NEXUS-NESS

NEXUS NATURE ECOSYSTEM SOCIETY SOLUTION

Fair and sustainable resource allocation demonstrator of the multiple WEFE Nexus economic, social and environmental benefits for Mediterranean regions

GRANT AGREEMENT NUMBER 2042

Deliverable D1.3
Data Management Plan
V1.1 30 December 2021

WP1 Leader and Task 1.4 Leader: WARREDOC, Fernando Nardi

NEXUS-NESS - NEXUS NATURE ECOSYSTEM SOCIETY SOLUTION: FAIR AND SUSTAINABLE RESOURCE ALLOCATION DEMONSTRATOR OF THE MULTIPLE WEFE NEXUS ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS FOR MEDITERRANEAN REGIONS

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WP1 Leader and Task 1.4 Leader: WARREDOC, Fernando Nardi

Deliverable Identification

Deliverable No and Title	D1.3 Data Management Plan		
Grant Agreement No	2042	**Acronym**	NEXUS-NESS
Project Full title	Fair and Sustainable Resource Allocation Demonstrator of the Multiple WEFE Nexus Economic, Social and Environmental Benefits for Mediterranean Regions NEXUS Nature Ecosystem Society Solution (NESS)		
Funding Instrument	PRIMA: To achieve, support and promote integration, alignment and joint implementation of national R&I programmes under a common research and innovation strategy to address the diverse challenges in water scarcity, food security.		
Call	PRIMA SECTION 1 (IA) Demonstrating benefits of the Water-Ecosystem-Food Nexus approach in delivering optimal economic development, achieving high level of environmental protection and ensuring fair access to natural resources		
Work-Package No and Title	WP1: Project coordination and management		
WP- Main Beneficiary	WARREDOC, Università per Stranieri di Perugia		
WP-Leader	Fernando Nardi (fernando.nardi@unistrapg.it)		
Task No and Title	T1.4 Information and data management		
Task Leader	Fernando Nardi (fernando.nardi@unistrapg.it)		
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Reviewed by	- Enrica Caporali, University of Florence - Filippo Tessari, Fondazione ENI Enrico Mattei - Renzo Rosso, Politecnico di Milano		
Abstract	The deliverable describes the overall data management life cycle for data collected, processed and generated by NEXUS-NESS. Its main aim to ensure data security and quality and foster data exchange and cooperation in accordance with FAIR principles.		
Key words	Data management; FAIR data; Open Data; WEFE Nexus		
DOCUMENT HISTORY			
Planned Release Date	30 December 2021	**Actual Release Date**	30 December 2021
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Abbreviations

CA	Consortium Agreement		
DDP	Deliverable Development Plan DM: Deliverable Manager Mx: Month number QC: Quality Control QM: Quality Management		
DMP	Data Management Plan		
DoA	Description of Action (Annex I of the Grant Agreement)		
DoW	Project Description of Work or Workplan		
EA	Exploitation Board		
EAB	External Advisory Board		
EC	Executive Committee		
EC	European Commission		
EEC	External Ethical Committee		
FAIR	Findable, Accessible, Interoperable and Re-usable		
GA	Grant Agreement		
GEA	General Assembly		
MSUP	Multi Stakeholder and User Platform		
NEL	Nexus Ecosystem Labs		
NNS	NEXUS-NESS Service		
PC	Project Coordinator		
PI	Principal Investigator		
PM	Project management		
PO	Project Officer		
PR	Project Review		
RP	Reporting Period		
RRI	Responsible Research and Innovation		

WP	Work Package of the Project consisting of tasks and subtasks		
WPL	Work Package Leader		
WEFE	Water, Energy, Food and Ecosystems		
WEFE Nexus	Water, Energy, Food and Ecosystems Nexus		

The NEXUS-NESS Consortium

N	Consortium member	Acronym
1	**Project Coordinator -** Università per Stranieri di Perugia (Italy)	UNISTRAPG
2	University of Florence - Department of Civil and Environmental Engineering (Italy)	UNIFI
3	Politecnico di Milano - Dipartimento di Ingegneria Civile e Ambientale (Italy)	POLIMI
4	Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna (Italy)	SSSA
5	Urbyetorbit Srls (Italy)	UEO
6	Fondazione Eni Enrico Mattei (Italy)	FEEM
7	Universidad Politécnica de Madrid (Spain)	UPM
8	XPRO Consulting Limited (Greece)	XPRO
9	Design & Data GmbH (Germany)	DDATA
10	Institut Agro, Agrocampus Ouest (France)	SAS
11	Alexandria University (Egypt)	AU
12	Institut des Régions Arides (Tunisia)	IRA
13	Commissariat Régional au Développement Agricole de Gabès (Tunisia)	CRDA

1. Purpose of the Deliverable

The main purpose of this deliverable is to provide the Data Management Plan (hereinafter – the "DMP") for the NEXUS-NESS which describes the overall data management life cycle of the project.

Our project has opted in for the Open Research Data Pilot, in order to improve access to and re-use of research data generated by NEXUS-NESS. Therefore, the present DMP is a mandatory and publicly available document, although it was mainly developed for internal use by the Consortium partners. At the same time, this DMP takes into account the need to balance openness and protection of scientific information, IPR and privacy concerns, security, data management and preservation questions.

2. Introduction

The NEXUS-NESS project advocates for transition towards the Water, Energy, Food and Ecosystems Nexus (hereinafter - "WEFE Nexus") approach through multi-sector and multi-stakeholder cooperation ensuring fair and sustainable allocation of resources based on science informed data and knowledge translated into "stakeholders' languages", i.e. tailored to facilitate its better understanding by different stakeholders with different specialisations and professional backgrounds.

To this end, NEXUS-NESS intends to demonstrate in living working conditions benefits of WEFE transition, in particular through prototyping a comprehensive web-based data driven technology - a Water-Energy-Food-Ecosystems (hereinafter - "WEFE") Nexus Service, namely Nexus Ness Service (hereinafter - "NNS") that will be tested in four living labs in Italy, Spain, Tunisia and Egypt. In addition, the project provides for a wide range of communication, dissemination and exploitation activities aiming at both **better stakeholders' engagement** in the NELs and raising **public awareness on WEFE Nexus**.

Data management is a cross-cutting activity that concerns all the WPs and Tasks of the project, for this reason good data management is at the core of the project's success.

The present NEXUS-NESS DMP reflects the current shared view of the Consortium partners regarding data collection, processing, generation, and storage in the context of the NEXUS-NESS project. It set out key procedures to ensure data security and quality, foster data exchange and cooperation and make NEXUS-NESS data Findable, Accessible, Interoperable and Re-usable (hereinafter "FAIR").

The main goal of the present DMP is to guarantee data management within the NEXUS-NESS project in accordance with *the Programme Guidelines on FAIR Data Management in Horizon 2020* (hereinafter - "Guidelines on FAIR Data Management")[1] and *the Guidelines to the Rules on the Open Access to Scientific Publications and Open Data Access to Research Data in Horizon 2020*[2] (hereinafter - "Guidelines on Open Data Access in Horizon 2020").

As foreseen in *the Guidelines on FAIR Data Management*, this DMP includes information on:
- Data collection, processing, generation and preservation during and after the end of NEXUS-NESS;
- Methodology and standards applied for overall data management;
- Issues related to open access to the project data.

Issues related to personal data protection and compliance with the General Data Protection Regulation (GDPR) (EU) 2016/679 are detailed in the Deliverable D1.4 "Ethics Issues management Plan".

This DMP is *a living document* that will be updated on a regular basis as the project evolves According to the workplan it be reviewed when needed. This version responds to the M18 (November 2022) update after a first initial release that was produced at M6 (December 2021)**.** It will be also reviewed during the project lifetime whenever significant changes occur, including but not limited to:
- Any amendments in the Consortium policies concerning data management;
- Changes in the Consortium's structure.

Attached to this document there are two Annexes:
- Annex I – Current list of Datasets characterized released using FAIR and Open Data principles by a (DOI)
  Annex II – Current list of Project Metadata

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[1] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf
[2] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-pilot-guide_en.pdf

3. Data Summary

3.1. Purpose of data collection and generation and its relation to the project's objectives

All the project's objectives and the Work Packages (WPs) are strictly connected with data collection and generation. The data collected and generated during the NEXUS-NESS project will regard:

- The NEL stakeholders' engagement in the NELs and Innovation Ecosystem Approach (IEA) (**WP2, WP3**);
- The Nexus-Ness Service (NNS) models and scenarios and the WEFE Nexus Management Plans (**WP4**);
- The WEFE Nexus policies and indicators (**WP5**);
- Communication, dissemination, and exploitation activities (**WP6**).

The NEXUS-NESS data will mainly relate to the WEFE Nexus domains, i.e. Water, Energy, Food and agriculture, Natural, Social and Economic Ecosystems as well as to the Grand Challenges which are different for each NEL and are being co-defined with local stakeholders.

At the current stage of the project, the Grand Challenges have been already drafted for all the NELs (See Table 1), although the final version of the Grand Challenges maps must be co-defined with the stakeholders.

NEL	Grand Challenge
Coastal Tuscany, Italy	Non-conventional use of water for agricultural production.
	Boosting the value of ecosystem services for a sustainable management of resources.
Adaja River, Spain	Manage water needs and optimize energy costs with the expansion of irrigation districts
	Quantify Green and Blue water and energy consumption for the major agricultural crops
Wadi Jir, Tunisia	-Identification of the best water and crop allocation strategy for sustainable food production and ecosystem conservation
	-Impact of the overall groundwater recharge on local water resources
	-Evaluate environment impact of water harvesting, Wadi riverbed cultivation and grazing
	- Evaluate different rural development strategies
Wadi Naghamish, Egypt	-Sustainable intensification of water infrastructures in the watershed for food production
	-Introducing sustainable land and water management practices to revert land degradation and soil loss.
	-Evaluate the introduction of the use of non-conventional waters

Table 1. List of the NELs grand challenges

Prototyping the NNS (Figure 1) and testing it in real life conditions in collaboration with multiple stakeholders involved in the NELs is the core element of the Project. NNS is being designed to equip decision making with WEFE Nexus data and scenarios, including high quality data on water, energy, food and ecosystem conditions (regional, local and site specific) and those regarding in particular integrated socio-environmental and economic analysis.

How do Nexus Ness Services work?

National and international databases provide high quality data on water, energy, food and ecosystem conditions, as well as maps, risk and vulnerability analyses, assessments, and long-term projections and scenarios. Regional and local databases are built to provide challenge and site specific conditions (**WEFE Nexus Management plans**)
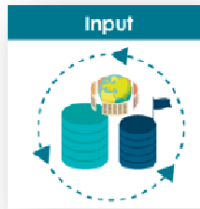
Socio-economic variables such as agricultural production trends, energy source and demographic change, land development and urban plans, infrastructure maps and trade routes for WEFE resources, may be combined, depending on regional strategies and stakeholder needs.
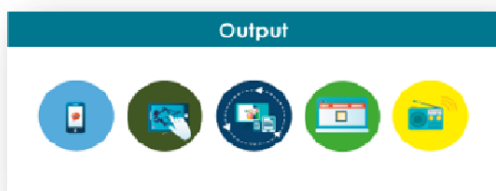
Nexus Ness Services equip decision makers with WEFE Nexus data, scenarios also including integrated socio-environmental and economic analyses. The Service supports the delivery of actionable information and shared guidelines for the different (often conflicting) economic sectors where knowledge about WEFE Nexus trade-offs is fundamental to help society increase security and sustainability of natural and human resources while adapting to social, environmental and climate change.

Figure 1. Nexus Ness Service schematic representation at the concept/workplan level

Co-production and co-testing with stakeholders of the WEFE Nexus management plans for fair and sustainable allocation of resources (GO1) and their implementation in the NELs by means of the NNS (GO2) require collection of wide range of data and use of transdisciplinary datasets as well. The data will regard stakeholders' on-site needs and challenges, local knowledge on WEFE Nexus and natural resources management as far as existing scientific knowledge and Open Data on these issues.

At the same time, the project will quantify **multiple socio-environmental and economic benefits and the distributed impacts** of WEFE Nexus approach and generate relevant data regarding the NELs that will be shared with the NELs stakeholders.

NEXUS-NESS provides, within the three-year project time-frame, **sustainability and economic stakeholder-oriented measurable indicators** that are co-designed with users and stakeholders involved in the **NELs** by means of the **Innovation Ecosystem Approach,** which stands also as a key theme of forthcoming Horizon Europe programme**.** **NEXUS-NESS** goes beyond actual standards of EEA and OCED indicators integrating both **technical/physical** and **social-behavioral** parametrizations to **compare as-it-is conditions with novel optimal settings where effects of WEFE Nexus strategies are considered**

Starting from the stakeholders and Political, Economic, Social, Technological, Legal, Environmental, Ethical and Citizen (PESTLEEC) analysis of the current situation ("as it is") of each NEL, the project will generate knowledge and data on "as is should be" shared vision of the local stakeholders involved in the NELs, by means of the NNS models and scenarios and implementation of the Responsible Research and Innovation Roadmap, in particular by using crowdsourcing facilities of the MSUP (**GO3**).

The ecosystem in NEXUS-NESS is intended as a three-fold concept including: the **environmental ecosystem** (e.g. ecosystem services for water security; ecological system preservation etc.); the **socio-economic ecosystem** (i.e. economy perspectives for social security and growth; community and cohesion preservation, cultural and identity values; life-style etc.) and the **innovation ecosystems** (i.e. stakeholder partnerships, effective supply chains, technology, regulations, policies), also referring specifically to the important of **Multi-Actor Engagement**.

Organization of participatory workshops in the NELs and other project activities, particularly dissemination, communication and exploitation activities may require collection of other data, including personal data of participants of the NELs workshops and other events (conferences etc.) and users of the NNS, the MSUP, the Open geo-information portal and the WEFE Nexus Forum.

The list of the collected and generated NEXUS-NESS data and the related datasets will be further specified in the DMP's updates and its Annexes. Input data used for the NNS modelling will be co-defined with the local stakeholders of the NELs. **Table 1** contains a list with input data for the NNS, though it would be adapted for each NELs after the definition of the Grand Challenges is completed.

N	Category	Input data
1	Water	Fresh water resources Water stress Rainfall time series and grid data Potential reference evapotranspiration
2	Energy	Fossil fuel resources and renewable energy production Solar radiation Wind speed
3	Food and Agriculture	Soil type Land use Maximum soil moisture storage capacity Maximum infiltration rate Crops production Fertilization Livestock production Crop Yields Crop coefficients and growing stages, planting and harvesting dates Crop-specific rooting depths for irrigated and rainfed crops and critical depletion factors
4	WEFE Nexus policies (Water, Energy and Climate, Food and Agriculture, Land Use and Soil)	Non-climate policies including development policies, technology policies, urban planning and transportation policies, energy security policies, and environmental policies to protect air, soil and water quality.
	Social Ecosystem	
5	Demographics	Total Population Population Age structure
6	Other societal factors	Attitudes to environment and sustainability issues Attitudes to gender equity Attitudes to social inclusion issues Life styles (including diets)

		Natural Ecosystem	
7	Resources	Other key natural resources	
8	Environmental and ecological factors	Biodiversity Vegetation Wetlands and irrigation areas	
		Economic Ecosystem	
9	Economic development	Regional GDP, or trends in productivity Regional, national, and sub-national distribution of GDP Sectoral structure of national economies, in particular the share of agriculture, and agricultural land productivity Nature of international trade Welfare Human development	
10	Technological development	Sectors of major developments, diffusion of innovation in particular sectors, e.g. energy supply, distribution and demand, industry, transport, agriculture	

Table 2 Draft list of the NNS input data

3.2. Data types and formats

The project collects and generates various types and formats of data as specified in Table 3**.** The datasets used and generated by the project contain different data formats.

Data type	File formats*
Stakeholder analysis and other participatory workshops data (interviews, surveys, questionnaires answers')	Tables (Open Data format; CSV, XLS [...] and other Open Data format) Documents (Word/Doc/Pdf/Excel/PowerPoint) Images and Media content
MSUP data	Tables (Open Data format; CSV, XLS [...] and other Open Data format) Documents (Word/Doc/Pdf/Excel/PowerPoint) Images and Media content
Open Geo-information portal data and Open Geo Data of the Nexus-Ness Service	Raster data (.tif, .asc) Vector data (.shp)

WEFE digital forum data	Tables (Open Data format; CSV, XLS [...] and other Open Data format)
	Documents (Word/Doc/Pdf/Excel/PowerPoint)
	Images and Media content
Field survey data and NEL data	Tables (Open Data format; CSV, XLS [...] and other Open Data format)
	Documents (Word/Doc/Pdf/Excel/PowerPoint
	Images and Media content

Table 3 Data types and formats

3.3. Data re-use

The NNS uses existing data and information and technological resources, tools and platforms, already available to NEXUS-NESS partners: H2020 MOSES, WATNEEDS and FREEWAT Datasets as well as Copernicus and GEOSS, Onda Dias, Knowledge Hub on Water and Agriculture.

In particular, the project reuses the Background[3], including data, of the Consortium partners as specified in the Consortium agreement (Section 9 "Access rights" and Attachment 1 "Background Included"), including the relevant datasets of the thematic models such as WATNEEDS and FREEWAT

WATNEEDS and FREEWAT models provide physically based water, crops and ecosystem resource management and scenario analytics with built-in features to simulate effects of climatic, hydrologic and environmental change and analyse water-agriculture-ecosystem interdependencies.

Consortium partner	Background	Specific limitations and/or conditions for <u>implementation</u> (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for <u>exploitation</u> (Article 25.3 Grant Agreement)
POLIMI	WATNEEDS dataset and algorithm (version available at https://doi.org/10.6084/m9.figshare.c.4893084)	WATNEEDS dataset and algorithm will be applied in forming NEXUS-NESS as described in the workplan. WATNEEDS data/output/authors will have to be referenced in all actions and products of NEXUS-NESS (including reports, software, scientific papers and so on).	WATNEEDS dataset and algorithm will be applied in forming NEXUS-NESS as described in the workplan. WATNEEDS data/output/authors will have to be referenced in all actions and products of NEXUS-NESS (including reports, software, scientific papers and so on).

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[3] In accordance with the Consortium agreement, background is defined as "*data, know-how or information (...) that is needed to implement the action or exploit the results*".

SSSA	SSSA will made available all of the public results derived from the projects H2020 FREEWAT and LIFE REWAT, including source codes developed with an open-source licence within these projects.	Outputs/authors will have to be referenced when output deriving from the mentioned projects are used to produce NEXUS-NESS deliverables (including reports, software, scientific papers and so on).	Outputs/authors will have to be referenced when output deriving from the mentioned projects are used to produce NEXUS-NESS deliverables (including reports, software, scientific papers and so on).
UEO	MOSES Project, awarding the H2020-WATER-2014-two-stage call, with the project code: 642258	UEO supported Esri Italia, coordinator of MOSES project, to develop the GIS-based Moses platform. Moses Consortium agreed to make available and open the MOSES platform for R&D purposes	MOSES Consortium agreed to make available and open the MOSES platform for R&D purposes
XPRO	RRI Roadmap	The RRI Roadmap will be applied in forming the NELs and executing the described actions in the workplan.	The RRI Roadmap will be applied in forming the NELs and executing the described actions in the workplan.
AU	Green Energy for Green companies, GRENECO". Funded by EU 2014 to 2016 ● Mediterranean Science, Policy, Research & Innovation Gateway, Med Spring". 2012 to 2016. ● Development of health intervention for El-Faiyoum: A holistic agro-ecosystem management. Phase I, 2002-2004; Phase II 2006-2009 ● Interuniversity Learning in Higher Education on Advanced Land Management–Egypt Country (ILHAM-EC) funded by EU, 2015-2019.	No limitations with proper citation	No limitations with proper citation

	Develop a master's degree in sustainable land management SLM		

The NEXUS-NESS project also re-uses existing Open Data from publicly available sources (see Section 4.4 of the present DMP) related to the WEFE domains in the four NELs, in particular data related to Sustainability and Economic Citizen-Centered Indicators (EEA, OECD and SDGs).

Open data will be used as an input data for the NNS and integrated thematic models such as FREEWAT and WATNEEDS as well as for production of communication and dissemination materials (3D, infographics, video content).

3.3. Data sources

The NEXUS-NESS will use data from different sources, including:

- Repositories with Open Data: Eurostat, National institutes of statistics such as Istat, EEA, OECD, SDGs MODIS, INSPIRE, meteorological stations, JRC/CORINE, NASA, USGS, Google, Knowledge Hub on Water and Agriculture, and other.
- Institutional partners of the Consortium;
- WATNEEDS datasets (available at global scale) and models;
- FREEWAT datasets and models;
- Participants of the NELs workshops and WP6 dissemination and communication activities;
- Users of the project's website, the MSUP, the Open geoinformation portal and the WEFE digital forum.

3.4. Data size

The expected size of the project data will be manageable in terms of storage capacity of the Consortium.

Documents and Table datasets will be characterized by limited size (few MB maximum), while geospatial datasets, such as the outcomes of the WATNEEDS model, expressed as rasters and vector data cover wide areas for the four NELs and are characterized by tens or hundreds of MB each.

3.5. Data utility

Whenever possible, the project data will be made openly available, in particular through the project website, the Open data geo-information portal, the WEFE Nexus Forum, the MSUP as well as open access repositories (FIGSHARE). The released data might be useful to various stakeholder groups involved in the WEFE Nexus domain in Europe and Africa but also in other world regions.

In particular, it can be used by research institutions, interdisciplinary scientific community, including young researchers, national, regional and local authorities and policy and decision makers at all levels, non-governmental organisations (NGOs), civil society organisations (CSOs), including grass roots organisations, industry and small and medium enterprises (SMEs), local communities.

4. FAIR Data for the NEXUS-NESS Project

The NEXUS-NESS project uses the following tools for data management:

1. External services (Google Drive Business Edition) hosting *the PRIMA NEXUS-NESS Cloud Repository*, managed by UNISTRAPG and composed of shared folders with the project data, with limited access available only to the project team through the links provided by the Project Coordinator.

2. *The project website,* with facilities for internal communication among partners and storage of collected and generated data in a password protected way, with limited access available only to the project team.
   The project website will also host *the Massive Open Online Course (MOOC)* and *the WEFE Nexus digital forum*, a knowledge hub promoting replication of the WEFE Nexus approach by means of the NNS.
   The NEXUS-NESS MSUP and the Open data geo-information portal, powered by a webGIS platform, with analytical and visualisation, download / customizable user and roles permissions tools to support NNS deployment. It will publish all project-generated open data as well as data with a restricted access to the project partners and the stakeholders involved in the NELs.

3. *An open data repository*: all the final datasets, deliverables and publications of the NEXUS-NESS project will be transferred to FIGSHARE, an open access repository with facilities supporting secure and FAIR data management.

Along with the FAIR principles for data management[4], the NEXUS-NESS Project implements OGC standards (www.ogc.org/docs/is) and the INSPIRE guidelines for Europe (inspire.ec.europa.eu/Technical-guidelines3) and supports the European Open Science Cloud initiative. Relevant solutions and rules will be further specified in the DMP's regular updates.

4.1. Making data findable, including provisions for metadata

The project's datasets will be shared among partners through the Figshare platform (https://figshare.com/account/home) , *NEXUS-NESS Cloud Repository* and Nexus-Ness website.

The NEXUS-NESS data objects will be made discoverable with metadata, uniquely identifiable and locatable through Digital Object Identifiers (DOIs) (where appropriate). All the data uploaded in FIGSHARE or other open access repository as well as all the articles and monographs produced within the project will have its own Digital Object Identifier issued by the respective repository or publisher. A suitable encoding of the data name will be used.

In order to make NEXUS-NESS data discoverable within the project, the internal NEXUS-NESS cloud repository will have folder names predefined by the project coordinator, creation of new folders should be approved by the project coordinator

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[4] Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 (2016). https://doi.org/10.1038/sdata.2016.18

The datasets in the figshare platform will be characterized by keywords in order to optimize possibilities of re-use. A versioning of the dataset will be specified identifying also the date of publication.

Regarding *metadata*, the NEXUS-NESS will follow the standard of the *OpenAIRE Guidelines*[5].

4.2. Making data openly accessible

Most outputs of the NEXUS-NESS project, including datasets, are expected to be open access. All public deliverables, outputs and open datasets will be published at the project's website and the Open geo-information portal.

The NEXUS-NESS project will facilitate the sharing of results and deliverables, both within and beyond the consortium. In this regard, the NEXUS-NESS project will follow the requirements of the Guidelines on Open Access to Scientific Publication and Research data in Horizon 2020 and the Grant and Consortium Agreements. All relevant for the scientific community publications and the project's deliverables will be published in an open access repository, together with related metadata (FIGSHARE or on other public software code repositories, like Github).

The project also foresees publications in open-access scientific journals and presentations at conferences.

In addition, MOOC training materials based on the NELs studies will be made publicly available.

Raw data produced by the NEXUS-NESS will be summarized in the project deliverables and scientific publications. If due to confidentiality, privacy or personal data concerns the release of raw data is not possible, the Consortium will anonymize it and sanitize the data in order to be able to publish it. Specific datasets whose intellectual property belong to specific partners, conditions for access will be specified.

4.3. Making data interoperable

In order to facilitate interdisciplinary interoperability, exchange and re-use of the project's data, NEXUS-NESS will use standard vocabularies, such as: OpenAIRe (https://www.openaire.eu/what-is-metadata) for all data types present in the NEXUS-NESS datasets.
Whenever possible and useful, more discipline-specific metadata will be also adopted, as those defined by OGC for geospatial data.

4.4. Increase data re-use (through clarifying licences)

The fourth FAIR principle is making data Re-usable. No particular restrictions on the re-use of data generated during the project will be imposed. The appropriateness of different licensing agreements under the Creative Commons licensing (CC BY 4.0) will be explored and the data will remain re-usable until the storage repository will be withdrawn.
The license for Open Access data release was the Creative Commons Attribution Share-Alike 4.0 License. This allows sharing, remixing, transforming and building upon the material for any purpose. Products should be redistributed under the same license.

Knowledge management (Open access). The project will publish all public deliverables and other public outputs through open access channels – most notably the website and geoportal, and where appropriate with the Creative Commons license (e.g. the MOOC). The project also has allocated budget for scientific publications in open-access journals. Intellectual Property Rights. Materials generated in the project, where

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[5] https://guidelines.openaire.eu/en/latest/

appropriate, will be protected by a shared copyright among the partners. However, most outputs are expected to be open access. Proper citation of public documents will be requested. The project will also generate graphical material (photos and illustrations) that will be made available to the Commission for reuse. For more information on the organization processes and standards that will guarantee proper and open management of research data and knowledge refer to the Implementation section and section 3.2 in particular.

5. Allocation of resources

No specific costs are allocated for making the NEXUS-NESS data FAIR. Each partner will be responsible for the data management costs of the data that they will produce.

6. Data security

In order to ensure a *secure storage* for all data collected and produced during the NEXUS-NESS lifetime, it will be stored in the following way:

1. A web server hosting the NEXUS-NESS website guarantees a high security level by means of firewall /will be secured by using Sitelock Premium Protection … https://www.sitelock.com/pricing/ as well as Sitelock Firewall www.sitelock.com/web-application-firewall; accessibility is anyway reserved only to registered users, via HTTP Secure protocol (https), for both upload and download functionalities
2. "PRIMA Nexus-Ness Cloud Repository" with all documentation and data related to the project coordination is already established and located in Google Drive. Files published in the Google Drive Cloud Repository will only be available to the project team who have direct links to the Repository and its files and folders and have registered credentials to login on the system (access will be granted to relevant project members). Cloud data storage should be avoided for high-risk information such as files that contain personal or sensitive information, information that is covered by the law.

Documents, Pictures, Videos that will be accessible by the MSUP will be collected by each user on cloud servers (using her or his own cloud personal space on Google and YouTube). Note that each user can select different levels of privacy for data and information collected.

In addition, all open access data of the project will be stored in an open repository, following policies on longevity and data security of the chosen open repository. Open access data will be accompanied by relevant metadata to enhance discoverability.

As regards *data recovery*, the following measures are applied to back up data:

1. Sitebackup Pro will be used for backing up data on the server.
2. All NEXUS-NESS data and documentation will be periodically a subject to back-up in order to avoid data loss. WP leaders, Task Leaders and NEL Leaders are responsible to upload in Google Drive Repository and keep a back-up of all data and documentation that they produce and update it (if necessary).

7. Ethical aspects

The ethical aspects related to the NEXUS-NESS data collection, processing and storing (such as personal data protection, informed consent, anonymity and confidentiality) are addressed in detail in the Deliverable 1.4 (Ethics issues Management Plan, sections 7.2 and 7.3) and Section 5 of the Description of the Action (hereinafter – "DoA").

These include protection of personal data, informed consent, anonymity and confidentiality associated with the stakeholders engagement in the project and related workshops, functioning of the NNS, the MSUP websites and the Open Geo-information portal and delivering the NEXUS-NESS capacity building activities (Summer/Winter schools and MOOCs).

The personal data that may be collected during the course of the project activities are as follows:

- name and contacts of citizens or other stakeholders' representatives;
- name and contacts of participants of capacity building workshops;
- stakeholders' answers to questionnaires and their opinions expressed during interviews or workshops;

The project's activities do not include any tracking of participants (e.g. localization data and/or WAN data, such as IP or MAC addresses, etc.). However, "cookies" will used in the project's website, the MSUP (including the Open Geoportal) and the NNS to help analyse how users use them. **A privacy statement** will be published on the website regarding the use of services like Google Analytics to track how many people access the project website and the MSUP.

In any case, the project does not collect or process any data related to special categories indicated in Article 9 of the GDPR, i.e. data on racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or a natural person's sex life or sexual orientation).

8. Other specifications

Along with the FAIR principles for data management, the NEXUS-NESS Project implements OGC standards (www.ogc.org/docs/is) and the INSPIRE guidelines for Europe (inspire.ec.europa.eu/Technical-guidelines3) and support the European Open Science Cloud initiative.

The relevant solutions and rules will be further specified in the DMP's regular updates.

Annex I – Current list of Datasets released using FAIR and Open Data principles (DOI)

A first list of **Open Data, released in the first part of the NEXUS-NESS project**, is inserted in the following table. To note that this deliverable is not intended to include the full NEXUS-NESS database. The following table 4 and the "Annex II – Current list of Project Metadata" are here reported for illustrating the methodology, the structure and the Data Management process employed by NEXUS-NESS consortium in adhering to the "**Open Research Data Pilot**" principles governing the project outcome in terms of advancing and sharing knowledge, data and tools to achieve the project mission.

DOI	Title	Description
https://doi.org/10.6084/m9.figshare.22263808.v1	NEXUS NESS NEL EGYPT Green and blue water	Data are raster layers in .tiff format, openly accessible. Reference: Chiarelli, D.D., Passera, C., Rosa, L. et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Sci Data 7, 273 (2020). https://doi.org/10.1038/s41597-020-00612-0
https://doi.org/10.6084/m9.figshare.22263862.v1	NEXUS NESS NEL ITALY Green and blue water	Data are raster layers in .asc format, openly accessible. Reference: Chiarelli, D.D., Passera, C., Rosa, L. et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Sci Data 7, 273 (2020). https://doi.org/10.1038/s41597-020-00612-0
https://doi.org/10.6084/m9.figshare.22263574.v1	NEXUS NESS NEL SPAIN Green and blue water	Data are raster layers in .tiff format, openly accessible. Reference: Chiarelli, D.D., Passera, C., Rosa, L. et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Sci Data 7, 273 (2020). https://doi.org/10.1038/s41597-020-00612-0
https://doi.org/10.6084/m9.figshare.22263826.v1	NEXUS NESS NEL TUNISIA Green and blue water	Data are raster layers in .tiff format, openly accessible. Reference: Chiarelli, D.D., Passera, C., Rosa, L. et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Sci Data 7, 273 (2020). https://doi.org/10.1038/s41597-020-00612-0
https://doi.org/10.6084/m9.figshare.22270366.v1	Italian and Spanish NEL Datasets in vector format	Data are vector layers in shapefile format, openly accessible. Reference: Chiarelli, D.D., Passera, C., Rosa, L. et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Sci Data 7, 273 (2020). https://doi.org/10.1038/s41597-020-00612-0

Table 4. List of Nexus-Ness Datasets with DOI

Annex II – Current list of Project Metadata

A first list of **Project Metadata, released in the first part of the NEXUS-NESS project**, is inserted in the following table. To note that this deliverable is not intended to include the full NEXUS-NESS database (data and metadata). The following table 4 and the "Annex I – Current list of Datasets released using FAIR and Open Data principles (DOI)" are here reported for illustrating the methodology, the structure and the Data Management process employed by NEXUS-NESS consortium in adhering to the "**Open Research Data Pilot**" principles governing the project outcome in terms of advancing and sharing knowledge, data and tools to achieve the project mission.

Location	Topic	Title	Reference partner	Spatial coverage	Temporal coverage	Source	Contributor (WP)	Data format	Note
Egypt NEL	Water, agriculture	NEXUS NESS NEL EGYPT Green and blue water	POLIMI	Wadi Naghamish, Egypt	2016-2021	Nexus-Ness	WP4	.tif	
Italy NEL	Water, agriculture	NEXUS NESS NEL ITALY Green and blue water	POLIMI	Coastal Tuscany, Italy	2016-2021	Nexus-Ness	WP4	.tif	
Spain NEL	Water, agriculture	NEXUS NESS NEL SPAIN Green and blue water	POLIMI		2016-2021	Nexus-Ness	WP4	.tif	
Tunisia NEL	Water, agriculture	NEXUS NESS NEL TUNISIA Green and blue water	POLIMI	Adaja River, Spain	2016-2021	Nexus-Ness	WP4	.tif	
Italy and Spain NEL	Water, agriculture	Italian and Spanish NEL Datasets in vector format	POLIMI and UEO	Wadi Jir, Tunisia	2016-2021	Nexus-Ness	WP4	.SHP	

1. References

1) European Commission. (2016). H2020 Programme: Guidelines on FAIR Data Management in Horizon 2020. Retrieved from https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf on November 9, 2021.
2) European Commission. (2018). Ethics and data protection. Retrieved from https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-data-protection_en.pdf on November 9, 2021.