Letter of Intent

for submission of a renewal proposal

1 Binding letter of intent as advance notification of a full renewal proposal

X	Binding letter of intent (required as advance notification for renewal proposals in 2024)

2 Formal details

- **Applicant**
  - Name of the consortium

    NFDI4Biodiversity - National Research Data Infrastructure for Biodiversity, Ecological and Environmental Data
  - Acronym of the consortium

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- Participant institution 4

  Bundesamt für Seeschifffahrt und Hydrographie (BSH)

- Participant institution 5

  Dachverband Deutscher Avifaunisten (DDA) e.V.

- Participant institution 6

  de.NBI e.V.

- Participant institution 7

  Deutsches Zentrum für integrative Biodiversitätsforschung (iDiv)

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- Participant institution 14

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- Participant institution 15

  Goethe-Universität Frankfurt am Main

- Participant institution 16

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- Participant institution 18

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  Universität Leipzig
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  Universität Münster
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3 Objectives, work programme and research environment in the second funding period

- **Research area of the proposed consortium**[1]

  2.11 Basic Research in Biology and Medicine
  2.12 Plant Sciences
  2.13 Zoology
  2.21 Microbiology, Virology and Immunology
  2.31 Agriculture, Forestry and Veterinary Medicine
  3.41 Atmospheric Science, Oceanography and Climate Research
  3.42 Geology and Palaeontology
  3.46 Water Research

NFDI4Biodiversity covers methods and data types from organismal biological and ecosystem research. Data typically include species observations recorded in the form of tables, photos, videos, specimens, audio files and others, often with additional information (e.g. molecular data, measurements, ecological information). Specimens are also frequently collected and preserved for further analysis and description (collection management/digitisation of historic material). Resources also cover molecular data collected by -omics methodology (genomics, metabolomics, glycomics, and transcriptomics), data from Earth System Sciences (e.g. environmental conditions, information on land use or colonisation) and data streams from continuous monitoring of environmental parameters by sensors/satellites. In addition to laboratory analyses, in vivo/in vitro experiments and computational methods are used (bioinformatics, environmental modelling and machine learning). Interdisciplinary studies on nature conservation and biodiversity monitoring efforts (socio-ecological research) additionally use social sciences methodology. Many of these data resources are isolated and not readily available for research.

Several subcommunities/groups in the fields of biodiversity informatics, bioinformatics, taxonomy, biodiversity monitoring, plant sciences and zoology have already been activated for collaboration under the roof of NFDI4Biodiversity. Also, the marine/aquatic biodiversity subcommunity is represented quite well. Forestry, agricultural diversity, crop science and livestock biology are related subcommunities to be integrated in conjunction with other NFDI consortia.

[1] http://www.dfg.de/en/research-funding/proposal-funding-process/interdisciplinarity/subject-area-structure

- **Concise summary of the consortium's main objectives and task areas**

Based on its mission[2], the general aim of the consortium NFDI4Biodiversity is to provide our domain stakeholders with the know-how, tools and services they need in order to share, find and access data for their work. The community represented in NFDI4Biodiversity needs comprehensive data through time and space in order to analyse the state of biodiversity and its drivers. A growing number of projects, initiatives and institutions with highly relevant data need to adopt the FAIR principles and mobilise the data needed for those comprehensive, integrative studies. In the first funding period, the NFDI4Biodiversity consortium successfully improved access to state-of-the-art technologies and a broad range of biodiversity and environmental data, creating common grounds through a series of individual use cases. In the second funding period, we aim for scalability by consolidation and broader dissemination of good practices. We will use our limited funds to stimulate momentum in and among the diverse subcommunities of the biodiversity domain and integrate with matching activities of other consortia as well as the NFDI. Through the measures in our work programme, we aim to 1) foster networking and self-organisation in the biodiversity community, 2) strengthen participation and data competencies, 3) consolidate the extensive service landscape and 4) build comprehensive data products for research applications. These overarching aims are complemented by a specific aim for each Task Area and form the framework for the measures in the work programme (Table 1).

Table 1: Overarching and specific aims for the second funding period of NFDI4Biodiversity. Integration with NFDI is a required feature of all Task Areas and measures in the second funding period.

TA	**1**	**2**	**3**	**4**	**5**
Title	**Community enabling and support (2enable)**	**International networking and standards (2connect)**	**A sustainable service and data network (2consolidate)**	**Research Data Commons (2build)**	**Coordination, collaborative governance and sustainability (2coordinate)**
Specific aim	SA1: Subcommunities with tailored solutions for their research needs	SA2: Embedment in the international data and service provider community	SA3: A consolidated, community-owned service portfolio	SA4: A coherent data ecosystem in the cloud	SA5: Efficient and effective management and long-term strategy for sustainable services
Over-arching aims	OA1: Foster networking and self-organisation in the community to adopt best practices in research data management and FAIR data mobilisation				
	OA2: Strengthen participation, training and dissemination of best practices in the community				
	OA3: Consolidate the service landscape, including common infrastructures				
	OA4: Build comprehensive data products for research and analysis (KI/research readiness)				

[2] https://nfdi4biodiversity.org/en/mission-statement/

Task Area 1: Community enabling and support (2enable): The measures in TA1 serve to reach the wider biodiversity network, enabling subcommunities to develop tailored solutions and data products for their research needs, and to promote best practices for the implementation of the FAIR principles. The target will be larger user groups and networks. In this way, TA1 will also contribute to a broader adoption of community services and improve data and user competencies among stakeholders. This will be achieved by the following measures: (1) Community-driven topic tables, (2) Novel data pipelines, (3) Open species observation data, (4) Training and education, (5) User support, (6) Legal aspects. In measures 1, 2 and 3 we will explore the potential to team up with other consortia, based on similarities in scientific methods and data types. In measures 4, 5 and 6, interfaces with NFDI sections Training and Education and ELSA are extended and further cross-consortia activities planned.

Task Area 2: International networking and standards (2connect): In line with the aim to disseminate good practices, the measures in TA2 serve to embed NFDI4Biodiversity in the evolving international landscape of biodiversity infrastructures. They negotiate key standards for data and metadata and the semantic annotation of data based on standardised vocabularies and workflows, which are necessary to enable interoperability both within the biodiversity research domain and across disciplines. Embedment will be achieved by the following measures: (1) Norm vocabularies and data annotation, (2) Cooperation with international biodiversity informatics infrastructures, (3) Standards (with a special focus on bioschema.org). Interfaces with NFDI Section (Meta)data, Terminologies, Provenance and Base4NFDI services like TS4NFDI will be further developed, as well as cooperations with other consortia, based on similarities in data types.

Task Area 3 - A sustainable service and data network (2consolidate): The measures in TA3 are designed to involve and support service providers, in line with our aim to consolidate the extensive service landscape and to foster networking in the biodiversity domain. The evolving service provider network in NFDI4Biodiversity will be key to provide a community-owned portfolio of high-quality, reliable data and services in the long-term. This will be achieved by the following measures: (1) Service quality and development, (2) Strengthening local research data management, (3) Enhancing the network of the national GFBio Data Centers, (4) Managing the service portfolio and lifecycle. Base4NFDI services as well as services of consortia with related data needs will be integrated as they become available.

Task Area 4 - Research Data Commons (2build): Reacting to community needs for a common infrastructure, TA4 will build a coherent data ecosystem in the cloud that will lower the technical barrier for engaging with heterogeneous biodiversity data, increasing its value through novel cross-domain syntheses and democratising it. This will be achieved by the following measures: (1) Data products, (2) Data and Service Integration, (3) Platform and core services, (4) RDC Governance. TA4 members will engage with the NFDI section Infra, and Base4NFDI services will be integrated as they become available.

Task Area 5 - Coordination, collaborative governance and sustainability (2coordinate): The aim for TA5 is efficient management and a long-term strategy for sustainable results of the NFDI4Biodiversity work programme. The measures in TA5 will ensure due diligence with regard to the funding and the work programme, coordination of work across Task Areas, appropriate strategy and decision-making processes, effective communication of the consortium's activities and alignment with NFDI and the larger research landscape in the domain: (1) Project Office, (2) Communications Office, (3) Integration with NFDI and sustainability. TA5 members will engage with matching Task Forces in the NFDI and contribute to the NFDI governance and strategy.

- **Use of existing infrastructures, tools and services**

In reaching its aims, the NFDI4Biodiversity consortium relies on a wide range of tried-and-tested services which are provided by partners and/or international initiatives. The list below is structured along the different purposes of the services for the community.

- Collaboration and communication:
  - Ticket system and wiki by GFBio e.V. (Helpdesk and collaboration platform)
  - Filesharing by GWDG
- Building the Research Data Commons:
  - Cloud services and pipelines of de.NBI service centres Bielefeld and Gießen
  - GWDG Academic Cloud services
  - Aruna object storage[3] by University of Gießen
  - GFBio Search and Harvesting infrastructure
  - International community AAI: Life Science Login[4]

[3] Developed in the first funding period with NFDI4Microbiota, https://kb.gfbio.org/display/KB/Aruna+Object+Storage
[4] Developed by ELIXIR/EOSC Life, https://lifescience-ri.eu/ls-login/,use case in IAM4NFDI

- Mobilising and publishing datasets from community projects:
  - GFBio Data Submission and Brokerage Service
  - Curation and archiving services of PANGAEA and the other GFBio Data Centers[5]
  - Curation and brokerage to ENA (GFBio e.V.)
- Systems for managing and annotating data
  - GFBio Data Management Planning Service
  - BEXIS2 provided by Uni Jena, Diversity Workbench (open source community)
  - BiodivPortal ontology repository and terminology service[6]
- API and data exchange
  - Checklist editor BfN/Red List Centre
  - GBIF Integrated Publishing Toolkit and other GBIF software[7]
  - BioCASE Provider software + Helpdesk (BO Berlin)

- **Interfaces to other NFDI consortia**

Interfaces to other consortia are developed through engagement in the NFDI e.V. sections and working groups. As our stakeholder group is very broad in terms of scientific methods and data types, we also use bi- and multilateral collaboration with other consortia to leverage each other's expertise and resources. Plans for future collaboration include:

- Forming a “biodata” interest group to **harmonise RDM strategies and services** with DataPLANT and NFDI4Microbiota (omics methods and data, de.NBI service infrastructure), eventually including NFDI4Bioimage (microscopy, image data), FAIRagro and NFDI4Objects (paleontology).
- Enhancing the NFDI4Biodiversity **service portfolio** through onboarding and co-development of services from other consortia with shared, methods-oriented subcommunities, namely from NFDI4Earth (environmental factors, satellite imaging, sensor data), MaRDI (modelling data) and KonsortSWD (qualitative and quantitative data from socio-ecological research).

[5] PANGAEA Data Publisher (UniBremen/MARUM, AWI), e!DAL-PGP – Plant Genomics and Phenomics Research Data Repository (IPK), BGBM – Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin, DSMZ – German Collection of Microorganisms, LIB - Leibniz Institute for the Analysis of Biodiversity Change, MfN – Leibniz Institute for Research on Evolution and Biodiversity, Berlin, SNSB – Staatliche Naturwissenschaftliche Sammlungen Bayerns, SGN – Senckenberg Gesellschaft für Naturforschung, SMNS – State Museum of Natural History Stuttgart - see https://kb.gfbio.org/display/KB/Data+Centers

[6] Result of the first funding period, https://kb.gfbio.org/display/KB/BiodivPortal

[7] provided by the Global Biodiversity Information Facility, https://www.gbif.org/resource/search?contentType=tool

- Development of **comprehensive data products for interdisciplinary research**, by joining forces in large showcases. An activity with FAIRagro and NFDI4Earth is under preparation.
- Development of joint Helpdesk and consultation services among the consortia of the life sciences - earth system - chemistry domain (working group established in May 2024)
- Joint **trainings and educational materials** for shared subcommunities. Formats already established and to be continued include Hackathons and Seasonal Schools, as well as multi-consortia collaboration in regional and national Data competence centres (DataNORD, WiNoDa) and RDM initiatives (Bremen, Hessia, Thuringia) and support for interdisciplinary research projects in the BMBF FONA programme. Activities with potential for synergies include the creation of RDM knowledge bases.
- Joining forces regarding the **regulatory side of our work**. An informal interest group on policy development regarding the issue of Digital Sequence Information in the Global Biodiversity Framework has already formed.

For integration on the level of work programmes we pursue the option of co-programming, joint participants, use cases and shared staff, as well as opportunity-driven activities such as workshops.

4 International and national networking

NFDI4Biodiversity is embedded in an extensive landscape of initiatives, projects, and infrastructures on the national and international level. In the first funding period, a comprehensive list of relevant national and international stakeholders was compiled to decide on levels of cooperation, with respect to their importance for current activities in the work programme. On this basis, a variety of activities was initiated, ranging from the concrete use of services and data pipelines (GBIF technology, ELIXIR standards and services) to joint service specification and development processes (checklist services of the German Red List Centre) and the formation of international working groups (cooperation of national data infrastructures under the umbrella of TDWG Biodiversity Information Standards). Strong working relations have been established with two major federal initiatives: the National Monitoring Centre for Biodiversity (NMZB) with its strong mandate for the monitoring community in Germany, and the National Centre for Environmental and Nature Conservation Information at the German Environment Agency (UBA), with the umwelt.info information system. Both centres are committed to join NFDI4Biodiversity as participants.

In the second funding period, we will continue to prioritise key topics and stakeholders. Activities of particular relevance for the interoperability of NFDI4Biodiversity services are for example Schema.org (and in particular the Bioschemas markup) as well as taxonomic annotation and related service providers such as Catalogue Of Life (COL), EUNomen and World Flora Online (WFO). In terms of Schema.org, joint developments with other NFDI consortia are planned (e.g. DataPLANT) in order to exploit the potential for comprehensive metadata searches and facilitate data harvesting of heterogeneous data types. In the area of linking and annotating research data with taxon references, we plan to integrate services of national, European and international initiatives into local NFDI4Biodiversity services and make them usable in a pragmatic manner. NFDI4Biodiversity will also continue the cooperation initiated with other national infrastructures for biodiversity data worldwide and aims to coordinate collaboration on their core roles. Finally, the NFDI4Biodiversity strategy group has begun to define essential services on the basis of a "Biodiversity Canvas", which will be the portfolio for embedding in the national and international infrastructure landscape. The result of this process will be a core offering that enables sustainable service operation and offers the greatest possible potential for synergies and complementary operation of infrastructures at national and international level. The aim is also to register and embed these services in the EOSC Resource Hub.