



Project no.:	101095738		
Project full title:	6G SHort range extreme communication IN Entities		
Project Acronym:	6G-SHINE		
Project start date:	01/03/2023	Duration	30 months

D1.3 – DATA MANAGEMENT PLAN – SECOND VERSION

Due date	29/02/2024 (M12)	Delivery date	29/02/2024 (M12)
Work package	WP1		
Responsible author(s)	Berit Hvidberg Christensen (AAU)		
Contributor(s)	Enrico Maria Vitucci (CNIT) Baldomero Coll Perales (UMH) Gilberto Berardinelli (AAU) Ramoni Ojekunle Adeogun (AAU) Frank Burkhardt (FHG)		
Version	V1.0		
Reviewer(s)	Baldomero Coll Perales (UMH)		
Dissemination level	Public (PU)		

VERSION AND AMENDMENT HISTORY

Version	Date (DD/MM/YYYY)	Created/Amended by	Changes
0.1	07/12/2023	Berit H. Christensen	Transforming D1.2 into D1.3
0.2	09/12/2023	Berit H. Christensen	Updates based on COO input
0.3	22/01/2024	Berit H. Christensen	Updates based on contributors' input
0.7	31/01/2024	Berit H. Christensen	Final version ready for internal review
0.8	08/02/2024	Berit H. Christensen	Updates based on reviewers' comments
0.9	25/02/2024	Berit H. Christensen	Minor refinements
1.0	29/02/2024	Berit H. Christensen	Final version

TABLE OF CONTENTS

TABLES	3
ABBREVIATIONS AND ACRONYMS	3
EXECUTIVE SUMMARY	5
1 INTRODUCTION	5
1.1 GENERAL	5
1.2 THE DMP TEMPLATE	6
1.3 WHY IS THE DMP IMPORTANT?	6
1.4 WHO USES THE DMP?	6
1.5 FAIR PRINCIPLES AND OPEN RESEARCH DATA	7
2 DATA SUMMARY	7
2.1 IS EXISTING DATA BEING RE-USED?	7
2.2 TYPES AND FORMATS OF DATA GENERATED	7
2.2.1 PUBLIC DELIVERABLES	8
2.2.2 SCIENTIFIC PUBLICATIONS	8
2.2.3 CONTRIBUTIONS TO STANDARDS	8
2.2.4 OTHER PUBLICATIONS	9
2.2.5 DATASETS AND SOFTWARE CODE	9
2.3 PURPOSE OF THE DATA COLLECTION/GENERATION AND RELATION TO THE OBJECTIVES OF THE PROJECT	10
2.4 EXPECTED SIZE OF THE DATA	11
2.5 ORIGIN OF THE DATA	11
2.6 DATA UTILITY	11
3 FAIR DATA	12
3.1 MAKING DATA FINDABLE, INCLUDING PROVISIONS FOR METADATA	12
3.1.1 IDENTIFICATION BY A PERSISTENT IDENTIFIER	12
3.1.2 STANDARDS FOR METADATA	12
3.1.3 SEARCH KEYWORDS	12
3.1.4 METADATA HARVEST AND INDEXATION	12
3.2 MAKING DATA ACCESSIBLE	13
3.3 MAKING DATA INTEROPERABLE	15
3.4 INCREASE DATA RE-USE	16
4 ALLOCATION OF RESOURCES	18
4.1 COST ESTIMATION AND RESOURCES FOR MAKING THE DATA FAIR	18
4.2 DATA MANAGEMENT RESPONSIBILITIES	18
4.3 COSTS AND POTENTIAL VALUE OF LONG-TERM DATA PRESERVATION	18
5 DATA SECURITY	18
6 ETHICAL ASPECTS	18
7 OTHER ISSUES	19
8 CONCLUSIONS	19
ANNEX 1	20
REFERENCES	23

FIGURES

Figure 1 The 6G-SHINE Zenodo repository.....	13
Figure 2 arXiv repository	13
Figure 3 SNS repository on the BSCW server	14
Figure 4 The Creative Commons License Options	15

TABLES

Table 1. Data Management Plan Overview.....	6
Table 2 Pre-standardization and standardization bodies.....	8
Table 3 Summary of 6G-SHINE’s planned generated software and datasets.	9
Table 4 Repositories used in the project.....	14

ABBREVIATIONS AND ACRONYMS

.mat	MAT-files are binary MATLAB® files that store workspace variables
.py	Python Software
ADAS	Advanced Driver-Assistance System
CA	Consortium agreement
CARLA	Integrated High-Fidelity 3D Simulation Platform
CC-BY-NC	Creative Common Attribution-Non Commercial
CC 0	Creative Common Public Domain Dedication
CAVS	Connected and autonomous vehicles
DOI	Digital Object Identifier
DMP	Data Management Plan
EC	European Commission
EOSC	European Open Science Cloud
ETSI	European Telecommunications Standards Institute
EU	European Union
FAIR DATA	Making data findable, accessible, interoperable, and reusable
GA	Grant Agreement
GNSS	Global Navigation Satellite System
HTTPS	Hypertext Transfer Protocol Secure
IEEE	The Institute of Electrical and Electronics Engineers, Inc.
IPR	Intellectual property rights
ISBN	International Standard Book Number
ISRC	International Standard Recording Code
ITU	International Telecommunication Union
LOS/NLOS	Line of Sight/Non-Line of Sight
NEXT GA	Next Google Analytic

NGMN	The Next Generation Mobile Networks
O-RAN	Open (O) - Radio Access Network (RAN)
PoC	Proof of concept
SQL	Structures Query Language
SygMa	The EC Research Participant Portal
UTF-8	Unicode Transformation Format 8-bit
3GPP	The 3rd Generation Partnership Project
URL	Uniform Resource Locator
UTF-8	Unicode Transformation Format 8-bit
WP	Work Package
3GPP	The 3rd Generation Partnership Project (3GPP)
5G-ACIA	5G Alliance for Connected Industries and Automation.

EXECUTIVE SUMMARY

This deliverable, D1.3, serves as the second version of the Data Management Plan (DMP) for the 6G-SHINE project, following the initial D1.2 version. With the project now progressing for 12 months, it's essential to review and adapt the DMP to accommodate the project's ongoing development. Consequently, the D1.3 DMP has been formulated to reflect the evolving requirements of the project.

The Data Management Plan (DMP) for the 6G-SHINE project identifies and categorises the different types of data that are expected to be collected, processed, generated, and disseminated in the project, namely: public deliverables, scientific publications, contributions to standards, datasets, Software Code etc.

Furthermore, it describes the methods to ensure the generation of FAIR data, making it Findable, Accessible, Interoperable, and Reusable. The DMP describes the life cycle of the data and how it will be handled during and after the end of the project. In addition, it explains how the data will be selected for usage and presentation according to the project's data collection methods and standards, and finally, how the data will be organised and stored.

The DMP for the 6G-SHINE project is a "living document" that will be updated and enhanced as the project evolves, as described in Work Package 1 (First, second, and third versions). Any reissue of an updated DMP will be defined and agreed upon by the consortium.

In the current version of the DMP, a summary of the data that will be collected and generated from the project, including the purpose of data collection/generation as well as the origin, type, and format of data, is presented.

1 INTRODUCTION

1.1 GENERAL

Efficient data management planning remains an aspect of research best practices, with the overarching goal of enhancing accessibility and promoting the reusability of research data. Complying with the Horizon Europe Model Grant Agreement, it is imperative to establish and regularly update a comprehensive Data Management Plan (DMP). This document is the deliverable D1.3 Data Management Plan (DMP), a product of WP1, Task 1.4 within the 6G-SHINE project. This DMP, presented in the twelfth month since the project began, marks the second version on this topic. It will be followed by the final vision, D1.4 scheduled for month 30 at the project's conclusion, as specified in the Grant Agreement.

The DMP for the 6G-SHINE project results from a collaborative effort involving the project coordinator and the valuable contributions and support from all project partners. It provides comprehensive insights into the strategies for data collection, processing, and generation within the various Work Packages (WP) throughout the project's 30-month duration. This DMP adheres to the template mandated by the European Commission for Horizon Europe projects [1]. In summary, the DMP outlines:

- The protocol for handling research data throughout and after the project's conclusion.

- The specifics of data collection, processing, and/or generation.
- The methodologies and standards to be applied.
- The intentions regarding data sharing and open access.
- The strategies for data curation and preservation, including post-project preservation.

As previously noted, the DMP will continually evolve throughout the project's lifecycle to accommodate emerging data and methodologies. It will undergo one more formal review and update during the project's duration, ensuring it remains aligned with significant changes in policies, organisational structures, or other influential factors impacting both the consortium and the project.

Table 1 summarises the revisions and updates of the Data Management Plan.

Table 1. Data Management Plan Overview

Deliverable No	Deliverable Name Work	Due Date (month)	Status
D1.2	Data Management Plan first version	M6	Submitted
D1.3	Data Management Plan second version	M12	Submitted
D1.4	Data Management Plan third version	M30	Pending

1.2 THE DMP TEMPLATE

The European Commission has issued a [template](#) [1] to complete the DMP. The template contains questions to be answered according to the project. These questions have helped form the structure for the following chapters, where the template's main sections and proposed content are listed, including 6G-SHINE's responses.

1.3 WHY IS THE DMP IMPORTANT?

The DMP is a crucial document within the project. It offers a comprehensive overview of the research data produced by the project, encompassing details about the data's types, formats, and the methods employed for processing and storage. This is done to ensure that the data adheres to the principles of FAIR data management, making it Findable, Accessible, Interoperable, and Reusable.

The primary purpose of the DMP is to provide guidance and assurance for appropriate data management practices throughout the entire duration of the project. Furthermore, the DMP encompasses:

- The consideration of any commercial and security aspects related to the data, identifying project data intended for sharing or open access, and information regarding the project's Intellectual Property Rights (IPR).
- The repository specification manages the data during and after the project's completion.
- A detailed description of the methodology employed in handling the data collected, processed, and/or generated within the project.

1.4 WHO USES THE DMP?

All project participants engaged in data collection, processing, and storage must respect the established data handling procedures and privacy notice. Additionally, all other project participants can refer to this document to gain insight into the data categories and their usage within the project.

1.5 FAIR PRINCIPLES AND OPEN RESEARCH DATA

6G-SHINE will follow the FAIR guidelines for open research data to make its data Findable, Accessible, Interoperable and Reusable. These guidelines concern the data handling, evaluation, sharing and reuse of the manually and automatically generated input.

FAIR Data Management provides:

- Summary of the data collected.
- Methods to ensure that the data is FAIR.
- Resources to be allocated.
- Data security.

These principles precede the implementation choices and do not necessarily suggest any specific technology, standard, or solution.

2 DATA SUMMARY

2.1 IS EXISTING DATA BEING RE-USED?

Data from other projects and existing work done previously by the project partners might be re-used at their discretion and permission.

2.2 TYPES AND FORMATS OF DATA GENERATED

A preliminary overview of the data types expected to be collected and generated in the 6G-SHINE project is presented below:

- WP1/2/3/4/5/6: Public deliverables
- WP2/3/4/5: Scientific publications (mainly scientific papers created by the consortium members) (See Annex 1: Publications)
- WP2/3/5: datasets (training and testing algorithms, including AI solutions, Proof-of-Concepts)
- WP2/4: software code (open-source software, released in public repositories)
- WP2/3/4/5: contributions to standard
- WP1/2/3/4/5/6: other publications (promotion material, press releases, white papers, etc.) (See Annex 1: Communication)

According to the project's scope, the data types are labelled following the expected method of usage:

- O - Open; entries which are candidates for open research data.
- L – Limited; parts of data or post-processed versions shall be evaluated to see if they can be published as open research data, while the complete, unprocessed data are expected not to be made open.
- C – Closed; no part of this data is expected to be made accessible as open research data:

Datasets listed as 'Limited' or 'Closed' are restricted because making those openly available has been flagged as being against the beneficiaries' legitimate interests, as industrial partners expect commercial exploitation from these data.

2.2.1 PUBLIC DELIVERABLES

All project deliverables will be listed on our website (www.6gshine.eu) and made available for download following submission to the EC and approval by the project officer and external reviewers. Deliverables will present the project advances in multiple technical fields. Deliverables will be provided in PDF format. So far, none of the submitted deliverables have received approval from the EC (Project Officer or external reviewers). Additionally, as requested by the chair of the SNS Steering board, the 6G-SHINE deliverables will be uploaded to the SNS repository on the BSCW server ([Figure 3](#)) upon submission to the portal. This upload includes the following disclaimer: "This deliverable has not yet been externally reviewed and approved by the European Union."

2.2.2 SCIENTIFIC PUBLICATIONS

The scientific publications generated by the consortium partners will be made available to the public and the scientific community in open source, using the 6G-SHINE [Zenodo](#) repository or other well-known open-science repositories such as [arXiv](#) ([Table 4.](#)) The publications will also be listed on the [6G-SHINE website](#).

2.2.3 CONTRIBUTIONS TO STANDARDS

6G-SHINE aims at pioneering the main technology components for short-range communications in in-X subnetworks. Given the project's timeline, which is expected to end earlier than the beginning of 6G standardization, the focus will be on pre-standardization. As described in 6G-SHINE's deliverable D6.1 [2], the project aims to contribute to the activities of major international standardization bodies and major industry fora. Potential contributions to pre-standardization are also presented in D6.1. Once a contribution to standardization is in preparation, this will be discussed within the consortium. The consortium members will also discuss its potential availability in open access. In WP6, we are actively monitoring and sharing standardization activities. This tracking effort aims to give all project partners a clear picture of the ongoing pre-standardization activities relevant to the topics of the 6G-SHINE project. So far, the 6G-SHINE project is tracking activities in 5 pre-standardization bodies and four standardization bodies, as listed in

Table 2.

PRE-STANDARDIZATION BODIES		STANDARDIZATION BODIES		
1	5GAA	1	3GPP	RAN1 RAN2 RAN4 SA1
2	5G-ACIA	2	ETSI	ETSI DECT 2020NR ETSI ITS ETSI THz ISG ETSI RIS ISG
3	NEXTGA	3	IEEE	IEEE802.11 IEEE802.15
4	NGMN	4	ITU	
5	ORAN			

PRE-STANDARDIZATION BODIES		STANDARDIZATION BODIES		
1	5GAA	1	3GPP	RAN1 RAN2

				RAN4 SA1
2	5G-ACIA	2	ETSI	ETSI DECT 2020NR ETSI ITS ETSI THz ISG ETSI RIS ISG
3	NEXTGA	3	IEEE	IEEE802.11 IEEE802.15
4	NGMN	4	ITU	
5	ORAN			

Table 2 Pre-standardization and standardization bodies.

2.2.4 OTHER PUBLICATIONS

6G-SHINE aims to reach a broad audience by generating different types of publications besides scientific publications. Those include flyers, posters, press releases, whitepapers, and information articles in national newspapers. (Annex 1) There will be information on the website and 6G-SHINE social media channels about the release of these publications. Non-confidential publications will also be uploaded on the project website or linked to the websites where the publications are made available.

2.2.5 DATASETS AND SOFTWARE CODE

The datasets and Software Code listed below will be available for open access during the project.

Table 3 Summary of 6G-SHINE's planned generated software and datasets.

WP (Partner)	Name of Dataset	Short description and format	Expected file size	Label
WP2/ Task 2.1/ Subtask 2.1b (UMH)	In-vehicle data traffic traces	Realistic data sets of raw and processed data traffic of in-vehicle networks that accurately represent the in-vehicle data traffic, especially the one related to the ADAS (Advanced Driver-Assistance System) domain of connected and autonomous vehicles (CAVs). The data sets differentiate the dataflow generated by different in-vehicle mounted sensors (cameras, radar, lidar, IMU, GNSS, etc.) and control functions by means of realistic traffic patterns (packet rate and size, traffic bursts, time correlation, etc.). The data sets are generated using an integrated high-fidelity 3D simulation platform (CARLA) with an automated driving stack (Autoware) available at UMH. (Software Code: Open-source software)	12,5 MB	O
WP2 Task 2.2. (CNIT)	Simulated and measured radio propagation Data	The design of the 6G-SHINE radio system requires a deep understanding of the radio propagation characteristics in the scenarios where the subnetworks are anticipated to operate. The radio propagation characteristics could be affected by a high clutter density, obstructed line-of-sight (e.g., engine in a vehicle or robotic parts in industrial environments affecting the LOS/NLOS conditions) and from being enclosed by a metal housing. The dataset consists of digital maps of the studied environments (in the form of point clouds or 3D vector data) and Matlab code to post-process	Between 1 GB and 10 GB	O

WP (Partner)	Name of Dataset	Short description and format	Expected file size	Label
		<p>measured and simulated data. Simulated data are generated with ray-tracing prediction tools and made available in the form of tables and/or Matlab structures. The post-processing code is used to produce propagation parameters, such as Path Loss, Delay Spread, Angle dispersion, cross-polarization ratios, etc., that can be used for modelling purposes and for the design of PHY and MAC enablers to achieve the desired service requirements. Also, basic Matlab implementations of macroscopic models for Reconfigurable Intelligent Surfaces (RIS), which can be used to assess the realistic performance of RIS and integrated into ray tracing simulations, are made available in the dataset (Software Code: Open-source software)</p>		
WP4/ Task 4.1. (AAU)	Simulation code for radio resource management in hyperdense subnetwork scenarios.	<p>The simulation code for mobile subnetwork scenarios is developed to model and perform the system-level evaluation of solutions in dense deployments of mobile subnetworks. The code base includes functionalities for creating deployments, simulating subnetwork mobility, modelling propagation, integrating algorithms for radio resource management and performing system-level analysis. (Software Code: Open-source software)</p>	Around 100 MB.	O
WP4/ Task 4.1 (AAU)	Synthetic data traces for interference in dense mobile subnetwork scenarios	<p>Simulated data sets of interference power in static and mobile subnetworks with different radio resource management techniques. The datasets capture the statistics of interference power in frequency, time, and spatial dimensions. The frequency dimension corresponds to different frequency sub-bands, and we capture the spatial dimension with the location of subnetworks inside simulated factory halls. The collected data sets contain time traces of aggregated interference power measured over each frequency sub-band at all subnetwork locations with the following dynamic sub-band allocations: random (fixed) sub-band selection, greedy channel selection, and centralised graph colouring. The data sets are generated using the in-X subnetworks simulator developed at AAU. The simulator implements functionality for system-level evaluation of mobile subnetworks and utilises channel models defined for indoor factory environments by 3GPP. (Software Code: Open-source software)</p> <p>By M12, a dataset for static dense subnetworks has been generated, considering the following setup:</p> <ul style="list-style-type: none"> - 20 static subnetworks in a 20 x 20 m² areas, each serving a single device - Carrier frequency 6 GHz, 40 MHz bandwidth divided in K=4 channels - 3GPP InF channel model - 200.000 snapshots, with different subnetworks and device positions within the factory area. <p>This preliminary dataset has a size of 2.38 GB. Further details will be included in an implementation note to be uploaded along with the dataset in the Zenodo repository.</p>	Between 2 GB and 20 GB.	O

2.3 PURPOSE OF THE DATA COLLECTION/GENERATION AND RELATION TO THE OBJECTIVES OF THE PROJECT

The overall objective of the project is to pioneer the main technology components for in-X wireless subnetworks, short-range low-power radio cells to be installed in a wide set of vertical and consumer entities like robots, vehicles, production modules, and classrooms for the sake of supporting extreme communication requirements in terms of latency, reliability, or data rates. With a TRL 2-4, 6G-SHINE will leverage the opportunities offered by the peculiar deployment characteristics of such short-range subnetworks for a highly performant yet cost-efficient radio design that allows bringing wireless connectivity to a level of pervasiveness which has never been experienced earlier. The open-access datasets and code provided address relevant aspects of the project, such as traffic characterization for in-vehicle use cases, radio propagation in the in-X subnetwork scenarios of interest, and radio resource management. These datasets and software codes are described, as far as possible, in [Table 3](#) [Table 3 Summary of 6G-SHINE's planned generated software and datasets.](#)

2.4 EXPECTED SIZE OF THE DATA

For three of the four expected datasets, the volume of the data is presently unknown (only an estimate is provided). Still, it is foreseen to stay small enough to be stored on the standard available servers used in the project. There is no indication of a need to budget for repository storage outside of the scope of what repositories accept within their free limit quotas. For one of the datasets, the WP4/Task 4.1 (AAU) 'Synthetic data traces for interference in dense mobile subnetwork scenarios', the preliminary dataset has a size of 2.38 GB.

2.5 ORIGIN OF THE DATA

The 6G-SHINE partners' research activities will generate the data. Partners may contribute additional data to the project. This data will be handled in accordance with agreements of usage (Consortium Agreement (CA) [3] in the project and will also. For those partners providing open-access datasets, these are described, as far as possible, in [Table 3](#)

2.6 DATA UTILITY

The data will be useful for subsequent research carried out by the partners, benefit the scientific community, and act as a basis for any subsequent projects.

3 FAIR DATA

3.1 MAKING DATA FINDABLE, INCLUDING PROVISIONS FOR METADATA

3.1.1 Identification by a persistent identifier

All data deposited in [6G-SHINE Zenodo Community](#) or other relevant repositories will be identified with a Digital Object Identifier (DOI) whenever possible to increase findability and citability.

3.1.2 Standards for Metadata

The project will adhere to industry standards and will respect GA provisions regarding metadata: “Metadata of deposited data must be open under a Creative Common Public Domain Dedication (CC 0) or equivalent (to the extent legitimate interests or constraints are safeguarded), in line with the FAIR principles (in particular machine-actionable) and provide information at least about the following: datasets (description, date of deposit, author(s), venue and embargo); Horizon Europe funding; grant project name, acronym and number; licensing terms; persistent identifiers for the dataset, the authors involved in the action, and, if possible, for their organisations and the grant. Where applicable, the metadata must include persistent identifiers for related publications and other research outputs.”

Each dataset has metadata associated with it, for descriptive, structural, and administrative issues. The embedded metadata in data will be part of the data collection and documentation process, which are elaborated before the publication of the metadata, both in terms of sanitising and for adding metadata. Some metadata will be created during the publication procedure for a given repository and follow the (metadata) standard(s) for the specific repository. As for the specific metadata format, Zenodo utilises Data Cite [4], a de facto standard for describing datasets. All partners are requested to include the following acknowledgement of funding in their metadata, which is supported by Data Cite in the metadata standard in the grant section, linking to the grant number 101095738, or mention the name of the project and grant agreement in case of metadata standards that do not have a separate grant section.

3.1.3 Search keywords

For generic repositories, the search keywords will be extracted from the metadata and provided as part of the descriptive metadata for the dataset. If subject-specific repositories are used, the search keywords will follow the standard utilised by the given repository.

3.1.4 Metadata harvest and indexation

Metadata harvest and indexation will be available depending on the repositories’ protocols. As for Zenodo, this is harvested into the most common search engines for research data like OpenAIRE [5].

3.2 MAKING DATA ACCESSIBLE

For publications, partners will be using The 6G-SHINE Zenodo repository (Figure 1) or other well established repositories such as ArXiv (Figure 2) or TechRxiv, as well as their own institutional repository.

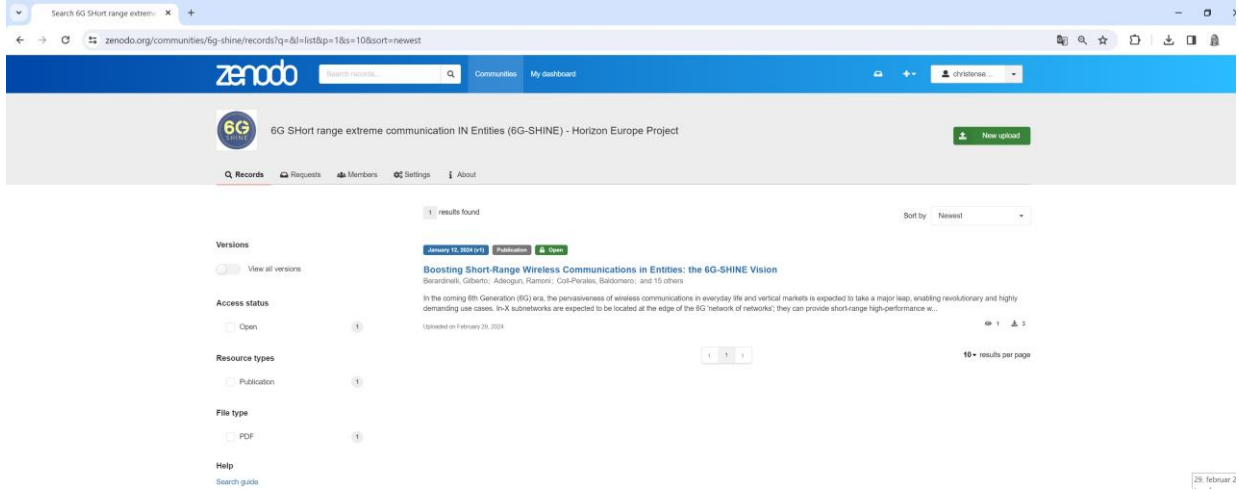


Figure 1 The 6G-SHINE Zenodo repository

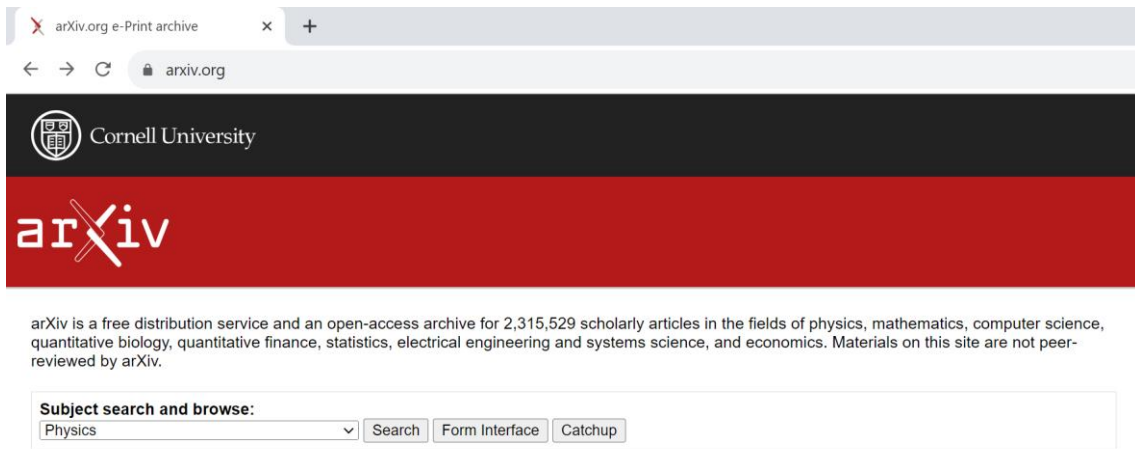


Figure 2 arXiv repository

A SNS repository has been setup on the BSCW server (Figure 3) by the SNS steering board, where the project deliverables will be uploaded.

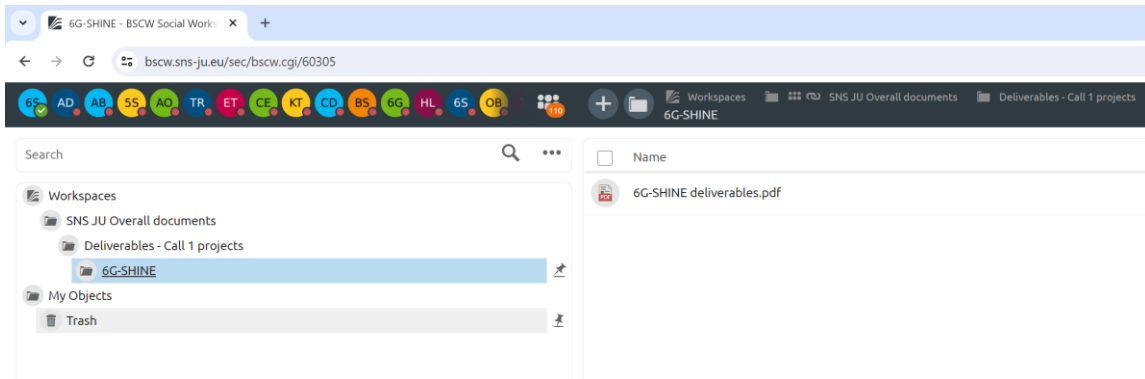


Figure 3 SNS repository on the BSCW server

Datasets deposited in Zenodo are provided with a DOI. Some of the institutional repositories that will be used, e.g., VBN [6], can provide a DOI upon demand. If this option is unavailable, partners are instructed to deposit in Zenodo.

When restricted data are stored on internal servers, partners are expected to include a note on Zenodo regarding the existence of the dataset. Access will be decided by project partners on a case-to-case basis. Partners will strive to describe a procedure for screening requests. This will follow the Consortium Agreement (CA) and Grant Agreement (GA). Repositories partners are planning to use (non-exhaustive list) are listed in Table 4.

Table 4 Repositories used in the project.

Partner	Repository
All	Zenodo is recommended by default for the 6G-SHINE Zenodo Community . For scientific publications, arXiv and TechRxiv can also be used.
All	The chair of the SNS Steering board stated during the February 12, 2024, meeting that all deliverables should be promptly uploaded to the SNS repository on the BSCW server upon submission to encourage collaboration across projects. The repository link is: https://bscw.sns-ju.eu/sec/bscw.cgi/14898
AAU	As producer of the code, AAU will take responsibility for the storage and preservation of the code at VBN, Aalborg University's Research Portal GitHub (for codes). The general project information, relevant publications, and datasets will be presented on VBN, Aalborg University's Research Portal . The code for the model description and some further Python scripts will be published on GitHub public repositories and possibly harvested to Zenodo to make the code citable with a DOI.
UMH	UMH, as a producer of the datasets, will take responsibility for the storage and preservation of the traces. DOI will be assigned, and data traces will be available on GitHub.
CNIT	CNIT, as a producer of the datasets, will take responsibility for the storage and preservation of the traces. DOI will be automatically assigned to each data set via Zenodo or Figshare [7]. Data traces will also be available on the European Open Science Cloud (EOSC). This ensures open access availability of all data for at least ten years and creates permalinks for all datasets, which can be used for referencing in publications.

3.2.1 Data

Data(sets) which can be made publicly available are identified in [Table 3 Summary of 6G-SHINE's planned generated software and datasets](#) (datasets marked as O – Open).

The data will be available in various file formats, with some being open, whilst others will be proprietary file formats due to the software used during the collection and analysis phase and to avoid the possible loss of important information if data is converted. The protocol for access will be determined by the repository used, which is most often an HTTPS protocol.

For the project members, a common project platform is available in Teams, where the different datasets to be shared can be stored for internal use. Further, data only used by individual partners will be stored on their platforms and according to their internal rules.

Public data will be deposited in [Zenodo](#) or other relevant repositories depending on each partner's preferences. There will not be an active data curation procedure for the specific repository. Still, data should remain available and findable for five years after the end of the project (the Zenodo website mentions that the data will be available for at least 20 years). A need for a data access committee, e.g., to evaluate/approve access requests to personal and sensitive data, has not been identified.

For example, CC BY-NC can be used (see [Figure 4](#)). This license allows re-users to distribute, remix, adapt, and build upon the material in any medium or format for non-commercial purposes only, and only as long as attribution is given to the creator.

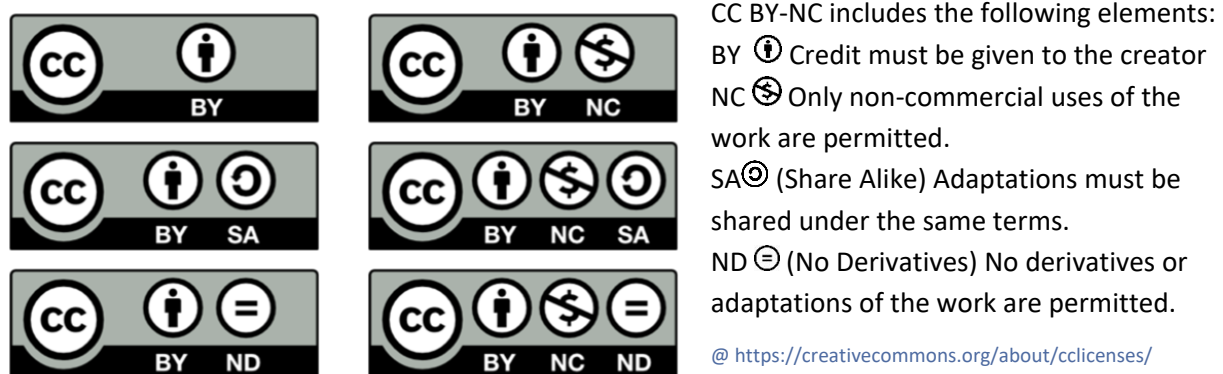


Figure 4 The Creative Commons License Options

3.2.2 Metadata

Whenever possible, metadata will be made openly available and licenced under a CC 0, as per the Grant Agreement. The metadata will include information about software needed to access or read the data, and, when possible, a link to the relevant software will be provided.

3.3 MAKING DATA INTEROPERABLE

3.3.1 Version control

Each data owner is responsible for deciding on the file naming conventions and including a clear version-control guideline. Version control will follow the file naming conventions that include a version control in the file name.

3.3.2 Standards to be followed.

All openly accessible data will be uploaded in a commonly accessible format and encoding (such as UTF-8). We are aware that some formats are considered proprietary. Where possible and feasible, we will convert files to non-proprietary formats. However, some data are best represented in the proprietary file formats, as some capabilities of the formats are not matched by their open alternatives.

3.3.3 Common vocabulary for data types

Data will be collected from many different partners; therefore, data types might differ depending on the provider. Therefore, the partners of the 6G-SHINE project intend to give the data relevant and representative names and use shared codes for representation in data, which clearly explain the content of the data type, including, e.g., the actual units in which they are measured, if relevant. This way, the partners can easily compare relevant data of the same type. The practice for this is yet to be determined when writing the DMP.

3.3.4 Qualified references to other data

Where possible, the documentation of the data will include descriptions with references to other datasets. Furthermore, if needed, the metadata in Zenodo will relate to other datasets, e.g., pointing to related datasets, papers, etc.

3.4 INCREASE DATA RE-USE

3.4.1 Documentation is needed to validate data analysis and facilitate data reuse.

Partners are encouraged to provide documents such as e.g., readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, and units of measurement, whenever possible. The data and publications will be interlinked using metadata in Zenodo or other repositories where possible.

3.4.2 How the data will be licenced to permit the most comprehensive reuse possible.

For publicly published data, an appropriate license will be selected, i.e., CC-BY-NC license or equivalent. The exact license is to be decided by the data owner at upload time.

3.4.3 When the data will be made available for re-use?

Whenever it is possible to provide the data, it will be made available as soon as possible after its generation. The publication will follow the publisher's guidelines if the data is supplementary to an article.

3.4.4 Usability by third parties of data produced in the project, after the end of the project

Parts of data will not be made publicly available and cannot be used by third parties. The data that is made publicly available can be used by other interested parties, with proper credit to creators and according to the specified license.

3.4.5 Documentation of data provenance

The current data provenance details are not decided. All researchers obey good research handling practice, which includes (described within each discipline) a way of ensuring that documentation of data provenance is ensured, aiming to make the results reproducible.

3.4.6 Data quality assurance procedures

Data Quality Assurance requires a plan to reduce error and bias, data processing and validation errors, and to increase reliability and integrity. In this respect, data quality is acceptable if the collection methods are stable and protected from bias or manipulation, sufficiently documented and detailed, and cross-checked.

Quality control of the data in 6G-SHINE is the responsibility of the partner generating it, whilst quality assurance is a horizontal management activity of the project, led by the Project Coordinator. Details on 6G-SHINE's quality control procedures, which include internal review for deliverables' production, are set out in the Project Handbook [8], which partners should follow. At this point (Version 2.0), there are no additional quality assurance measures at the partner's levels.

4 ALLOCATION OF RESOURCES

4.1 COST ESTIMATION AND RESOURCES FOR MAKING THE DATA FAIR

Providing FAIR data is the responsibility of each partner, and a budget for open access fees has been included in the project budget for the partners who requested it. As for making data available through Zenodo, we expect to remain within the free limits of Zenodo. We do not expect extensive data handling procedures for making data available, like converting data to new files, cleaning data or the like before publication.

4.2 DATA MANAGEMENT RESPONSIBILITIES

The project's General Assembly will handle potential issues regarding data management. Project partners are responsible for the data generated; however, in case of disputes, the Project Coordinator will be responsible for resolving these, aided by legal advisors, as necessary.

4.3 COSTS AND POTENTIAL VALUE OF LONG-TERM DATA PRESERVATION

No additional cost is foreseen for long-term data preservation. All costs are included in the project budget.

5 DATA SECURITY

Each partner is required to follow the data security standards of their own institution, including guidelines for information security. This will also include local guidelines for backup and restore procedures, as well as for ensuring, e.g., the proper user management for confidentiality, integrity, and accessibility of data. Where possible, partners will use certified solutions for storing data. Partners will transfer data using either secure encryption transportation protocols or by trusted encryption techniques, including proper transfer of encryption key(s) – as necessary. In case non-aggregated data (or non-anonymised data) are located on non-national servers, a permission request from participants is needed. All data storage will be on the EU territory, except for the data generated by Interdigital, an associated partner residing in the United Kingdom.

6 ETHICAL ASPECTS

The project does not include any ethics deliverables. The usage of AI methods in the 6G-SHINE project does not bring any ethical issues in relation to objectives, methodology, and impact. The 6G-SHINE project will apply AI methods to data that is synthetically generated with simulations/emulation software platforms or measured in laboratory facilities. Such data refers to radio signal characteristics such as signal power, signal envelope, and data traffic measured in laboratory facilities related to control applications in machinery. For the latter, 6G-SHINE will only measure and use data traffic characteristics related to packet size and packet interarrival times and not the content of the actual communication.

Since this project deals with the basic research design of radio system components, 6G-SHINE will not use any data related to humans and animals. The AI solutions developed in the project will, therefore, not stigmatise or discriminate against people. Also, the AI solutions are not expected to interact, replace or influence any human decision-making process since the designed solutions will only be used for

decision-making of radio electronics for the sake of improving wireless communication performance and reducing energy consumption. The AI solutions will not lead to any negative social and/or environmental impact nor raise any other ethical concerns.

7 OTHER ISSUES

Each partner is expected to follow their national and institutional procedures for data management.

8 CONCLUSIONS

D1.3 provides information about the data types to be generated and used by the project consortium partners, as well as information on formats, storage, and making the data FAIR. This document's objective is to report on data management issues handled during the implementation of the 6G-SHINE project. Its scope comprises the overall data management plan for data handling and the reporting and publishing of project datasets.

Daily data management is an important task undertaken by all partners in the consortium according to the elements described in this document and through continuous collaboration between the coordinator, the administrative project manager, the partner responsible for its development and the rest of the consortium.

As this report is generated in month 12 of the project's implementation, it is considered a living document that will evolve along with the project. Revised and extended versions of this DMP will be prepared according to the GA and internal reviews agreed upon by the partners.

While partners must make sure they respect the defined data management strategy and its procedures, the project coordinator will ensure that all data management issues in the project will be handled promptly and fairly.

ANNEX 1

Publications submitted by M12 in The EC Research Participant Portal (SygMa)

Type	Title	PID of deposited publication
Article in journal	An Efficient Ray-Based Modeling Approach for Scattering from Reconfigurable Intelligent Surfaces	10.36227/techrxiv.23041643.v1
Article in journal	Establishing Multi-User MIMO Communications Automatically Using Retrodirective Arrays	10.1109/ojcoms.2023.3289326
Article in journal	On the required radio resources for ultra-reliable communication in highly interfered scenarios	10.48550/arxiv.2306.06393
Publication in conference proceeding/workshop	Boosting Short-Range Wireless Communications in Entities: the 6G-SHINE Vision	10.5281/zenodo.10722941
Publication in conference proceeding/workshop	Experimental Study of Spatial Statistics for Ultra-Reliable Communications	https://doi.org/10.48550/arXiv.2402.11356
Publication in conference proceeding/workshop	Unsupervised Deep Unfolded PGD for Transmit Power Allocation in Wireless Systems	10.48550/arxiv.2306.11865
Publication in conference proceeding/workshop	Unsupervised Graph-based Learning Method for Sub-band Allocation in 6G Subnetworks	https://doi.org/10.48550/arXiv.2401.00950

Communication activities submitted by M12 in The EC Research Participant Portal (SygMa)

Communication description	Main Target Audience	Communication Channel
Press release of the project on the AAU website, introducing the project and the kick-off	Research Communities	Press Release
A LinkedIn post including a link to the press release	Industry, business partners	Social Media
A Tweet including a link to the press release	Industry, business partners	Social Media
Video of the project introduction at the SNS webinar	Research Communities	Video
Creation of project website with initial content	Innovators	Website
Project leaflet for the EuCNC	Innovators	Print Materials
YouTube video at EuCNC	Innovators	Social Media
Linked in post for EuCNC	Innovators	Social Media
Short statement Video for SNS JU	EU Institutions	Video
SNS JU communication taskforce telco	EU Institutions	Other
Description of the project in the first SNS journal	Industry, business partners	Print Materials
The first newsletter presenting main communication activities during the first 6 months of the project	Industry, business partners	Newsletter
First AB meeting, with participation by Orange and ABB	Industry, business partners	Other
Short description of the 6G-SHINE project (DACOB)	National authorities	Website
Article presenting the research concept behind the 6G-SHINE project (Ingeniøren)	Civil society	Media Article

Dissemination activities submitted by M12 in The EC Research Participant Portal (SygMa)

EU activity definition	Main Target audience (reached)	Title of activity/paper/presentation
Meeting	Industry, business partners	Introduction to the project at the ETSI meeting
Collaboration with EU-funded projects	Industry, business partners	Presentation of the project at SNS webinar 4
Other scientific collaboration	Research Communities	Poster at EuCNC2023
Conferences	Research Communities	Keynote at ICC 2023 (Workshop on Holographic MIMO)
Education and training events	Industry, business partners	Presentation at Global 5G Evolution
Education and training events	Research Communities	Keynote at VTC 2023
Education and training events	Research Communities	PhD school on Short range radio propagation
Education and training events	Research Communities	Special session at CSCN 2023
Education and training events	Research Communities	Presentation of the 6G-SHINE vision at the IEEE Future Networks World Forum
Collaboration with EU-funded projects	Research Communities	Panel discussion on 6G research in Europe at IEEE Future Networks World Forum
Conferences	Research Communities	IEEE International Conference on Communications (ICC)
Education and training events	Research community	Webinar on RIS modeling
Education and training events	Industry, business partners	Presentation at the 6G series workshop by Hexa-X-II
Education and training events	Research Communities	Workshop proposal EuCNC 2024 (ongoing)
Education and training events	Research Communities	Workshop proposal EuMW 2024 (ongoing)
Other	Industry, business partners	Panel proposal at Hannover Fair (ongoing)

REFERENCES

- [1] Data management Plan template for Horizon Europe, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/report/data-management-plan_he_en.docx (EU Grants: Data management plan (HE): V1.1 – 01.04.2022).
- [2] D6.1. Dissemination, Exploitation and Communication Plan for the 6G-SHINE project <https://6gshine.eu>
- [3] General Contract Clauses: Consortium Agreement
- [4] Date Cite <https://datacite.org/>
- [5] OpenAIRE, a European project supporting Open Science <https://www.openaire.eu/>
- [6] VBN, Aalborg University's research portal <https://vbn.aau.dk/en/>
- [7] Figshare, online open access repository <https://figshare.com/>
- [8] D1.1 Quality Project Management Handbook <https://6gshine.eu>