NFDI4Earth

NFDI Consortium Earth System Sciences

Lars Bernard – November 2020 – NFDI4Earth Conference

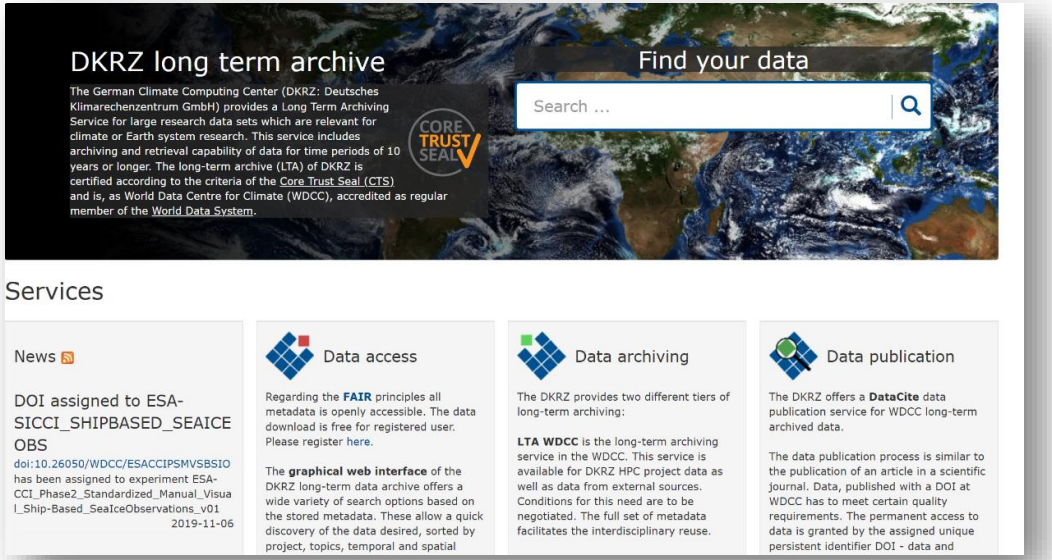
Our domain - Earth System Science

- **Earth System Science (ESS)**
  Geosphere, Atmosphere, Biosphere, Hydrosphere, Cryosphere, and Anthroposphere
- Research from **Local Processes to Global Challenges**
  e.g. climate change, environmental pollution, land-use change, natural hazards, scarcity of raw materials, water scarcity
- Observing, measuring, modelling, analyzing, predicting the Earth System
- In **international and interdisciplinary** settings
- **Spatio-Temporal Data** as **common reference**

Open FAIR Data, Tools and Data Science Methods to enable new level of synthesis

What we have

- **Digital experience** and positive attitude **to Openness, FAIRness and Collaborative Development**
- **Data** from different sources, growing openness
- Established **repositories**
  PIDs, curation, …
- Several **standards** for interoperability
  Metadata, Data Schemas, APIs, Spatio-temporal reference systems, Vocabularies/Ontologies
- Demanding models and big data applications - **too big for local processing**



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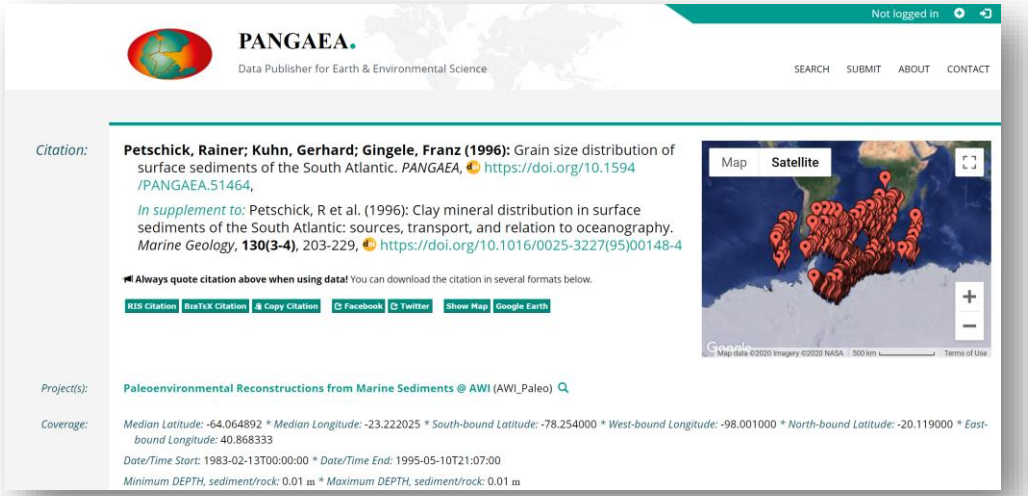


https://doi.pangaea.de/10.1594/PANGAEA.51464

Our Issues

- **Large, diverse number of data services (> 100) and activities** related to ESS…**only a few sustainable**

- **Different data qualities**: dimensions, semantics, scale, coverage, temporal and spatial resolutions, sizes, repeatability, provenances, curation levels,…

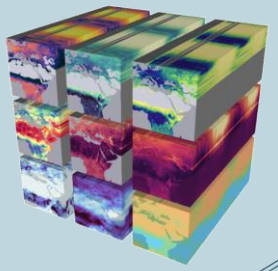
- **Different data cultures** within sub-disciplines and organizations…RDM experts and novices…need for recognition
- **Incomplete support along the data lifecycle**
- Lack of support (platforms, tools) for **joint and collaborative interpretation of heterogeneous and decentralized data**

Our Challenges to stimulate a Cultural Change

- Large, diverse number of data services (> 100) and activities

- *One* Community approach to Openness and FAIRness in Earth System Science

- Offering a OneStop for ESS RDM and User Support integrated in NFDI and international infrastructures

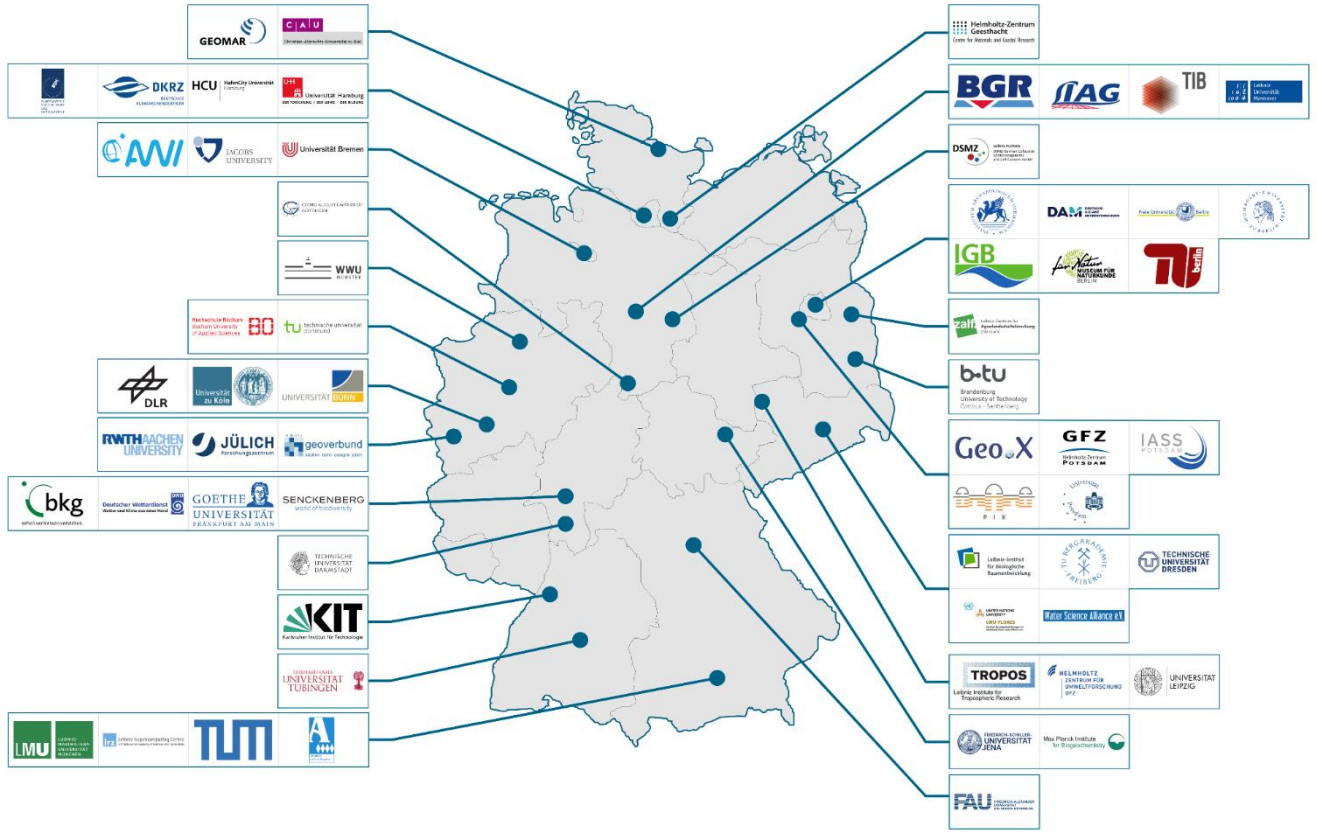


- Innovative Platforms for data integration and collaborative data analysis

- Qualification for people, data, tools and services as a basis for sustainability

Who we are

- More than 50 German partners from:
  - Universities
  - Research Organisations
    Helmholtz, Leibniz, Max Planck Society
  - Infrastructure Providers
    Research Infrastructures, Repositories, High Performance Computing Centers, Libraries
  - Governmental Institutions
  - Scientific Associations



- Established 2018 as an **Open Consortium** and the **Earth System Science (ESS)** branch **in the German Research Data Infrastructure (NFDI)**

NFDI4Earth – Strategy & 2021-26

NFDI4Earth2Participate
M1.1: Earth System Science Pilots *
M1.2: Incubator Lab
M1.3: Education and Training Materials and Services *
M1.4: NFDI4Earth Academy *

Coordination
H. Gödde
M. Mahecha
M. Sester
A. Wytzisk-Arens

Task Area 1

NFDI4Earth2Facilitate
M2.1: OneStop4All
M2.2: User Support *
M2.3: Governmental Data *
M2.4: Data in Long-Term Storage *
M2.5: Advancing Tools

Coordination
P. Braesicke
M. Reichstein
H. Thiemann

Task Area 2

NFDI4Earth2Interoperate
M3.1: Synthesis of a Sustainable NFDI4Earth Architecture *
M3.2: Common Standards for FAIR ESS Data *
M3.3: NFDI Commons *
M3.4: International Networking & Embedding *

Coordination
R. Bertelmann
S. Frickenhaus
H. Marschall
K. Wesche

Task Area 3

NFDI4Earth2Coordinate
M4.1: Coordination, Collaborative and Sustainable Governance of NFDI4Earth *
M4.2: Towards a Cultural Change in ESS Research Data Management *
M4.3: Central Support Services for the federated NFDI4Earth *

Coordination
L. Bernard
W. Nagel

Task Area 4

Community Engagement

Piloting Innovations

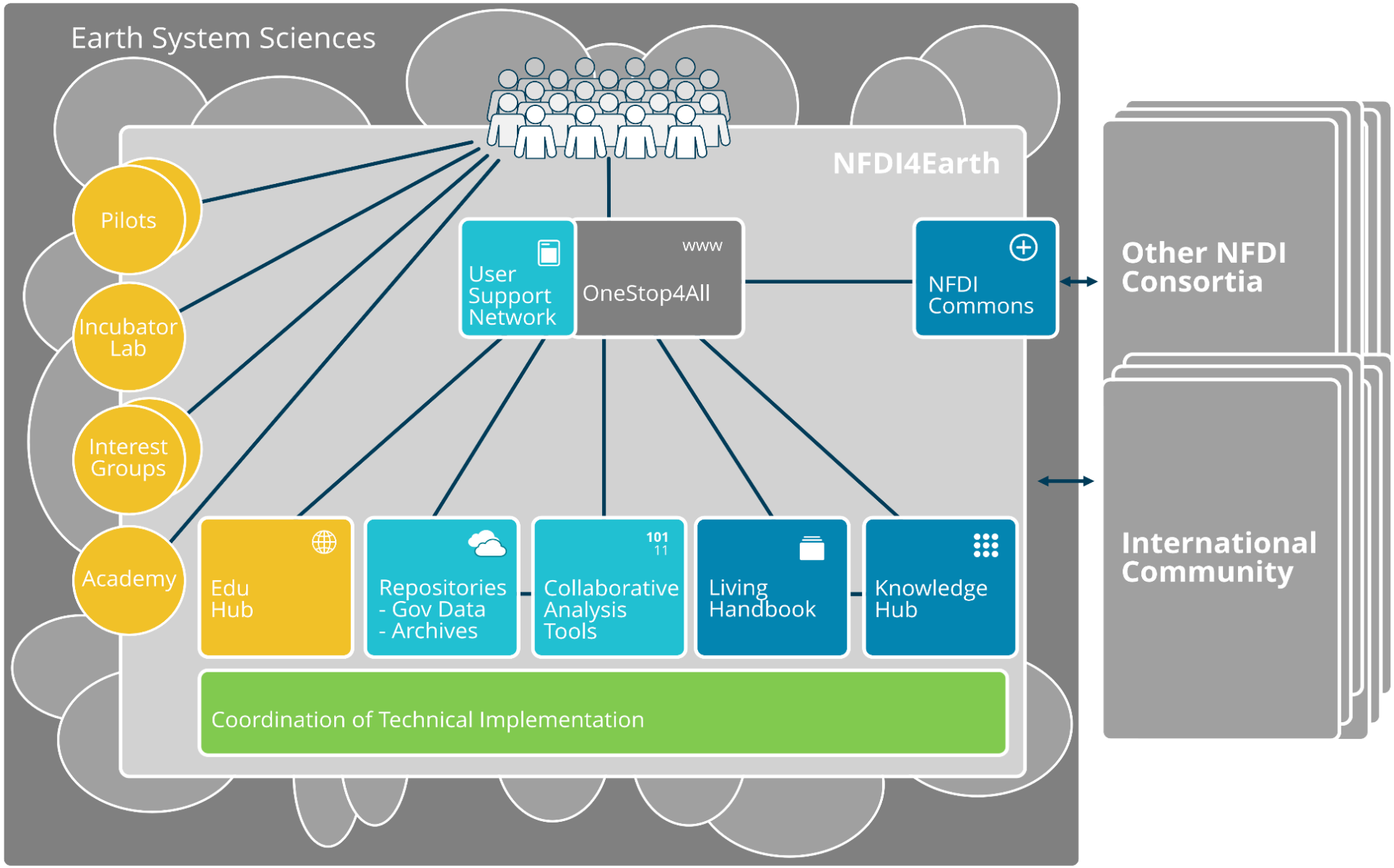
User Perspective

Infrastructure Perspective

NFDI & International Integration

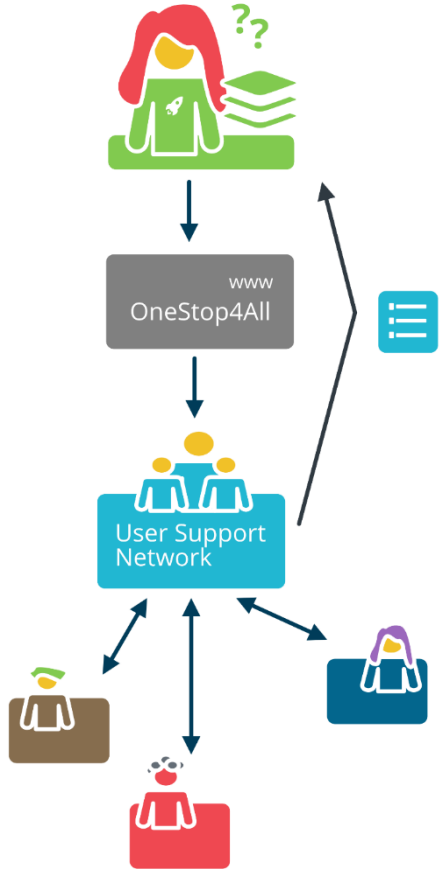
Community Support

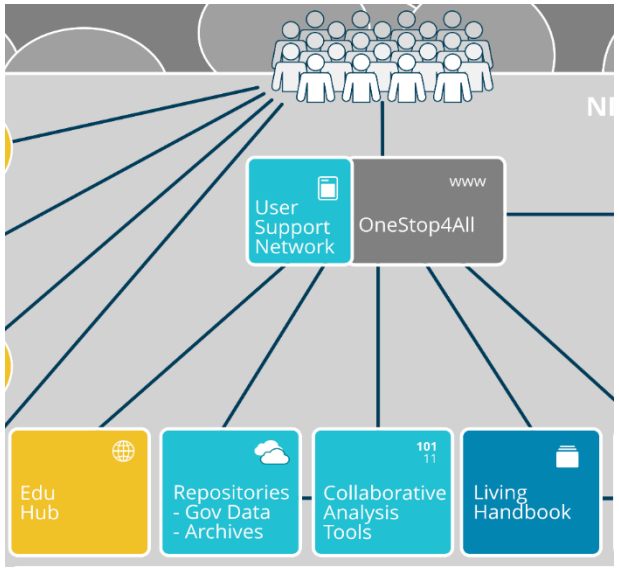
NFDI4Earth – Approach



Coherent User Support

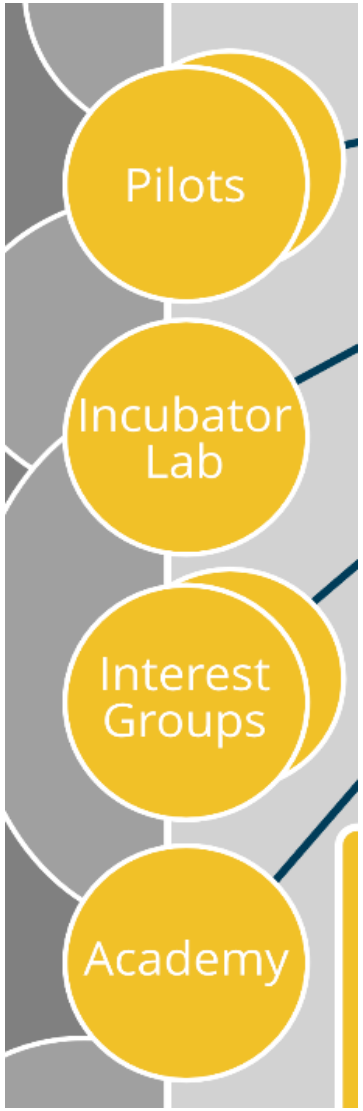
- **OneStop** for (ESS) Open and FAIR Research Data Management and access to the NFDI4Earth partners' offerings (1st level support)
- **User Support Network (USN)** as distributed ESS RDM help desks (individual 2nd and 3rd level support e.g. on curation, archiving, tools, links to education measures, etc.)





- **Open Educational Resource** for modular NFDI4Earth-ready courses
- Develop **curricula and courses** for profiles as *Earth System Data Scientists* and *Research Data Curators/Stewards*

Engage with community and foster innovation

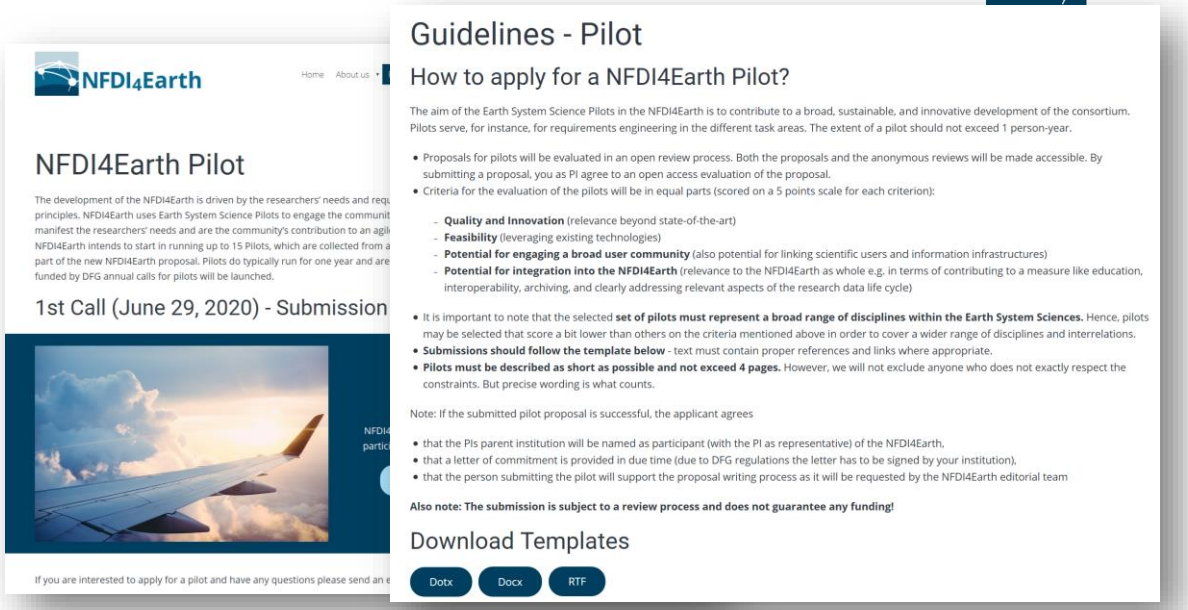


- **ESS Pilots – *doing Open and FAIR ESS RDM***
  - one year termed implementation projects from open calls
  - reflect a variety of use cases and complexities and the different FDM maturity levels in the ESS community.
  - crosslink with different TAs and support the agile development of new tools
- **Incubators – *exploring new ES data science methods***
  - Small, short termed innovation projects from 3 open calls, beginning 2023
- **Interest Groups (IGs) – *developing common topics***
  - group around technical or community topics, first groups establish
- **Academy – *linking in next generation researchers***
  - also stimulate research cooperations across NFDIs
  - starts with one site and grows in increments

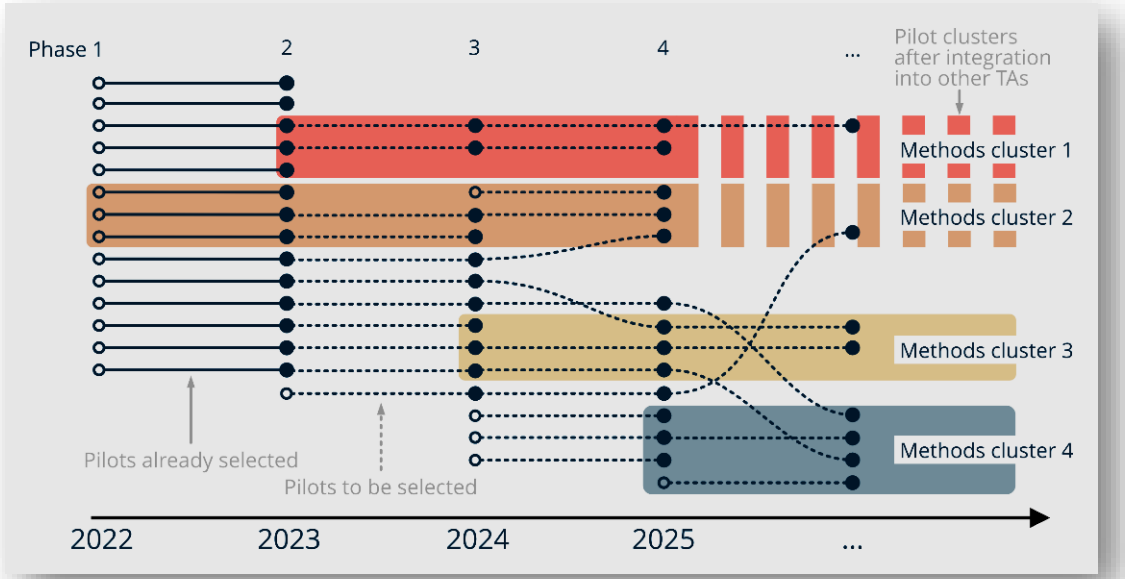
Engage with community and foster innovation

Successful call for ESS Pilots

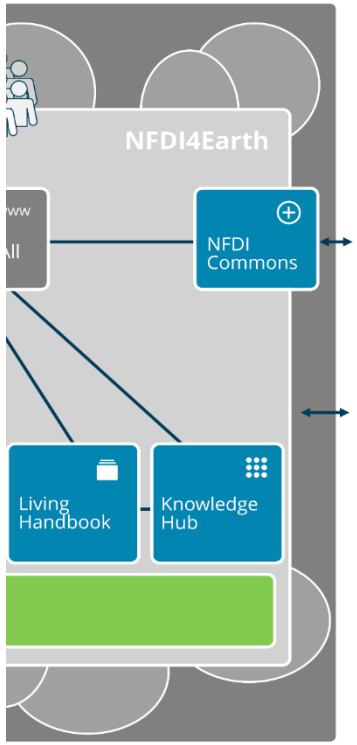
- Received 38 applications for a short notice call in June 2020 spanning over different sub-domains and RDM and data science aspects
- 14 pilots selected in a transparent, criteria-based review process to start 1/2022
- Plan for three more open calls in 2022-2024
- **See examples of ESS Pilots in later sessions !**



https://www.nfdi4earth.de/participate/get-involved-by-pilots



Interoperability and Integration

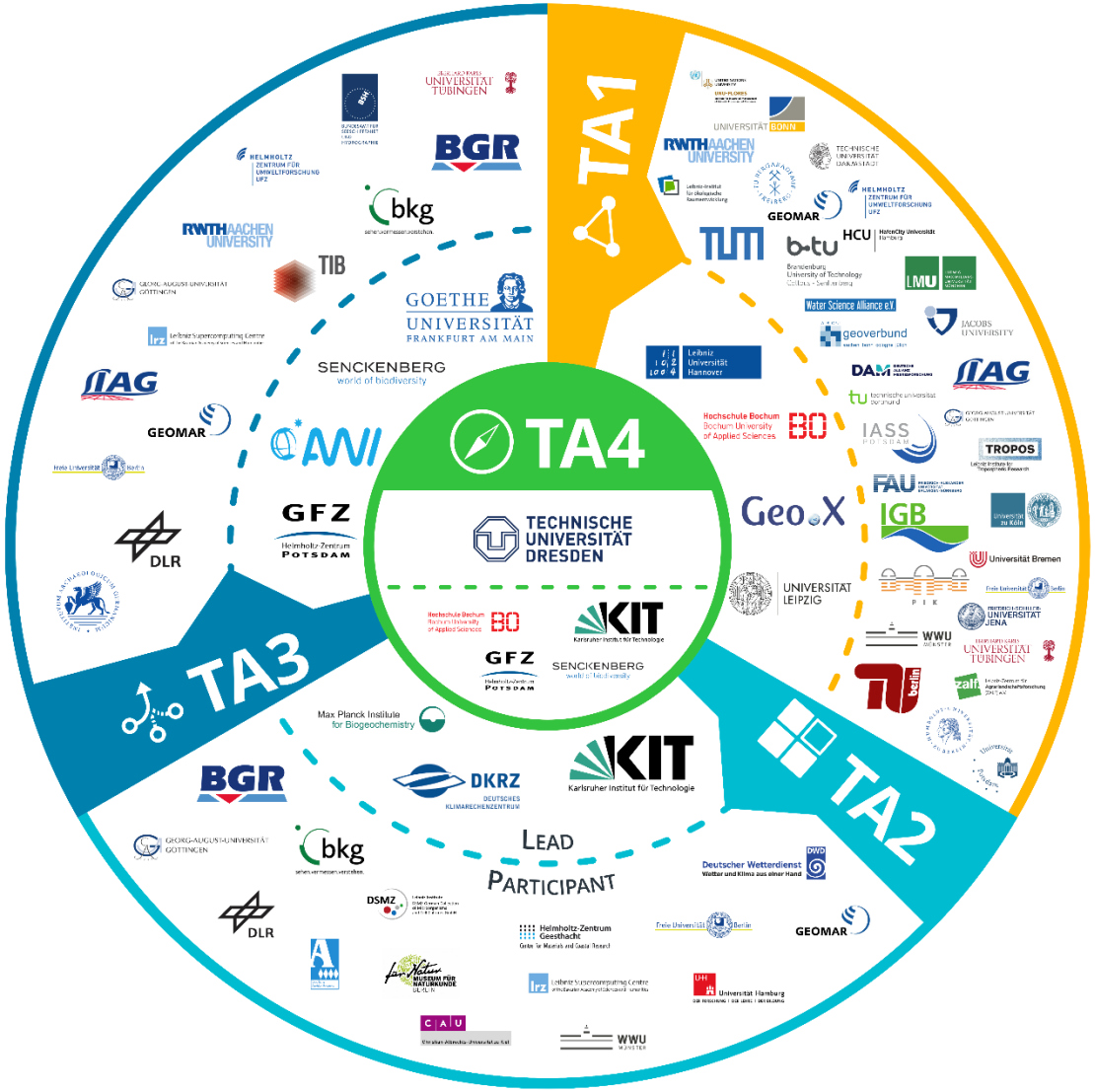


- **Sustainable Architecture to interoperable combine and link services** of NFDI4Earth partners
  - Identify (core) components and services
  - Define a set of **Common Standards for FAIR ESS RDM**
  - Continuously contribute to / align with NFDI
- Establish **NFDI4Earth Knowledge** Hub (on services, standards, ontologies/vocabularies, etc.) as a common backbone
- Develop **NFDI4Earth Label** as key driver and indicator for interoperability of services
- Establish **self-evaluation process for ESS RDM service offerings** (building on RISE, EOSC/FAIR Metrics)

Contributing to the NFDI Process, national and international embedding

- Collaborative Development of **NFDI Commons**
  - Knowledge hub on **geo-spatio-temporal data/services**
  - Facilitate cross-disciplinary FAIR data sharing and integration (via pilots and the academy)
  - Link with **governmental agencies** (GDI-DE, BGR, BKG, DWD,…) and other national stakeholders in the 4Earth context
  - links HPC centres **to envision scientific computing cloud**
- **International Embedding**
  - Ensure **international visibility & interoperability** of NFDI4Earth
  - Have **one voice** for ESS related RDM
  - Support novel avenues for ESS related RDM in international initiatives

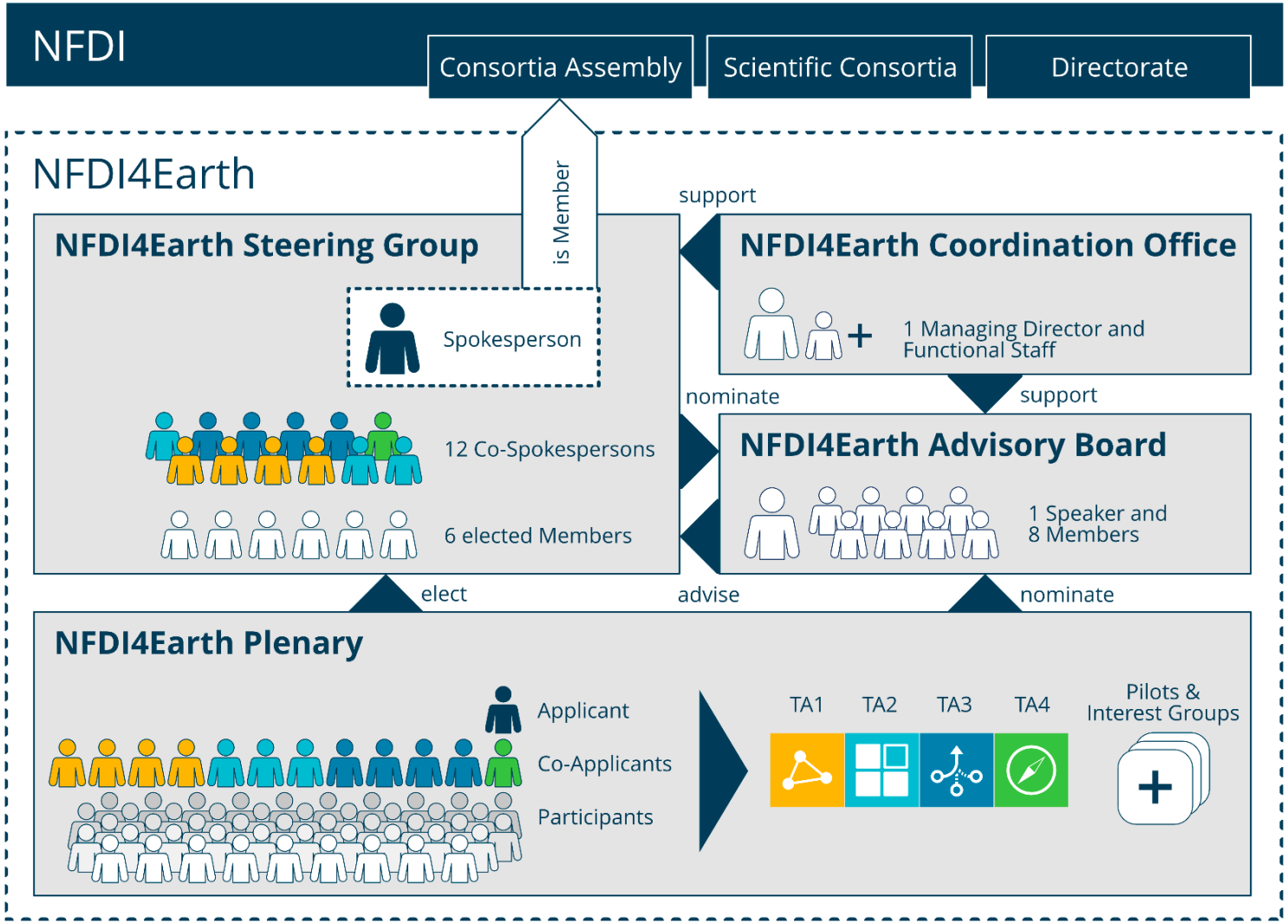
NFDI4Earth Partners Involvement



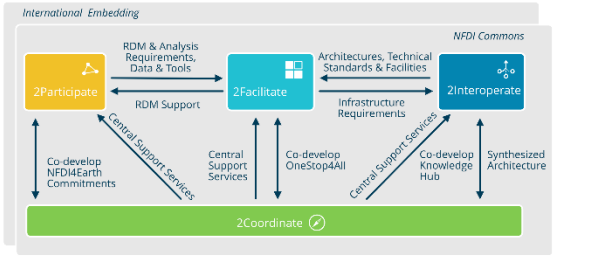
- 58 Partners contribute and already actively engage
- **Join the NFDI Verein and form the NFDI4Earth branch**
- **Designed as a an open consortium !**

- Calls for pilots and incubators
  - to attract and involve new participants
  - to better adapt to changing requirements

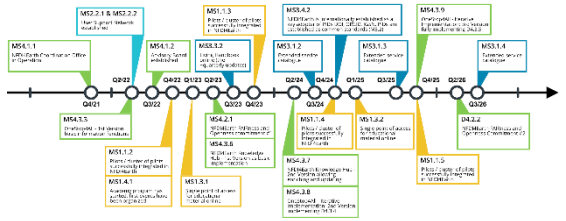
NFDI4Earth – Governance



Key Task Area Interactions



Major Milestones

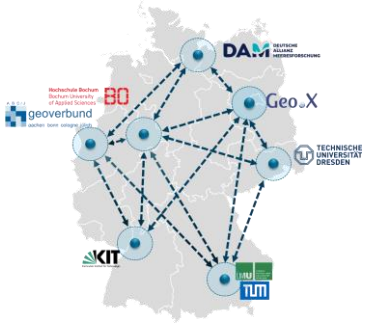


Success Measures

NFDI4Earth Objective	Measure of Success
Active and continuously committed ESS stakeholders form the NFDI4Earth community and develop FAIR and Open RDM capacities in the German ESS in a community driven process.	• Start of the NFDI4Earth project • Regular, well-attended plenaries • Good response on call for Pilots, Incubators and Interest Groups • Active Interest Groups (developing white papers, communications, related project ideas, etc.) • Young researchers are part of NFDI4Earth

Towards sustainability and long term operation…

- Proceed as **one national ESS Community Effort**
  - Link into related initiatives and measures by the Helmholtz Association, the Leibniz Association, and the Max Planck Society (esp. *Helmholtz Research Field Earth and Environment DataHub*)
  - Network ESS Stakeholders (NFDI4Earth EduHub Network, Academy Sites, etc.)



- **NFDI4Earth FAIRness and Openness Commitment**
  - Engage *all* ESS stakeholders (researchers, societies, infrastructures, publishers,…)
  - Foster incentives for Open and FAIR RDM in ESS
- Become integral part of NFDI, EOSC and international infrastructures
- Develop common long term operation model for services and support structures

Thank You !

https://www.nfdi4earth.de/