Federal Ministry
of Education
and Research

Global Challenges, Joint Solutions

Federal Government Report on International Cooperation in Education, Science and Research 2021–2022

Political summary

Foreword

Dear reader,

Cooperation with the brightest minds and the most innovative science centres around the world provides inspiration and stimulates the German research and education community. What is more: exchange across national borders is often indispensable for achieving scientific success. We have seen an outstanding example of this during the COVID-19 pandemic. Detection methods and vaccines were developed in record time – here in Germany.

The Federal Government is taking advantage of the opportunities offered by international cooperation in numerous other fields as well, for example in research on new energy technologies and green hydrogen. In this way, we are actively combatting climate change.

In addition, multilateral cooperation strengthens our independence and resilience. This is of growing importance in a world characterized by fierce global competition, systemic rivalry, and geopolitical uncertainties such as those resulting from the Russian war of aggression against Ukraine. What this means for us is clear: we must readjust our international cooperation – working with partners within and outside the European Union. Our ambition is to ensure as much openness in education, science and research as possible. At the same time, we want to minimize risks and increase our security.

The Federal Government report describes these conflicting requirements and how international cooperation provides us with opportunities which we want to use. Multilateral forums can serve to maintain dialogue even with challenging states. At the same time, we can defend our principles at international level and reach agreement with partners who share our values. This conviction also guided us in our G7 Presidency in 2022, when we placed a focus on freedom and security in science and research. The report also deals with the restructuring of the European Research Area and the question of how common European goals and priorities can be realized under the German Action Plan.

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Member of the German Bundestag
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Political Summary

1 Addressing challenges together – current trends in international cooperation

The report "Global Challenges, Joint Solutions – Federal Government Report on International Cooperation in Education, Science and Research 2021–2022"[1] comes during a period characterized by developments with a major impact on international cooperation in education, science and research.

Climate change requires us to take adaptation and mitigation measures which affect the whole of society. The increase in transmissions of diseases across species highlights that the cross-sectoral One Health approach is needed in order to improve prevention. This means that the health of humans, animals and the ecosystem have to be considered together. The digital transformation will radically change many areas of life, for example due to the impacts of quantum technology or artificial intelligence. Current geopolitical challenges involve new threats to the freedom of education, science and research. Events such as the COVID-19 pandemic or the Russian Federation's war of aggression against Ukraine in violation of international law impacted Germany and the international community extensively and without much warning. The *Zeitenwende* or turning point in history, as spoken about by Federal Chancellor Olaf Scholz on 27 February 2022, together with national security interests require German scientific players to adjust the orientation of their international cooperation.

These challenges – and other major challenges addressed by the Future Research and Innovation Strategy Germany, such as preserving biodiversity and strengthening resource efficiency – also make it necessary, in many cases, to change our thinking in education, science and research. At the same time, science and research also offer opportunities that may contribute to overcoming these challenges. High-quality and freely accessible education is the essential foundation for this.

1 The first chapter of the report serves as a political summary. The political summary (in German and in English) as well as the full report (in German) are available at Bundesbericht Internationale Kooperation – BMBF.

Changed framework conditions for international cooperation

The challenges mentioned are of transnational and cross-sectoral nature and can therefore only be successfully addressed through international cooperation. Building on its activities at national level, the Federal Government is therefore engaging and networking at regional and global level. Multilateral bodies and structures facilitate and strengthen this type of global networking and coordination. At the same time international cooperation is characterized by a situation where, on the one hand, opportunities need to be utilized while, on the other, there is competition between countries and governments for power and influence in an increasingly multipolar world. What is therefore becoming more important are coalitions of countries that share the same values and principles – such as freedom, human rights and democracy – and jointly defend these in an international context.

Systemic rivalries increase the risk of misappropriation or misuse of research findings. This as well as attempts at external political interference threaten the **freedom of education, science and research.** In Germany, the freedom of science, research and teaching enjoys constitutional protection. This also places direct responsibility on higher education and research institutions as well as on researchers. In the higher education sector, for example, the Competence Centre for International Academic Collaborations of the German Academic Exchange Service (DAAD KIWi) advises higher education institutions on how to meet this responsibility even under complex overall conditions.

The Federal Government also assumes its responsibility for protecting the freedom and security of science. The Federal Ministry of Education and Research (BMBF) engages in discussion about the freedom of science and research in the European Higher Education Area and the European Research Area as well as with like-minded partners within the G7 and the OECD and also at bilateral level. The Federal Government supports the science community by raising awareness about current risks, creating suitable framework conditions and providing specific precautionary measures. Where there is a need for improvement, the Federal Foreign Office regularly highlights scientific freedom as an important precondition for science cooperation with Germany and the EU in political discussions with other countries.

Germany and the People's Republic of China have shared many years of cooperation in research and education. As explained in the Federal Government's China Strategy of July 2023, China is simultaneously a partner, competitor and systemic rival. China's actions and decisions have led to increased rivalry and competition in German-Chinese relations over the last few years. For this reason, the Federal Government regularly exchanges views and information concerning aspects of the relationship with China with the Länder (federal states), the Alliance of Science Organisations in Germany and higher education institutions. At European level, the Federal Government aims for a coordinated stance and an evidence-based approach that is based on reciprocity, European values and interests. The firm guiding principle is that cooperation with China will concentrate on projects offering added value for Germany and Europe. The Federal Government is taking measures to minimize the risk of research findings being misused. With regard to research on global challenges such as climate change, Germany is actively reminding China of its responsibilities as a partner. At the same time, China's policy of Military-Civil Fusion limits cooperation. The Federal Government bears in mind that civilian research projects, including basic research, are strategically examined by China in terms of their potential military use.

The relationship with the Russian Federation following the start of the Russian war of aggression against Ukraine is an extreme example of developments leading to a shift from international cooperation towards systemic rivalry and even to an almost complete discontinuation of government cooperation.

With its war of aggression against Ukraine as well as the so-called "annexation" of Ukrainian territories in 2014 and 2022, **the Russian Federation (Russia)** violates basic principles of international law. The international community has condemned Russia's aggression and Belarus's support for the war of aggression by an overwhelming majority in the UN General Assembly.

The Federal Government immediately condemned the war of aggression and its repercussions in the strongest terms. It has taken action aimed at highlighting to the Russian Federation that cooperation under previously applicable conditions is now inconceivable in light of the gross violation of international law.

Therefore, the BMBF's and Federal Foreign Office's reaction was resolute. Cooperation in education, science and research with authorities in the Russian Federation and Belarus was immediately frozen. The Alliance of Science Organisations in Germany and the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany acted in the same way. Existing cooperation activities with state authorities in the Russian Federation were subjected to critical review and, in compliance with legal framework conditions, discontinued or continued without Russian or Belarusian partners. Activities under the German-Russian Roadmap of Collaboration in Education, Science, Research and Innovation were suspended. Planned measures were not followed up. The Federal Government has continued to honour its obligations under international law. During the reporting period, the Moscow office of the German Academic Exchange Service continued to deal with a high demand for individual funding of Russian students and researchers.

Support for Ukraine

In view of Russia's war of aggression in violation of international law, the Federal Government stands in solidarity with Ukraine together with the Alliance of Science Organisations in Germany and the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany. Thus, German-Ukrainian cooperation in education and science is being continued and expanded resolutely at all levels in a spirit of trust. Together with the Federal Foreign Office, the BMBF regularly exchanges views with Ukraine on how to shape the future of education and research in Ukraine. This is true both for the area of research cooperation and when it comes to developing education potential and training skilled workers for the purpose of reconstruction.

Together with the *Länder* and science organizations, the Federal Government works to offer the best possible education and job prospects for Ukrainian pupils, students and researchers – whether they have remained in their home country or have sought refuge in Germany (see full report Chapter 4.4).

COVID-19 pandemic

In the two-year reporting period, the COVID-19 pandemic had a major impact on many areas of life around the world. In addition to the immediate negative impact of the pandemic, in particular on health, society and the economy, there were also positive developments in international cooperation. The borderless nature of the pandemic highlighted the urgent need for international cooperation which, as a result, was intensified (see full report Chapter 3). The various international initiatives for vaccine development and distribution are excellent examples in this regard. Moreover, there is a rising awareness with regard to the crucial role of access to research results. The increase in fake news and the dissemina-

tion of non-evidence-based information during the pandemic put the focus on science communication which serves the public interest. The G7 countries, for example, announced plans for a joint working group on questions relating to science communication.

Over the next few years, post-COVID syndrome will pose a global challenge. We need joint international research to examine what causes the long-term effects of COVID-19 and to derive effective treatment and care.

2 Strategies for our future – progress through education, science and research

The **Federal Government's Strategy for the Internationalization of Education, Science and Research** has been providing the framework for Germany's international cooperation in these areas since 2017. Chapters 2 to 5 of the full report (available in German) provide a detailed and comprehensive description of the Federal Government's activities which contribute to the five objectives of the Strategy. An overview and analysis of key data on international cooperation are provided in Chapter 6 of the full report.

The five objectives of the Federal Government's Strategy for the Internationalization of Education, Science und Research

Objective 1 Strengthening excellence through worldwide cooperation

Objective 2 Developing Germany's strength in innovation on the international stage

Objective 3 Internationalising vocational training and qualification"

Objective 4 Working with emerging and developing countries to shape the global knowledge-based society

Objective 5 Overcoming global challenges together

Over the last few years, the amount of federal government resources used to fund international cooperation has continued to grow. The report shows that multiple ministries provide funding for projects demonstrating excellent cooperation with international partners. In 2022, the Federal Ministry of Education and Research (BMBF) alone invested approximately 1.335 billion euros, including contributions towards R&D infrastructures and programmes. In the reporting period, the Federal Foreign Office provided around 494 million euros for international funding activities in tertiary education. In the context of European Partnerships, the Federal Government provided a total of approximately 100 million euros in 2022[2] for networking at European level.

2 Pre-call budgets reported to ERA-LEARN, as at: June 2023, source: ERA-LEARN.

Under its Strategy for the Internationalization of Education, Science and Research and in the context of different strategic processes, the Federal Government is continuously adapting to changing framework conditions based on needs. In doing so, specific geographical or thematic approaches are used. Examples of geographical approaches include: Creating Prospects! New Impetus for Cooperation with African Partners in Education, Science and Research; Policy guidelines for the Indo-Pacific; or the Action Plan Ukraine. Examples of thematic approaches are: Science Diplomacy Strategy; Research for Sustainability – A Strategy of the Federal Ministry of Education and Research; Global Health Strategy; and the Federal Government's Strategy for International Cooperation in Vocational Education and Training. (See full report Chapter 2)

With its launch in early 2023, the Federal Government's **Future Research and Innovation Strategy** has provided a new foundation for research and innovation policy in order to improve the framework conditions for research and innovation both nationally and internationally. For this purpose, the Federal Government has agreed six missions. These address topics such as efficient resource use, climate and biodiversity protection, health, technological sovereignty, environmental protection, and societal resilience. In order for Germany to play its role in helping to solve the current challenges, the Strategy focuses upon strong European and international networking as a hub of science and research, as well as on the creation of new and effective research and innovation partnerships, especially with like-minded countries.

3 Shaping the future together – multilateral cooperation

Meeting of the G7 Science Ministers in Frankfurt am Main, 12–14 June 2022

Multilateral cooperation and international organizations are crucial when it comes to pooling resources, overcoming global challenges and maintaining an opportunity for official exchange in the event of differences between states. What is more, they allow us to promote our values and principles internationally and to make other actors more familiar with them. International bodies also serve to address topics of national and transnational interest in the area of education, science and research. For this reason, Germany is actively involved in the Group of Seven (G7), the Group of Twenty (G20), the United Nations (UN) and the OECD, for example.

At the 2022 meeting of the G7 science ministers under the **German G7 Presidency,** there was further consideration of promoting and protecting freedom, integrity and security in science and research, after it had been put on the agenda by the UK Presidency in 2021. Under the German Presidency, a joint document entitled "G7 Common Values and Principles on Research Security and Research Integrity" was published. This topic and the discussions on health and climate research will continue to play an important role in the G7.

In the last few years, the topics of education and research have become increasingly important at the meetings of the **G20.** Italy's G20 Presidency in 2021 provided an important launch with the G20 meeting of the science ministers. Indonesia's Presidency in 2022 was also committed to these topics and hosted a meeting on each.

In May 2021, UNESCO and the BMBF together with the German Commission for UNESCO hosted the digital World Conference **Learn for Our Planet. Act for Sustainability.** The Conference marked the official launch of the new decade for the global integration of Education for Sustainable Development (ESD) in all areas of education by 2030. More than 2,500 representatives from politics, science, industry and civil society from all over the world discussed ideas on how best to integrate ESD in all areas of education. They adopted the Berlin Declaration on Education for Sustainable Development whose aims include establishing measures for the environment and climate as core elements of the curriculum as well as promoting social learning and skills needed for shaping societal change.

The fight against the **COVID-19 pandemic** remained one of the priorities of multilateral cooperation in the reporting period. All over the world, funding was mobilized for the development of diagnostics, therapies and vaccines. Numerous international initiatives were started for the support of multilateral projects, the networking of researchers and the joint use of research infrastructure and data.

Networked research and multilateral exchange are decisive in supporting countries in the implementation of the **green and digital transformation** in line with the UN Agenda for Sustainable Development. In 2021 and 2022, the United Nations University Institute for Environment and Human Security (UNU-EHS) examined, with funding from the BMBF, factors contributing to natural disasters and described possible solutions in the Interconnected Disaster Risks Report.

Conservation of biodiversity is a global challenge. For this reason, Germany is actively contributing to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) through the BMBF and the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV). The **German IPGES Coordination Office** established by the BMBF and BMUV coordinates the involvement of German scientific expertise in the compiling of global reports and informs on the activities in the IPBES.

Cooperation at European and international level is fundamental for the conservation of genetic resources. On behalf of the Federal Ministry of Food and Agriculture (BMEL), the **Information and Coordination Centre for Biological Diversity (IBV)** of the Federal Office for Agriculture and Food (BLE) coordinates international cooperation on the conservation and sustainable use of genetic resources for food and agriculture in Germany. To this effect, the Federal Government has signed international agreements on the conservation and sustainable use of biodiversity and in particular of genetic resources (for example the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)).

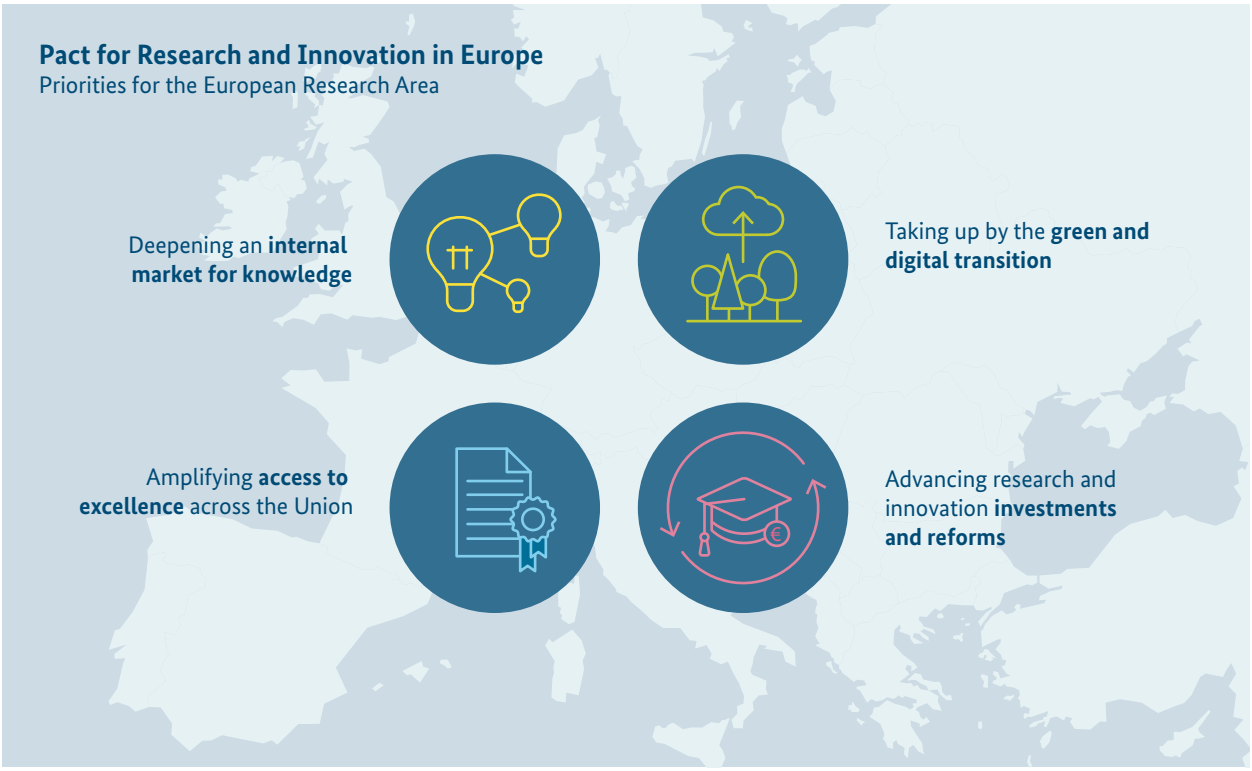
4 At the centre of international cooperation – Europe

Global challenges and geopolitical changes also led to a reorientation at European level. At the end of 2021, the Pact for Research and Innovation in Europe was launched, providing a new strategic direction for the European Research Area (ERA). It calls for and supports the necessary coordinated cooperation of the EU Commission and the Member States. Areas for action include the funding of knowledge transfer, digital and ecological transformation, access to excellence as well as strengthening reforms and investment. The first ERA Policy Agenda 2022–2024, which was developed with Germany's participation, is currently being successfully implemented. It contains 20 measures (ERA actions) for the practical implementation of the European Research Area and the related policy objectives by the Commission and the Member States. For the direction of Germany's EU research and innovation policy, the Federal Government plans to adopt a National Action Plan for the European Research Area (ERA Action Plan) during 2023.

The ERA continues to be the strategic basis for the EU Framework Programme for Research and Innovation "Horizon Europe". The large number of German researchers and research institutions participating in Horizon Europe sends a clear signal for a strong European Research Area. At the same time, it also shows how well the German research community is networked within the European Union.

Education is the basic prerequisite for research and innovation. At strategic and operational level, Germany actively promotes general, vocational and higher education cooperation in Europe. Germany also works to increase dovetailing of EU programmes as well as of the European Education Area and the European Research Area.

In light of geopolitical tensions and complex global challenges, such as addressing climate change and hybrid threats, the EU readjusted its position regarding the most important principles and values for international cooperation in research and innova-



Graphic 1: Overview of the four overarching priority areas of the Pact for Research and Innovation in Europe

tion. This occurred with the adoption of the Council Conclusions on a global approach (2021). Germany supports this joint approach aimed at creating strong synergies within the EU and strategically defining common key areas and interests. Intensifying the diverse European bilateral and multilateral research cooperation is a decisive factor for Germany. From the German perspective, it is important in this context to promote European Science Diplomacy. We also consider it important to advance a common principles-led approach towards protecting the freedom of science on the basis of the Bonn Declaration on the Freedom of Scientific Research as well as to increase awareness of external threats among researchers and research organizations.

5 Good Practice – examples of bilateral cooperation

Germany is engaged in a large number of bilateral collaborations in education, science and research around the world. In the reporting period, successful collaborations were continued and new projects initiated. The following examples show the range of collaborations.

Cooperation with **France,** Germany's most important European partner, has traditionally been very close and diverse. The Treaty of Aachen, which entered into force in 2020, and the annual Franco-German Council of Ministers provide the political framework. In May 2021, the two governments adopted the Franco-German Declaration of Berlin. As part of the Franco-German cooperation on AI, the BMBF and its French partner ministry launched a joint funding measure for research and transfer projects in October 2020. This successful bilateral cooperation was continued with a second funding call in June 2022. Another outstanding example of bilateral cooperation is the Franco-German University.

Since 1986, the Villa Vigoni German-Italian Centre for European Dialogue has been a unique example of the close bilateral cooperation in education, culture and science with **Italy.** Current research projects address the role played by historical knowledge and societal resilience in overcoming crises.

Since 2021, joint research projects have led to the **Western Balkans** being linked even more closely to the EU. Until 2024, the BMBF is providing funding of approximately six million euros for 14 bilateral research projects with Albania, Bosnia and Herzegovina, Kosovo, the Republic of North Macedonia, Montenegro, and Serbia.

As strong science locations and partners with shared values, cooperation between Germany and the **USA** is traditionally close. In the area of health research, the BMBF has been funding joint projects with US partners for many years. One example for this is the funding initiative "Bilateral Cooperation in Computational Neuroscience: Germany – USA" which is supported together with the US funding organizations National Science Foundation, National Institutes of Health and

the Department of Energy. In autumn 2022, there were 30 projects in operation with American project partners. A further funding round was announced in 2022.

In 2021 and 2022, cooperation with **Canada** was marked by the 50th anniversary of the Agreement Between the Government of Canada and the Government of the Federal Republic of Germany on Scientific and Technical Cooperation. More than 70 scientific events on various cooperation priorities took place during the reporting period. Over the last few years, research partners have successfully cooperated in the areas of digital production technologies, artificial intelligence and clean technologies, for example.

For many years, **Brazil** and Germany have been working together to find solutions to research questions concerning the environment, resource conservation and climate change. Germany is currently intensifying cooperation, in particular in the areas of bioeconomy, resource efficiency and environmental research. In 2021 and 2022, the BMBF provided funding for six bilateral collaborations, which are developing sustainable processes for the extraction of high-tech metals and the recycling of bio-based materials, among other things.

Cooperation between **Japan** and Germany is based on the 1974 Intergovernmental Agreement on Cooperation in Science and Technology, in particular in the areas of marine research, life sciences and environment. In the reporting period, the focus was on collaborations on topics such as green hydrogen, connected and automated driving, marine and polar research, battery research, bioeconomy as well as aerospace research. In 2021, a joint 2+2 funding call on green hydrogen technologies was published.

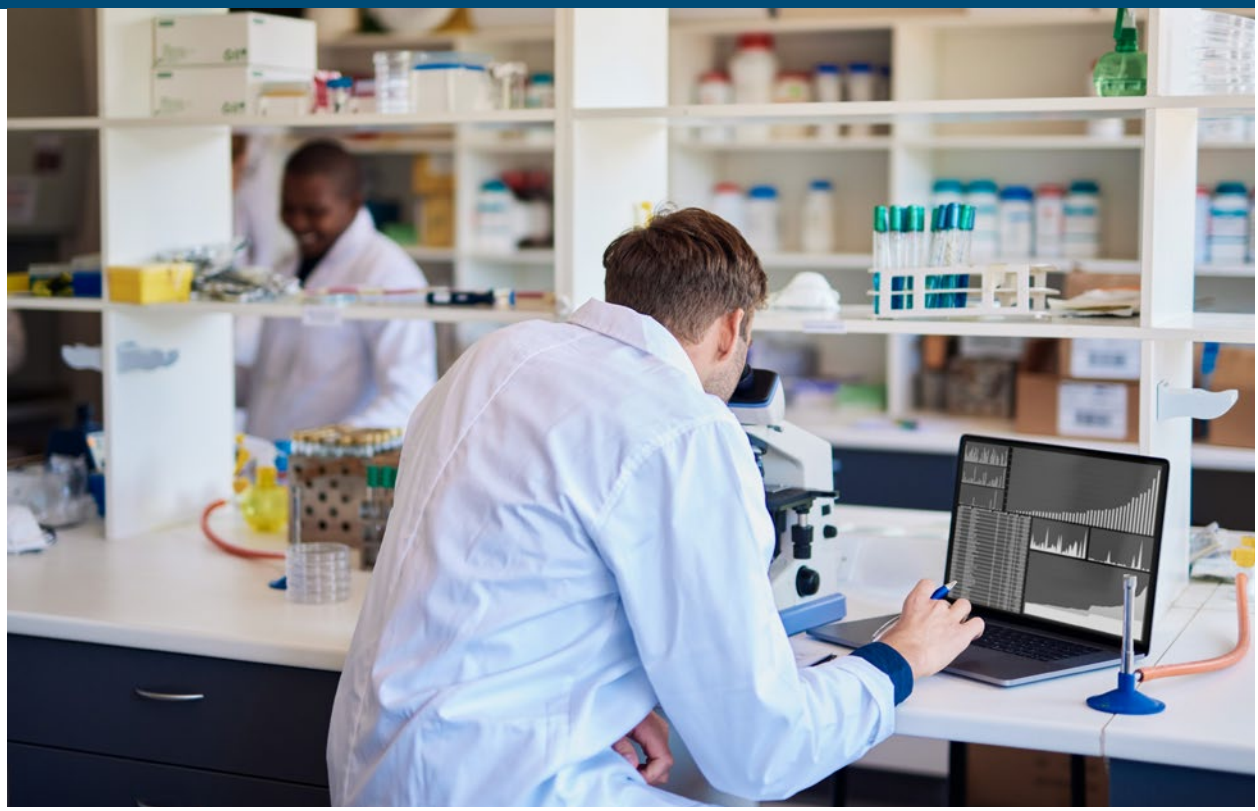
Vietnam is one of the BMBF's most important cooperation partners in Southeast Asia. Cooperation priorities include water and environmental technologies, resource technologies and efficiency, land management, adaptation to climate change, bioeconomy, health, and urban development. Under the "CLIENT II – International Partnerships for Sustainable Innovations" funding measure, seven projects were funded with Vietnam in the reporting period. The BMEL is setting up bases in Vietnam and Tanzania for long-term cooperation on animal health and One Health.

Federal Research Minister Bettina Stark-Watzinger travelled to **Australia** in May 2022 in order to intensify the existing research partnership on green hydrogen. With the joint HySupply feasibility study, industry and science experts examine how green hydrogen can be transported from Australia to Germany. In February 2022, the BMBF and the Australian Renewable Energy Agency (ARENA) launched the HyGATE initiative to fund pilot projects for the development of innovative green hydrogen technologies. This represents the largest bilateral research funding by the two countries to date.

Since 1996, there has been an agreement on cooperation in science and research with **South Africa** between the BMBF and the South African Department of Science and Innovation (DSI). A Joint Science and Technology Cooperation Committee convenes on a regular basis, most recently in Berlin in June 2022 in a hybrid format. Energy, health and climate research are among the priorities of German-South African cooperation. Federal Chancellor Olaf Scholz travelled to South Africa in May 2022 to announce the funding of a consortium for the development of optimized catalysts for green kerosene production.

Ghana is one of Germany's most important partner countries in West Africa. The headquarters of the West African Science Service Centre for Climate Change and Adaptive Land Use (WASCAL) is in Accra. It coordinates, for example, new initiatives funded by the BMBF such as the International Master's Programme in Energy and Green Hydrogen (IMP-EGH). The BMBF-funded Waste2Energy project sees Ghanaian and German researchers and companies constructing a novel 400kW hybrid photovoltaic biogas plant, which turns waste into energy and raw materials.

6 International cooperation on the ground – activities of the science and intermediary organizations



The German science and intermediary organizations are engaged in a wide variety of international activities. The German Research Foundation (DFG), the Max Planck Society for the Advancement of Science (MPG), the Helmholtz Association of German Research Centres (HGF), the Fraunhofer Society for the Promotion of Applied Research (FhG), the Leibniz Association (WGL), the German Academic Exchange Service (DAAD), the Alexander von Humboldt Foundation (AvH) and the Conference of Rectors and Presidents of German Universities and Other Higher Education Institutions (HRK) are involved in a wide range of activities. They include setting up research centres abroad (for example the establishment of eight interdisciplinary "global centres" for climate and health issues funded via the DAAD in 2021), support for the internationalization of German higher education institutions by the DAAD and the HRK, and cross-border cooperation in large research infrastructures (for example a new experimental station at the SESAME X-ray radiation source in Jordan, established in 2022 and developed by five Helmholtz Centres.

Collaborations with excellent partners worldwide are also extremely important. The same is true for targeted support for scientific excellence, such as the "European Laboratory for Learning and Intelligent Systems" (ELLIS), a network which was co-initiated by researchers of the Max Planck Society with the aim of researching and further developing cutting-edge artificial intelligence.

In response to Russia's war of aggression against Ukraine, science and intermediary organizations set up numerous support measures for Ukrainian researchers and students in 2022.

Detailed information on the activities of the science and intermediary organizations can be found in the chapters 4 and 5 of the full report (available in German).

List of abbreviations

AA	Federal Foreign Office
AvH	Alexander von Humboldt Foundation
BMBF	Federal Ministry of Education and Research
BMEL	Federal Ministry of Food and Agriculture
BMG	Federal Ministry of Health
BMI	Federal Ministry of the Interior and Community
BMVg	Federal Ministry of Defence
BMWK	Federal Ministry for Economic Affairs and Climate Action
BMZ	Federal Ministry for Economic Cooperation and Development
CLIENT II	BMBF funding programme on "International Partnerships for Sustainable Innovations"
COVID-19	Corona Virus Disease 2019
DAAD	German Academic Exchange Service
DFG	German Research Foundation
DLR	German Aerospace Center
DWIH	German Centres for Research and Innovation
ERA	European Research Area
EU	European Union
FhG	Fraunhofer Society for the Advancement of Applied Research
GOVET	German Office for International Cooperation in Vocational Education and Training
G7	Group of Seven: Germany, France, United Kingdom, Italy, Japan, Canada, US
G20	Group of Twenty
HGF	Helmholtz Association
HRK	German Rectors' Conference
iMOVE	International Marketing of Vocational Education and Training
MPG	Max Planck Society
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
RICH	Research Infrastructures Consortium for Horizon 2020
SASSCAL	Southern African Science Service Centre for Climate Change and Adaptive Land Management
SDGs	Sustainable Development Goals
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WASCAL	West African Science Service Center on Climate Change and Adapted Land Use
WHO	World Health Organization

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