24/02/2026

Version 1.0

MS10 First version of the BMD Data Catalogue deployed

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Co-funded by the European Union

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

BMD (Biodiversity Meets Data) receives funding from the European Union's Horizon Europe Research and Innovation Programme and the Swiss State Secretariat for Education, Research and Innovation (SERI) (ID No 101181294). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union, the European Research Executive Agency (REA) or SERI. The EU, REA and SERI cannot be held responsible for them.

Prepared under contract from the European Commission
Grant agreement No. 101181294
EU Horizon Europe Research and Innovation Action

Project acronym:	**BMD**
Project full title:	**Biodiversity Meets Data**
Project duration:	01.03.2025 – 28.02.2029 (48 months)
Project coordinator:	Stichting Naturalis Biodiversity Center (Naturalis)
Call:	HORIZON-CL6-2024-BIODIV-01
Milestone title:	First version of the BMD Data Catalogue deployed
Milestone n°:	MS10
Means of verification:	Report
Work package:	WP2
Nature of the milestone:	Report
Contribution to deliverable n°:	D2.1
Licence of use:	CC0
Lead beneficiary:	SIB Swiss Institute of Bioinformatics
Recommended citation:	Bortoluzzi, C., Vaira, L., Tzafesta, E., Martin, O. & Waterhouse, R. (2026). ***First version of the BMD Data Catalogue deployed***. BMD project deliverable MS10.
Due date of milestone:	28 February 2026 **(M12)**
Actual submission date:	28 February 2026
Quality review:	Yes

Milestone status:

Version	Status	Date	Author(s)	Actions
0.1	Draft	09 January 2026	Chiara Bortoluzzi, SIB Swiss Institute of Bioinformatics	Sent for review within WP2, Task 2.1
0.2	Draft	12 January 2026	Lucia Vaira, LifeWatch ERIC Olivier Martin, SIB Swiss Institute of Bioinformatics	Reviewed

0.3	Review	20 January 2026	Sharif Islam, Naturalis	Reviewed
0.4	Review	02 February 2026	Niels Billiet, Meise Botanical Garden	Reviewed
1.0		03 February 2026	Chiara Bortoluzzi, SIB Swiss Institute of Bioinformatics	Finalised, with incorporation of feedback from reviewers
1.0	Review	23 February 2026	Niels Raes, Naturalis	Final check
1.0		24 February 2026	Teresa Calafat, Naturalis	Submitted

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Summary

This milestone report outlines progress towards developing a catalogue of resources of relevant biodiversity and environmental data under Task 2.1 of Work Package 2 (Data Catalogue, Data Mobilisation and High-throughput Data Capture) within the Biodiversity Meets Data (BMD) project. Key developments include (1) identifying, through input from T2.1 partners and the support of the BMD community at large, available biodiversity and environmental datasets and data resources relevant for the Virtual Research Environments (VREs) under Work Package 5 (WP5) and (2) setting up a queryable catalogue of these datasets using the open source GeoNetwork informatics solutions, augmented with metadata needed for spatio-temporal harmonisation in WP3. While the Data Catalogue described in this milestone report represents a first version, it establishes the essential groundwork for achieving the objectives of WP2. The BMD Data Catalogue currently includes 103 datasets, of which 87 are drawn from two data sources: WEKEO and the Copernicus Data Space Ecosystem (CDSE). Datasets included in the catalogue span all three ecosystems (freshwater, marine, and terrestrial), as well as different data types (e.g., environment, climate). Most datasets have a global spatial extent; however, seven datasets are limited to Europe because their data are provided by the European Environment Agency (EEA). The activities detailed in this milestone report are critical to the delivery of a comprehensive Data Catalogue of relevant biodiversity and environmental data sources together with the key associated information—such as metadata, licences, and data formats—required to support data harmonisation and enable their effective downstream use in the BMD project.

List of abbreviations

API	Application Programming Interface
BMD	Biodiversity Meets Data
CDSE	Copernicus Data Space Ecosystem
CNR	Consiglio Nazionale delle Ricerche
CoL	Catalogue of Life
EAA	Environment Agency Austria
EEA	European Environment Agency
EML	Ecological Metadata Language
EU	European Union
MeiseBG	Meise Botanical Garden
ISO	International Organisation for Standardisation
IHU	International Ellenic University
RBGE	Royal Botanic Garden Edinburgh
SAP	Single Access Point
SIB	Swiss Institute of Bioinformatics
SGN	Senckenberg Gesellschaft für Naturforschung
UFZ	Helmholtz Centre for Environmental Research
UTartu	University of Tartu
VRE	Virtual Research Environment
WP	Work Package

1. Milestone description

Task Leaders: SIB - Leader SIB (12), Naturalis (2), RBGE (2), MeiseBG (2), UFZ (2), LifeWatch ERIC (2), UTartu (2), CoL (2), IHU (2), SGN (2), EAA (2), CNR (2)

This milestone forms part of Work Package 2 (WP2: Data Catalogue, Data Mobilisation and High-throughput Data Capture), which aims to identify available biodiversity and environmental data resources relevant for the Virtual Research Environments (VREs) to be developed in WP5 (Thematic VREs & FAIR workflows) and to set up a queryable catalogue of these datasets. Datasets are enriched with metadata required to support spatio-temporal harmonisation activities in WP3 (Data harmonisation in Space-Time-Taxonomy, Data gaps and biases), including variable names and format and temporal and spatial extent. By identifying, storing, and querying such resources, WP2 seeks to facilitate and support the overall objectives of the BMD project. This milestone report documents the progress achieved during the first 12 months of the project. It provides evidence of advancements in the identification and inclusion of biodiversity and environmental data in the Data Catalogue, the content of which is expected to continue growing in the coming months.

2. Progress towards milestone

2.1 Identification of relevant data resources for inclusion in the BMD Data Catalogue

The first step towards deploying the first version of the Data Catalogue involved surveying project partners to identify datasets and data sources relevant for the catalogue. In this context, we define a *dataset* as the metadata description for each set of data that was added to the catalogue, whereas *data source* is the location (e.g., WEKEO) (Copernicus 2026) from where dataset metadata descriptions were retrieved before being added to the catalogue. To support this process, WP2 established an internal tracking system using Google sheets, which allowed a structured overview and understanding of the different datasets, data sources, and data types that are currently available or will be made available (mobilised) to serve the project needs through the VREs (WP5) and the Single Access Point (WP6). Surveying project partners also aimed to register the tools needed to access and process which types and which sources of data and collate information on data policies in use and how these need to be complied with for data reuse.

During the initial phase of the project, information collected included, among others, ecosystem type (freshwater, marine, terrestrial), data type (environment, climate, observation), dataset or data source, versioning, access technology (e.g., Application Programming Interface – API), data formats, metadata standards, and spatial and temporal coverage. Dataset and data source information was provided by project partners following their direct involvement in data generation efforts and their connections to other relevant initiatives. Information was subsequently reviewed by the task lead partner (SIB).

In the initial phase of the project, we were able to identify a total of 78 datasets and data sources (**Table 1**), most of which belong to the terrestrial (n = 28) and marine (n = 13) ecosystems (**Table 2**). A complete list of all identified datasets and data sources is reported in the Annex.

Table 1: Datasets and data sources identified by BMD T2.1 project partners. BMD project partners are ordered alphabetically.

Project partner name	Number of datasets/sources identified
Consiglio Nazionale delle Ricerche	2
Environment Agency Austria	2
LifeWatch ERIC	1
Meise Botanical Garden	1
Naturalis Biodiversity Center	26
Senckenberg Gesellschaft für Naturforschung	2
Swiss Institute of Bioinformatics	25
Helmholtz Centre for Environmental Research	17
University of Tartu	2

Table 2: Number of datasets and data sources per ecosystem type identified by BMD T2.1 project partners. The ecosystem types are ordered alphabetically.

Ecosystem	Number of datasets/sources identified
Freshwater	4
Marine	13
Mixed	31
Other	2
Terrestrial	28

To ensure their streamlined integration into the Data Catalogue, datasets and data sources were prioritised by the task lead partner according to the following criteria:

- The dataset or data source is open access
- Relevance of the dataset or data source to the objectives and activities of WP3 and WP5.
- Clearly defined access technology (e.g., via an API); where API access is not available, a clearly documented and actively maintained URL is required.
- Clearly defined and documented metadata.
- Clearly identified data provider.
- Clearly specified versioning.

The prioritisation process resulted in the inclusion of 16 datasets (**Table 3**) and two data sources from which 87 datasets were drawn: WEKEO (n = 9), which is the only resource that integrates all data and information from Copernicus and more, and the Copernicus Data Space Ecosystem (CDSE) (n = 78), which provides users with access to all historical data available from the Sentinel satellite constellations (Milcinski et al., 2024) (**Table 4**). It should be noted that, in this first version of the Data Catalogue, not all datasets available through WEKEO and CDSE were included, as many were not considered relevant by project partners. Instead, the catalogue focuses on Sentinel-2, Sentinel-3, and Sentinel-5P Level 2 datasets. Nonetheless, the over representation of Copernicus data (see **Table 4**) is mostly due to the large amount of datasets hosted by these data sources.

The BMD Data Catalogue includes datasets spanning all three ecosystems: freshwater (n = 3), marine (n = 2), and terrestrial (n = 7), as well as mixed-ecosystem datasets (n = 4) (**Table 3**). All datasets drawn from WEKEO and CDSE are mixed-ecosystem datasets (**Table 4**). Of the 103 datasets, most are environmental datasets, followed by climate-related ones. We also identified other types of data, such as the *Conservation status of habitat types and species: datasets from Article 17, Habitats Directive 92/43/EEC reporting (2013-2018) - Aug. 2020* dataset and the *Global Human Settlement Layer* dataset (**Tables 3 and 4**). Most datasets have a global spatial extent; however, seven datasets are limited to Europe because their data are provided by the European Environment Agency (EEA) (Nelson 1999). To date, the datasets cover a broad temporal extent, ranging from 1971 to 2100 (**Tables 1**).

Table 3: Datasets currently present in the BMD Data Catalogue. Datasets are ordered alphabetically. If the temporal extent is not specified, the cell displays "–" to indicate a missing value.

Dataset	Ecosystem	Data type	Data source (provider/organisation name)	Spatial extent	Temporal extent
Bio-ORACLE	Marine	Environment/Habitat	Vlaams Instituut voor de Zee (VLIZ), Belgium	Global	01/01/2000 - 31/12/2100
Biogeographical regions, Europe 2016, ver. 1	Terrestrial	Environment/Habitat	European Environment Agency	Europe	01/01/2011 - present

CHELSA Bioclim	Terrestrial	Climate/Water	Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Switzerland	Global	01/01/1971 - 31/12/2100
Conservation status of habitat types and species: datasets from Article 17, Habitats Directive 92/43/EEC reporting (2013-2018) - Aug. 2020	Mixed	Other	European Environment Agency	Europe	01/01/2013 - 31/12/2018
EarthEnv - Topography	Terrestrial	Environment/Habitat	Yale University, United States of America	Global	-
European catchments and Rivers network system (ECRINS) - version 1, Jun. 2012	Freshwater	Environment/Habitat	European Environment Agency	Europe	01/01/1990 - 31/12/2006
European catchments and Rivers network system (ECRINS), lakes and reservoirs - version 1, Jun. 2012	Freshwater	Environment/Habitat	European Environment Agency	Europe	01/01/1990 - 31/12/2006
Global Forest Change 2000-2024	Terrestrial	Environment/Habitat	University of Maryland, United States of America	Global	01/01/2000 - 31/12/2024
Global Human Settlement Layer	Terrestrial	Other	European Commission	Global	01/01/1975 - 31/12/2030
Global Land Cover and Land Use Change 2000-2020	Terrestrial	Environment/Habitat	University of Maryland, United States of America	Global	01/01/2000 - 31/12/2020
Global Surface Water 1984-2021	Freshwater	Environment/Habitat	European Commission	Global	01/01/1984 - 31/12/2021
Invasive Alien Species reporting under EU Regulation	Mixed	Other	European Environment Agency	Europe	01/01/2015 - 31/12/2018

1143/2014, 2015-2018					
Natura 2000 - version end 2023	Mixed	Environment/Habitat	European Environment Agency	Europe	01/01/2023 - 31/12/2023
Population trend of bird species: datasets from Article 12, Birds Directive 2009/147/EC reporting (2013-2018) - Apr. 2021	Mixed	Other	European Environment Agency	Europe	01/01/2013 - 31/12/2018
SoilGrids250m	Terrestrial	Environment/Habitat	ISRIC - World Soil Information	Global	-
World Ocean Atlas 2023	Marine	Environment/Habitat	National Oceanic and Atmospheric Administration (NOAA), United States of America	Global	01/01/1955 - 31/12/2022

Table 4: Data sources from which data descriptions were fetched and added to the BMD Data Catalogue. Data sources are ordered alphabetically.

Data source	Ecosystem	Data type	Data source (provider/organisation name)	Spatial extent	Temporal extent[1]
Copernicus Space Data Ecosystem (CDSE)	Mixed	Environment/Habitat	European Commission	Global	27/06/2015 - current
WEKEO	Mixed	Other	European Commission	Global	01/01/2005 - 31/12/2021

[1] Temporal extent is not fully specified for all datasets. In most cases, a start date is provided, but an end date is missing. As a result, the reported temporal extent is incomplete and reflects only those datasets for which both dates were available.

Wherever possible, metadata were ingested programmatically using dataset-specific scripts. All scripts have been deposited in the BMD GitHub page and are thus freely available to the BMD project partners as well as the broader community. When programmatic ingestion was not possible, metadata were added manually directly to the Data Catalogue following the LifeWatch ERIC Application Profiles (version 1) (Vaira et al., 2022) and the guidelines of Bortoluzzi et al. (2026), developed with task partners to enhance the consistency of the process.

2.2 Co-design, population, and validation of the GeoNetwork-based BMD Data Catalogue

As part of WP2 activities, the LifeWatch ERIC Metadata Catalogue (**Figure 1**) was used to document the metadata of all datasets collected throughout the BMD project, forming the BMD Data Catalogue. In this context, LifeWatch ERIC acts as the Service Provider, ensuring that the BMD Data Catalogue and associated metadata records are hosted, maintained, and made operational for a minimum of nine (9) years (the four years of the project plus five additional years post-project). The Catalogue is a GeoNetwork-based platform (Ticheler & Hielkema 2007) designed for the creation, management and publication of metadata describing resources related to biodiversity and ecosystem research. In the context of BMD, it provides a consistent and standardised framework for metadata documentation, while at the same time supporting dataset discoverability and accessibility.

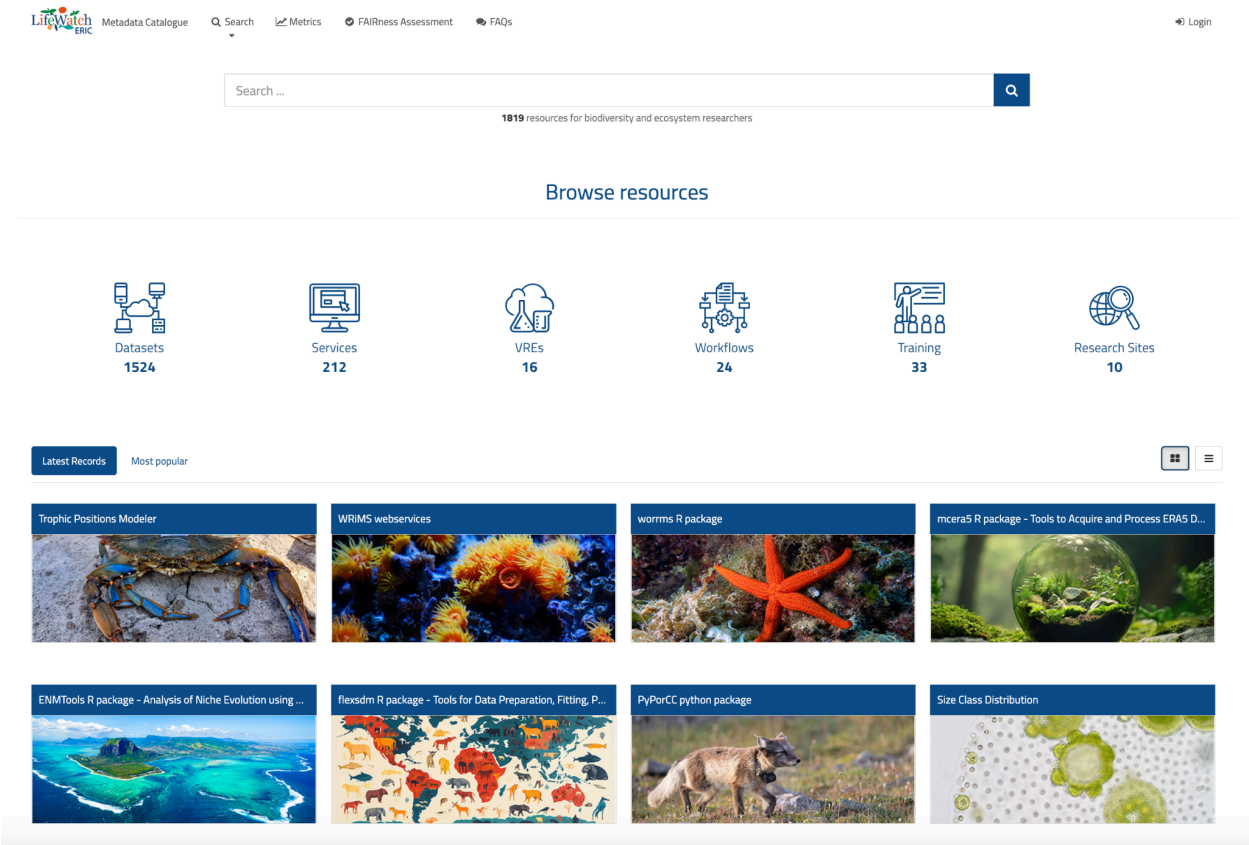

Figure 1: The LifeWatch ERIC Metadata Catalogue frontpage.

The Catalogue offers an easy-to-use web interface that supports dataset discovery through keyword-based searches, predefined filters (e.g. temporal extent), and map-based queries. In particular, the interactive map functionality enables users to search for metadata records based on their spatial extent or specific geographic locations, facilitating the exploration of spatially explicit data resources. Metadata can be accessed either manually or programmatically: when accessed manually, metadata

records can be downloaded in multiple formats, including ZIP, PDF, XML, RDF, and JSON, while programmatic access is provided via the LifeWatch ERIC APIs, which can deliver metadata in JSON format. APIs are accessible here: https://metadatacatalogue.lifewatch.eu/doc/api/index.html. To filter by resource type and select only dataset metadata records for example, the API call is: https://metadatacatalogue.lifewatch.eu/srv/api/records?type=dataset.

Metadata records were created either manually through the editor or imported in XML format. The online editor provides a structured, user-friendly workflow that distinguishes mandatory from optional fields and offers detailed guidance for each metadata element. Although the Catalogue supports both ISO 19139 (Kresse & Fadaie 2004) and Ecological Metadata Language (EML) 2.2.0 standards, the latter was adopted for the BMD project as the most appropriate standard for ecological data (Jones et al., 2019).

Once a record was finalised, the responsible person from SIB submitted it for publication, triggering the internal editorial workflow within LifeWatch ERIC. During this process, an assigned reviewer evaluated the metadata record, from both a technical and content-related perspective. Typical checks during the review include verification of licence and access information, assessment of the completeness and correctness of mandatory metadata fields, and validation of overall metadata consistency. Based on the outcome of the review, feedback and suggestions for improvement were provided to the contributor, or the record proceeded directly to publication.

In addition to the initial manual editorial workflow, the Catalogue implements automated quality-control mechanisms to support the long-term maintenance of metadata records and ensure consistent quality over time. Specifically, an automated link-monitoring process is scheduled on a weekly basis to check the reachability of URLs included in metadata records, enabling the identification of common failure codes (e.g. 400, 401, 404, 500) and timely corrective actions.

To further support metadata quality and long-term reuse, the Catalogue incorporates an integrated FAIRness assessment tool (Devaraju and Huber 2020) (**Figure 2**) to evaluate compliance with the FAIR (Findable, Accessible, Interoperable, Reusable) principles (Wilkinson et al., 2016). Each individual metadata record is assigned a FAIR score that helps metadata providers identify areas for improvement. The assessment evaluates key elements of metadata quality, including the use of globally unique identifiers (e.g. DOIs or URIs), the completeness of core metadata fields, compliance with recognised standards, and the presence of clear licensing and access information.

Given that the outcomes of the BMD project are expected to have long-term relevance, a dedicated strategy was established to manage updates to the datasets documented in the BMD Data Catalogue. Dataset changes are identified and communicated by the relevant BMD partners, after which the corresponding metadata record can be updated either through manual editing by the original contributor at SIB or by providing an updated XML metadata file. In the latter case, the revised XML is imported to the Catalogue, automatically updating the existing metadata record. As dataset information inevitably evolves over time, this workflow ensures that such changes are accurately reflected in the corresponding metadata records.

Overall, the first release of the BMD Data Catalogue is fully operational and hosted within the LifeWatch ERIC infrastructure. As detailed above, metadata records are exposed in standardised, machine-readable format and can be queried programmatically, enabling automated access and integration into external

systems. This setup ensures that they can be consumed by other components of the BMD project, such as the Virtual Research Environments (WP5) and the Single Access Point (WP6).

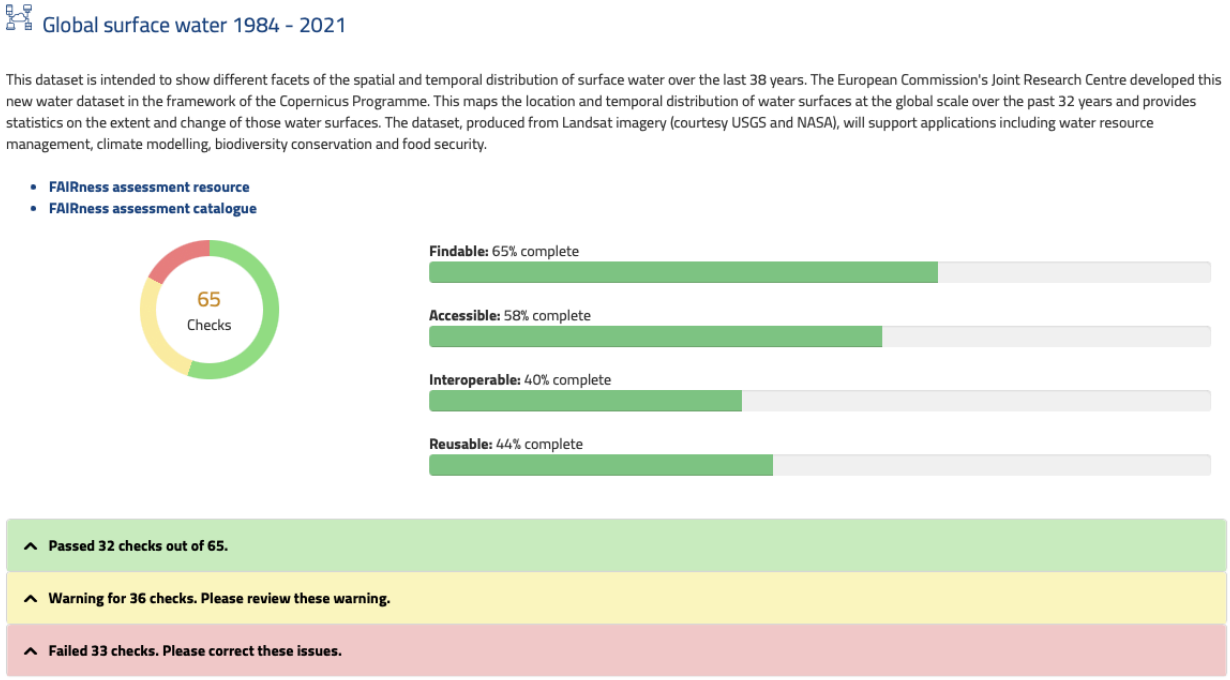

Figure 2: The FAIRness assessment tool implemented in LifeWatch ERIC. An example of the FAIR assessment tool for the *Global surface water 1984 - 2021* dataset in the BMD Data Catalogue.

3. Evidence of milestone achievement

The tasks listed have been substantiated by the following evidence:

LifeWatch ERIC Metadata Catalogue (BMD Group): BMD Data Catalogue

LifeWatch ERIC Metadata Catalogue User Manual: User Manual

4. Impact and future work

Progress in setting up the first version of the BMD Data Catalogue has significantly strengthened the capacity of project partners to query and use datasets, supporting both data harmonisation (WP3) and their effective downstream use by the VREs (WP5). As the BMD project advances, we anticipate an increasing and more frequent use of the Data Catalogue by project partners. This growing engagement is expected to stimulate updates and refinements of the catalogue tailored to partners' evolving needs, particularly those of WP3 and WP5.

Work on the second and final release of the BMD Data Catalogue has already begun. This process has started with a re-assessment of datasets and data sources, incorporating additional input from BMD partners and applying the prioritisation criteria described in section 1. For the second and final release of the BMD Data Catalogue particular attention will be given to avoiding duplicate entries, as redundancy undermines the overall objectives of the BMD project and, by extension, WP3 and WP5. For instance, the Human Footprint Index is likely to be excluded because another similar dataset, the Global Human Settlement Layer, has been added to the catalogue. Furthermore, the latter is provided as pre-computed data, unlike the Human Footprint Index. Priority will be given to the freshwater and marine realm, as these are currently underrepresented in the first version of the Data Catalogue. Emphasis will also be placed on datasets and data sources that are publicly available and can be accessed without requiring user accounts or logins.

In parallel, WP2 will start working in collaboration with WP1 to build on and expand the dataset collection. By leveraging the stakeholder engagement outcomes of WP1, we aim to connect with a broader network of potential data providers, identify additional relevant datasets, and prioritise their inclusion in the Data Catalogue based on stakeholder needs. This approach is expected to further improve the relevance of the catalogue and usability for downstream applications, including supporting natural park managers in their decision-making processes.

Looking ahead, our focus will remain on expanding the Data Catalogue to meet the requirements of the BMD partners and the wider stakeholder community. Furthermore, we will continue to refine and improve existing catalogue entries aligning them with the evolving needs of other WPs and maintaining high standards of metadata quality, completeness, and re-usability.

5. References

Anusuriya Devaraju, & Robert Huber. (2020). F-UJI - An Automated FAIR Data Assessment Tool. Zenodo. https://doi.org/10.5281/zenodo.6361400

Bortoluzzi, C., Martin, O., Vaira, L., Tzafesta, E., & Waterhouse, R. (2026). Guidelines on how to manually enter metadata into the LifeWatch ERIC BMD Data Catalogue (1.0). Zenodo. https://doi.org/10.5281/zenodo.18253815

Copernicus. (2026). https://wekeo.copernicus.eu/

Jones, M. B., O'Brien, M., Mecum, B., Boettiger, C., Schildhauer, M., Maier, M., ... & Chong, S. (2019). Ecological metadata language version 2.2. 0. *KNB Data Repository*, *10*, F11834T2.

Kresse, W., & Fadaie, K. (2004). *ISO standards for geographic information*. Springer Science & Business Media.

Milcinski, G., Bojanowski, J., Clarijs, D., & de la Mar, J. (2024, July). Copernicus data space ecosystem-platform that enables federated earth observation services and applications. In *IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium* (pp. 875-877). IEEE.

Nelson, D. A. (1999). European environment agency. *Colo. J. Int'l Envtl. L. & Pol'y*, *10*, 153.

Ticheler, J., & Hielkema, J. U. (2007). GeoNetwork opensource. *OSGeo Journal*, *2*, 15-19.

Vaira, L., Fiore, N., & Rosati, I. (2022). LifeWatch ERIC Application Profiles (Version 1). LifeWatch ERIC. https:/ doi.org/10.48372/8528-9Z45.

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data*, *3*(1), 1-9.

6. Annex

Table 1. List of datasets identified by the BMD community. Datasets are ordered alphabetically.

Dataset	Ecosystem	Data type	Spatial extent	Temporal extent
A 17-year time-series of fungal environmental DNA from a coastal marine ecosystem reveals long-term seasonal-scale and inter-annual diversity patterns	Marine	Observations-DNA	United Kingdom	2002 - 2018
An integrated spatio-temporal view of riverine biodiversity using environmental DNA metabarcoding	Freshwater	Observations-DNA, Environment/Habitat	Europe, North America	2017 - 2018
Annual 30-m maps of global grassland class and extent (2000–2022) based on spatiotemporal Machine Learning	Terrestrial	Environment/Habitat	Global	2000 - 2022
Bio-ORACLE	Marine	Environment/Habitat	Global	2000 - 2100
Biogeographical regions, Europe 2016, ver. 1	Terrestrial	Environment/Habitat	Europe	2011 - current
CHELSA Bioclim	Terrestrial	Climate/Weather	Global	1971 - 2100
Conservation status of habitat types and species: datasets from Article 17, Habitats Directive 92/43/EEC reporting (2013-2018) - Aug. 2020	Mixed	Other	Europe	2013 - 2018
EarthEnv - Topography	Terrestrial	Environment/Habitat	Global	-
Ecologically or biologically significant marine areas (EBSAs)	Marine	Environment/Habitat	Global	-
Ecosystem Intactness Index	Terrestrial	Environment/Habitat	Global	1993 - 2009
EEA Reference grid	Mixed	Other	Europe	2024 - current
Environment90m	Mixed	Climate/Weather,	Global	1981-2010 2041-2070

		Environment/Habitat		2071-2100
ESA CCI Land Cover	Terrestrial	Environment/Habitat	Global	1992 - 2020
EUNIS habitat distribution plots (spatial data)	Mixed	Environment/Habitat	Europe	1940 - 2017
EUNIS Habitat Maps: Enhancing Thematic and Spatial Resolution for Europe through Machine Learning	Mixed	Environment/Habitat	Europe	-
European catchments and Rivers network system (ECRINS) - version 1, Jun. 2012	Freshwater	Environment/Habitat	Europe	1990 - 2006
European catchments and Rivers network system (ECRINS), lakes and reservoirs - version 1, Jun. 2012	Freshwater	Environment/Habitat	Europe	1990 - 2006
European primary forest database v2.0	Terrestrial	Environment/Habitat	Europe	1985 - 2018
Global Forest Change 2000-2024	Terrestrial	Environment/Habitat	Global	2000 - 2024
Global Land Cover and Land Use Change 2000-2020	Terrestrial	Environment/Habitat	Global	2000 - 2020
Global Spore Sampling Project: A global, standardized dataset of airborne fungal DNA	Other/NA	Observations-DNA	Global	2018 - 2019
Global surface water 1984 - 2021	Freshwater	Environment/Habitat	Global	1984 - 2021
Human Footprint Index	Terrestrial	Environment/Habitat	Global	2001 - 2020
Invasive Alien Species reporting under EU Regulation 1143/2014, 2015-2018	Mixed	Other	Europe	2015 - 2018
IUCN range maps	Mixed	Observations-Expert	Global	-
LUCAS: Land Use and Coverage Area frame Survey	Terrestrial	Environment/Habitat	Europe	2022
MARSPEC	Marine	Environment/Habitat	Global	1900 - current

MSFD regions and subregions - version 2, Oct. 2022	Marine	Environment/Habitat	Europe	2016 - current
Natura 2000 - version end 2023	Mixed	Environment/Habitat	Europe	2023
OpenLandMap	Mixed	Environment/Habitat	Global	1985 - 2022
OpenStreetMap+ Protected nature areas in continental Europe (IUCN status + Natura 2000)	Mixed	Environment/Habitat	Europe	2019
Population trend of bird species: datasets from Article 12, Birds Directive 2009/147/EC reporting	Mixed	Other	Europe	2013 - 2018
Shifts in native tree species distributions in Europe under climate change	Terrestrial	Environment/Habitat	Europe	2041 - 2060 2061 - 2080
Si-moussi, S., Thuiller, W. (2024). Species habitat suitability of European terrestrial vertebrates for contemporary climate and land use (Version 1) [Dataset]. German Centre for Integrative Biodiversity Research.	Terrestrial	Environment/Habitat	Europe	2020
Tara Ocean Expedition	Marine	Observations-DNA	Global	2009 - 2013
The Global Soil Mycobiome consortium dataset	Terrestrial	Observations-DNA	Global	-
Tree Cover Density 2018 (raster 100 m)	Terrestrial	Environment/Habitat	Europe	2012 - 2018
World Ocean Atlas 2023	Marine	Environment/Habitat	Global	1955 - 2022
Worldclim	Terrestrial	Climate/Weather	Global	2021 - 2040 2041 - 2060 2061 - 2080 2081 - 2100

Table 2. List of data sources identified by the BMD community. Data sources are ordered alphabetically.

Data source	Ecosystem	Data type	Spatial extent	Temporal extent
BioTIME	Mixed	Environment/Habitat	Global	1874 - 2023
Copernicus Atmosphere Monitoring Service (CAMS)	Mixed	Climate/Weather	Global	Various
Copernicus Climate Change Service (C3S)	Mixed	Climate/Weather	Global	Various
Copernicus Land Monitoring Service (CLMS)	Terrestrial	Environment/Habitat, Climate/Weather	Global	Various
Copernicus Marine Monitoring Service (CMEMS)	Marine	Environment/Habitat	Global	Various
Copernicus Space Data Ecosystem (CDSE)	Mixed	Environment/Habitat	Global	Various
DATRAS (the Database of Trawl Surveys)	Marine	Environment/Habitat	Europe	1965 - current
DEIMS-SDR (Dynamic Ecological Information Management System - Site and dataset registry)	Mixed	Environment/Habitat	Global	-
eBio Atlas	Mixed	Observations-DNA	Global	-
eBird	Mixed	Observations-Image	Global	-
EBV Data Portal	Mixed	Environment/Habitat	Global	-
ECMWF Reanalysis v5 (ERA5)	Mixed	Climate/Weather	Global	1940 -current
ECO data cube	Mixed	Environment/Habitat, Climate/Weather, Observations-Image	Europe	2000 - 2020
Edaphobase - Open access Data Warehouse for Soil Biodiversity	Terrestrial	Observations-Expert, Environment/H	Europe	-

		abitat		
eLTER DAR	Mixed	Environment/Habitat	Europe	2008 - 2025
European Digital Twin Ocean	Marine	Environment/Habitat	Europe	-
European Geological Data Infrastructure (EGDI)	Terrestrial	Environment/Habitat	Europe	-
European Marine Observation and Data Network (EMODnet)	Marine	Environment/Habitat	Global	2011 - current
FAO - DAD-IS	Terrestrial	Environment/Habitat	Global	-
GBIF	Mixed	Observations-DNA, Observations-Image, Observations-Audio	Global	Various
GeoPl@ntNet species and habitat type distributions	Terrestrial	Environment/Habitat	Europe	-
Global Human Settlement Layer	Terrestrial	Environment/Habitat	Global	1975 - 2020 2025 - 2030
Knowledge Centre for Biodiversity	Mixed	Environment/Habitat	Global	-
LifeWatch Data Catalogue	Mixed	Environment/Habitat, Climate/Weather, Observations-DNA, Observations-Image, Observations-Audio, Observations-Expert	Global	1900 - current
LTER-Italy network Digital Asset Register	Marine	Environment/Habitat	Italy	Various
MODIS - moderate resolution imaging spectroradiometer	Mixed	Environment/Habitat, Climate/Weath	Global	-

		er		
Movebank	Mixed	Observations-Image, Observations-Audio	Global	-
Natural Lands Map showing land cover classes	Terrestrial	Environment/Habitat	Global	-
Ocean Biodiversity Information System	Marine	Environment/Habitat, Observations-DNA, Observations-Image, Observations-Audio	Global	-
PANGAEA	Mixed	Environment/Habitat, Climate/Weather	Global	Various
Planetary Computer Data Catalog	Mixed	Observations-Image, Environment/Habitat, Climate/Weather	Global	Various
Soil Health Data Cube (EU)	Terrestrial	Environment/Habitat	Europe	2000 - 2024
SoilGrids250m	Terrestrial	Environment/Habitat	Global	-
WEKEO	Mixed	Environment/Habitat	Global	Various
Xeno-canto	Terrestrial	Observations-Audio	Global	-
Zenodo LTER-Italy community	Mixed	Environment/Habitat	Europe	-