



Federal Ministry
of Education
and Research

Federal Government Report on International Cooperation in Education, Science and Research 2017–2018

Political summary



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Political summary

The Federal Government adopted its updated Strategy for the Internationalization of Education, Science and Research in February 2017. The strategy forms the basis for a new calibre of international cooperation in these fields. The Federal Government presented its first report on international cooperation in education, science and research in June 2017, which summarised the progress made between 2014 and 2016. The second report, presented herein, focuses on the main activities of the ministries as well as the research and intermediary organisations in the years 2017 and 2018. This report highlights cooperation with Africa. Cooperation with this continent has experienced a considerable boost in recent years as well as a new overarching strategic framework in the form of the Africa Strategy, launched by the Federal Ministry of Education and Research (BMBF) in November 2018. As in the first report, this document also includes a chapter that is dedicated to European cooperation in education, science and research.

1. Major trends in international cooperation

The Internationalization Strategy provides a new programmatic framework for the work of the ministries and the research and intermediary organisations. This highlights the Federal Government's position that education, research and science are a significant factor in achieving democracy, freedom and social cohesion, both within Germany and around the world. In so doing, the Federal Government is sending a clear signal against the current trends of isolationism that are playing a growing role in social debate worldwide.

International cooperation comprises a broad spectrum of activities and initiatives led by various different ministries and research and intermediary organisations. In many cases, it rests on the enthusiasm and commitment of individuals and organisations, which provide important impetus for putting the spirit of education and global understanding into practice, helping to tackle global challenges together. The full version of this report is a lively expression of all the variety that international cooperation has to offer.

One of the core objectives of the 2017 Internationalisation Strategy is to place a stronger strategic focus on international cooperation, not least in order to make the multitude of activities and initiatives more visible and more effective and to give them a more harmonised sense of direction.

This report shows that, together with the research and intermediary organisations, the Federal Government has made considerable progress towards achieving this goal. The major trends of the last few years are as follows:

1. Strategic emphasis on internationalisation results

in action: All the research and intermediary organisations have adopted their own internationalisation strategies, which are now being implemented rigorously. The Federal Government supports these efforts in a number of ways: firstly, in the context of major research policy initiatives (pacts), most recently with the new Strategy for Excellence in Higher Education, in which international networks play a key role; secondly, by means of political strategies focusing on research and innovation such as the High-Tech Strategy 2025, the Federal Government's Implementation Strategy for Digitalization or the Artificial Intelligence Strategy; and thirdly, in the context of cultural relations and education policy.

2. Integrating international cooperation in both

education and research: In order to maximise the positive effects on society, education and research should be understood and treated as two sides of the same coin. This approach is exemplified by the Africa Strategy, adopted by the BMBF in autumn 2018.

3. International collaboration now features more

innovation cooperation: German businesses are becoming increasingly integrated in global value creation chains. This is resulting in a growing interest in bilateral innovation cooperation both on the part of industry and our partner countries. This trend is illustrated by the wide range of '2+2' projects that have been established, for example with Asian and South American partners and German Centres for Research and Innovation (DWIH).

4. Development of new forms of multilateral cooperation based on science and technology cooperation

(STC): S&T cooperation continues to develop and increasingly constitutes the basis for new forms of multilateral cooperation, as exemplified by the travelling conferences that are held in Central Asia or the establishment of research structures in South America.

2. Activities and initiatives 2017–2018

The following section uses the objectives of the Internationalization Strategy to illustrate the key developments of 2017 and 2018. In addition to this, it also summarises the most important aspects of the strategic focus on Africa, reports on outstanding activities in the European context and gives relevant examples of bilateral collaborations. Chapters 2 to 5 of the entire report (available in German) contain detailed and comprehensive descriptions of all activities. Chapter 6 of the entire report comprises a presentation and analysis of key data regarding international cooperation.

Over the last few years, the amount of federal government resources used to fund international cooperation has continued to grow. In 2018, the BMBF alone invested approximately €978 million, including contributions towards R&D infrastructures and programmes. In the same year, €33.5 million were awarded solely for collaboration projects with Africa, while in 2017 around €138.9 million were provided to fund German participation in R&D partnerships.

Other ministries are also actively involved in funding international cooperation in education and research. During the reporting period, around €461 million were provided in funding by the Federal Foreign Office to support global academic and scientific exchange, including institutional funding for the Alexander von Humboldt Foundation (AvH) and the German Academic Exchange Service (DAAD). This included approximately €30 million for the Albert Einstein German Academic Refugee Initiative (DAFI), a third country scholarship programme run through the United Nations Refugee Agency (UNHCR), which enables individuals with recognised refugee status to participate in higher education in their country of asylum.

In both 2017 and 2018, the Federal Ministry of Food and Agriculture (BMEL) provided €10 million for international research cooperation on global food security, bilateral scientist exchange programmes and other international research activities in the field of nutrition, agriculture and consumer health protection. This also included the costs of participating in funds as part of ERA-Net research projects and other EU initiatives. The BMEL's departmental research institutions have entered into cooperation agreements with numerous foreign research institutions in the food and agriculture sector with whom they carry out joint research projects. In addition to this, participation in relevant study or research periods abroad by departmental research scientists and visits from guest researchers to the BMEL's departmental research institutions serve to further advance the internationalisation of science and research. Both of the BMEL's research project management agencies, the Federal Office for Agriculture and Food (BLE) and the Agency for Renewable Resources (FNR), use a variety of activities such as organising international workshops to maintain their excellent international networks.

Implementing the goals of the Internationalization Strategy

Objective 1 – Strengthening excellence through worldwide cooperation

Scientific excellence thrives on discussion and competition between the world's best experts. During the reporting period, Germany has become considerably more attractive as a place to study and conduct research. The Federal Government had originally set a target of attracting 350,000 international students to Germany. This goal was already exceeded in the 2016/2017 winter semester. The number of foreign students in Germany then rose again to 375,000 in the 2017/2018 winter semester. This represents around 13% of all students. Most of them come from China, India, Russia, Austria and Italy. Approximately 282,000 of all the international students obtained their higher education entrance qualifications in another country. This makes Germany one of the five biggest host countries for international students and shows the successful development of internationalisation at German institutions of higher education in terms of enrolment by foreign students.

The newly launched Excellence Strategy also shines the spotlight on Germany as an internationally attractive base for academic, scientific and research activity. The BMBF's support for Excellence Clusters involves project-based funding in internationally competitive fields of research at individual universities or university alliances. In September 2018, following a science-based selection procedure, the Excellence Commission¹ selected a total of 57 excellence clusters at 34 universities to receive funding from 2019.

Objective 2 – Developing Germany's innovative strength on the international stage

The adoption of the Internationalization Strategy has provided considerable impetus to innovation-focused international cooperation over the last two years, thus successfully meeting the needs arising from the rapid development of global value creation chains and increased international involvement. The '2+2' projects deserve particular mention in this context. In the last two years, these projects have become a driving force behind international cooperation, particularly when working with partners in Asia. They give German SMEs access to new markets and allow them to participate in global collaborations. The same is also true of the funding measure Internationalization of Leading-Edge Clusters, Forward-Looking Projects, and Comparable Networks, which was launched in 2014. The planning phase has already been completed by a number of applicants and a variety of subsequent international implementation projects have now been launched with partners from all over the world. As a joint showcase of German science organisations, the German Centres for Research and Innovation (DWIH) continued to play a leading role throughout the reporting period.



¹ Panel of experts and the Federal and Länder ministers responsible for science and research.

Objective 3 – Developing the international aspects of education and training

Alongside science and research, education policy is also becoming increasingly important – in both bilateral and multilateral forums. For example, the first meeting of the G20 education ministers was held during the Argentinian G20 presidency in 2018. The main priorities outlined in the Education Ministers' Declaration include skills for the future and international cooperation in education. Notably, other countries consider Germany's dual system for vocational education and training to be very forward-looking. Meanwhile, the Federal Government has now signed 16 bilateral cooperation agreements on the topic of vocational education and training with partners all over the world. In 2018, in addition to bilateral activities focusing on topics such as the provision of skills for vocational training personnel or the development of shared standards, a peer learning exchange format was launched during the Didacta Education Trade Fair in Hanover, to which Russia, India, China, South Africa, Mexico and the USA were invited to join as partner countries to cooperate in vocational education and training.



Parliamentary State Secretary Thomas Rachel during the G20 Meeting of Education Ministers

Vocational education is an important prerequisite for the successful implementation of the 2030 Agenda for Sustainable Development, which is why it is prioritised within German development policy. Between 2013 and 2018, funding commitments made by the Federal Ministry for Economic Cooperation and Development (BMZ) for vocational education and training more than doubled, meaning that Germany was once again by far the world's most important provider of funding for vocational education and training in 2018, with over €255 million in funding commitments.

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

One of the central demands of the Internationalization Strategy is the establishment of collaborations with emerging and developing countries that are aspiring to become science nations. The special focus on Africa is described below.

In addition to cooperation with Africa, there is also a focus on collaboration with Central and South America as well as with emerging countries in Asia. Particular reference should be made to the CLIENT II – International Partnerships for Sustainable Innovations programme, which was set up to fund demand-based R&D cooperation with selected emerging and developing countries. Research cooperation in the humanities and the social sciences has also received greater structural support; a particular highlight is the longer-term programme to fund the international Maria Sibylla Merian International Centres for Advanced Studies in the Humanities and Social Sciences. At the Merian Centres, scientists and academics from Germany, the respective host country and other countries in the host region work together to carry out research. The first research centre of this kind was opened in New Delhi, India. It received positive results from the interim evaluation conducted in 2017. Two further Merian Centres were launched in early 2017, one in Guadalajara, Mexico, and the other in São Paulo, Brazil. A research centre in Accra, Ghana, opened its doors for the first time in 2018.

Through their Centres of Excellence, the DAAD promotes cooperation – primarily in developing and emerging countries – with outstanding foreign partners involved in teaching and research who have especially close ties to Germany, both professionally and culturally, and who work closely with German higher education institutions and scientists. The BMZ uses networks such as the Managing Global Governance programme run by the German Development Institute (DIE), the Global Development Network, the European Association of Development Research and Training Institutes (EADI) and the Poverty Reduction, Equity and Growth Network to support the long-term joint generation of knowledge together with African science networks such as the African Economic Research Consortium on development-related topics within the economic and social sciences.

Objective 5 – Overcoming global challenges together

The key highlights described here under the objective ‘Overcoming global challenges together’ underscore the increased significance of international cooperation in the Federal Government’s thematic programmes, thereby also demonstrating the integrative cross-sectoral character of the Internationalization Strategy. The highlights are thus based on the major national programmes concerning global challenges and not on individual international measures. New international stimulus provided by programmes such as Health, Bioeconomy and Research for Sustainable Development (FONA) is particularly important here. The BMBF funding measure Bioeconomy International aims to establish partnerships with target countries around the world which will develop innovations for new products and services in the field of bioeconomy and contribute towards solving global challenges such as global food security, climate change mitigation and environmental protection. To date, funding has been awarded to 74 collaborations and 141 individual projects in five subject areas (securing global nutrition, ensuring sustainable agricultural production, producing healthy and safe foods, using renewable resources for industry, developing biomass-based fuels).

Winner of the German Environmental Award 2018, the high-profile work of the Integrated Water Resources Management funding measure in Jordan constitutes a key achievement in the Middle East. This work saw researchers and authorities working together to develop a framework for decentralised waste-water management based on demonstration facilities with appropriate technologies and relevant training programmes. This framework has already been adopted by the Jordanian cabinet.

Product development partnerships (PDPs) are an outstanding example of successful cooperation between public and private stakeholders in the fight against global problems. In a second round running from 2016 to 2022, the BMBF is again providing support for six PDPs focusing on malaria, tuberculosis, leishmaniasis, African sleeping sickness and HIV as well as the diagnosis of parasitic diseases.

PDPs are non-profit organisations in which various different stakeholders such as academic institutes, public research institutions, pharmaceutical companies and non-governmental organisations work together to develop vaccines and drugs or diagnostic aids to improve the treatment of neglected and poverty-related diseases. PDPs are predominantly financed by private foundations and public-sector funding providers such as the BMBF. Their aim is to support cooperation between public research organisations and the pharmaceutical industry in order to quickly develop urgently needed products and then make them available to the most severely affected regions in the world (primarily in Africa) at affordable prices.

The BMEL is responsible for research in the fields of agriculture, food, forestry and fishing as well as nutrition and health-related food research. As part of their research cooperation on the topic of global food security², the BMEL is particularly committed to supporting scientific cooperation between countries in the Global South – in Africa, South Asia and South East Asia – and Germany. Important work is thus being done in the field of global food security that will help towards achieving the Sustainable Development Goals (SDGs) set out in the 2030 Agenda. Within the scope of these responsibilities, the BMEL uses a variety of support instruments such as bilateral cooperation and research collaborations on the topic of global food security. The work and expertise of the BMEL’s departmental research institutions also play a key role in achieving the agriculture, environment and food-related SDGs.

Due to the central importance of agricultural research for ensuring a sustainable and climate-proofed food supply in developing and emerging countries, the BMZ has continuously provided reliable support to the Consultative Group on International Agricultural Research (CGIAR) since its foundation in 1971. This network currently comprises fifteen research centres on four continents.

² BMEL-Concept for Global Food Security and Nutrition: Agrifood policies – key to achieving the human right to adequate food, January 2015

3. Focus on Africa

Ministry strategies and measures in Africa

The BMBF's Africa Strategy was published in November 2018. The BMBF will support future German–African cooperation in the fields of education, science and research with at least €300 million across five core action areas. African and German stakeholders will work together to develop solutions for major challenges.

The new Africa Strategy aims to make education, science and research in Germany even more international and to promote future prospects and opportunities for sustainable development in Africa. To do this, the strategy draws on African priorities and focuses on five fields of action: **knowledge transfer and innovation**, providing **training and qualifications** as the key to social advancement and participation, **increasing employability and the synergies resulting from German involvement** are expected to help **achieve the UN Sustainable Development Goals** and improve the economic outlook and prosperity in our African partner countries.



Research and education cooperation with Africa

In addition to the activities already mentioned (CLIENT II, Merian Centres), the following activities from 2017 and 2018 are particularly noteworthy.

- Since 2012, the BMBF has worked in successful cooperation with ten West African countries to establish the West African Science Service Centre for Climate Change and Adaptive Land Use (**WASCAL**) with its headquarters in Accra, Ghana. WASCAL is an impressive example of how education, research and innovation can lead to sustainable development in Africa. The core elements comprise a regional academic training programme with twelve graduate schools, a German–African research programme and a climate data centre with measuring networks and a research infrastructure in Ouagadougou, Burkina Faso. The range of topics has been expanded to include renewable sources of energy. Run in cooperation by five countries, the Southern African Science Service Centre for Climate Change and Adaptive Land Management (**SASSCAL**) pursues the same priorities. The headquarters and data centre are located in Windhoek, Namibia. Over the course of ten years, the BMBF has already provided around €100 million to support WASCAL and SASSCAL. To date, more than 420 PhD, master's and bachelor's students have completed programmes addressing climate, energy and agricultural issues. The BMBF is planning to provide up to €40 million by 2023 to support further programme elements dealing with research and capacity building.
- Results obtained from applied agricultural research collaborations also feed into the networks of green innovation centres, part of the BMZ's special initiative **ONE WORLD – No Hunger**, which supports the farming and food sectors in selected developing countries – with Africa as the main priority – by providing needs-based innovations and knowledge. This results in a wide variety of supporting measures for the Comprehensive Africa Agriculture Development Programme (CAADP) as well as thematic synergies with the BMBF-funded programmes SASSCAL and WASCAL.

- An excellent example from the health sector is the **Research Networks for Health Innovations in Sub-Saharan Africa** initiative, for which the BMBF has allocated €50 million in funding until 2021. The research networks are coordinated by local African scientists and researchers. Their research focuses on combating diseases that pose a particular risk to people in Africa.
- Robust local health systems are a key prerequisite to quickly identifying and responding to health crises. In response to the decisions made by the G7, a programme focusing on Africa in particular has been launched by the Robert Koch Institute, the Paul Ehrlich Institute, the Federal Institute for Drugs and Medical Devices and the Bernhard Nocht Institute for Tropical Medicine in order to **strengthen health systems and implement international health regulations**. Roughly €20 million have been allocated to the programme for the period 2017–2021.
- **PRIMA – Partnership for Research and Innovation in the Mediterranean Area**: The new international funding initiative PRIMA was launched in early 2018 with the aim of using research and innovation to effectively tackle the challenges currently faced in the Mediterranean region such as water shortages, population growth, urbanisation and climate change. Based on a strategic research and innovation agenda, funding calls are published every year on the priority topics of water management, agricultural systems and value creation chains in farming and the food industry. These calls also offer the German science community and industry plenty of opportunities to get involved in all three fields. Along with the European Commission, a total of 19 countries from Europe and the southern and eastern Mediterranean regions are currently involved in PRIMA. Overall, approximately €500 million will be available for PRIMA over a period of ten years, of which the European Commission is to provide €220 million. The BMBF has agreed to provide €20 million over the entire duration of the project.
- **Transnational education and German higher education projects abroad**: The DAAD has supported German study programmes abroad since 2001. The projects that have been funded to date deal with topics ranging from establishing individual degree courses that offer a final qualification recognised in both Germany and in the partner country to setting up departments and institutes to founding entire institutions of higher education. The transnational education (TNE) programme is responsible for financing the German share. German higher education institutions are involved in nearly 300 TNE degree programmes around the world with over 32,000 students in 35 countries (as of 2018). They are beacons of German science cooperation in partner countries. Within the scope of their own respective strategies, various ministries use different instruments to provide complementary support. The Federal Foreign Office supports academic mobility from a foreign policy perspective, thus helping to improve the spread of intercultural skills and give graduates a sense of connection with Germany. It provides basic funding for institutes such as the Kazakh-German University, the Andrassy University Budapest and the Sino-German University in Shanghai as well as Centres of Excellence in Africa and around the world. The BMBF primarily provides support to programmes that focus on the internationalisation of German institutions of higher education. The following TNE projects are just some examples of the projects that are thus supported through the DAAD using BMBF funding: the binational Turkish-German University (TDU) in Istanbul, the German Jordanian University (GJU), the German University in Cairo (GUC), the Vietnamese-German University (VGU), the German University of Technology (GUTech) in Oman, the German-Russian Institute of Advanced Technologies (GRIAT) in Kazan, Tatarstan, the International University Liaison Indonesia (IULI) in Bumi Serpong Damai (BSD City) and the TU Berlin Campus El Gouna in Egypt. Since 2013, the basic programme TNE – German Study Programmes Abroad has been augmented by the addition of the programme TNE – Strength and Excellence through Profile-Building (TNE-STEP). The funding calls for the TNE Study Programmes Abroad and TNE-STEP are normally published once a year. In addition to this, the BMBF – along with contributions from the Federal Foreign Office and the Länder – is also involved in funding the German share at the Franco-German University

(DFH/UFA), an alliance of more than 190 member institutions in Germany and France with a wide range of integrated programmes of study that is based in Saarbrücken. Regardless of the discipline, all degree courses contain elements that have close ties to Germany. Learning German is thus a mandatory part of the curriculum for around three quarters of TNE students. Nearly all students have the opportunity to spend at least a short – if not a longer – period of their programme in Germany; this is mandatory for around one third of students. In July 2018, the German Council of Science and Humanities published recommendations to expand the TNE network. A total of five sites in Africa are to be supported with BMBF funding from 2018 onwards. In addition to programmes in natural sciences and technology in Meknès, Morocco, and El Gouna, Egypt, interdisciplinary programmes are also being offered in Addis Ababa, Ethiopia, to master's and PhD Global Studies students with an emphasis on Peace and Security in Africa. The establishment of a two-year master's programme in Archival Studies in Jos, Nigeria, by the Goethe University Frankfurt in cooperation with the Deutsches Filminstitut (German Film Institute) started in October 2018.

- A series of strategic analyses and scoping missions were carried out in 2017 in selected African countries in order to explore potential collaborations in vocational education and training and possible ways in which the BMBF could support these. Germany has successfully **collaborated with South Africa in the field of vocational education and training** since 2013. As part of this cooperation, Germany supports the collaborative project TRAINME.
- In 2018, the BMZ agreed to provide a total of €161 million to fund vocational education and training in Africa. The ministry currently works with 22 African partner countries on vocational education and training programmes in sectors such as farming, health, skilled trades and services. In addition to this, the BMZ also cooperates with regional organisations such as the African Union, for example, within the scope of the Skills Initiative for Africa.

- Implemented by the Alexander von Humboldt Foundation (AvH), the BMBF's **German Research Chairs programme** is designed to support the establishment of five professorships at centres of the African Institute for Mathematical Sciences (AIMS) network. The Research Chairs programme is a successful model that promotes a broad spectrum of activities. In addition to the professorships, the DAAD also supports cooperation with German universities and South-South networking with other AIMS centres as well as financing doctoral students and post doctoral positions. Furthermore, cross-project synergies arising from the BMZ's green innovation centres and the BMEL's demonstration projects are being utilised and continuously strengthened.

- **Funding of international research collaborations on global food security:** The BMEL is involved in supporting multi-year research cooperation projects in the field of global nutrition/food supply and security in collaboration between German research institutions in the agricultural and food sector and relevant institutions in Africa and/or South East Asia respectively. During the reporting period, 19 research projects on the topic of nutrition along the value creation chain were granted funding; these projects involve more than 70 partners from eastern, western and southern Africa, South East Asia and Germany.

A total volume of nearly €20 million was granted to ongoing multi-year research projects for the period from 2017 to 2018. One of the main aims behind funding these collaborative research projects is to establish lasting strategic partnerships and productive research networks that are focused on finding practical applications and solutions. In addition to enhancing scientific progress and discussion, the establishment of long-lasting international alliances also plays a significant role in improving capacity development in the Global South.



The 2018 **Round Table on the Internationalization of Education, Science and Research** highlighted the priorities of the Federal Government. Within the thematic area **Creating prospects for Africa**, inter-ministerial working groups were set up covering four key topics: health; agriculture, food production and nutrition; water (in relation to energy and climate); and administration, economy and finance.

Funding of a doctoral programme in sub-Saharan Africa: The BMEL is involved in supporting doctoral training as part of existing research partnerships between its departmental research institutions and the Leibniz institutes. Eight PhD students from Ghana, Kenya, Zambia, South Africa, Tanzania and Uganda are currently working towards achieving their doctorates with the support of this programme, which has been allocated a funding volume of €800,000 for a period of three years.

4. Europe

European cooperation on education and research constitutes the core of Germany's international cooperation. Whilst education policy is the sole responsibility of each respective Member State, research policy is a joint task of the EU and its Member States, which is to be implemented within the European Research Area (ERA).

For the EU, the most important implementation tool for the ERA is Horizon 2020, its framework programme for research and innovation. For the Member States, the primary aim is to implement structural reforms that will enable research and innovation to make the best possible contribution towards achieving societal goals.

Horizon 2020, the current research and innovation framework programme, was adopted at the end of 2013 for the period 2014–2020. German participation in Horizon 2020 during the reporting period can be summarised as follows:

- Between January 2014 and March 2019, German institutions received around €6.12 billion in European grants.
- German funding applicants had an average success rate of 16.9%.
- As of March 2019, Germany had a 13.7% participation rate and a 16.8% share of funding (each in reference to the EU-28). Germany thus tops the list of all participating countries for the amount of funding received, ahead of the United Kingdom and France.
- As of March 2019, Germany also had a 13.9% share (in reference to the EU-28) in coordination activities.

In June 2018, the European Commission presented its proposal for the forthcoming framework programme for research and innovation, Horizon Europe, which is set to run from 2021 until 2027. As well as continuing key elements of Horizon 2020, Horizon Europe also introduces new elements at a European level. The main new features include:

- European Innovation Council (EIC): The European Innovation Council aims to help the EU play a leading role in groundbreaking innovations that create new markets.
- Thematic clusters: Consolidation of topics from the former pillars 'industrial technology' and 'societal challenges' to form thematic clusters.
- Mission focus: A limited number of very prominent R&I missions will be defined in coordination with members of the public, stakeholders, the European Parliament and the Member States after the start of Horizon Europe.



European Research Area and the six ERA priorities

The measures implemented by the Federal Government and the research and intermediary organisations in the years 2017 and 2018 were based on the **Strategy of the Federal Government on the European Research Area – Guidelines and National Roadmap (ERA Strategy), adopted in 2014**. The **ERA Roadmap 2015–2020** was adopted at European level in 2015 with the aim of achieving a stronger focus on the ERA within national measures.

The following section highlights the key Federal Government measures aimed at implementing the ERA priorities in 2017 and 2018:

- Published in September 2018, the Federal Government's **High-Tech Strategy 2025 (HTS 2025)** defines the priorities of Germany's research and innovation policy in three specific fields of action: 'Tackling the grand challenges', 'Developing Germany's future competencies' and 'Establishing an open innovation and venture culture'. The HTS 2025 thus plays a significant role in creating a more efficient and effective research and innovation system in Germany (ERA Priority 1).
- **Optimal transnational cooperation:** The synergies between national and international programmes are used to create the necessary critical mass to facilitate work on important issues. Germany is heavily involved in these measures, investing €138.9 million in 2017 within the context of public-public partnerships, which the EU Member States use to coordinate their R&D funding calls. In 2017, all Joint Programming Initiatives (JPIs) presented their long-term planning for the next ten years, thus marking an important step towards better complementarity between national, intergovernmental and European R&I measures aimed at solving global challenges (ERA Priority 2a).
- **European Research Infrastructures:** Research infrastructures provide the basis for excellent research. In many cases, they can only be implemented through transnational cooperation. During the reporting period, Germany played an active role in the development and update of the road map for the European Strategy Forum on Research Infrastructures (ESFRI), which was published in September 2018. Germany, or more specifically, German institutions are involved in the legal form of 65% of the ESFRI Landmarks, which are ESFRI Projects that have entered the implementation phase (ERA Priority 2b).
- **Transfer of knowledge between science, industry and society:** In September 2016, the BMBF published its Open Access Strategy with the intention of supporting the scientific community in their efforts to make open access standard practice. This strategy has already and will continue to introduce a wide variety of measures that will significantly improve access to scientific publications, with particular support given to initiatives from the scientific community itself. In October 2016, the BMBF added an open access clause to its own terms and conditions for project funding. As of January 2018, the BMBF funds 20 innovative projects that will improve the creation, handling and management of open access publications. In the next step, the BMBF will set up a skills and networking platform on the topic of open access. The strategy will be refined on an ongoing basis and expanded to become a national strategy. In collaboration with the key stakeholders within the German science system, this will act to expedite the transition to open access science (ERA Priority 5).

- **International cooperation:** Under **Horizon 2020**, German researchers are working together with partners from 149 countries around the world in order to tackle global challenges and cross-border issues in cooperation with third countries. Based on participation rates, third country cooperation is most frequent with the USA, China and Canada. The BMBF is also involved at a global level in European R&D dialogues through which the European Commission, the EU Member States and non-European partners coordinate their involvement in international cooperation measures. For example, the BMBF is a European partner in the High Level Policy Dialogue (HLPD) on science, technology and innovation between the African Union and the EU. In 2016 and 2017, the HLPD approved two road maps; one on food security and one on climate change and sustainable energy. One of the major successes to result from the policy dialogue between the EU and the southern and eastern Mediterranean countries has been the new international funding initiative PRIMA (Partnership for Research and Innovation in the Mediterranean Area), which was launched in early 2018. PRIMA's objective is to use research and innovation to tackle the challenges currently faced in the Mediterranean region in the fields of farming and food systems and water shortages. The BMBF will provide €20 million for this measure (ERA Priority 6).
- **EU-AU partnership on food and nutrition security and sustainable agriculture (LEAP-AGRI):** The BMEL has been involved in the jointly financed EU-Africa research and innovation partnership for food and nutrition security and sustainable agriculture since 2016. A funding consortium has been set up, consisting of 24 funding providers (ministries and project management agencies) in Africa and Europe. A call for research proposals with a total funding volume of €22.7 million was published in September 2017 covering the topics Sustainable Intensification, Agriculture and Food Systems for Nutrition and Expansion and Improvement of Agricultural Markets and Trade. The BMEL is financing German grant recipients in 6 of the 27 international cooperation projects with a total funding volume of €2 million over the course of three years.

Developing education and training in Europe

Even though education policy is the sole responsibility of each respective Member State, there are still several political initiatives and funding programmes in place at EU level. These include the Erasmus+ programme, the 2009 'Strategic framework for European cooperation in education and training' (ET 2020) and the New Skills Agenda for Europe from 2016, a communication from the European Commission outlining a total of ten initiatives, the majority of which have been negotiated with the Member States during the reporting period and adopted as recommendations by the Council.

In addition to this, the Federal Government maintains a series of bilateral agreements on European cooperation in education policy, particularly in the field of vocational education and training.

Some of the most significant measures in the 2017–2018 reporting period are as follows:

- **EU level: Erasmus+ programme**
Erasmus+ is the European programme to support education, training, youth and sport. The programme's objective is to enable more than four million people to go abroad to study or train by 2020. To this end, it brings together several previously isolated funding programmes. A total budget of around €14.7 billion has been made available to finance this programme (2014–2020) – for better learning mobility and closer cooperation in education, youth and sport in Europe. All 28 Member States are involved in Erasmus+ as well as Iceland, Liechtenstein, Norway, Turkey and the Republic of North Macedonia. Germany has a total estimated budget of €1.5 billion for the period from 2014 to 2020. More than 40,000 students in higher education and 5,100 university employees from Germany received Erasmus+ funding between June 2015 and May 2017. More than 32,000 students went abroad to study, while 8,000 completed an internship.



- **European Higher Education Area: Bologna Process**

The European Higher Education Area spans 48 countries and acts as a bridge between Europe and its eastern neighbours on matters relating to higher education policy. Albeit with some variations, the countries participating in the Bologna Process have succeeded in introducing the two-cycle system of bachelor's and master's degrees. In addition to this, the process has created a shared understanding of what high-quality academic education should look like, including quality assurance measures. All 48 participating countries are expected to have implemented the core reforms of the Bologna Process by the next ministerial conference in 2020. A support process has been established for this purpose. Furthermore, the alarming developments in certain countries with regard to scientific freedom are addressed by the Bologna Process. A taskforce has been formed to develop indicators for measuring breaches of scientific freedom and the institutional autonomy of universities and institutions of higher education.

- **Transnational educational establishments in Europe**

The Andr ssy University Budapest (AUB) is a university accredited under Hungarian law with an international and interdisciplinary approach that focuses strongly on Europe. It is the only completely German-language university outside of the German-speaking countries and was set up in 2001 by the Federal Foreign Office and its partners in the course of the eastward enlargement of the EU. Hungary is the primary funder of the AUB, but project funds and, above all, teaching staff are also provided by the Federal Foreign Office and its partners Austria, Bavaria and Baden-W rttemberg.

COST and EUREKA: intergovernmental research cooperation

EUREKA, the international network for strengthening Europe's competitiveness, is increasingly being used to expand bilateral and multilateral innovation cooperation within Europe. Within this context, Germany launched a range of joint calls for proposals during the reporting period, for instance, with the countries in the Danube Region, with the Czech Republic, with Hungary and Spain.

In December 2017, **COST**, the European research initiative for fostering networks between science and technology researchers in Europe, adopted a strategic plan to strengthen its role within the European Research Area. The plan lays out a set of measures for promoting the spread of excellence.

5. Examples of bilateral cooperation

There is a wide and varied range of bilateral cooperation in science and education. New forms of multilateral collaboration have developed as a result of science and technology cooperation.

Bilateral cooperation in Europe

Bilateral cooperation with European countries is a central element of Germany's research policy. Key objectives here are to reinforce and consolidate cooperation and also to strengthen joint involvement in and support for the European Research Area.

The Federal Government maintains bilateral agreements³ and declarations of intent on education and research cooperation with a total of 23 European countries.



Some examples of the initiatives launched during the 2017–2018 reporting period are as follows:

- At the 6th **Franco-German Forum for Cooperation in Research** in June 2018, both ministries agreed to a joint package of measures aimed at introducing fresh momentum to promote Europe as a prime location for innovation in international competition. New joint measures and positions on the topics of the research forum, which were specified by the 19th Franco-German Council of Ministers in July 2017, were developed by expert groups and ministries and are expected to be implemented shortly. This will help maintain the atmosphere of positive change that can clearly be felt in Franco-German cooperation and which is also demonstrated by the key importance attached to research and innovation cooperation in the Aachen Treaty as signed on 22 January 2019. Both parties have agreed to further develop their existing partnership and work towards expanding the Franco-German economic area. Important issues here concern global challenges such as climate change, energy, sustainability and the fight against antibiotic resistance. Moreover, they boast a high degree of social importance such as civil and IT security research as well as artificial intelligence and breakthrough innovations. In this context, a Franco-German network for artificial intelligence is to be set up with the aim of supporting basic research and the translation of findings into the business sector as well as dealing with ethical issues relating to artificial intelligence. A joint call for proposals in the field of energy research, storage and smart grids was published in late 2018.
- At the first **German-Dutch Forum for Science and Innovation** in February 2017, the foundations were laid for furthering the development of the European Open Science Cloud (EOSC), which receives joint support from Germany and the Netherlands. Since then, France has also joined the project. Designed to further advance the collection of research data, the GO FAIR initiative marks one of the first steps towards establishing the EOSC. A joint office shared with the Netherlands and France was set up in December 2017 in order to facilitate the coordination of the GO FAIR initiative.

³The term 'bilateral agreements' encompasses both agreements on scientific and technological cooperation (STCs) and comprehensive bilateral memoranda of understanding (MoUs) on the subjects covered in this report (education, science and research).

- Cooperation with countries in **central-eastern and south-eastern Europe** is characterised by the expansion of the European Research Area and the continued integration of the EU. The BMBF has increased its activities in the Danube Region over the past few years. One of the highlights in this process has been the second BMBF funding call for the Danube Region, 'Formation and expansion of innovative R&D networks with partners in the Danube States', which saw 15 funded projects being launched in 2017. Against the backdrop of the social and political challenges currently encountered in the western Balkan countries, the BMBF continues to pursue its goal of supporting this region on its path to becoming part of the European Research Area. Published in March 2018, the funding measure Integration of the Central Eastern and South-Eastern European region in the European Research Area (Bridge2ERA) marks the continuation of the BMBF's involvement in the region.
- **Canada:** In October 2018, Federal Minister Karliczek visited Canada accompanied by a delegation from the German Bundestag. The trip included the official launch of joint '2+2' projects on the topic of Advanced Manufacturing – Industrie 4.0. This was the first time that the BMBF published a joint funding call together with the National Research Council (NRC) and the Natural Sciences and Engineering Research Council (NSERC). The call focuses on the topic of Industrie 4.0. Cooperation with Canada also forms a core priority in the Internationalization of Leading-Edge Clusters, Forward-Looking Projects and Comparable Networks funding measure. In this context, a delegation from the funded clusters and networks and the BMBF travelled to Canada in September 2018 to visit the newly launched Canadian 'superclusters'. The first collaborative projects were launched in autumn 2017.

Bilateral collaborations with North and South America

- Germany maintains close relations with Argentina, Brazil, Chile, Canada, Colombia, Mexico and the United States of America. Among others, new measures were initiated with Canada, Chile, Costa Rica and Cuba during the reporting period.
- **United States of America (USA):** Researchers in Germany have worked in close cooperation with their US colleagues for a long time. Roughly 28.6% of all international papers co-published in 2017 by German researchers were written in collaboration with US scientists. This close cooperation is enhanced by policy initiatives concerning certain priority areas. A few specific examples include the funding initiative 'Multilateral cooperation in computational neuroscience: Germany – USA – Israel – France', which was launched in October 2017 as well as the ongoing cooperation established in the same year between CISPA, the BMBF competence centre for IT security research, in Saarbrücken and Stanford University, California, which focuses on international exchange and discussion as well as training for world class researchers in the fields of IT security, privacy and data protection.
- **Brazil:** Research questions on key raw materials such as rare types of earth are explored in cooperation with Brazil. In 2017 and 2018, as part of the BMBF funding measure CLIENT II – International Partnerships for Sustainable Innovations, the BMBF provided support for a range of aspects from the extraction to the production of these high-technology metals. With large land reserves and a tropical climate, Brazil fulfils the requirements for the efficient cultivation of bioresources such as sugar cane. The country is therefore one of the preferred partner countries for the BMBF's Bioeconomy International research programme. Together with Brazilian funding organisations, the BMBF provided support for 14 research collaborations during the reporting period.
- **Argentina/Chile/Colombia/Mexico:** Since 2017, the BMBF has supported the establishment of joint research structures by means of their funding measure 'Research structures with Argentina, Brazil, Chile, Colombia and Mexico'. This measure aims to facilitate access to research objects and networks as well as to personnel and infrastructure-related resources.

Bilateral collaborations with Asia

Germany has a number of bilateral agreements that form the basis of its particularly close cooperation with nine countries in the Asia-Pacific region: China, India, Japan, the Republic of Korea, Vietnam, Indonesia, Singapore, Australia and New Zealand. During the reporting period, new measures were introduced regarding regional cooperation with the ASEAN member states as well as bilateral cooperation with China, India, Australia, New Zealand, Singapore, Korea and Japan.

- **China:** The foundations for Germany's long-standing cooperation with China in the fields of education and research were renewed in October 2015 with the publication of the BMBF's China Strategy 2015–2020. In order to tackle global environmental challenges, the strategy focuses on cooperation in the life sciences, key technologies, humanities and the social sciences as well as in vocational education and training. Since its launch, the China Strategy has been implemented successfully and 2018 marked the 40th anniversary of cooperation between Germany and China in the field of science and technology. This partnership covers a broad range of topics and activities. For example, the Sino-German Innovation Platform has promoted exchange and cooperation on the topic of innovation since 2011. The BMBF has been engaged in bilateral cooperation with China on intelligent manufacturing (Industrie 4.0) and smart services since 2016. In this context, two funding calls have been published in coordination with the Federal Ministry for Economic Affairs and Energy (BMWi). In addition to this, several coordinated funding calls and research projects were initiated in 2017 and 2018 in fields such as biomaterials, electromobility and lightweight construction. New ideas and impetus are also added to the China Strategy based on current needs. This was seen at the German-Chinese Intergovernmental Consultations in 2018, where it was agreed to increase cooperation in the field of climate research. On top of this, the BMBF also launched an initiative in 2017 aimed at increasing expertise about China within Germany in coordination with the Standing Conference of Länder Ministers of Education and the Federal Foreign Office.

Bilateral collaborations with Africa

The BMBF currently maintains agreements on bilateral cooperation in education and research with four African countries: Egypt, Morocco, Tunisia and South Africa (education and STC). New measures were introduced with South Africa during the reporting period. Multilateral measures are the main focus of Germany's work with Africa (see also Section 1.3 on implementing the Africa Strategy).

- **South Africa:** The second funding period for the research partnership SPACES – Science Partnership for the Adaptation of Complex Earth System Processes in Southern Africa started during the reporting period. The funding programme was developed in close consultation with research funding institutions in South Africa and Namibia. The SPACES projects are supported by capacity building measures such as summer schools, training on research vessels, individual support for research trips abroad, integration and networking activities as well as workshops with key decision-makers.

Bilateral collaborations with Russia, Eastern Partnership countries and Iran

Germany maintains agreements on bilateral cooperation in education and research with Russia, the Ukraine, Belarus, Moldova, Armenia and Iran. Cooperation with Eastern Partnership countries focuses on providing funding for joint research projects and supporting reform processes within their respective systems for science and research. Germany is engaged in successful collaboration with both Russia and Iran in the field of vocational education and training. Germany and Russia have also worked together for many years on the development and construction of large-scale research facilities.

- **Russia:** The reporting period saw the first joint ten-year strategy being drawn up: the Roadmap for German-Russian Cooperation in Education, Science, Research and Innovation. The road map outlines four pillars for cooperation. The first two pillars, Large Research Infrastructures (Pillar I) in the field of physical basic research and the thematic Priorities (Pillar II), are both aimed at expanding the scope of joint cutting-edge research. The Young Talent programme for supporting young scientists and vocational education and training forms the third pillar of the road map. This programme aims to enable Russian trainees to visit large-scale research facilities in Germany and obtain training for their work in Russia or for technicians to receive further vocational training. The fourth pillar – Innovation, Science and Society – is designed to help increase the translation of research results into society by improving practical relevance and communication in both countries.

Bilateral collaborations with the Middle East

The key priority countries for cooperation with the Middle East are Jordan, the Palestinian Territories and Turkey.

- **Jordan:** The BMBF has launched its funding priority Integrated Water Resources Management (IWRM) in order to support finding solutions for the growing water shortages in the region. The SMART (Sustainable Management of Available Water Resources with Innovative Technologies) collaborative project, which entered its third phase with a funding volume of €4.5 million during the reporting period, involves multilateral and interdisciplinary cooperation between science, industry, competent authorities, local ministries and non-governmental organisations. In order to consolidate the results from the SMART project, the BMBF set up the NICE implementation office, located within the Jordanian Water Ministry in Amman in 2012. The NICE office is run by the Helmholtz Centre for Environmental Research (UFZ). In recognition of this work, the team was awarded the German Environmental Award 2018.

6. Activities of the research and intermediary organisations

The research and intermediary organisations are engaged in a wide variety of international activities. The German Research Foundation (DFG), the Max Planck Society (MPG), the Helmholtz Association (HGF), Fraunhofer (FhG), the Leibniz Association (LG), the DAAD, the Alexander von Humboldt Foundation (AvH) and the German Rectors' Conference (HRK) are all involved in activities ranging from science diplomacy (e.g. the UNESCO project SESAME in Jordan, the first large particle accelerator in the Middle East, which was opened in 2017 with the support of several Helmholtz Centres) to scientific capacity building measures (e.g. the German Research Chairs programme in Africa, established by the AvH) all the way to interdisciplinary research on tackling global challenges (e.g. the cooperation between the Leibniz ScienceCampus Plant-Based Bioeconomy and the Leibniz Research Alliance Sustainable Food Production and Healthy Nutrition

with the French National Institute for Agricultural Research (INRA) whereby the joint goal is to develop new sources of protein for the growing global population). Further key activities focus on cooperation with excellent partners around the world and providing targeted support for scientific excellence (as presented by the DIOSCURI programme, which is run by the MPG and was launched in 2017 in Poland with the aim of strengthening top-class research in Central and Eastern Europe).

The entire report can be found online (in German): [bmbf.de/de/bundesbericht-internationale-kooperation-4317.html](https://www.bmbf.de/de/bundesbericht-internationale-kooperation-4317.html)

List of abbreviations

| | |
|---------|--|
| AIMS | African Institute for Mathematical Sciences |
| AvH | Alexander von Humboldt Foundation |
| BMBF | Federal Ministry of Education and Research |
| BMEL | Federal Ministry of Food and Agriculture |
| BMWi | Federal Ministry for Economic Affairs and Energy |
| BMZ | Federal Ministry for Economic Cooperation and Development |
| CAADP | Comprehensive Africa Agriculture Development Programme |
| CGIAR | Consultative Group on International Agricultural Research |
| COST | European Cooperation in Science and Research |
| DAAD | German Academic Exchange Service |
| DAFI | Albert Einstein German Academic Refugee Initiative |
| DFG | German Research Foundation |
| DIE | German Development Institute |
| DWIHI | German Centres for Research and Innovation |
| EADI | European Association of Development Research and Training Institutes |
| ERA | European Research Area |
| EIC | European Innovation Council |
| EOSC | European Open Science Cloud |
| ERA | European Research Area |
| ERA-Net | European Research Area Networks |
| ESFRI | European Strategy Forum on Research Infrastructures |
| EU | European Union |
| EUREKA | European initiative for market-oriented research and development |
| FhG | Fraunhofer |

| | |
|---------|--|
| FONA | Research for Sustainable Development |
| G7 | Group of Seven |
| G20 | Group of Twenty |
| HGF | Helmholtz Association |
| HRK | German Rectors' Conference |
| JPI | Joint Programming Initiative |
| LG | Leibniz Association |
| MoU | Memorandum of Understanding |
| MPG | Max Planck Society |
| PDP | Product Development Partnership |
| R&D | Research and Development |
| SASSCAL | Southern African Science Service Centre for Climate Change and Adaptive Land Use |
| SDGs | Sustainable Development Goals |
| SME | Small- and Medium-Sized Enterprises |
| STC | Science and Technology Cooperation |
| UNHCR | United Nations High Commissioner for Refugees |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| USA | United States of America |
| WASCAL | West African Science Service Centre on Climate Change and Adapted Land Use |

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