Data Management Plan

D7.5

Acknowledgement

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 776866

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Authors: IHE

Contributors: TUHH, UNEXE, InterAct

Document Information

Project Number	**776866**	Acronym	**RECONECT**
Full Title	RECONECT- Regenarating ECOsystems with Nature-based solutions for hydrometeorological risk rEduCTion		
Project URL	http://www.reconect.eu/		
Document URL			
EU Project Officer	Laura Palomo Rios		

Deliverable	Number	D7.5	Title	Data Management Plan
Work Package	Number	WP7	Title	Project Management and Coordination

Date of Delivery	Contractual	28/02/2019	Actual	26/02/2019
Status	version 1.0		final □	
Deliverable type*	O			
Dissemination level **	PU			

*R – Report, P – Prototype, D – Demonstrator, O – Other.

**PU – Public, PP – Restricted to other programme participants (including the Commission Services), RE – Restricted to a group specified by the consortium (including the Commission Services), CO – Confidential, only for members of the consortium (including the Commission Services).

Authors (Partner)	Blanca Pérez-Lapeña, Zoran Vojinovic			
Responsible Author	Name	Blanca Pérez Lapeña	Partner	IHE
Contributors (Partner)	Natasa Manojlovic (TUHH), Lydia S. Vamvakeridou-Lyroudia (UNEXE), Jos Nijhof (InterAct)			

Abstract (for dissemination, 100 words)	The RECONECT Data Management Plan (DMP) addresses the relevant aspects of making data FAIR – findable, accessible, interoperable and re-usable, including what data the RECONECT project will generate, whether and how it will be made accessible for verification and re-use, and how it will be curated and preserved.
Keywords	DMP, ORDP, FAIR

Version Log				
Issue Date	Rev. No.	Author	Change	Approved by
26/02/2019	1	BPL, ZV		

Executive Summary

The Data Management Plan (DMP) presented in D7.5 addresses the relevant aspects of making data FAIR – findable, accessible, interoperable and re-usable, including what data the RECONECT project will generate, whether and how it will be made accessible for verification and re-use, and how it will be curated and preserved.
This is a live document to be periodically elaborated and updated as the implementation of the project progresses and in those situations when significant changes occur.

Contents

List of tables

1 Introduction

1.1 Scope

This document describes the RECONECT Data Management Plan (DMP) that corresponds to Deliverable D7.5. The DMP:

- Provides a description of how the research data collected, processed, and generated will be handled during and after the RECONECT project.
- Describes which standards and methodology for data collection and generation will be followed, how data will be shared and be curated and preserved.

The document follows the template provided by the European Commission on DMP[1]. The DMP is delivered for the RECONECT project as it participates in the Pilot on Open Research Data in Horizon 2020.

The DMP is intended to be a living document and, as such, it will be periodically elaborated and updated as the implementation of the project progresses and in those situations when significant changes occur. In addition, Intellectual Property Rights (IPR) will be carefully considered in the DMP and addressed throughout the project duration.

1.2 Project context

RECONECT aims to rapidly enhance the European reference framework on Nature Based Solutions (NBS) for hydro-meteorological risk reduction by demonstrating, referencing, upscaling and exploiting large-scale NBS in rural and natural areas. In an era of Europe's natural capital being under increased cumulative pressure from intensive agriculture, fisheries and forestry, and urban sprawl, RECONECT will stimulate a new culture of co-creation of 'land use planning' that links the reduction of hydro-meteorological risk with local and regional development objectives in a sustainable and financially viable way.

RECONECT adopts the holistic ecosystem-based concept which is based on the premise that our ability to adapt to extreme hydro-meteorological events in a sustainable way depends on the co-evolutionary nonlinear interaction between the ever changing social, economic and cultural requirements and technical developments (which combine engineering “grey infrastructure” measures and NBS) on one side and natural processes on the other.

RECONECT will demonstrate and evaluate the multi-benefits of NBS within the RECONECT network of cases (Demonstrators and Collaborators) that cover a wide and diverse range of local conditions, geographic characteristics, institutional/governance structures and social/cultural settings to successfully upscale NBS throughout Europe and Internationally. Therefore, a sound data management strategy in the context of the RECONECT project is of high importance.

1.3 DMP and FAIR data

According to the EC guidelines[1], Research data should be FAIR, i.e., findable, accessible, interoperable and re-usable.

As part of making Research data fair, a DMP documents the context in which Research data is generated, the methodologies and standards to be applied, which data will be shared/made open access, and how data will be managed, maintained and preserved, during and after project completion.

[1] Guidelines on Data Management in Horizon 2020, http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

1.4 Data affected by the DMP

The main purpose of a DMP is to describe Research Data with the metadata attached to make them discoverable, accessible, assessable, usable beyond the original purpose and exchangeable between researchers. According to EC guidelines, Research data refers to information such as facts or numbers, collected to be examined and considered as a basis of reasoning, discussion, or calculation. In a research context, examples of these data include statistics, results of experiments, measurements, observations resulting from fieldwork, survey results, interview recordings and images. Research data, in the context of this DMP, do not include publications, articles, lectures, or presentations. The DMP leaves explicitly open the handling, use and curation of products like tools, software and written documents. Thus, the DMP focuses on digital data products like produced model data or observation data.

The RECONECT project will collect raw data that will be further processed and summarized in project deliverables and scientific publications. These raw data, underpinning the published work, constitute the main Research data sets that will be made publicly available. It is envisioned that scripts used for post-processing the raw data will also be shared. In cases where release of complete raw data sets is impossible due to, for example, privacy or personal data concerns, data will be anonymized to enable publishing.

1.5 Responsibilities

The responsible partner for the implementation of the DMP is IHE (WP7) though all WP Leaders and co-Leaders shall be involved in the compliance of the DMP. In addition, each network case lead partner is responsible for the DMP content in relation to interventions made in their study area, with the support of the case collaborating partners. The information will be gained continuously from partners in each network case and will be reported to WP leaders and co-leaders. IHE will be responsible to communicate with the WP Leaders and co-Leaders and collect the required information and update the DMP.

1.6 GDPR – General Data Protection Rights in the RECONECT project

The GDPR is a regulation by which the European Parliament, the Council and the European Commission intend to strengthen and unify data protection for individuals within the European Union (EU). It also addresses export of personal data outside the EU. The primary objectives of the GDPR are to give citizens back the control of their personal data and to harmonize the regulation within the EU.

'Personal data' is defined in the GDPR as any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person (GDPR 2016).

If a partner operating in the name of the RECONECT project collects personal data, information must be provided to the individual whose data it concerns so that he/she provides the consent to the processing of personal data relating to him or her.

The consent should be obtained in written form after the participants have been provided with clear and understandable information on aspects such as the objectives and duration of the research, handling of personal data in the study results, voluntary participation in the activity, the possibility to withdraw the consent at any point of the process, and a contact person acting as the reference investigator in the project activity. This is further elaborated, together with the consent forms to be filled in by research participants in Deliverable 8.1 on Ethics.

Therefore, the handling of personal data within the DMP will receive special attention and special efforts will be devoted to anonymize information and securing accessibility.

1.7 Structure of the document

In the next Sections, we make use of the template provided by the European Commission on DMP[1] to discuss FAIR principles and how will be tackled in the project through the DMP. As specified in the guiding document, it is not required to provide detailed answers to all questions in the first version of the DMP. Rather, the DMP is intended to be a living document. As a minimum, the DMP should be updated in the context of the periodic evaluation/assessment of the project. In the following, Research data will be referred to as dataset/s.

2 Data Summary

The RECONECT Consortium will identify the relevant datasets that will be produced and during the lifetime of the project. As the project started in September 2018, the data collection and generation is at a very early state and it is difficult to have a complete overview of the datasets that will be collected and generated. The datasets of interest to RECONECT that are currently identified can be classified as follows:

- Structured quantitative data: these data encompass, for example, sensor observations and other measurements collected throughout the monitoring process (e.g., flow measurements)
- Semi-structured qualitative data: these data include responses from stakeholder consultations (e.g., for stakeholder mapping in the network of cases).
- Geo-referenced data: spatial data that can be analysed in a Geographical Information System (e.g., remote sensing data).

The abovementioned datasets will underpin published research output like publications in Conference and Scientific Journals.

Datasets will be available in a variety of easily accessible formats, including Post Script (.pdf, .xps), Excel (.xlsx), text (.txt, .csv), Word (.doc), image (.jpeg, .png, .gif, .tiff), audio/video (.mp3, .mp4), and ESRI shapefiles (.shp).

The information listed in Table 1 presents the Work Packages (WPs) and identifies potential resulting datasets.

Table 1: WP descriptions and potential resulting data;

WP	Title	Data Summary
1	Framing science, policy and practice of NBS	WP1 provides the necessary scientific, policy and practical base for the NBS implementation and transfer. A main activity in this WP comprises the selection and enhancement of a holistic ecosystem-based framework that enables to study interactions between hydro-meteorological events and sociotechnical activities and assess effects of different institutional policies, cultural contexts and land management practices on the effectiveness of NBS under different circumstances and conditions. Such framework will enable to study interdependencies between sociotechnical activities (e.g., market demand dynamics, land planning, policy, etc.), to analyse the drivers for demand and supply for NBS, their replication and upscaling. It will also enable to define the co-evaluation framework to suit rural and natural scale NBS. Involvement of stakeholders will be of great importance in these activities. The potential data and information collected and produced in this WP include summaries of scientific literature, summary results from stakeholder consultations, guidelines depicting the social innovation approach for co-creation, and guidelines to support NBS implementation and evaluation as well as to support governance and policy formulation.
2	Demonstration	WP2 provides the ground work for demonstration activities by conducting stakeholder analysis in Demonstration sites, specifying

		the technical, planning, and data requirements of Demonstrators, addressing in depth the technical requirements for co-implementation of works in Demonstrator A sites and preparing the evaluation and validation work in Demonstrator B sites, developing co-evaluation and co-monitoring plans for Demonstrators A and B, and actual construction of NBS in Demonstration A sites. The potential data and information collected and produced to address the abovementioned objectives include summary results from stakeholder consultations, summaries on technological aspects (e.g., sensor installation) and non-technological aspects (e.g., financial), issues and barriers as related to Demonstrators, and guidelines for the design, construction, and maintenance of NBS in Demonstrator sites.
3	Co-evaluation and Validation	WP3 focuses on monitoring and evaluation of demonstrated NBS measures. Most of the FAIR datasets resulting from the project will have their roots in this WP. The overall objective of this work package is to operationalise the scientific research findings across other RECONECT Work Packages into accessible and user-friendly monitoring and evaluation/validation tools for NBS that are applicable in both Demonstrators and Collaborators. It will also leverage upon an existing body of knowledge and tools. WP3 will identify the current data and knowledge gaps in the RECONECT network of cases to enable the widespread implementation of NBS, advance the current approaches and practice to monitoring and evaluation of NBS, implement and enhance the RECONECT Services platform to support co-creation activities throughout the project, and develop evaluation protocols and manuals and carry out the co-monitoring and co-evaluation work. Most of the data collection and management activities will be carried out using the RECONECT Services Platform - an ICT platform that will contain various service components - that will facilitate the storage, integration, normalization, evaluation, and visualization of quality data on NBS performance. Some of these data will be sourced from local authorities and some of them will be collected through real-time monitoring activities, while some other data will be collected through social science surveys. Other than raw-data, the platform will contain processed data, for example, from modelling exercises. RECONECT will also involve collection of remote sensing data. Moreover, at some sites we may also include the UAV (e.g., drone) video streaming technology to monitor some of the implemented NBS. Furthermore, WP3 will also collect various kinds of societal data (e.g., social acceptance and cultural/ historical path dependencies of landscapes) and some of them will be collected using mobile crowdsourcing Apps.
4	Overcoming barriers, upscaling and synergies with collaborators	WP4 addresses overcoming barriers to the implementation of NBS, upscaling and synergies with Collaborators. In this WP the gathered knowledge and experience in the demonstrator sites will be shared and further upscaled within the RECONECT EU and international collaborators. Activities will aim at obtaining a better understanding of local acceptability, sustainability, and feasibility of NBS in Collaborator sites and at co-producing a framework for future action

		encompassing land-use and sea-based policies of relevance to selected NBSs. The potential data and information collected and produced in this WP include summaries of scientific literature, summary results from stakeholder consultations, NBS policies and management plans, and data required to carry out prefeasibility studies for implementation of NBS in Collaborator sites.
5	Consolidation of evidence base, exploitation and standardisation	WP5 focuses on maximizing the impact of RECONECT with regards to upscaling and business aspects. Activities in this WP include the generation of a Catalogue of regions with comparable demands and characteristics, the definition of an investment strategy, governance, and business models for upscaling, actions for spinoffs and startups, development of standards for design, implementation, and management of NBS, analysis on potential replication of similar projects in Europe, and the synthesis of lessons learned to produce a roadmap for NBS in Europe and beyond. Most of the data needed for activities in this WP will be obtained from other WPs. For example, the definition of regions with comparable demands and characteristics will use input data from WP1, WP2, and WP4. Potential data to be generated include guidelines for addressing governance, business models and investment strategies for large-scale NBS, results from market studies, business plans, standards for the design, implementation, and management of NBS, geodata on topography, climate, water bodies, urban areas, industry, and any other relevant parameter relevant to the analysis of potential locations where NBS could be envisaged.
6	Communication and Dissemination	WP6 focuses on communication and dissemination activities. This WP will develop and implement a communication and dissemination strategy and plan (including a clear visual identity and branding) for outreach to policy makers, decision makers, practitioners, private and public stakeholders to influence implementation of NBS in accordance to relevant EU, International, National and Local policies. It will organize dissemination activities and events targeted to RECONECT institutional and technical stakeholders, in order to reach as many potential RECONECT users as possible and make more effective the presentation of project progress and results, the sharing of experience and best practices and the advantages on the point of view of hydro-meteorological risk reduction and climate change adaptation. The potential data and information collected and produced in this WP include promotional materials (e.g., leaflets and brochures) and datasets used in the development of the MOOC.
7	Project Management and Coordination	WP7 focuses on the administrative and financial aspects of the RECONECT project and therefore, we do not expect publishable datasets for which the FAIR principles apply.
8	Ethics requirements	This WP identifies the ethics requirements that the project must comply with. This type of information has been included already in deliverable D8.1, including the resulting developed consent form, and therefore it is not expected other datasets resulting from this WP.

Over the course of the project, this section will be updated. The following table presents the template that will be used to report datasets related to each Work Package.

WP	Reported by (WP leader)/(WP co-leader)	Dataset name	Purpose	Link to Metadata	Open Access (Yes/Why not)

3 FAIR data

In the following sections we provide the general strategy to adhere to the FAIR principles in the RECONECT project. We reflect on how FAIR principles can be addressed within the RECONECT ICT Platform as well as within Open data repositories.

3.1 Making Data findable, including provisions for metadata

The RECONECT Services Platform is an ICT solution that combines a network of distributed data, intelligent tools and standardised web-services, accessible through a centralized catalogue of network services. The Catalogue of services will support the exchange of platform data and information between project partners.

Data produced within the project will be discoverable in the RECONECT Services Platform and will be uniquely identified and described by metadata. This applies to those cases where data will be stored in the platform (for those cases where TeleControlNet will store partners' data) and for those cases where the data resides in the partners' local servers. Existing software that is used should be background information of a given partner and as such could be documented but not discoverable.

It is not envisioned for datasets to be solely discoverable in the RECONECT Services Platform. Instead, datasets can be uploaded to, for example, a project's repository accessible through the project's website, institutional (partner) repository, and/or to subject repositories selected from Open Access Infrastructure for Research in Europe (OpenAIRE). A DOI may be assigned to these datasets for effective and persistent citation when it is uploaded to the repository.

For datasets, we will define naming conventions which will include the identifier of the project, unique chronological number of the dataset, dataset title, version of the dataset, and an identifier linking the WP with the deliverable/task.

We will keep an internal log file containing a description of each produced dataset during the course of the project. This dataset description will be included in the metadata file associated to each dataset (refer to Section 3.3).

In the log file, we foresee datasets descriptions containing the following main fields:

- Dataset identifier allocated in the naming convention outline above.
- Title of the dataset
- Version number
- Responsible partner
- WP
- Dataset description
- Dataset dissemination
- Format
- Expected size
- Source
- Repository (expected/actual repository to be submitted)
- Keywords
- Link to the metadata file

3.2 Making data openly accessible

The RECONECT Services Platform consists of three types of distributed services: (1) data access services, (2) generic NBS network services and (3) tools for analysis and feedback. The aim of the chosen topology is flexibility for project partners (NBS Demonstration and Collaboration Clusters) and possibly later on for other users outside of the Consortium to access and connect to the available services with their own data sources and tools. Intermediate data (i.e., non-final data produced during the processing chain elaboration) will

be stored in the RECONECT Services Platform but we envision to only be accessible to Consortium partners. Final datasets, will be freely accessible also by external users. This will specifically apply to research data needed for scientific scrutiny and peer review purposes. As already mentioned in the previous section, RECONECT will establish a long-term sustainable data platform to manage and upscale best practices through open source and freely accessible initiatives, such as pan-European web-based repositories OPPLA. The datasets will follow well-established existing standards such as the INSPIRE Directive and OGS in order to secure long-term data accessibility, usage and operability. After project completion, and in case of no objection by project partners and by ensuring that anonymization is preserved (i.e., a user cannot be identified from their data) the data may be published, and openly accessible, in an Open Data portal (for example in http://open-data.europa.eu) for future research.

3.3 Making data interoprable

The technologies implemented in the RECONECT project will facilitate information sharing and analysis across EU Member States through direct implementation of the INSPIRE directive, and the use of standardized procedures for information exchange and integration on WISE and GEOSS platforms.

Many of the open standards promoted by RECONECT, based on OGC formats, are also adopted by the Comité Européen de Normalisation (CEN) and the International standardization organization ISO, working closely with CEN/TC287, ISO/TC211, but also aligned with wider IT standards, e.g., those from the Worldwide Web Consortium [W3C]. RECONECT deployments and promotion of “Open Standards” enables users, with interfaces implementing the standard, to access data and services of many types available on a wide variety of servers. The three organizations (OGC, ISO/TC 211, CEN/TC 287) agreed ways in which XML schema for adopted standards can be managed more effectively and efficiently across these organizations.

3.4 Increase data re-use (through clarifying licenses)

This section will be updated on next iterations to provide detailed information on how data will be made useable beyond the original purpose for which it was collected, and more in detail:

- Data licensing to permit the widest reuse possible
- Data availability for re-use
- Why and for what period a data embargo is induced
- Data useable by third parties after the end of the project

3.5 Allocation of resourses

As described in the RECONECT GA Article 26, Results (which include datasets) from the project are owned by the partner that generates them. Therefore, partners will be responsible for the dataset management with support of WP leaders and co-leaders, and partners involved in the development of the RECONECT Services Platform.

This section will be updated on next iterations of the DMP to provide detailed information on cost estimation to make data FAIR and costs associated with long-term data preservation.

3.6 Data security

In the development of the RECONECT Services Platform we will explicitly deal with security issues from a technical perspective. In the DMP, security and privacy issues are addressed from the management perspective. An important aspect is data security when related to personal data. In RECONECT, the following categories of data may be generated (e.g., by use of questionnaires): i) personal status (e.g., age, gender), ii) socio-economic data (e.g., city of residence, social status, marital status, and income category), iii) social network data, and iv) domain related data. Such data will be stored in a project database managed by the project Coordinator. Each project participant will have secured web access to the previously

anonymized data, which will have been automatically checked for consistency, homogeneity and completeness.

3.7 Ethical aspects

The information in this section has already been covered in the context of the ethics review, ethics section of the DoA, and ethics deliverable D8.1.

References

GDPR (2016). Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Official Journal of the European Union, Vol. L119, pp. 1-88.