENSOPAD's data practices are aligned with the Grant Agreement, and protect partners' IPR while fully complying with GDPR. Data management considerations will be integrated into every phase of the project and updated accordingly in the DMP in the upcoming releases. Information will remain secure, reliable and accessible while still supporting sharing and reuse. Ownership of datasets will be based on the consortium and certain partners mainly prior to publishing and then it will be defined accordingly.

Defining clear data usage licenses is crucial for each dataset, by establishing the relevant licensing framework and the conditions that it will be used, shared and adopted by others. The primary license used by partners will be Creative Commons, especially CC BY 4.0 for openly available datasets, allowing reuse if the original creators are credited. Additional license choices will be explored once the project's full data landscape is clearer, as partners have total visibility and find out the necessary restrictions that will be applied, such as commercial use, restricted data re-use etc., intending to maximize the reuse whenever possible and always while respecting legal, ethical and contractual boundaries and protecting partners' IPR.

READMEs, .txt files, or dedicated analyses are the standard and most frequently used methods to ensure dataset reusability and reproducibility. This material is crucial because it provides detailed instructions on how to use the dataset, thoroughly explains its content, and documents the data collection methodology, processing steps, and any necessary contextual information for a deep understanding of the data. To have well-documented datasets, partners will ensure that provenance is well documented, for example, data lineage, which is metadata that tracks a digital object's history in time and in relation to other entities. Documentation, metadata, methodology as well as related reports will be preserved alongside datasets to ensure future reusability and an industry-accepted data management practice will be adopted where needed and the usage of reputable repositories like Zenodo, UDC, EU Open Research Repository. Finally, each entry will include source reference, processing steps and version control records where necessary according to contractual agreements. To ensure quality assurance procedures, SENSOPAD partners will use tools for automatic checks, conform data to format specifications and even if needed, set up a scientific or technical committee, even though for most partners this information is still not available.

Finally, SENSOPAD is committed to ensure the clarity and completeness of its datasets, going beyond the standards of FAIR data principles. Each raw dataset will be supplemented with explanatory notes and usage instructions. This will enable users to easily understand the content without requiring direct support from the project team. Furthermore, to maximize the impact and visibility of the project's outcomes, SENSOPAD will proactively promote the generated datasets and the project community. Targeted dissemination activities, including website updates, social media engagement, and the creation of training materials, will be used to attract and facilitate knowledge exchange with other scientific and industrial communities focused on the prevention of endometriosis.

4. Other research outputs

At the beginning of the project, NTUA set up a SharePoint platform powered by Microsoft Teams as the consortium's central collaboration and document repository. In practice, however, repeated access and permission issues made it difficult to ensure smooth and timely availability of materials to all partners. These difficulties were related to restrictions and compatibility conflicts associated with their institutional email accounts, which are governed by internal organizational IT policies. As a result, authentication and access synchronization problems occurred, potentially causing limited or delayed access to shared project files and collaborative spaces. The issue was technical in nature and not related to lack of engagement, and appropriate steps were taken to resolve it in coordination with the respective IT services.

As a contingency measure, NTUA transitioned the consortium's shared workspace to Google Drive environment which is currently used as the operational repository for all submitted deliverables, WP presentations, and the minutes of the respective monthly meetings, with access granted to authorised members of the consortium only. NTUA maintains clear file- and folder-level version control practices (including version identifiers and date labels) to support traceability and to keep a transparent record of updates over time, while ensuring that shared materials remain consistently available to partners for reporting, review, and coordination purposes.

5. Allocation of resources

NTUA will be responsible for the management and preservation of SENSOPAD's FAIR data until the conclusion of the project at M48. During this time, the data will be securely stored on Google Drive/SharePoint (depending, of course, on evolving project storage requirements). NTUA will also continue to maintain the SENSOPAD Zenodo Community, update the DMP, and provide support to partners for the upload, documentation and publication of their datasets.

To achieve open, reusable data, it relies on preparing datasets in standardised, interoperable formats and generating comprehensive, FAIR-compliant metadata. While platforms like Zenodo and OpenAIRE offer free long-term storage, the preparation phase incurs internal operational costs. These costs primarily stem from the time and effort invested by the Data Coordinator and project partners in crucial steps such as dataset review, content validation, and ensuring accuracy before public release. Initially, most partners underestimated the cost of making their data FAIR, expecting minimal or zero expenses focused primarily on storage. Some stated, though, that internal costs will be covered through the project funding and FCT national agreements, as well as internally in case-by-case basis. However, RDM encompasses more than storage; it extends to archiving, security, and ensuring data reusability. Therefore, the primary anticipated costs are direct and include cloud storage, repository deposits, data curation, metadata preparation, and long-term preservation. While indirect costs might occasionally arise and will be detailed later, under Horizon Europe grants, these expenses are typically covered by the institution's existing infrastructure or a blend of infrastructure support and the project grant.

Each partner will have a representative who will be responsible for the management of the described output, and he/she will be in close contact with the Data Coordinator for issues around data governance/management. Some partners will support this effort with project managers, scientific

coordinators, and technical team leaders who have been assigned by each individual. All authors and contributors will be responsible for the accuracy and integrity of their publications and associated datasets, following the procedures outlined in the DMP, Consortium Agreement, and Grant Agreement. Partners will continue updating the DMP questionnaire with each iteration of DMP updates, while NTUA will oversee the analysis of partner inputs and develop a Data Monitoring Dashboard for the project. This ongoing effort ensures that data governance remains aligned with the project's progress and that all outputs continue to meet FAIR and Open Science expectations.

6. Data Security

Data security is paramount for the SENSOPAD project, and the consortium is committed to employing modern security safeguards to deliver continuous protection for all data and metadata. These measures will include firewalls, encryption protocols, secure authentication and controlled network access. As partners stated, the first security measure will have to do with access control and permissions, such as restrictions and usage constraints. Additionally, there will be implemented measures such as passwords and firewalls, followed by encryption and physical access control. Firewalls will limit exposure to open ports, and all data transfers within the consortium will take place through protected and locked communication channels in SharePoint, supported by an IP filter and password-based access. Any potential data breach issue will be monitored, and datasets that contain personal information identifiers will be pseudonymised, and raw data will be kept on secure servers with limited access according to data protection policies. Specifically, some measures to be taken are:

- Access control policies: Based on responses, the main measure for access control will be the use of restricted, password-protected environments and controlled user-access management
- Specific Encryption: Sensitive data will be stored on secure institutional servers with encrypted connections (SSL/TLS) and controlled user access. Raw data from devices will be transferred to the cloud platform via encrypted services. Data stored on secure institutional drives also often includes the use of encrypted connections.
- Other measures: Include pseudonymization before storage to protect privacy, embargo periods, avoid sharing of PII, device system authentication like sensoMFgFET.

The security measures outlined, covering data access, storage, recovery, sharing, and transmission, apply to all the aforementioned conditions. Specifically, personal data gathered through experiments, workshops, pilots, interviews, or social media, alongside signed volunteer consent forms, will be handled with the highest level of care, strictly adhering to the procedures detailed previously. To preserve the described datasets, research outputs in the long-term, partners plan to:

- Use of Repository and Storage Location: Data preservation will utilize internal servers, institutional platforms or external, secure repositories like Zenodo
- Follow preservation and curation policies: Follow guidelines by specific institutional rules. Institutional strategies by using backups, maintaining metadata to guarantee accessibility and provenance for years after project completion

The SENSOPAD consortium will employ distinct data management strategies tailored to the datasets collected and their preservation requirements. Prioritizing how to handle personal and sensitive data is

at the forefront of SENSOPAD and using different techniques will be implemented in close cooperation with NTUA when necessary, to ensure full compliance with GDPR and contractual obligations. Before uploading any dataset to an open-access platform, a thorough review will be conducted to prevent the unintentional disclosure of confidential information. To secure data transfers, technical safeguards like encryption methods (e.g., public-key or symmetric encryption over HTTPS) will be applied when appropriate. Furthermore, a Data Monitoring Dashboard may be utilized to support updates to the Data Management Plan (DMP) and provide partners and NTUA with a clear overview of data management processes, supported by internal statistics.

7. Ethical Aspects

The SENSOPAD consortium prioritizes ethical compliance in data collection and management, focusing on protecting personal information from unauthorized disclosure or access. The consortium will treat and process special categories of personal data (sensitive data), and any relevant collection, as detailed in Sections 3 and 6, while adhering to the highest ethical and legal standards. Many partners assert that their planned data collection raises no ethical or legal concerns because it excludes personal, proprietary, or confidential information. The partners collecting PII will treat this data with the highest standards as explained in previous chapters, while always respecting participant consent, withdrawal rights, and ensuring compliance with CBS ethics and EU GDPR requirements.

For activities involving human participants, information sheets and informed consent forms will be provided in clear, accessible language, ensuring that all participants fully understand the purpose, scope, and implications of their involvement. The main rules of social science research will be applied, including voluntary participation and informed consent. The project's DMP aligns with the Consortium Agreement, ensuring IPR protection, as well as GDPR compliance throughout the project's duration. Any intellectual property resulting from the project's activities will remain the sole property of the partner responsible for its development.

SENSOPAD will continue to support FAIR and Open Science principles while ensuring that any ethical obligations will not be compromised. Open access will only be granted upon partners' decision on IPR rights as per the dissemination access level of each data product. Special consideration will be given to activities associated with dissemination or stakeholder engagement data collection to fully comply with GDPR and personal data protection.

8. Other Issues

Based on the partners' responses, the consortium does not plan to use any alternative data management procedures.

9. Conclusions

This document presents the inaugural version of the DMP for the SENSOPAD project, developed and maintained by NTUA to fulfil the requirements of Deliverable D14.3 and Task 14.6, in accordance with the Grant Agreement (GA). This DMP follows a flexible structure consistent with Horizon Europe requirements, and it is built upon the information gathered from the questionnaire distributed to all consortium partners to support an efficient and coordinated approach to data handling. SENSOPAD

adopts the FAIR principles (Findable, Accessible, Interoperable, Reusable) as the cornerstone of its data-sharing and reuse strategy. The consortium will systematically map all generated datasets, which originate from experimental work, modeling activities, material development, and demonstration tasks. A detailed plan is in place for each data case to guarantee adherence to FAIR principles and all relevant ethical considerations. The DMP and the accompanying repository structure, as explained above, will certify that datasets remain organised, intelligible, and transparent as the project evolves.

Long-term, open access to datasets and metadata is secured through integration with trusted infrastructures, including Zenodo and the broader OpenAIRE ecosystem. These platforms ensure persistent identifiers, metadata indexing, and sustainable access, thereby guaranteeing that the project's outputs remain discoverable and reusable beyond SENSOPAD's lifetime. Zenodo will be used to maintain the DMP as a living document and all open-access datasets will be reported using the EC-proposed guidelines through the community portal.

By combining strong data governance, GDPR-compliant security measures, and Open Science practices, this DMP will establish that all partners can handle research data responsibly while preserving confidentiality where necessary. As the project continues, the accompanying repository structure, alongside the DMP, guarantees that datasets remain organized, intelligible, and transparent throughout the project's evolution. The DMP is a dynamic document and will be routinely updated to incorporate new datasets, evolving project requirements, and input from partners. These updates will reinforce the project's long-term impact by ensuring that SENSOPAD's research outputs remain accessible, understandable, and usable for future scientific and industrial stakeholders. Ultimately, the DMP provides the essential foundation for collaboration, transparency, and innovation across the entire SENSOPAD consortium.

9.1 Next Actions

This document represents the first version of the DMP (Version 1; M18 – Initial DMP phase) for the SENSOPAD Project. In line with the Grant Agreement and the project's DoA, the next updates of this document will be in M36 and M48 in periodic reports. The later versions will refine and expand the information that is provided in this deliverable, offering a more accurate and detailed overview of the data management practices and the decisions taken for datasets as the project progresses.

The upcoming phase will focus on completing the full data management workflow and ensuring seamless integration of all project outputs across Zenodo community and the dedicated DMP Plan, respectively. The next steps will be:

- Identify all project-generated datasets that will contain the digital footprints and be reported in the Zenodo community. Preparatory work will also begin for the public release version in collaboration with partners, including dataset packaging, development of metadata and DOI assignment.
- Organize research data, sensitive data in collaboration with relevant stakeholders, partners to assess risk and development solutions.
- Identify IPR potential issues, PII dataset treatment and embargo periods for the datasets to be published.
- Share upload guidelines and coordinate partner contributions for uploading material in Zenodo and finalize the next version of the DMP outputs

- Review metadata completeness, licensing choices and interoperability with external repositories. Finalize dataset entries and make sure these are aligned with reporting obligations and support upcoming deliverables

9.2 Deviations from DoA

No deviations from the Description of Action have been reported, nor are any anticipated.

10. Annex



Data Management Plan - Questionnaire

Under **Horizon Europe**, open science is a core principle. Beneficiaries are required to ensure **open access to research data** by default, unless legitimate exemptions apply (e.g. protection of intellectual property, personal data, national security, or other justified restrictions).

All projects must submit a **Data Management Plan (DMP)** outlining the handling, sharing, and preservation of research data in line with the **FAIR principles** (Findable, Accessible, Interoperable, Reusable). The DMP must detail:

- The types of data to be generated or collected
- Standards and methodologies used
- How data will be curated and preserved after the project
- Conditions for data sharing and access

Open access to data aims to **maximize transparency, reproducibility, and reusability**, while balancing openness with necessary protections.

* Indicates required question

Email *

Your email

Participant Name: *

Choose your organization.

Choose

Will your organization collect/generate/produce/process any kind of data? *

If at least one of the conditions holds (collect/generate/produce/process) then chose **Yes**

☐ Yes

☐ No

Purpose of Data:

*

State the purpose of the data collection/generation, indicating the relation with the objectives of the project. Add additional objectives if necessary.

* In case it doesn't apply add N/A

Your answer

Type and Format of Data

*Describe the type of data used
or generated within the project, specifying the form and format of the data.*

- *Form: Field or laboratory notes, survey responses.*
- *Format: plain text, (txt), HTML, XLM, PDF/A ...*

Data Type: *

- ☐ Text
- ☐ Numeric
- ☐ Audiovisual
- ☐ Simulated
- ☐ Discipline specific information
- ☐ Instrument specific
- ☐ Reused-Data (rd)
- ☐ Other: _____

Choose the corresponding Work Package & Data Type

* Given the datasets that you described for each WP in the previous questions, tick ✓ the relevant format for preserving and sharing your data (it can be more than one). **Note the scrolling bar (left-right) at the end when ticking your file formats.**

Data origin Definitions

Here we consider what types of data you create and/or work with, and what format those data take. Your data stewardship practices will be dictated by the types of data that you work with, and what format they are in.

Data types generally fall into five categories:

1. Observational:

- Captured in situ
- Can't be recaptured, recreated or replaced

Examples: *sensor readings, images, telemetries, sample data*

2. Experimental:

- Data collected under controlled conditions, in situ or laboratory-based
- Should be reproducible, but can be expensive

Examples: *gene sequences, spectroscopy, microscopy, chromatograms, magnetic fields readings*

3. Derived or compiled:

- Reproducible, but can be very expensive
- **Examples:** *text and data mining, derived variables, compiled database, 3D models*

4. Simulation:

- Results from using a model to study the behavior and performance of an actual or theoretical system
- Models and metadata, where the input can be more important than output data
- **Examples:** *climate models, economic models, biogeochemical models*

5. Reference or canonical:

- Static or organic collection [peer-reviewed] datasets, most probably published and/or curated.
- **Examples:** *gene sequence databanks, chemical structures, census data, spatial data portals*

Types of data *

Tick ✓ the types of data that you will be dealing with

☐ Observational

☐ Experimental

☐ Derived/Compiled

☐ Simulation

☐ Reference or Canonical (links)

☐ Other: _____

Dataset lifecycle

Consider the lifecycles of datasets WP1 - WP17:

- a. **Data Lifecycle Stages:** What phases will the data undergo? For instance, stages such as generation, collection, processing, storage, management, analysis, visualization, and interpretation.
- b. **Methodologies at Each Stage:** What approaches will be employed during each phase?
- c. **Tools and Instruments:** Which tools and instruments will be utilized?
- d. **Data Growth Projections:** How rapidly do you anticipate the data expanding?
- e. **Personnel Involved:** Who will participate in the process? For example, professors, laboratory researchers, or PhD students.
- f. **Data Management Strategies:** How will this dataset be managed? Consider aspects such as storage solutions, media types, backup frequency, responsible parties, and backup methodologies.

WP1-WP17

Please provide the WP referring to and your answer for each case (a–f). If a particular dataset doesn't pertain to you, feel free to skip that section.

For example:

WP1:

- a)
- b)

Your answer

Metadata Standards

Metadata refers to *structured information that facilitates the discovery, understanding, and management of a data or information resource*, such as a dataset. According to the European Commission, a **metadata record** captures the essential attributes of a resource - including ***who created it, what it contains, when and where it was produced, why it was generated, and how it can be accessed or used***. In essence, metadata serves as a descriptive guide that supports the effective reuse and governance of data.

How will metadata be generated and captured for each of your datasets (WP1 - WP8)? *

In your answers refer to the specific WP and dataset in question, e.g. WP1:

Your answer _____

Are there any metadata standards commonly used in your field that could be applied to your datasets? *

Examples include general standards such as **Dublin Core (DC)** or **Resource Description Framework (RDF)**, as well as domain-specific standards like:

- **Directory Interchange Format (DIF)** for geosciences
- **Ecological Metadata Language (EML)** for environmental data
- **Data Documentation Initiative (DDI)** for social, economic, and behavioral sciences

☐ Yes

☐ No

If **Yes** specify

Otherwise leave this blank.

Your answer _____

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