1. Overview of the initiative

<table>
<thead>
<tr>
<th>Name of initiative</th>
<th>National Research Data Infrastructure / Nationale Forschungsdateninfrastruktur (NFDI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Development and Funding of a National Research Data Infrastructure, which allows access and use of research data across disciplines</td>
</tr>
<tr>
<td>Type</td>
<td>Agreement between the Federal government and the Federal States (Länder) – Funding programme</td>
</tr>
<tr>
<td>Responsible policy making bodies</td>
<td>Federal Ministry of Education and Research &amp; the governments of the Federal States (Länder) - Joint Science Conference (Gemeinsame Wissenschaftskonferenz – GWK)</td>
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<tr>
<td>Responsible implementing bodies</td>
<td>NFDI Directorate and Scientific Senate (The NFDI will be made up of scientific consortia coordinated by a Directorate and a Scientific Senate)</td>
</tr>
<tr>
<td>International reference framework</td>
<td>(European Open Science Cloud)</td>
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<tr>
<td>Target audience</td>
<td>Consortia of universities, non-university research institutions, departmental research institutions, academies and other publicly funded information infrastructure institutions or other relevant actors</td>
</tr>
<tr>
<td>Total duration of initiative</td>
<td>10 years</td>
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<tr>
<td>Total budget of initiative</td>
<td>Up to 90 million Euros per year</td>
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<tr>
<td>Sectoral focus</td>
<td>Spanning across sectors and disciplines</td>
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<tr>
<td>Type of data concerned</td>
<td>Research data</td>
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<tr>
<td>Target audience (scientific community, business, civil society, general public)</td>
<td>Scientific community</td>
</tr>
<tr>
<td>Expected results</td>
<td>The NFDI is supposed to systematically develop a comprehensive research data management system, including standardised data management according to FAIR principles. It aims to sustainably secure and utilize research data, as a digital, regionally distributed and networked knowledge repository.</td>
</tr>
</tbody>
</table>

2. Rationale, motives and key drivers

In 2013, the Joint Science Conference (Gemeinsame Wissenschaftskonferenz, GWK)\(^2\) of the Federal States (Länder) and the Federal Government of Germany established the German Council for Scientific Information Infrastructures (Rat für Informationsinfrastrukturen, RfII)\(^3\), representing members of a broad spectrum of scientific disciplines, actors and institutions. The Council advises academia and the government in strategic questions regarding the future of digital science. In 2016, the Council published its recommendations “Performance through Diversity” and thereby recommended to establish a coordinated research data infrastructure for Germany (NFDI)\(^4\). Three further discussion papers directed towards the scientific community on the design of the suggested infrastructure were additionally published by the RfII. Various stakeholders, such as the Alliance of Science Organisations in Germany\(^5\), published responses to the idea of establishing a national research data infrastructure.

The Council summarised its findings concerning the current state of research data management as follows:

“While there are several good examples of research data management in Germany, there is an overall absence of coordination, and current efforts often take the form of parallel, project-based initiatives. Universal access to services for data management is lacking, as the key players at present are individual institutions and organisations, and their efforts often suffer from limited financing and/or excessive niche focus. High staff turnover means that valuable know-how is frequently lost. Furthermore, the range of services being provided is impaired by the absence of governance mechanisms which could impart greater strategic direction. In addition, there is a risk of international competitive disadvantage for Germany due to unresolved issues in the domains of quality assurance, legal compliance, data privacy, and data security. In this way, there is a clear need for action in a variety of areas.”\(^6\)

The NFDI is a wide-ranging approach to deal with this diverse landscape and therefore aims to increase the efficiency of the entire science system by establishing and further developing a comprehensive research data management system, including standardised data management according to FAIR\(^7\) principles. The NFDI is to set standards in data management and, as a digital, regionally distributed and networked knowledge repository, to sustainably secure and utilise research data. It will allow systematic and sustainable access to digital data that is easily accessible to third parties to secure (re-)use beyond the boundaries of individual databases, disciplines and countries.

The basis of the NFDI’s establishment is a Federal State-Länder Agreement\(^8\), prepared by a working group of the GWK and agreed upon in November 2018. According to the Agreement, the NFDI specifically aims at:

- developing a coordinated, networked information infrastructure for the development of sustainable interoperable research data management;

\(^2\) [https://www.gwk-bonn.de/en/](https://www.gwk-bonn.de/en/)


\(^5\) [https://www.allianzinitiative.de/?lang=en](https://www.allianzinitiative.de/?lang=en)

\(^6\) German Council for Scientific Information Infrastructures, 2016, p.1.

\(^7\) FAIR: Findable, Accessible, Interoperable and Re-Useable. The FAIR Data Principles; [https://www.force11.org/group/fairgroup/fairprinciples](https://www.force11.org/group/fairgroup/fairprinciples)

\(^8\) [https://www.gwk-bonn.de/fileadmin/Redaktion/Dokumente/Papiere/NFDI.pdf](https://www.gwk-bonn.de/fileadmin/Redaktion/Dokumente/Papiere/NFDI.pdf) (in German only)
• establishing processes and procedures accepted in the scientific disciplines for the standardised handling of research data;
• creating a reliable and sustainable range of services covering the overarching and subject-specific needs of research data management in Germany;
• the development of cross-disciplinary metadata standards for the comprehensive (re-)usability of research data;
• connecting German research data infrastructures to European and international platforms;
• the optimisation of the re-usability of research data already collected as well as the infrastructures in which they are embedded; thereby generating additional knowledge without the high costs of new data collection;
• creating a common basis for data protection and the sovereignty, integrity, security and quality of data.

3. Governance of the initiative

The National Research Data Infrastructure (NFDI) is funded by the Federal Ministry of Education and Research and the Länder. The Joint Science Conference (GWK) makes all fundamental financial decisions regarding the NFDI and, further, decides upon the legal form and office of the NFDI.

The NFDI consists of Consortia, a Consortium Assembly, a Scientific Senate and a Directorate.

**Consortia**

Consortia will be composed of several existing institutions, which may include state and state-recognised universities, non-university research institutions, non-university research institutions, academies and other publicly funded information infrastructure facilities or other relevant actors. Generally, they are organised according to specialist groups or methods, with no specifications for their institutional composition. The consortia shall develop and promote a culture of data sharing and information literacy in accordance with the FAIR principles; they shall ensure that technical services for data provision, archiving and development are established, maintained and the necessary data storage and hardware capacities are adapted to carry out national tasks. In this way, the NFDI will be formed by users of research data and infrastructure facilities working together in and between the Consortia.

The NFDI builds on existing responsibilities and complements existing funding. The member institutions within a consortium conclude cooperation agreements in which they agree on common objectives and milestones and determine who will receive funding, how the flow of funds within the consortium will be regulated and by whom the use of the funds will be demonstrated to the donors. The member institutions in the Consortia collaborate in a networked structure while maintaining their legal independence.

**Consortium Assembly**

The Consortium Assembly shall consist of the elected spokespersons of each Consortium. It determines the content-related and technical principles for the overall work of the Consortia. The Consortium Assembly ensures an exchange of information between Consortia and defines the framework conditions for implementing the standards set by the Scientific Senate and the interfaces for generic services in the participating services. It also takes position on strategic issues of the NFDI and on the involvement of the NFDI in international developments.

**Scientific Senate**

The Scientific Senate is the strategic body of the NFDI and in particular responsible for the overall strategic orientation of the NFDI. It decides on standards across consortia, metadata standards and formats on the basis of a proposal by the Consortium Assembly. Moreover, the Scientific Senate advises on the progress of the consortia’ projects and decides on the inclusion and integration of comprehensive services in the NFDI. The Scientific Senate consists of a total of 13 persons. It is made up of the Director as the chairperson; four
representatives of the Consortium Assembly; four experts from member institutions of the Alliance of Research Organisations; as well as four other experts nominated by the GWK. The members of the Scientific Senate are appointed by the GWK.

**Directorate**

The NFDI has a Director and a Head Office (Directorate). The Head Office supports the activities of the NFDI as a whole. The Director shall be a scientific expert and will be appointed for a period of five years by the GWK on the basis of a proposal from a Selection Committee, which is set up with the involvement of scientific and scientific-organisational expertise. Once the NFDI has been established as a separate legal entity, this task shall pass to the NFDI Supervisory Board. The Director is also chairperson of the Scientific Senate.

The Director represents the NFDI internally and externally. He/she steers the NFDI on the basis of the decisions and deliberations of the Scientific Senate and the Consortium Assembly and may submit topics for discussion and decision to the Scientific Senate and the Consortium Assembly. Furthermore, the Director coordinates NFDI-wide cooperation and attends to interests of the NFDI, prepares agreements with the consortia and monitors their compliance.

4. **Process and timeline**

The establishment of a National Research Data Infrastructure (NFDI) is initially planned for a period of ten years, from 2019 to 2028. The project funding period has just been initiated and started with a search for a suitable institution for the Directorate of the NFDI. By the end of the first year of the project funding period at the latest, the Directorate should be transformed into a legal entity and the Head Office of the Directorate should be determined. Established producers, users and data providers are now called upon to join consortia. Overall, the Federal Government and the Länder intend to select a total of up to 30 consortia in three tender rounds. The first call for tenders will start in the first quarter of 2019. It will be the responsibility of the German Research Foundation (DFG), as will be the peer review process.

A structural evaluation of the project is planned for the year 2025 by the German Science Council (Wissenschaftsrat). Taking into account the results of this structural evaluation, the GWK will decide in 2026 on the prospective configuration of the NFDI and on the details of further funding from 2029.

5. **Adoption and implementation**

On 26 November 2018, the GWK resolved the Announcement of the Federal State-Länder Agreement on the Establishment and Promotion of a National Research Data Infrastructure (NFDI)⁹.

Within the NFDI, users and research data providers, who work with data in a variety of ways, should be brought together to establish coordinated infrastructures for research data and to decide on standards in data management according to the FAIR principles. Research data spanning across several sectors and disciplines should be concerned. The NFDI is supposed to systematically develop a collection of research data and make it usable across disciplines. The NFDI sets standards in data management as a digital, regionally distributed and networked knowledge repository. In it, research data is sustainably secured and made usable.

As part of the data management, also metadata are an important topic of the NFDI and standards for metadata should be established to enhance data (re-)usability.

Existing data collections and services should contribute to the development of the NFDI.

6. **International Aspects**

One objective of creating the National Research Data Infrastructure is a connection of German research data infrastructures to European and international platforms. Currently, the German science system is very complex and mainly based on “vertical” structures. The NFDI aims to connect and coordinate these structures as horizontally-oriented network that organises services, personnel and processes for science in Germany.

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On the one hand, transnational activities—such as the Go-FAIR initiative\(^{10}\) or the planned European Open Science Cloud (EOSC)—are important precursors and parallel activities that can guide and advance the NFDI process.

On the other hand, many international networks—such as European Strategy Forum on Research Infrastructures (ESFRI)\(^{11}\) projects or the EOSC—rely on nationally financed and organised nodes or ‘implementation networks’\(^{12}\). The large number of international initiatives requires a coordinated national strategy, not least in order to plan the necessary investments on a case-by-case basis. Therefore, a national network and infrastructure is crucial for a qualified participation in the international coordination of data management.

The NFDI should work closely with European and international research data infrastructures wherever possible for a mutual benefit. The services offered by the NFDI may be open for regulated cross-border use, but may also include access to corresponding resources abroad. This will partly have to be organised for certain domains by the consortia and partly negotiated across the NFDI. At the level of NFDI consortia and overall management, coordination offices for internationalisation are therefore proposed.

Overall, the NFDI offers the potential to be a core element and important actor in the development of the EOSC and in further international cooperation. The NFDI wants to interlock at European level from the outset and will enable coordinated, and thus efficient, investments in German EOSC activities that might otherwise compete with each other.

7. Monitoring and Evaluation

The Federal States-Länder Agreement includes the funding of evaluation as well as potential scientific accompanying research on structural aspects of the NFDI. The intended evaluation is twofold and addresses the effectiveness of the NFDI itself as well as the funded consortia.

It is planned that the director will submit a report to the GWK summarising his/her experiences with the structural design of the NFDI including bodies and governance and their impact on the substantive work. In order to review attainment, effectiveness and increase in efficiency of the NFDI, the Science Council will then implement a structural evaluation after seven years.

The funded consortia will be evaluated regularly by the DFG. The GWK will decide on the basis of the evaluation on further integration of the respective consortium in the NFDI, further funding and, where applicable, permanent adoption/consolidation of services or the exclusion from the NFDI. In the latter case, the respective consortium will receive degressive funding of no more than two years.

8. Lessons and Challenges

The NFDI is a comprehensive approach to establish a national network for research data across several disciplines and to create new structures for cooperation. The initiative officially started on 1 January 2019 and its implementation is yet to be realised.

As mentioned in section 6 on international aspects, the cooperation with other international initiatives, such as the EOSC, is planned and some approaches and developments of the NFDI may be transferable to the EOSC or other member states of the OECD.

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\(^{10}\) Germany, together with the Netherlands and France, initiated the Go FAIR initiative, which aims at building a common environment enabling data-driven research and innovation around the world. \[https://www.go-fair.org/\]

\(^{11}\) \[https://www.esfri.eu/\]

\(^{12}\) see e-IRG: 'A strong European e-infrastructure is dependent on strong national building blocks'