

Erster deutscher Staatenbericht (2025) zur UNESCO-Empfehlung von 2021 zu

Open Science

Offene Wissenschaft (Open Science) ist schon heute vielerorts Realität. Dass sich die Wissenschaft „öffnen“ sollte, wird seit Anfang dieses Jahrtausends ernsthaft diskutiert. Einer der wichtigsten Impulse war die „Berliner Erklärung“ von 2003. Seitdem hat sich die Wissenschaft tatsächlich bereits geöffnet. Mehr als ein Drittel der wissenschaftlichen Aufsätze erscheint heute als Open Access. In der EU werden Schätzungen zufolge etwa ein Fünftel der wissenschaftlichen Daten offen bereitgestellt. Auch die Einbeziehung von Laien in Citizen Science ist für manche Disziplinen schon Standard.

Die UNESCO als die für die Wissenschaft zuständige UN-Organisation hat 2020 und 2021 ein gemeinsames Dach für Initiativen wie Open Data oder Citizen Science geschaffen. Die UNESCO benennt dabei Ziele von Offener Wissenschaft, die zugleich innerhalb wie außerhalb der Wissenschaft liegen: Einerseits soll der offenere Austausch innerhalb und zwischen wissenschaftlichen Disziplinen sowie zwischen Wissenschaft und Gesellschaft die Qualität und die Integrität der wissenschaftlichen Arbeit erhöhen. Andererseits soll die Umsetzung Offener Wissenschaft dazu führen, dass die Wissenschaft stärker als bisher zu gesamtgesellschaftlichen Zielen wie Diversität, Gerechtigkeit und Nachhaltigkeit beiträgt.

Die UNESCO hat ihre Empfehlung zu Offener Wissenschaft aufbauend auf verschiedenen eigenen völkerrechtlichen Grundlagen erarbeitet. Dies ist der erste Völkerrechtstext in diesem Feld überhaupt; eine Empfehlung muss anders als eine Konvention nicht in nationales Recht übersetzt werden. Auf der UNESCO-Generalkonferenz im November 2021 wurde die Empfehlung im Konsens von 193 Staaten verabschiedet.

Alle Staaten der Welt können und sollen die Empfehlung nutzen, insbesondere Hochschulen sowie außeruniversitäre und weitere Forschungseinrichtungen. Am besten überführen die Staaten dazu die Vorgaben der Empfehlung in rechtliche Normen oder politische Strategien auf nationaler bzw. institutioneller Ebene. In Deutschland ist neben der Bundes- auch die Landesebene eingeladen, die Umsetzung von Offener Wissenschaft zu gestalten.

Inwiefern dies passiert, dazu müssen die Staaten alle vier Jahre Bericht erstatten. In der ersten Berichtsrunde bis Ende Februar 2025 haben sich Bund und Länder bei der Beantwortung eines UNESCO-Fragebogens abgestimmt und dabei auch die Mitglieder der Allianz der Wissenschaftsorganisationen und den Stifterverband zu Beiträgen eingeladen. Die Deutsche UNESCO-Kommission hat den Prozess koordinierend unterstützt. Die inhaltlichen Antworten auf diesen Fragebogen werden in der Folge unwesentlich gekürzt, redaktionell angepasst und graphisch aufbereitet vorgestellt. Der Bericht ist zur Einreichung bei der UNESCO in englischer Sprache verfasst.

1. PROMOTING A COMMON UNDERSTANDING OF OPEN SCIENCE, ASSOCIATED BENEFITS, AND CHALLENGES, AS WELL AS DIVERSE PATHS TO OPEN SCIENCE

1.1 Has the 2021 Recommendation been promoted and/or shared with appropriate ministries and institutions as well as affiliated organizations in your country?

Yes, at federal government level, with the Federal Ministry for Education and Research (BMBF), as well as Federal Ministry for Digital and Transport (BMDV).

At state government level, with the relevant ministries mandated for scientific research of the 16 German Länder through the Standing Conference of the Ministers of Education and Cultural Affairs (KMK).

In addition, with the members of the German “Alliance of Science Organizations” (National Academy of Sciences, German Research Foundation, Max Planck Society, Fraunhofer Society, Helmholtz Association, Leibniz Association, DAAD, Alexander von Humboldt Foundation, German Science and Humanities Council, HRK - Conference of rectors of the 300+ German universities) and the the Stifterverband (a joint initiative of German companies and foundations devoted to higher education, science and innovation).

In addition, with the 50 most important Learned Societies of Germany.

1.2 Is the 2021 Recommendation on Open Science available in the national language(s) of your country?

Yes, in [German](#).

1.3 Have there been awareness raising activities on open science including all its key elements, associated benefits and challenges, organized or foreseen to be organized by the end of 2025 in your country by national authorities or entities?

Yes. However, before focussing on the 2021 Recommendation, the pioneering role of the German science system with regard to open principles in the science system has to be highlighted, since it started already in the year 2003. The “Berlin Declaration” is globally recognized as a key milestone of the Open Science movement; it has created enormous awareness globally and has been signed by some 800 institutions until today. All members of the German “Alliance of Science Organizations” have signed the Berlin Declaration. The OA2020 initiative has later added new momentum to the Berlin Declaration.

As concerns the 2021 Recommendation, the German Commission for UNESCO has organized about fifteen conferences and workshops to raise awareness about the Recommendation, starting in 2020 with the start of the negotiations. These activities targeted different audiences in Germany and internationally. As invited speakers to other conferences, representatives of the German Commission for UNESCO contributed to at least another fifteen Open Science events in Germany.

Several key Open Science stakeholders of German science organizations have included the 2021 Recommendation prominently into their standard presentations and their websites. Major funders and science organizations refer to the recommendations in their own Open Science Positions or Policies, see below 1.4.

In March 2022, the international Open Science Conference 2022 hosted by the Leibniz Association (with several hundred participants) was co-organized with the German Commission for UNESCO. Its main panel discussed the 2021 Recommendation, with participation (inter alia) from UNESCO Secretariat and the current Chair of the UNESCO Executive Board. In addition, a diverse culture of Open Science event formats has developed in Germany over the years (e.g. Open Science Festivals, thematic conferences and meetings).

In 2024, the German Commission for UNESCO has published a brochure with the translation of the Recommendation into German alongside the English original.

In 2024, the German Commission for UNESCO hosted a global online seminar for National Commissions to prepare this very 2025 periodic reporting procedure.

In October 2024, the European Open Science Cloud (EOSC) Symposium was held in Berlin, attracting more than 600 participants from Germany, Europe and abroad.

1.4 Have specific actions been undertaken or are planned to be undertaken by end of 2025 in your country to incorporate the values and principles of open science, in publicly funded research?

Yes.

In 2022, the Helmholtz Association of large German research facilities adopted its new Open Science Policy. In its very first line, the Policy refers to the 2021 Recommendation as basis of the Helmholtz Association's commitment to Open Science (<https://os.helmholtz.de/en/open-science-in-helmholtz/open-science-policy/>).

In 2022, the Leibniz Association of 96 research institutes that address issues of historical, social, economic, technological, health, and ecological relevance adopted its new Open Science Policy. The Policy uses almost all definitions in an identical way to the 2021 Recommendation and also refers to UNESCO explicitly (<https://zenodo.org/records/13777926>).

In 2022, the German Research Foundation (DFG) published its position paper on "Open Science as part of a Culture of Science". On its first page, the document refers to the 2021 Recommendation "as an essential basis for the further development of open science" (<https://www.dfg.de/en/news/news-topics/announcements-proposals/2022/info-wissenschaft-22-79>).

The joint focus "Digitalisation in Science" of the German "Alliance of Science Organizations", established already in the year 2008 as the joint initiative "Digital information", ensures consistent action of the German science system. While the initial focus was on improving access to digitally available information, the focus has been significantly widened to cover most Open Science principles in line with the UNESCO 2021 Recommendation in recent years.

2. DEVELOPING AN ENABLING POLICY ENVIRONMENT FOR OPEN SCIENCE

2.1. Does your country have a national policy, strategy or plan of action on science, technology and innovation (STI)?

Before answering this and the following questions specifically for Germany, it has to be highlighted that the STI policies of the European Union and its associated instruments, entities and funding programmes, in particular Horizon Europe and the European Research Council, are very important for the German STI system. The European Open Science Cloud (EOSC) with its recently (October 2024) launched service platform EOSC EU Node will likely be the most important Open Science platform in Europe, and therefore for Germany. Another recent example is the European Commission's Revised Charter for Access to Research Infrastructures to foster open science, innovation, and research security. On a national level, the development of the European Research Area is supported via the German ERA Roadmap by the Federal Ministry for Education and Research (BMBF).

However, assuming that there will be a separate coverage of the European level, all following answers to all questions will focus specifically on the German level.

Document and details: "Zukunftsstrategie" or "Future Research and Innovation Strategy"; Federal Ministry for Education and Research (BMBF); developed in cooperation with advisory bodies of the ministry such as the Experts' Commission EFI, the Hightech Forum, the Innovation Dialogue and the OECD Review of Innovation Policy Germany (www.bmbf.de/SharedDocs/Publikationen/DE/1/730650_Zukunftsstrategie_Forschung_und_Innovation.pdf?__blob=publicationFile&v=4); predecessor: Hightech Strategy in 2006, 2010, 2014 and 2018; 2023; English version of the Executive Summary: www.bmbf.de/SharedDocs/Publikationen/DE/FS/747580_Zukunftsstrategie_Forschung_und_Innovation_en.pdf).

2.2. In your country, is there a policy, or a set of policies and/or legal framework(s) at the national level that address open science or any of its key elements in line with the definition, values and principles outlined in the 2021 Recommendation on Open Science?

Yes.

Secondary Publication Right; German Copyright Law; 2014; covers scholarly publications which are publicly funded; German version: www.gesetze-im-internet.de/urhg/_38.html

Open Data Strategy; German Federal government; 2023; covers specifically also research data; English version: <https://bmdv.bund.de/SharedDocs/DE/Anlage/K/driving-progress-with-data.pdf>

Open Access in Germany, Joint Guidelines; Federal Government and the Länder; 2023; English version: www.bmbf.de/SharedDocs/Publikationen/DE/FS/772970_Open_Access_in_Deutschland_en.pdf

National Strategy on Open Educational Resources; Federal Ministry for Education and Research (BMBF); 2023; German version (translation currently not available)
www.bmbf.de/SharedDocs/Publikationen/DE/3/691288_OER-Strategie.pdf

White Paper Citizen Science Strategy 2030 for Germany; consortium of several hundred representatives of German science; 2022; English version: <http://zenodo.org/record/7117771>

Adopting a Research Data Law at national level is currently under discussion.

Recommendations on the Transformation of Academic Publishing: Towards Open Access; German Science and Humanities Council, 2022:
www.wissenschaftsrat.de/download/2022/9477-22_en

Federated Data Infrastructures for Scientific Use. NFDI, EOSC, Gaia-X, and the European Data Spaces: Comparison and Recommendations for a Committed Engagement to Shape the European Research Data Ecosystem; Rat für Informationsinfrastrukturen; 2024:
<https://rfii.de/download/federated-data-infrastructures-for-scientific-use/>

2.3. In your country, are there specific policy instruments that aim to promote open science?

Yes, there are several such specific policy instruments already in existence and more are under development. It is impossible to list them all. The following short selection focuses on some of the most important instruments.

The National Research Data Infrastructure (Nationale Forschungsdateninfrastruktur, NFDI) has been founded in 2019, upon initiative of the Council for Information Infrastructures (RfII). The goal of NFDI is to establish a nation-wide, decentral and ever-growing network of infrastructure and services for research data management according to agreed standards and the FAIR principles. One key goal is to foster the re-use of research data in and across all disciplines. NFDI has been established as a private-law organization and has currently more than 300 members. 27 NFDI consortia in different scientific disciplines are funded (with up to 90 million Euro per year until 2028) by the national and the state governments. The NFDI is considered as the main German (in-kind) contribution to the European Open Science Cloud (EOSC). With respect to EOSC, NFDI is among the potential candidates for the enrolment of the first wave of Candidate EOSC Nodes and currently part of the first-stage dialogue meetings (<https://eosc.eu/news/2024/11/eosc-tripartite-governance-establishes-process-to-sequence-enrolment-of-candidate-eosc-nodes/>).

GO FAIR is an international initiative with focus on Europe that has been jointly created by France, Germany and the Netherlands, with a shared funding of all three governments and a shared coordination office by the three countries. GO FAIR has as key purpose to promote the FAIR principles in the context of the EOSC.

Open Access is the element of Open Science with the largest diversity of policy instruments in Germany:

The DEAL Consortium is initiated by the Alliance of Science Organizations in Germany, spearheaded by the German Rectors' Conference (HRK) and operated by the Max Planck Digital Library (MPDL). DEAL negotiates nationwide transformative and ground-breaking "Publish and Read" agreements with the largest three commercial publishers of scholarly journals on behalf of the German research institutions landscape. All scientific publications published under DEAL's framework contract rules are accessible Open Access. By

participating in the DEAL agreements, German scientific institutions receive a uniform, comprehensive service package that covers access to the entire range of these journals. These access rights are also permanently secured by DEAL. Currently, DEAL started an “Open Access means CC-BY” initiative. The most recent five-year “opt-in” contract with Elsevier was signed in 2023, the second with Springer Nature in 2023, and also the second with Wiley in 2023, enabling approximately half of German research outputs to be published Open Access. The aim is to enable researchers in Germany to publish openly. At the same time, it aims to contain the costs of scientific publishing and establish a sustainable, publication-based funding model. (<https://deal-konsortium.de/en/about-deal/rationale-and-objectives>).

The German Research Foundation’s (Deutsche Forschungsgemeinschaft) funding programme ‘Open Access Publication Funding’ is of great significance to promote Open Science. The Programme grants a fixed allowance for the publication of research results via Open Access to research institutions (not individuals). In 2024, grants worth more than 38 million Euro have been awarded (funding rate of 93%). To foster equity along the lines of the UNESCO recommendations, Diamond Open Access and publicly funded infrastructures for Open Access are supported as well, e.g. the National Service Center for Diamond Open Access (<https://www.dfg.de/en/news/news-topics/announcements-proposals/2025/ifr-25-07>). Further funding programmes target establishing and developing infrastructures for research data management and – since 2024 – for research software also.

The Max Planck Society has a significant impact both nationally and globally through its dedication to advancing Open Access scholarly publishing. Beginning in 2003, as initiator of the Berlin OA Conference series, the Max Planck Society has continued to provide one of the most important forums for professional discussion of the international development towards Open Access publishing of scientific knowledge. Over the years, this conference series has evolved and is now organized by Open Access 2020 (OA2020), a dedicated initiative that continues to convene international stakeholders to drive Open Access forward. OA2020, coordinated by the Max Planck Digital Library (MPDL), brings together research institutions and funders worldwide to coordinate and enhance negotiation power with publishers and to foster policy development. At the national level, the Max Planck Society operates the MPDL Services gGmbH, which was established to implement nationwide Open Access transformation agreements under the DEAL project (see above).

The German Ministry for Research and Education is funding the establishment of an Open Access culture as central part of Germany’s scientific landscape in diverse funding programmes and initiatives, ranging from the national open-access.network competence center for Open Access to concrete projects for establishing new Open Access formats and business models.

As concerns Open Science in truly all its facets, activities of the Leibniz Association and of the Helmholtz Association stand out. The Leibniz Strategy Forum on Open Science (of the Leibniz Association; the name of the format was previously the Leibniz Research Alliance Open Science) foster Open Science practices within the Leibniz Association and beyond. For more than 10 years, it hosts the annual international Open Science conferences. In turn, the Helmholtz Open Science Office has been founded in 2005. It has established an Open Science task force across all Helmholtz Association research facilities, it provides consultancy and advice, published practical recommendations, guidelines and briefings and hosts diverse meetings (e.g. more than 70 online seminars).

Also non-governmental international initiatives have to be highlighted that have impact in Germany, such as the "Amsterdam Declaration on Funding Research Software Sustainability", which has been signed in 2024 by the DFG, for example. Similarly, the 2024 "Barcelona Declaration on Open Research Information" has been signed by several higher education institutions and academic libraries from Germany.

2.4. In your country, is there a national implementation plan, strategy, policy or a roadmap for implementation of open science at the national level in line with the 2021 Recommendation?

No. In light of existing strategies for Open Data, Open Access, OER, Citizen Science (cp. above), the need for such an instrument was not seen so far. Discussion is ongoing.

2.5. In your country, are there policies and/or strategies that promote open science in line with the 2021 Recommendation at institutional level, including in the context of research-performing institutions, universities, scientific unions and associations and learned societies?

Yes, compare question 1.4 as refers to research associations and organisations. Additionally, many if not most higher education institutions of all types and sizes in Germany have implemented Open Science strategies and/or policies. There is no complete overview on the national level due to the federal structure of the German research and education system. Some pertinent examples: Berlin University Alliance (HU Berlin, FU Berlin, TU Berlin, and Charité Berlin), University of Freiburg, University of Tübingen, Leibniz University Hannover, TH Köln, the universities in Hamburg, University of Applied Sciences Jena.

2.6 In your country, are there specific funding mechanisms for open science at the national level?

Yes, compare question 2.3.

2.7. In your country, have open science practices been integrated in existing research funding mechanisms?

Yes, the German research funders have not made Open Access practices a legally obligatory requirement for recipients of research funding in general. However, a change of German copyright law made a secondary publication according to Open Access principles a legally possible choice for the authors in the first place (compare the act UrhG).

Also at the level of the Länder, there exist funding programmes for Open Science practices. For example, the "NiedersachsenOPEN" programme, with a total fund of 3.5 millions EUR, supports non-commercial, science-based publication programmes based on 'Diamond Open Access' and, beyond that, the development of a 'Diamond Open Access publication landscape' in the state of Lower Saxony (www.mwk.niedersachsen.de/startseite/aktuelles/presseinformationen/niedersachsen-fordert-open-access-publikationen-mit-neuem-fonds-230331.html). Similar funds to support Open Access publications exist in Schleswig-Holstein and Thuringia.

Researchers employed by certain types of institutes, for example those of the Helmholtz Association, are required to publish Open Access (if there are no contravening legal requirements).

The Alexander von Humboldt Foundation also supports the Open Access publication of research results.

There are ongoing discussions in the German Alliance of Science Organizations and in the German National Chapter of CoARA members as to whether and how to include Open Science practices in Research Assessment. The current view is that while Open Science activities should, where appropriate, be recognized as part of the assessment of individual researchers, it is unwise to treat (the degree of) Open Science implementation as a criterion in the assessment of research proposals, as there are currently more effective ways to support Open Science.

2.8. Have efforts been made or are foreseen to be undertaken by end of 2025 in your country to foster equitable public-private partnerships on open science in line with the 2021 Recommendation?

Yes. For the DEAL consortium, please refer to question 2.3. The Stifterverband has promoted the adoption of Open Science strategies and policies by higher education institutions in different ways. E.g. it has developed an Open Science self-assessment tool for universities (<https://road2openness.de/en/>) as well as set up an Open Science strategy workshop programme to develop such a strategy with workshops, consultation hours, dialogue and networking. For the call for applications see www.stifterverband.org/road2openness-strategiewerkstatt.

Specifically, with regard to research data, there are intense discussions how partners from industry and publicly-funded research can exchange their data and enter into collaboration agreements. In this regard, the NFDI section “industry engagement” (<https://www.nfdi.de/section-industry-engagement/?lang=en>) is an important player.

2.9. Is there a national monitoring framework for open science in your country? Or are there specific indicators on open science included in the national monitoring and evaluation framework for STI policy?

Not on a national level. However, there is German involvement in the OSMI, the Open Science Monitoring Initiative (<https://open-science-monitoring.org>), with the Charité Berlin as a founding member.

3. INVESTING IN OPEN SCIENCE INFRASTRUCTURES AND SERVICES

3.1. What is the latest official data for your country's percentage of national gross domestic product (GDP) dedicated to research and development expenditure? Please also indicate the year of publication of this data, and to which year(s) it refers.

In 2023, Germany invested 3,1% of its GDP in research and development (<https://www.stifterverband.org/forschung-und-entwicklung>; <https://www.destatis.de/Europa/DE/Staat/EU-Staaten/Deutschland.html>).

3.2. What is the latest official data for the percentage of your country's population that have access to reliable internet and bandwidth? Please also indicate the year of publication of this data, and to which year(s) it refers?

In Germany, almost the entire population has access to reliable internet with sufficient bandwidth. In 2021, 98.3% of urban households and 82,3% of rural households had access to broadband of at least 50 Mbit/s. Mobile internet comes on top (in 2024, 99.8% coverage of 2G and 92.5% of 5G) (BMVI 2021: https://bmdv.bund.de/SharedDocs/DE/Publikationen/DG/breitband-verfuegbarkeit-mitte-2021.pdf?__blob=publicationFile)

3.3. Are there national research and education networks (NRENs) active in the country?

Yes, the “German Research Network” (DFN) was established in 1984. It connects some 850 universities and other research institutes to the X-WiN (most recent network infrastructure with 10,250 kilometers of optical fiber connections and a multi-terabit core network) and Géant. X-WiN is one of the largest and most powerful communication networks in the world. www.dfn.de/en/network/.

3.4. Are there national or institutional open science infrastructures in your country?

Yes, all infrastructure suggested in this question is available in a non-commercial way to German public sector scientists (i.e. federated information technology infrastructure for open science, including high-performance computing, cloud computing and data storage; community managed infrastructures, protocols and standards, for example those that support biodiversity and engagement with society; platforms for exchanges and co-creation of knowledge between scientists and society; community-based monitoring and information systems to complement national, regional and global data and information systems).

Many or most infrastructures respect the FAIR principles (Findable, Accessible, Interoperable, and Reusable). Through the work of NFDI consortia, the CARE principles (Collective Benefit, Authority to Control, Responsibility and Ethics) get more and more known. Many infrastructures are offered at the level of the 16 Länder, because the Länder have the constitutional mandate for education and higher education. Providing a list of all such infrastructures is therefore impossible because of the high number. However, there is a number of relevant registries for publication repositories (Liste der Publikationsdienste - Deutsche Initiative für Netzwerkinformation e. V., <https://dini.de/dienste-projekte/publikationsdienste>), research data repositories (www.re3data.org) and other reliable and certified infrastructures (https://risources.dfg.de/home_en.html).

The UNESCO Open Science Outlook 2023 contained the information from May 2023 that Germany with 498 Open Data repositories ranked No 2 globally and with 299 Open Access repositories ranked No 4 globally. In addition, there are about 345 Diamond Open Access journals.

According to a study by the Technopolis Group (2023), commissioned by the German Research Foundation for the Alliance of Science Organizations, with the goal to map and describe Open Access services in Germany, non-commercial Open Access offerings in Germany form an important (and importantly decentralised) backbone of the academic publishing culture, which includes sufficient subject-specific and interdisciplinary publication offerings and background services. However, there remains a lack of success

criteria as well as coordination for avoiding redundancies. In addition, not all services are yet reliable, sustainable, and competitive in terms of their quality.

For the nation-wide developed standards for research data management in the NFDI project, compare question 2.3.

Germany hosts several high-performance computers at public research facilities. The three computers that are currently offering more than 5 PetaFLOPS in peak capacity are HAWK in Stuttgart (26 PetaFLOPS), LEVANTE at the German Climate Research Center Hamburg (14 PetaFLOPS) as well as JUWELS at Jülich Research Center (85 PetaFLOPS). In 2025, with JUPITER, the first European ExaFLOPS computer will be launched in Germany.

Furthermore, the NHR Alliance (www.nhr-verein.de/en) bundles the resources and competencies of university high-performance computing and make them available to scientists at German universities free of charge. The NHR Alliance does not only provide computing capacities, but also supports users e.g. by training in the use of high-performance computing in their fields of application.

Most of the 16 Länder offer a state-wide academic cloud to their universities (e.g. Academic Cloud in Lower Saxony: <https://academiccloud.de/>).

One of the most important infrastructures for Open Science are “support offices” that provide advice and consultancy at the level of some of the 16 Länder. Examples are:

- the openaccess.nrw network and collaboration of the state of Northrhine Westfalia
- “Hamburg Open Science” of the state of Hamburg
- the Open Access office of the state of Berlin

Such state-based infrastructures are often based on state Open Science strategies

- the E-Science strategy of the state of Baden-Württemberg
- the Open Access strategy of the state of Brandenburg
- the state of Schleswig-Holstein’s strategy 2020
- the state of Thuringia’s strategy for a digital society

In the context of Open Access, these are anchored on a national level by BMBF’s Open Access strategy from 2016, the Bund-Länder-Open-Access-Guidelines from 2023 and BMBF’s establishment of nation-wide infrastructure like the open-access.network competence platform and the Open Access Monitor.

As concerns Citizen Science, the networking platform www.mitforschen.com (earlier: www.buergerschaffenwissen.de) is the central national platform for Citizen Science in Germany. The platform presents, connects and supports citizen science projects since 2014 and is funded by the BMBF.

Since the year 2000, the BMBF has funded the initiative “Science in Dialogue” (“Wissenschaft im Dialog”, WiD, <https://wissenschaft-im-dialog.de/>) as the most important nationwide structure to foster science communication. WiD offers the annual national forum on science communication. There is also NaWiK (<https://nawik.de/>), the national institute on science communication, and the national association of higher education communication (www.bundesverband-hochschulkommunikation.de/). All three partners provide together the platform www.wissenschaftskommunikation.de and together or individually they offer

several additional nationwide formats such as training, newsletters, etc. All formats receive funding by the BMBF.

Currently, a “National Service Point for Diamond Open Access” is being established in Germany (compare question 2.3) Its aim is to promote the establishment and further development of diamond open access publication structures. As the German ‘Diamond Capacity Centre’, the Service Agency will be part of a European network in the European Diamond Capacity Hub (EDCH).

3.5. Does your country host or fund any federated regional or international information technology infrastructure for open science?

Yes, Germany is a key supporter of the European Open Science Cloud (EOSC). The EOSC Association based in Brussels has 19 institutional members from Germany, among them NFDI (compare question 2.3), the DFG, the DFN (cp. question 3.3) and individual institutions such as DESY, DLR and GSI. The NFDI is the officially mandated organisation in the EOSC association and is considered at the main (in-kind) contribution of Germany to the EOSC. In addition, a process is currently underway to select so-called national EOSC nodes that complement the EOSC EU node that was presented to the public in October 2024. The EOSC EU node currently offers six services open for European researchers, among which file sync and share, virtual machines, large file or bulk data transfer and a cloud container platform.

Furthermore, Germany supports the expansion of Open Research Europe as a publicly funded publication infrastructure. It also funds or contributes to funding international infrastructures like zbMath, SCOAP3, DOAJ and OAPEN.

3.6. Is your country involved in any North-South, North-South-South and South-South collaborations to optimize infrastructure use and joint strategies for shared, multinational, regional and national open science platforms?

Yes, Germany supports North-South and North-South-South collaborations in research with all world regions. Moving the frameworks of such collaborations towards equity among participants in the collaborations is a priority. At the same time, Open Source principles are also actively promoted in such collaborations, sometimes with considerable funding. This is especially true in collaborations that aim at establishing long-term viable research infrastructures. However, it has become more and more important to take security and competition aspects into account when implementing Open Science principles worldwide.

An example for this support is SASSCAL (Southern African Science Service Centre for Climate Change and Adaptive Land Management), established in 2012 with funding from BMBF. Part of SASSCAL is the transnational OADC (Open Access Data Center, <https://sasscal.org/oadc-open-access-data-center/>). For West Africa, WASCAL (West African Science Service Centre on Climate Change and Adapted Land Use), also established in 2012, with funding from BMBF, is working on an open data infrastructure.

Open Science principles are also actively promoted in smaller-scale projects such as in the 2021-2023 project OWASA (Open science to support local water security in Southern Africa) as part of the BMBF funded African-German research programme Water Security in Africa - WASA (www.fona.de/en/measures/funding-measures/water-security-in-africa-wasa.php), providing observation and modelling data to government stakeholders and research institutions in Africa.

4. INVESTING IN HUMAN RESOURCES, TRAINING, EDUCATION, DIGITAL LITERACY AND CAPACITY BUILDING FOR OPEN SCIENCE

4.1. Has systematic capacity building on open science taken place in higher education and/or research performing institutions in your country?

Yes, building the “[open-access.network](#)” started in 2019 and is now, after completion, a nation-wide network for capacity building on Open Access, funded by BMBF. The network offers full information on Open Access, and clarifies any question and presents benefits and challenges. The network aims at connecting relevant Open Access pioneers and existing Open Access service points in higher education institutions and research performing institutions and offers various trainings, workshops and webinars. A large variety of Open Educational Resources and other Open Access competence building material is offered by [open-access.network](#) to be included in competence building measures at higher education or research institutions.

There are similar platforms for research data (<https://forschungsdaten.info>) and for Open Educational Resources (<https://open-educational-resources.de>).

Universities in Germany are autonomous. Therefore, each of the 400+ German universities decides individually about the capacity building it offers to its students, early-career scientists and seasoned scientists. Many or most universities offer regular formalized courses on Open Science. Often, such courses are provided by the university library. To our knowledge, there are no obligatory courses for students yet at German universities.

As an example, since 2023, the University of Konstanz which is a leading German university in terms of Open Science, offers (in English language and as OER) a basic course and an advanced course on Open Science, with altogether 15 online modules of 15 minutes each: www.kim.uni-konstanz.de/en/openscience/open-science-courses/. As another example, the University of Bochum has hosted its first Open Science Month with a Moodle course and more than 20 events in November 2024, after hosting Open Science weeks in previous years. Another pioneer is Munich’s LMU university which in 2018 has founded the LMU Open Science Center (www.osc.uni-muenchen.de).

German Science Organisations do also engage in capacity building. The Max Planck Society e.g. is active through regular initiatives aimed at researchers. A key component of these efforts are the periodically organized Open Science Days, a conference that hosts open expert discussions on current developments within Open Science within and beyond the Max Planck Society. This is complemented by the annual meeting of the Open Science Ambassadors, a network primarily composed of early-career researchers who serve as multipliers within their Max Planck Institutes. The meeting includes dedicated talks, workshops and discussion on potential activities to further promote Open Science practices across the Max Planck Institutes.

In addition, the consortia of the National Research Data Infrastructure (NFDI; cf. 2.3) offer a wide range of discipline-specific training workshops, tools or help desks to support researchers. German institutions also actively contribute to the annual international Love Data Week (LDW), an international week of action around the topics of research data and

research data management, with a very broad and varied programme (<https://forschungsdaten.info/fdm-im-deutschsprachigen-raum/love-data-week-2025/>).

In 2021 and 2022, the BMBF implemented three calls for proposals on data competencies in research: one focussing on young researchers, one on data management in universities of applied sciences and one with a structural component with the aim to build-up 11 data competence centres (Datenkompetenzzentren) at German higher education and research institutions. The projects are currently running.

The Länder support the Kooperationsnetzwerk OER-förderliche Infrastrukturen und Dienste (cooperation network OER-promoting infrastructures and services; KNOER). KNOER is an association of mandated public institutions that promote, coordinate and network digitally supported teaching and learning in their respective higher education institutions.

With the KNOER cooperation network, the participating institutions have created a binding and sustainable structure for cross-Länder cooperation in the digitisation of teaching in the higher education sector. The cooperation is geared towards cross-Länder networking and bundling of OER-conducive, digital teaching/learning infrastructures and services. The network enables its members to exchange experiences as equal partners, identify common interests and represent them at the federal level. In doing so, they jointly advance important issues and solutions around OER in higher education.

4.2. Have capacity building programmes for policy makers on how to integrate core values and principles of open science (as laid down in the 2021 Recommendation) in STI policies and strategies taken place in your country?

Yes, Germany has a favourable political framework for Open Science and is making good progress in this respect. It is the subject of numerous ongoing initiatives and open science activities and is partly covered by funding activities (e.g. BMBF-funded programme on data competence centres).

4.3. Has a framework of open science competencies been incorporated into higher education research skills curricula in your country, or is it foreseen by the end of 2025?

No. Open Science (or relevant parts of Open Science such as science communication or Open Access) are part of many individual higher education curricula. Due to university autonomy, only very few centralized requirements are possible for higher education curricula in Germany. Higher education curricula in general are not approved by state authorities but subject to quality assurance procedures based on a peer process run by private-sector accreditation agencies and the German Accreditation Council. Therefore, it is impossible for the Member State to require the incorporation of such competencies in curricula. Instead, it is incumbent upon the Member State to highlight the importance of Open Science practices and count on voluntary inclusion into curricula. This is happening.

4.4. Are open educational resources as defined in the 2019 UNESCO Recommendation on Open Educational Resources, used as an instrument for open science capacity building in your country in line with the 2019 Recommendation mentioned above??

YES (compare question 4.1)

- 4.5. Have there been any initiatives in your country to support science communication in line with open science value and principles with a view to the dissemination of scientific knowledge to researchers of different disciplines, decision-makers and the public at large?**

Compare the list of initiatives in 3.4

5. FOSTERING A CULTURE OF OPEN SCIENCE AND ALIGNING INCENTIVES FOR OPEN SCIENCE

- 5.1. Have there been any initiatives at the national or institutional level, e.g. by universities and/or research performing institutions, to review the existing research assessment and evaluation processes in order to align them with open science principles and values or are they foreseen by the end of 2025?**

Yes. German science organizations participate in several international initiatives to review current practices of research assessment. For example, CoARA has more than 30 members from Germany, including the DFG, the Leibniz Association, the Alexander von Humboldt Foundation and several large universities. A National Chapter for CoARA was created in 2024 (www.dfg.de/de/aktuelles/neuigkeiten-themen/info-wissenschaft/2024/ifw-24-17). The EU Commission has established in 2024 an action plan to implement CoARA recommendations (ARRA).

The Global Young Academy, whose Secretariat is hosted in Germany, is also involved in several initiatives.

German researchers also provided much input to the debate on quality criteria for societal engagement in research.

- 5.2. Have specific clauses that recognize open science practices, including sharing, collaborating and engaging with other researchers and societal actors beyond the scientific community, or dialogue with other knowledge systems, been incorporated in the career evaluation and progression systems or are foreseen by the end of 2025?**

No. There are early debates on this issue and the Alliance of Science Organizations held a workshop on this topic in 2024 preparing a document to be made public in 2025. The German Research Foundation published a thorough analysis of currently obstacles in Research Assessment as relating to publications: DFG, German Research Foundation - Academic Publishing as a Foundation and Area of Leverage for Research Assessment (www.dfg.de/resource/blob/175776/d2d371e8572b7bcf23bd8bf273354ac6/positionspapier-publikationswesen-en-data.pdf).

- 5.3. Have there been any initiatives in your country to recognize and reward open science practices or are they foreseen by the end of 2025?**

There are (and have been) several awards for Open Science practices. For example, the “Enter Award” for Open Access practices, funded by the BMBF and implemented by [irihts.lab](https://www.irihts.org/) in 2024. The Hamburg Open Science Programme, the Humboldt University of Berlin, the University of Lübeck, the University of Oldenburg, and the Max Planck Institute

for Educational Research have also established such awards. Also, the Berlin Institut of Health @ Charité offers a range of awards which aim at diverse dimensions of open science: www.bihealth.org/en/translation/innovation-enabler/quest-center/calls-and-awards. The Stifterverband is one of the key players to support Open Science practices and as such offers e.g. the Open Data Impact Award (www.stifterverband.org/innosci/open-data-impact-award).

5.4. Have there been any unintended negative consequences of open science practices reported in your country

Yes. There is an intensive debate in the German science system on how to promote openness in international cooperation with partner countries with other practices and understanding of openness. Negative consequences are currently also discussed in relation to the costs for (commercial) Open Access. Open Science has become a topic in relation to Research Security and Digital Sovereignty.

6. PROMOTING INNOVATIVE APPROACHES FOR OPEN SCIENCE AT DIFFERENT STAGES OF THE SCIENTIFIC PROCESS

6.1. Have there been any initiatives at the national or institutional level that promote innovative, participatory methodological or procedural changes at different stages of the research cycle to increase the openness of the entire scientific process?

Yes, at both national and institutional levels. All practices stated as examples in the question are relevant (promotion of pre-prints; exploration of open peer-review practices; valuing and sharing of negative scientific results and associated data; participatory methods that value inputs from societal actors, e.g. citizen science, crowdsourcing scientific projects; development of participatory strategies for identifying the needs of marginalized communities and highlighting socially relevant issues to be incorporated into research agendas; promoting open innovation practices).

Such practices are promoted or at least discussed and experimented with at national and at institutional level. Most of these issues have been addressed before in this questionnaire. In particular, there are examples of higher education institutions' Open Science policies and strategies that address several of these actions (see above). Also, the NFDI is an important actor contributing to sharing data openly in and across disciplines.

Many of these aspects are covered by the "[Code of Conduct: Guidelines for Safeguarding Good Research Practice](#)" (administered by the DFG) that is adopted by almost all universities and research organizations. Regarding pre-prints and open review as well as sharing negative results, see e.g. the DFG report "[Academic Publishing as a Foundation and Area of Leverage for Research Assessment](#)" (cf. 5.2). As concerns Open Innovation as a part of Open Science, Germany has supported the 2024 consensus in the G20 on an Open Innovation Strategy. Also as concerns Open Innovation, the "Stifterverband" of German foundations has implemented a multi-annual project in recent years (innOsci) that has promoted the strategic opening of innovation processes. The project has resulted, inter alia, in an "Open Transfer Index" to measure open innovation processes. Two examples with

considerable use in Germany can be given as concerns participatory strategies for highlighting socially relevant issues: “Bürgerräte” (bringing together dozens or hundreds of randomly chosen citizens), inter alia the “BürgerRat Forschung” (citizens’ council on research), as well as “Reallabore” (“living labs”) as structured cooperation formats between science and civil society. Both formats are used at the local level and at the national level.

With regards to Citizen Science, the Leibniz Association promotes the concept through its internal working group Citizen Science, dozens of concrete projects and participation in the European Citizen Science Association. The Helmholtz Association pursues exactly the same approach. The Alliance of Science Organizations in Germany has issued a statement in 2022 where it commits itself to enable participation in research and to support it where it promises added value for science and the humanities and society. It also defines certain premises for fruitful citizen participation in science (www.allianz-der-wissenschaftsorganisationen.de/wp-content/uploads/2022/11/2022-11-09_Allianz_Statement_Participation.pdf)

See also the BMBF funded internet portal «[mit:forschen](http://mit.forschen)». The 6th Forum Citizen Science was held in 2023 in Freiburg.

7. PROMOTING INTERNATIONAL AND MULTI-STAKEHOLDER COOPERATION IN THE CONTEXT OF OPEN SCIENCE AND WITH VIEW TO REDUCING DIGITAL, TECHNOLOGICAL AND KNOWLEDGE GAPS

7.1. How is your country promoting and facilitating international scientific collaborations on open science as outlined in the 2021 Recommendation on Open Science?

Relevant strategies of German international scientific cooperation, for example the 2024 Strategy for promoting an international orientation of German universities (www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2024/2024_06_14-Strategie-Internationalisierung-Hochschulen.pdf), contain implicit or explicit references to Open Science principles – already the predecessor 2016 strategy promoted North-South collaborations on Open Access.

7.2. Does your country have a strategy or a plan for stimulating cross-border multi-stakeholder collaboration on open science, including with regards to exchange of best practices, capacity building and metrics for open science?

No. It is a priority to promote Open Science principles as part of all international activities. A stand-alone plan on cross-border Open Science practices is not a priority thus.

However, Germany is an active member of CoNOSC, the Council for National Open Science Coordination. CoNOSC brings together national Open Science leaders to engage in an international dialogue and to share good practice for a stronger and more unified, workable Open Science policy framework (<https://conosc.org/>).

7.3. Is your country involved in any discussion on the establishment of regional and international funding mechanisms for open science?

Yes. European Open Science Cloud (<https://eosc.eu> and <https://open-science-cloud.ec.europa.eu>) – INFRAEOSC

Open Research Europe (Statement of Intent on Open Research Europe:
<https://zenodo.org/records/14624287>)

8. GENERAL CONSIDERATIONS

8.1. Are there any specific external causes that may impede the implementation of the 2021 UNESCO Recommendation on Open Science in your country?

No.

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