



The
Federal Government

Strategy of the Federal Government on the European Research Area (ERA)

Guidelines and National Roadmap

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I. The European Research Area: Driver for Europe's Future Viability

Knowledge, research and innovation have never before been so decisive for remaining internationally competitive, facilitating growth and being able to tackle grand societal challenges. With its share of almost 30% of global knowledge production, Europe is in principle in a good position to secure its future viability as a continent of ideas and to assert a leading role in science, research and technology. Germany plays an important part as Europe's largest research nation. However, the global science and innovation race is becoming increasingly tough. Important scientific and technological centres and innovation capacities are expanding dynamically in Asia in particular. According to recent estimates, research expenditure in the region is increasing (2012: 561 billion USD; 2014: 632 billion USD) far faster than in Europe (2012: 350 billion USD; 2014: 351 billion USD). Apart from tougher competition, this development also means new opportunities for cooperation that should be seized as a matter of mutual interest.

Against this background, Europe needs a common research area that is efficient and open and can attract the brightest international talents and where the national science systems of the Member States can cooperate more effectively with one another and establish stronger external networks. This calls for a research and innovation policy on the part of EU Member States which skilfully links national activities with European and international activities. Optimum efficiency and coherence can only be ensured if politics, science and industry work as partners at national and European level. After all, alongside publicly funded science, it is companies in particular with their considerable financial investments in research and development and their commitment to translating ideas and research results into new products, services and processes that play a decisive role in securing Europe's position on the global markets through innovations and by creating and maintaining employment in Europe.

The Federal Government sees the further development of the European Research Area as an important driver for strengthening Europe's scientific performance as a whole and expanding its innovative capacity to meet the objectives of the Europe 2020 Strategy. Key measures must be taken at national level so that the European Research Area, like the Single Market, can become a perceptible reality for the people of Europe. The most important instrument at European level is the new EU Framework Programme for Research and Innovation "Horizon 2020", which provides funding of approximately 77 billion euros over the period 2014 to 2020 as a central element of the European Research Area. Activities are being funded along the entire innovation chain – from basic and frontier research to application-oriented research to the preparation of market-ready products and services. As the world's largest, integrated research and innovation programme, Horizon 2020 is giving innovations an additional boost and enabling more cooperation and exchanges across national borders. National measures are being efficiently linked with European initiatives.

The realization of the European Research Area became a declared EU goal that is anchored in primary law and a mandatory task for all concerned, particularly the Member States, with the entry into force of the Lisbon Treaty in December 2009 (Article 179 Treaty on the Functioning of the European Union – TFEU). This joint objective was endorsed at the highest political level by the European Council – accompanied by the target of completing the European Research Area by 2014.

The European Commission (Communication: "A Reinforced European Research Area Partnership for Excellence and Growth" of July 2012) and the Member States (Council Conclusions of December 2012) identified the following individual fields of action for the creation of a strong European Research Area – the so-called **ERA Priorities**:

- 1) More effective national research systems
- 2) Optimal transnational cooperation and competition (planning and implementation of transnational cooperation and research infrastructures)
- 3) An open labour market for researchers
- 4) Gender equality and gender mainstreaming in research
- 5) Optimal circulation, access to and transfer of scientific knowledge
- 6) Strengthening the international dimension of the European Research Area

A special European Research Area Monitoring Mechanism (EMM) has been introduced based on Article 181 TFEU in order to ensure a binding and transparent procedure. This is part of the European Semester and will be used to regularly assess the status of implementation of the individual priorities.

The year 2014 is an important year for the reinforced partnership in the European Research Area between Member States, science and research funding organizations and the European Commission: The Commission plans to present its second progress report in September and the European Council will comment on the completion of the European Research Area in autumn. The Federal Government takes the view that considerable progress has been made in recent years. The European Research Area has been placed on a sound basis and realized in principle, but still requires further development. Against this background, 2014 is to be seen as a milestone in the evolutionary process of the further implementation of the European Research Area which the Member States in particular must now accelerate.

Germany is already well positioned in most of the fields of activity of the European Research Area – the high political significance afforded to research and innovation is paying off. The Federal Government is determined to secure this position and to make its contribution to actively promoting steps to strengthen the European Research Area at national and European level in cooperation with the various stakeholders and implementing concrete measures. The guiding principles are the **Guidelines** described under II. and the **National Roadmap** explained under III. **Together they form the Strategy on the European Research Area** over the next years. The Federal Government is thereby implementing both the objectives that were jointly agreed at European level and its mandate under the Coalition agreement, which emphasizes Germany's responsibility for the European Research Area and for strengthening the European science and innovation system as a whole.

The special significance that the Federal Government attaches to strengthening the European Research Area is demonstrated not least by the fact that the BMBF has established a division to deal specifically with matters of the European Research Area and has created a special budget line as an effective incentive mechanism to Europeanize its funding programmes.

The Federal Government will evaluate the status of the implementation of the current strategy before the end of the legislative period and report to the German *Bundestag* accordingly.

II. Guidelines for further shaping the European Research Area

The Federal Government is led by the following **guidelines** regarding the further shaping of the European Research Area:

- 1) Germany's considerable economic clout and scientific and technological capacity give it a special role as driver for the further development of an excellence-based European Research Area that serves as an international beacon. The Federal Government is facing up to this responsibility and will actively promote measures to strengthen the European Research Area at national and European level. It is focusing particularly on the intelligent integration of national, bilateral and European research and innovation policy as well as the stronger involvement of stakeholders from Germany in corresponding European programmes and initiatives.
- 2) The European Research Area is based on the diversity and respective strengths of the national research and innovation systems of the Member States. It is therefore primarily the responsibility of the Member States to make substantial progress with the further realization of the European Research Area on the basis of self-commitments and concrete strategies for action, thereby taking into account the different national starting positions. This includes the possibility of implementing concrete measures and cooperation based on the principle of variable geometry – that is to say, on a voluntary basis involving flexible groups or formats for stronger cooperation – in order, for example, to increase openness and interoperability between different funding mechanisms. The Federal Government considers harmonizing legal measures at European level to be the wrong step, however. This would be detrimental to the diversity of the research systems and cultures in Europe, which encourages the competition needed for outstanding scientific performance and excellence. Additional regulation also leads to additional bureaucracy and limits scope, which is essential for the development of science.
- 3) The European Research Area must be made more effective as a whole and placed on a broad basis through the optimum use of national and regional diversity with regard to research and innovation systems as well as through different funding and cooperation instruments. The effective combination of excellence-driven research and innovation funding under Horizon 2020 and funding opportunities under the Structural Funds is especially important in this respect. This combination of measures releases synergies, encourages weaker Member States to catch up and helps to reduce the innovation gap within Europe.
- 4) It is also important to strengthen the international dimension of the European Research Area with regard to third countries. Only thus can Europe succeed in asserting its leading position in research and innovation in a changing world, in which countries like China, India, South Korea and Brazil are exercising an increasing influence, and in making the best possible use of opportunities for cooperation – particularly in tackling global societal challenges. This requires that the European Research Area be given a strategic international focus which builds on the diverse bilateral and multilateral relations of the Member States with third countries and on an efficient interaction with corresponding EU cooperation activities and initiatives. Germany's framework of reference in this context is the 2008 Strategy of the Federal Government for the Internationalization of Science and Research, which is being

further developed in this legislative term under the leadership of the BMBF to reach new standards in international science cooperation and networking.

III. National Roadmap on the European Research Area

The **National Roadmap** below forms the basis for the further implementation of the individual ERA Priorities. It follows the basic principle that the EU Member States should play a stronger and more committed role, an aspect which is also emphasized in the Council Conclusions on the European Research Area of February 2014. The measures described are not to be regarded as a final list. They simply represent priority areas which indicate how Germany will contribute towards shaping the further realization of the European Research Area as an active partner in Europe.

ERA Priority 1: More effective national research systems

Content:

Efficient and effective national research systems are the precondition for a strong European research environment. The effectiveness of research and science systems plays an important role in economic growth and social progress. The level and efficient use of public funding for research and science are decisive factors together with the establishment, maintenance and development of performance-enhancing structures, framework conditions and processes. This involves questions of quality (e.g. selection of the best projects), relevance (e.g. potential for using possible results) and efficiency (e.g. input-output ratio). Effectiveness is also influenced by factors such as good cooperation between the research stakeholders and the availability of efficient national research and innovation strategies. In this respect, Germany has one of the most efficient research and innovation systems in both Europe and the world. According to the European Commission's Innovation Union Scoreboard 2014 and the World Economic Forum's Global Competitiveness Report 2013-2014, it is among the group of innovation leaders. Germany is the European country with the highest share of companies that successfully market their innovations.

Nevertheless, in view of the great scientific and technological dynamism of other world regions, Germany needs to constantly review and optimize the preconditions for its success and reframe them as necessary.

The European Commission has singled out the following criteria from a number of factors that are relevant for effectiveness: The competition-based allocation of funds via open funding calls, evaluated by independent domestic and non-domestic experts (peer review); the evaluation of research institutions as an instrument for the allocation of public funding; and the application of the core principles of international peer review by all public bodies/funding providers.

These factors are an integral part of the German research and innovation system. Current statistics show an increase in expenditure on research and development (R&D) in Germany to a record level of 79.4 billion euros in 2012. This means that the share of R&D as a percentage of gross domestic product has reached a peak of 2.98%. In other words, Germany has virtually

achieved the 3% target of research intensity stated in the Europe 2020 Strategy. Germany is therefore among the leaders by European comparison. Only the Scandinavian countries Finland (3.55%), Sweden (3.41%) and Denmark (2.99%) spent even larger amounts on R&D in relation to gross domestic product in 2012. The European average (EU-28) was 2.06%. Germany intends to maintain this high level of R&D intensity in future. Furthermore, competition-based funding procedures are a core element of national strategies and initiatives (e.g. High-Tech Strategy, Excellence Initiative). Over one third of the public funds allocated for research and development in Germany (2011: 37%) involve measures in the field of competition-based project funding. At the same time, scientific excellence does not thrive on competition alone. It also needs reliability and scope to experiment. Germany is therefore focusing in the institutional field on a balance between reliable funding and competition-based procedures. What is more, the principles of international peer review are firmly anchored in the German research and science system. The combination of qualitative performance goals, long-term financial planning certainty (e.g. Pact for Research and Innovation) and improvements to the legal framework serves to enhance the performance of the system as a whole. The Academic Freedom Act, which came into effect in late 2012, is also expected to have an important positive influence in this context. This law provides non-university scientific institutions with more freedom in financial and personnel decisions, in shareholdings and construction projects. This means fewer bureaucratic obstacles, the pooling of competences and the acceleration of licensing procedures. Furthermore, the federal institutions with research responsibilities at the interface between science, industry, society and politics also contribute significantly to the high level of efficiency of the German research system.

The science organizations involved in the Pact for Research and Innovation (German Research Foundation DFG, Fraunhofer-Gesellschaft, Helmholtz Association, Max Planck Society and Leibniz Association) had budget certainty during the period 2005 to 2010 with a 3% annual rate of increase. An annual budget increase of 5% has been agreed for the period 2011 to 2015. In return, the science organizations have committed themselves to science policy objectives (inter alia, development and implementation of international cooperation strategies, establishment of sustainable partnerships between industry and science and the intensification of networking activities within the science system, for example, through regional institutional collaborations).

Objectives:

The Federal Government strongly supports efforts to secure and enhance the high level of effectiveness of the German research and innovation system via a raft of measures. The proposed amendment to the Basic Law (Article 91b GG) is of central importance in this context. It is intended to expand the opportunities for cooperation between the Federal Government and the *Länder* in order to heighten the efficiency of the higher education institutions. The further development of the High-Tech Strategy to become a comprehensive, interdepartmental innovation strategy and the development of the Pact for Research and Innovation are also important factors.

Furthermore, it is essential that research information and evaluation systems heighten their focus on evidence-based political action (e.g. through initiatives of the German Council of Science and Humanities regarding research rating and the establishment of core data). Efficiency

analyses are to be applied to different degrees, taking into consideration the objective and the time horizon of a funding measure. At the same time, a systematic exchange of experience will assess best practice procedures at European level (e.g. under Horizon 2020) and national level as to their applicability in a different context. A further aim is to strengthen departmental research.

In addition, the targeted use of synergies between European and national research and innovation programmes – also within the framework of preparatory bilateral cooperation projects – will open up new potential for development and expand intra-European cooperation. In this context, the Federal Government is aiming to increase German participation in the new EU Framework Programme for Research and Innovation, Horizon 2020. The level of participation in Horizon 2020 by stakeholders from Germany will be raised to match Germany's position and significance as a centre of research in Europe in respect of both quantity and quality.

The European Research Area will only be successful if those Member States which currently have weaker science systems step up their efforts and Europe succeeds in closing the excellence and innovation divide in Europe. One important objective therefore is to strengthen cooperation with the new EU Member States (EU-13) in support of European measures (particularly teaming/twinning approaches under the new Horizon 2020 funding line "Spreading Excellence and Widening Participation") with a view to increasing Europe's overall scientific performance and innovative strength.

Measures:

- ***Expanding the opportunities for cooperation between the Federal Government and Länder by amending Article 91b of the Basic Law (GG) to strengthen the performance of higher education institutions in the long term:*** The Federal Government is aiming to amend Article 91b Basic Law in order to establish the constitutional framework for broader cooperation between the Federal Government and the Länder in the academic sector. The amendment to the Basic Law enables the Federal Government and the Länder to cooperate extensively in funding science, research and teaching at higher education institutions as well as at non-university research institutions in cases of supra-regional importance. The expansion of opportunities for cooperation provides the Federal Government and the Länder with a range of instruments which can be used to lastingly strengthen the performance of the higher education institutions at national and international level whilst at the same time upholding the clear division of responsibilities between the federal and Länder levels. The institutions of higher education form the nucleus of the science system with their unity of research and teaching. On the one hand, they train future scientists and on the other hand, they provide research results for the transfer of knowledge and technology.
- ***Further development of the High-Tech Strategy to become a comprehensive, interdepartmental innovation strategy:*** The focus will be on outstanding drivers of innovation such as the digital economy and society as well as on sustainable business/energy. Further planned priorities are new instruments for improved national and international networking activities involving science and industry, strengthening European cooperation through the skilful interlinkage of national and European research and innovation funding programmes

(Horizon 2020) and improving governance structures (including regular quality assurance, control of results and impact analysis).

- **Continuation/further development of the Pact for Research and Innovation:** The Pact for Research and Innovation has contributed to a surge in dynamism and has helped enhance the performance of the German science system in recent years. The science organizations involved in the Pact (German Research Foundation DFG, Fraunhofer-Gesellschaft, Helmholtz Association, Max Planck Society and Leibniz Association) had budget certainty during the period 2005 to 2010 with a 3% annual rate of increase. An annual budget increase of 5% has been agreed for the period 2011 to 2015. The Federal Government is committed to steadfastly continuing the course of internationalization and actively promoting the structuring of the European Research Area under the planned further development of the Pact. This includes providing for reliable documentation in terms of both quantity and quality of the European and international networking activities of the German science organizations and their commitment to shaping the European Research Area.
- **Evaluation of the Excellence Initiative:** The German Research Foundation DFG and the German Council of Science and Humanities will present the Joint Science Conference with a data-based report on the progress of the Initiative for Excellence in summer 2015. This initiative promotes first-rate, internationally visible research at higher education institutions under the three funding lines of "Graduate Schools", "Clusters of Excellence" and "Institutional Strategies". Furthermore, an external commission involving international experts will evaluate the Excellence Initiative and analyse its effects on the science system. The results are expected in early 2016. These two reports form the basis for deciding on the further strategic approach for the period after the Excellence Initiative expires at the end of 2017.
- **Increasing participation by German stakeholders in Horizon 2020:** The Federal Government is committed to supporting and extending participation by German science and industry (particularly small and medium-sized enterprises) in Horizon 2020. Based on the respective national research programmes, measures include developing BMBF strategies for Europeanization and strengthening synergies between national funding activities and Horizon 2020. The BMBF will use incentive instruments to increasingly introduce and support measures which enhance the chances of success of German applicants in the European competition. Furthermore, the German Government will set up an efficient information and advisory system on Horizon 2020 to support German research stakeholders and reach out to new players. The Federal Government will also become involved in the further strategic development and implementation of the two-year Work Programmes on Horizon 2020 at an early stage and will put forward a constructive and coherent German position. This too will play a significant role in the subsequent success of German applicants.
- **Strengthening the performance of the European Research Area as a whole with a focus on EU-13 states:** At national level, there are plans for a BMBF programme to promote the establishment and expansion of joint research structures involving excellent German institutions and companies and research establishments, companies and, if appropriate, regions in EU-13 countries. Furthermore, the Federal Government intends to set up a special fellowship programme for science managers from EU-13 Member States ("ERA Fellowships"). The aim is to improve the effectiveness of the respective national research systems by providing excellent

training for science managers and strengthening networking activities with these partner countries. In addition, the Federal Government will continue to contribute towards unlocking research and innovation potential and strengthening the efficiency of the European Research Area as a whole through its bilateral and multilateral cooperation activities (inter alia, BMBF programmes on international research cooperation with EU-13 countries and other countries in South-East Europe) as well as within the framework of EU macro-regional strategies (Danube region, Baltic region). Germany's recent intensified research cooperation with Greece can be seen as an example in this context. Bilateral cooperation covers health and energy research, bio-economy and key enabling technologies such as information and communication technologies, nanotechnology and photonics as well as the humanities and social sciences. At European level, the Federal Government is promoting the successful implementation of the Horizon 2020 programme line "Spreading Excellence and Widening Participation". This will support cooperation in so-called "teaming" measures between excellent research institutions and weaker regions.

- **Continuation and expansion of institution-specific activities and initiatives of the German science organizations:** These include intensifying networking activities within the science system through regional institutional collaborations in science such as the Karlsruhe Institute of Technology (KIT: merger between the Karlsruhe Research Center and Karlsruhe University), the Jülich Aachen Research Alliance (JARA: integrative partnership between RWTH Aachen and Forschungszentrum Jülich) and the Berlin Institute of Health (BIG: cooperation agreement between the Charité and the Max Delbrück Center for Molecular Medicine). At European level, the German science organizations are actively helping to shape the European Research Area, inter alia, through the European umbrella organizations of science and research institutions (particularly Science Europe, European Association of Research and Technology Organizations – EARTO, European University Association – EUA).

ERA Priority 2.1: Optimal transnational cooperation and competition – Planning and implementation of transnational cooperation

Content:

In view of the limits to national public funding and capacities, transnational cooperation and coordination of research efforts are of decisive importance particularly when it comes to tackling major societal challenges such as climate change, food security and demographic change. No single Member State can master these challenges on its own.

Against this background, a research policy strategy was introduced at European level in 2008 in the shape of the Member State-driven Joint Programming. The goal of this Joint Programming was to use strategic coordination and exploit synergies between national programmes in order to create enough leverage and the necessary critical mass to enable successful research on complex issues. In the ten ongoing Joint Programming Initiatives (JPIs) – eight of which involve the participation of the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Food and Agriculture (BMEL), and the Federal Ministry of Health (BMG) – the Member States coordinate their research programmes "in variable geometry". The topics of the JPIs are neurodegenerative diseases, demographic change, agriculture/food security/climate change,

healthy nutrition/lifestyles, urbanization, water, questions of cultural heritage, seas/oceans, climate research/networking of climate knowledge and antimicrobial resistance.

In the view of the Commission, the core elements needed to further optimize transnational cooperation include the intensification of efforts to carry out joint research agendas in the area of major societal challenges, the allocation of adequate national funds, the mutual recognition of evaluations based on international peer review standards as well as the dismantling of legal and other obstacles to enhance the cross-border interoperability of national programmes.

Germany has achieved a great deal already. Between 2009 and 2013, the BMBF alone spent around 470 million euros for European transnational cooperation in project support. This represents an increase of approx. 50% in this period. In addition to the above-mentioned active participation in JPIs, German science and research are involved in a wide variety of other transnational cooperation initiatives with and without the participation or support of the Commission. Implementing joint transnational calls for proposals has become a routine procedure for example in the context of numerous ERA-NETs. Where transnational initiatives include common evaluation procedures, the results of scientific and technical evaluation are usually recognized. The basis for this are the BMBF's guidelines on transnational cooperation as well as the procedural rules agreed for individual initiatives, which significantly facilitate interoperability. At the same time, examination of the formal admissibility of an application for funding must continue to be performed on the basis of the respective budgetary and funding regulations of the national or regional funding organizations – ideally before it is subjected to international peer review. Transnational cooperation means joint funding of activities on the basis of the 'virtual common pot' funding model with each Member State funding its own national contribution to the project.

Objectives:

The Federal Government aims to expand transnational cooperation still further and to improve the framework conditions for such cooperation. Under its Strategy for the Internationalization of Science and Research it is aiming for a 20% participation rate by foreign partners in BMBF-funded projects, taking into account programme-specific features. At the same time, it aims to strengthen the visibility of the intensive European/international networking of German science. However, it is opposed to the wholesale opening up of national funding programmes as well as to multilateral cooperation that would be mandatory and legally binding for all national and regional funding activities in the area of research and innovation. The consistent application of the principles of flexibility, variable geometry and voluntarism as well as user-friendly procedures are decisive for the lasting success of transnational cooperation.

The Federal Government regards JPIs with their focus on grand societal challenges as strategic initiatives whose substantive and structural impact goes way beyond the mere implementation of transnational calls enabled by the alignment of national resources at European level. Their particular added value is to be found in the joint development of strategic research agendas that serve as reference frameworks at national as well as European level. The aim, therefore, is to systematically enhance the potential of these initiatives in particular.

In addition, the aim is to retain and make greater use of other instruments, initiatives and platforms of cross-border cooperation in the European Research Area and to expand them as appropriate.

Measures:

- **Strengthening the structural impact of the Joint Programming Initiatives (JPIs):** In particular, this measure includes designing and implementing 'bivalent' programmes, i.e. when BMBF funding programmes are being planned, wherever possible and appropriate a European component is also to be developed that is geared in terms of content to the strategic research agendas agreed within the context of JPIs.
- **Continuation and greater utilization of other instruments, initiatives and platforms of cross-border cooperation in the European Research Area:** In addition to active participation in JPIs, European Innovation Partnerships (EIPs), ERA-NETs and ERA-NET Cofund Actions in Horizon 2020, this measure applies in particular to the two transnational European research initiatives EUREKA and COST which usefully complement the EU Framework Programme for Research and Innovation as important instruments in the European Research Area with their marked bottom-up approach, their flexibility and their lean administration.
- **Utilization and expansion of measures in accordance with Article 185 TFEU (public-public partnerships – P2Ps),** such as the successful SME research funding programme EUROSTARS implemented under the EUREKA initiative, the European Metrology Programme for Innovation and Research EMPIR implemented by EURAMET e.V., the Joint Baltic Sea Research and Development Programme BONUS and the European and Developing Countries Clinical Trials Partnership programme EDCTP carried out in close partnership between European and sub-Saharan African countries, **as well as measures under Article 187 TFEU (public-private partnerships – PPPs)** with the participation of German industry, such as the initiatives for biobased industries (BBI), fuel cells and hydrogen (FCH), aviation (Clean Sky 2 – CS 2 and the Single European Sky ATM Research – SESAR) or innovative medicines (IMI). In this way, important impulses are given in areas in which the market often fails (P2Ps), and, at European level, such measures are driven by industry (PPP) in order to create a critical mass for near-market support of key technologies which are of particular importance for Europe's global competitiveness.
- **Increasing the visibility and documentation of the European/international networking of German science:** The Federal Government will work towards improving the relevant indicators, including for the purpose of data collection in the ERA Monitoring Mechanism (EMM) in accordance with Article 181 TFEU.
- **Continuation, expansion and support of transnational cooperation by the science organizations:** The German Research Foundation DFG contributes at various levels and in various integration phases to creating a science-led environment for transnational research cooperation. At project level, the required financial resources can either be obtained through the flexible use of project funds or additionally applied for. At institutional level, the DFG cooperates with foreign partner organizations – for example within supraregional or international collaborations such as Science Europe and the Global Research Council – in order to better coordinate the research funding systems for the benefit of the scientific community, for example

by working towards comparable standards and procedures. Tried and tested mechanisms of the DFG for transnational research funding such as the "Money Follows Cooperation Line", "Money Follows Researcher" and "Lead Agency" processes in Germany, Austria, Switzerland and Luxembourg as well as funding based on bilateral and multilateral agreements in the various programmes are to be continued. The development and expansion of the Lead Agency process is being trialled by means of pilot measures with other countries.

The Helmholtz Association is helping to reinforce the long-term pooling of research expertise and research backing for relevant initiatives at European level with the further development of the European Energy Research Alliance (EERA) and the European Climate Research Alliance (ECRA) which also includes the activities of relevant JPIs and Knowledge and Innovation Communities (KICs) of the European Institute of Innovation and Technology (EIT). The Helmholtz Association also continues to work actively in the EU-funded Human Brain Project (a Future and Emerging Technologies (FET) Flagship) as well as in the three KICs established so far by the EIT.

The German Rectors' Conference (HRK) aims to develop a European Research Map on the basis of its national Research Map for universities; this web-based tool will make it easier to search for key research priorities of European universities and will thus improve their visibility. The HRK also maintains a database of collaborations between European universities in border regions. These collaborations form an important component of the European Research Area. With nine neighbouring countries, Germany is a key location for such cooperation. The HRK wants to create a future platform for the exchange of European experience and for developing ideas and strategies in this area.

ERA Priority 2.2: Optimal transnational cooperation and competition – Research infrastructures

Content:

Excellent research infrastructures are of the utmost importance for a high-performing and forward-looking science and research system. They are the key to dealing with demanding scientific questions at the highest level, to achieving significant technological advances and to opening up new areas of research. Access to research infrastructures offers an important basis for exchange between scientists as well as their continuing education and promotes the transfer of technology and knowledge. Investment in research infrastructures is therefore investment in a society's future.

However, the high costs involved in building and operating complex research infrastructures increasingly means that this can only be done on the basis of European or even worldwide cooperation. Consequently, European and international coordination processes are becoming ever more important. It was against this background that the "European Strategy Forum on Research Infrastructures" (ESFRI) was established in 2002 by the EU research ministers as a strategic instrument for the development of scientific cooperation in Europe and the strengthening of international cooperation. ESFRI serves to support a coherent and strategically-based approach to developing research policy decisions on new and existing pan-European and global research infrastructures; it also serves to support multilateral initiatives that lead to a better utilization and development of research infrastructures at European and international

level. Since being launched, ESFRI has developed into a successful instrument. It is the central forum in which Member States can introduce their ideas and considerations on research infrastructures in line with their national priorities and can implement them in variable geometry following joint discussions.

Germany plays a leading role in the provision and use of research infrastructures and, as one of the world's most research-intensive countries, benefits to an extraordinary extent from its close connections with its European neighbours in this area. Germany has therefore been an active participant in ESFRI since the outset and chaired it with success and international visibility from 2010 to 2013.

The Commission has a supporting function for ESFRI projects: It facilitates the implementation of the projects through preparatory projects, supports the networking of research infrastructures and can facilitate access to them. The new European legal form ERIC (European Research Infrastructure Consortium) provides a useful instrument for the establishment of joint research infrastructures in Europe. However, the Commission does not provide support for the construction or operation of research infrastructures. It therefore considers the acceptance or confirmation of financial commitments by the Member States to build and operate research infrastructures to be in the interest of all Europe, particularly when it comes to drawing up national roadmaps and structural funds programmes, and thus to be at the heart of the ERA priority "Optimal Transnational Cooperation – Research Infrastructures". At the same time, legal and other obstacles to cross-border access to research infrastructures are to be removed.

Germany is a financial contributor to 18 of the 48 projects on the ESFRI Roadmap and is the host country of European XFEL (Hamburg), FAIR (Darmstadt), SHARE (Munich) and INFRAFRONTIER (Munich). At national level, the BMBF Roadmap for Research Infrastructures was published at the end of April 2013. This covers projects that have been allocated the highest priority in an overall research policy assessment which considers scientific potential, importance for science in Germany, practical feasibility, the possibilities for scientific exploitation, financial feasibility and their significance for society. Following evaluation by the German Council of Science and Humanities, three new ESFRI projects have been added to the BMBF Roadmap (Cherenkov Telescope Array (CTA), EU-OPENSREEN in the field of life sciences and IAGOS for the collection of atmospheric data). The BMBF Roadmap also shows the previously selected research infrastructures. These include research ships, climate research infrastructures, medical research facilities, infrastructures for computer simulations as well as platforms in the fields of the humanities and the social and cultural sciences. This clearly demonstrates the successes that have already been achieved in the German science system with regard to the expansion of research infrastructures.

Objectives:

Early agreement on joint interests with European and non-European partners will become even more important in the future planning, construction and operation of research infrastructures. It is therefore the Federal Government's goal to continue to be actively involved in shaping the Member State-led ESFRI process and to connect it in a useful way with the national roadmap process for research infrastructures initiated by the BMBF. At the same time the Federal

Government will work towards the further development of ESFRI itself and will also be committed to intensive participation in the European Research Infrastructures funding priority in Horizon 2020 as well as to continual further development of the existing national funding instruments.

Further activities to develop the landscape of research infrastructures at German, European and international level involve an ideas-finding phase agreed with all the stakeholders and the further development of clear criteria for the acceptance of new projects into the ESFRI process but also viable "exit strategies" for research infrastructures. Regular evaluations also need to be performed both at strategic and operative level in order to ensure effective management of the portfolio of research infrastructures.

Measures:

- **Active participation in the further development and updating of the ESFRI Roadmap:** This will involve a review and if needed a revision of the evaluation and decision-making processes as well as of the criteria for accepting projects onto the roadmap together with our European partners. At the same time, as part of the updating of the ESFRI Roadmap, the prioritization process that was introduced to support the implementation of projects will be continued.
- **Further development of ESFRI:** Examination of the establishment of a limited-volume budget for ESFRI ("common pot"), out of which funding will be provided for example for experts for the evaluation of ESFRI projects, for studies on socio-economic impacts of research infrastructures as well as for workshops for the exchange of experience of successful good practice in the construction and/or management of research infrastructures. In addition: Examination of the possibility to expand ESFRI's range of tasks so that ESFRI can in future pay greater attention to existing research infrastructures in the Member States and associated countries as well as to continue to pursue the path already established to standardize the evaluation processes and criteria for research infrastructures across Europe.
- **Strengthening participation in the funding priority "European Research Infrastructures" in Horizon 2020:** The EU Framework Programme for Research and Innovation offers a wide range of possibilities for funding for design studies or for the preparatory phase as well as for the integration and cross-border opening of research infrastructures (including e-infrastructures). Measures for the public procurement of scientific equipment, for strengthening the available human resources as well as for international cooperation complete the list of what can be funded with regard to research infrastructures under Horizon 2020. The Federal Government supports efforts to make greater use of such possibilities where synergies with national processes arise.
- **Continuation of the BMBF Roadmap process for research infrastructures:** This process is used to prepare and support strategic research policy decisions on research infrastructures at national level as well as to create funding transparency for planned projects. All projects in various fields of science and all potential research funding organizations are included in the considerations concerning the demand for research infrastructures, their goals and quality, as well as their construction and operating costs. In view of the fact that many research infrastructures are realized in European or international collaborations, the national BMBF Roadmap process is to continue to be closely linked to the ESFRI Roadmap process as an instrument of research policy prioritization.

- **Strengthening the connection of universities to research infrastructures:** Existing national funding instruments (in particular for collaborative research) will be developed further and used more efficiently.
- **Continuation of the strong commitment of German science in the planning, construction and operation of and participation in research infrastructures:** At conceptual level, both the Helmholtz Association and the Leibniz Association draw up their own strategies or roadmaps for prioritization, planning, construction and operation of research infrastructures which are to be linked with processes at national and European level (BMBF Roadmap, ESFRI). Special mention should also be made of the fact that German science organizations will continue to actively participate in the debate at European level, for example within the Science Europe Working Group on Research Infrastructures (German Research Foundation DFG, Max Planck Society, Helmholtz Association, Leibniz Association).

ERA Priority 3: Open labour market for researchers

Content:

An open labour market that offers researchers optimal conditions for mobility within Europe as well as attractive working conditions and career prospects provides Europe with a decisive competitive advantage as a place for research. It allows more cooperation and competition between European science and research establishments and thus creates incentives for continual improvements in quality which is essential for research excellence, innovativeness and growth in the European Research Area.

International mobility is a key element in scientists' career planning and progression. Relevant programmes of the EU Framework Programme for Research and Innovation (Horizon 2020) make a major contribution to the mobility of men and women in European and international research. International mobility promotes greater networking and pooling of know-how within Europe as well as integration in global research networks, creating scientific added value as it does so. For these advantages to become reality, open and transparent recruitment procedures that are based on merit are needed in all the Member States. The ERA Priority "An open labour market for researchers" also focuses on the introduction or expansion of structured innovative doctoral programmes, the implementation of the Human Resources Strategy for Researchers while taking account of the European Charter for Researchers and its Code of Conduct for their recruitment as well as improving the cross-border portability of government grants.

Germany has a highly differentiated system of qualification. With its large variety of institutional forms and funding possibilities, it takes account of the independence and differences between the doctoral and post-doctoral phases which each impose their own specific requirements on young scientists. Universities have responsibility for awarding most of the scientific qualifications. They are aided in this through the support provided for young scientists by the Federal Government and the *Länder*, research institutions and funding organizations.

Important structural improvements have already been achieved through the funding of more strongly structured doctoral programmes (such as the Research Training Groups of the German Research Foundation DFG), the funding of graduate schools in the first funding line of the

Excellence Initiative, the establishment of structured doctoral programmes with funding from the Pact for Research and Innovation as well as through the expansion of the additional qualifications offered. The variety of paths to a doctorate including individual doctoral programmes must, however, be retained for the future. Earning a doctorate represents the first step on the scientific career ladder. The indispensable factor of doctoral study is and will continue to be independent scientific research.

For the sake of Germany's innovativeness and competitiveness, it is vital that the best brains are recruited for German science on a lasting basis and that the opportunities of cross-border mobility are utilized. Important steps have been taken to achieve this over the past few years. The German Academic Freedom Act, which was passed in 2012, has given non-university research institutions more freedom in financial and staffing decisions enabling them to offer more internationally attractive conditions for scientists. International announcements of both temporary and permanent positions for researchers are the norm in Germany. The Internet portal "EURAXESS – Researchers in Motion" provides information about international vacancies for researchers, social insurance, visa requirements and administrative support. A broad spectrum of programmes promotes the international mobility of German scientists and qualification and work periods of excellent foreign researchers in Germany. The number of foreign scientists at German universities and non-university research institutions increased significantly from approximately 29,000 in 2006 to approximately 42,000 in 2011.

Objectives:

We need to build on the positive developments mentioned above in order to improve the conditions for the mobility of researchers still further. One key challenge is the continued differences between Europe's social insurance systems. The time-consuming steps to secure entitlements and in some cases limited or no possibilities to transfer social insurance entitlements to another country (in particular pension entitlements) make it harder to continue a scientific career in another Member State. This represents a significant competitive disadvantage for German and European research. The goal must therefore be to prevent possible gaps in insurance provision that result from cross-border transfers and to offer more attractive retirement provision to mobile researchers.

Furthermore, our system must also offer competitive working and career path conditions for young scientists. This applies not only with regard to the increasing competition with other European and international locations but also in comparisons with employment opportunities outside of the scientific field. The employment situation for young researchers in Germany is still too often characterized by uncertainty and a lack of transparency, particularly in the post-doctoral phase. Career paths in science and research must therefore offer greater scope for planning, transparency and certainty. For this purpose, an active personnel policy in universities and research institutions including the systematic development of personnel development strategies must be strengthened further in order to enable the successful advancement of scientific careers but also careers outside of science.

Measures:

- **Further improvement of mobility conditions for science:** *The Federal Government will strongly persist with its activities in this area especially through the support of the scientific and intermediary organizations (such as the German Academic Exchange Service and the Alexander von Humboldt Foundation), in order to ensure the attractiveness of Germany as a research location for the best brains from abroad and to provide the best possible support for the international mobility of German researchers. In order to improve the provision of advice to internationally mobile researchers, the Federal Government continues to fund the National Contact Point for Mobility and contributes to the funding of the Europe-wide information portal EURAXESS. It also supports the supplementary pensions agency for Federal and Länder employees VBL in the further development of the interactive platform www.FindYourPension.eu, where researchers can find information about the possibilities and conditions of retirement provision in Europe.*
- **Commitment of the German Rectors' Conference (HRK) to more flexible systems of retirement provision:** *The HRK regularly informs universities and scientific institutions about current developments in retirement provision for mobile scientists and draws up recommendations for improvement. It has signed a general cooperation agreement with the supplementary pensions agency for Federal and Länder employees VBL and contributes support and publicity for the www.FindYourPension.eu platform. In autumn 2014 it will hold a policy conference on the subject of More Flexible Retirement Provision Systems for Greater Mobility in Science with the support of the BMBF and the participation of all the stakeholders involved. Potential future reform steps will be discussed there.*
- **Mobility funding by the Alexander von Humboldt Foundation and the German Academic Exchange Service:** *In order to facilitate the recruitment of foreign post-docs for research in Germany, the Alexander von Humboldt Foundation intends to launch a competition to help improve the conditions for post-doctoral researchers in Germany. The Alexander von Humboldt Foundation is also trialling a pilot project to examine the possibilities for granting extra benefits as well as pension contributions in addition to regular fellowship grants. The German Academic Exchange Service is examining the possibility of opening up its scholarship programmes for studies and research periods abroad to foreigners studying and doing research at German universities.*
- **Active support for the implementation of and participation in Marie-Sklodowska-Curie Actions (MSCA) under Horizon 2020:** *The Federal Government actively supports the implementation of MSCAs since these provide a significant contribution to structuring the training and career development of researchers in the European Research Area particularly through the systematic funding of transnational and cross-sector mobility. Particular importance is attached to the co-financing of national and regional mobility programmes. The various types of MSCAs are optimally geared to the needs of this ERA priority and are publicized and assisted by the German National Contact Point for Mobility to secure high levels of participation in Germany.*
- **Improving the prospects for young scientists in universities and research institutions:** *Support for young scientists is already being consistently addressed by many Federal*

Government and Länder measures, for example as an important element of Germany's Excellence Initiative and the Pact for Research and Innovation. Building on this, we need to proceed with the development of an overall approach to supporting young scientists; we need to continue to work towards attractive and internationally competitive career structures both in universities and in non-university research institutions and federal institutions with research responsibilities. In particular, the reorganization of the universities' personnel structures needs to be clearly supported and there needs to be a review of the provisions of the Academic Fixed-Term Contract Act.

- **Strengthening academic personnel development at universities:** The members of the German Rectors' Conference (HRK) want to create more certainty and transparency for young scientists in planning their careers. The HRK published guidelines on this in May 2014, which, among other things, envisage the drawing up and implementation of personnel development strategies ("Guidelines for the advancement of early career researchers in the post-doctoral phase and for the development of academic career paths in addition to that of a professorship"). Even before this, the HRK has recommended that its member organizations participate in the process of the European Commission's Human Resources Strategy for Researchers, and it supports the efforts of German universities which develop personnel strategies for researchers on this basis and want to earn the right to use the European HR Excellence in Research logo. However, such participation should continue to be on a voluntary basis and independent of access to European funding. Synergies are being sought as the new HRK guidelines are fine-tuned and the implementation of the Human Resources Strategy for Researchers is further developed.
- **Continuation and further development of innovative approaches for the support of young talent in science organizations:** The funding programme of the German Research Foundation DFG for research training groups provides for a closer linking of the support for doctoral candidates with the opening up of new research prospects. The DFG is also working towards the across-the-board application of the possibility created in 2009 that doctoral candidates in all subjects will be paid on the basis of employment positions rather than grants. There are also plans for the expansion of programme elements which look at post-doc career paths for young academic talent. Furthermore, measures for the internationalization of support for young scientists have already been a priority for the DFG for a long time. This is demonstrated, among other things, by the high proportion of international research training groups. It is intended that further internationalization measures should also support this trend in all the other (national) research training groups. The Max Planck Society will continue its successful programme for structured doctoral training at its International Max Planck Research Schools (IMPRS). Max Planck institutes are cooperating with German as well as foreign universities in the more than 60 IMPRS. The International Leibniz Graduate Schools, which are being continued as well, also offer structured doctoral programmes in an excellent international research environment. In the Helmholtz Association, common guidelines provide the basis for structured doctoral training. Helmholtz Graduate Schools and Helmholtz Research Schools are designed to improve the structuring of the doctoral phase and give doctoral students stable supervision conditions and an individually agreed qualification programme consisting of subject-specific and general elements. As of 2014, the German Academic Exchange Service's "IPID4all" programme for the internationalization of doctoral studies in Germany, which is funded by the BMBF, provides support to universities in Germany which want to establish an internationally attractive

environment for their doctoral students. The aim is to fund a wide range of measures to create internationally competitive conditions for doctoral students which are attractive to young scientists around the world.

ERA Priority 4: Gender equality and gender mainstreaming in research

Content:

The power and innovative strength of the European Research Area can only be secured in the long term if it makes full use of existing potential in all areas. In many cases the expertise of highly qualified women in science is still not used to the fullest extent possible. All across Europe, the proportion of women who are higher up the academic career ladder and in leadership positions drops with every step upwards in the hierarchy, whereas the numbers of men and women (doctoral) students are roughly equal. As a result, female researchers are often under-represented in expert groups and in decision-making committees and advisory boards. It is also a fact that approaches in research and innovation, for example to the solution of societal challenges, frequently remain incomplete without inclusion of the gender dimension.

In the course of the further development of the European Research Area, the European Commission has set for itself and the Member States the task of creating even more incentives in the area of science to remove gender-specific barriers to recruitment, retention of employment and career progression throughout Europe. Furthermore, efforts must be made to achieve a gender balance in decision-making processes and committees of the European research organizations. The Commission's envisaged target is the participation of least 40% of the under-represented sex in committees which are involved in recruitment/career progression and in establishing and evaluating research programmes. Another aim is to further strengthen the gender dimension in national and European research programmes and projects.

Germany still lags behind other EU Member States in the realization of equal opportunity in many fields of science. Germany ranks second to last in the EU, just ahead of Luxembourg, with its proportion of female researchers of 25%, (EU-27 average, excluding Croatia: 33%); the number of rectorates at universities (7%) is still under the EU average of 10%. However, there is a positive trend: Germany ranks in seventh place in terms of the growth rate for female researchers among the EU-27. (Source: She Figures 2012, European Commission). The rate of female professorships also rose from 14% to 20% between 2005 and 2012. Thus Germany is well on its way to making better use of the potential of highly qualified women in science to secure the country's strong scientific performance in the long term. Best practices in other countries of the European Research Area could be followed and help to achieve the aim.

Cross-cutting initiatives such as the Higher Education Pact and the Pact for Research and Innovation as well as targeted gender equality initiatives in the science system have contributed to recent successes. These initiatives include the Programme for Women Professors of the Federal Government and the *Länder* (2008-2017) to increase the proportion of women in academic leadership positions, or the National Pact for Women in STEM (Science, Technology, Engineering and Mathematics) Careers between partners from science, research, industry, government and associations. The Higher Education Laws of the Federal Government and the

Länder also enshrine equal opportunities for men and women in the science system. Article 3 of the Federal Law on Gender Equality also requires recipients of funding from the Federal Government such as the non-university research organizations to commit to gender equality. The research organizations involved in the Pact for Research and Innovation have put measures into place in recent years to increase the proportion of women in leadership positions in particular. Specifically, they have set themselves the task of achieving target quotas for the recruitment of young female researchers and executive personnel which are based on a cascade model. This has set the right course but further efforts must be made because women remain significantly under-represented in top-tier positions in Germany's science system.

Objectives:

Gender equality is a priority objective of the Federal Government which has also been enshrined in the coalition agreement, including with regard to science and research. Binding target quotas are to further increase the proportion of women and to achieve a proportion of women in scientific executive committees of at least 30%. The Federal Government, the *Länder* and the science organizations are jointly pursuing the objective of an appropriate representation of women at all levels of the science system. Giving men and women equal career opportunities will require broader, firmer establishment of family-friendly structures within organizations. Science organizations must make even better use of existing instruments and seek to optimize these tools through regular mutual exchange about best practices.

One factor which has been neglected up to now is the consistent and appropriate consideration of the gender dimension in basic and application-oriented research. The term "gendered innovations" introduced by a group of experts at EU level is based on a belief that the inclusion of gender aspects in research can assure scientific excellence and enable the development of more targeted solutions. As an example, the reliance on a 'masculine default' in the development of machine translation technologies produces grave errors in machine translations; the neglect of osteoporosis research in men leads to delays in treatment. The BMBF's "More Women at the Top" programme made an important step in the right direction. Besides including projects in sociological gender research, the programme also funded projects in medicine which integrated the gender aspect in their research method. The aim of the Federal Government is to increasingly entrench the gender dimension in national research and innovation programmes in future.

Measures:

- ***Ensure equal opportunities in organizational structures and processes:*** *The assurance of equality of opportunity will remain a key focus area in the planned further development of the Pact for Research and Innovation. Important measures include equal opportunity in the processes and procedures of selection of candidates for job vacancies and committees, career development schemes to support equal opportunity career management and the promotion of family-friendly organization structures. The overall aim is to increase the proportion of women at all career stages and in leadership positions and on executive boards of science organizations in particular, based on ambitious target quotas following the cascade model.*
- ***Continuation of the Programme for Women Professors of the Federal Government and the Länder:*** *The Women Professors Programme (Phase I: 2008-2012, Phase II: 2012-2017) of the*

Federal Government and the Länder is a highly effective measure to increase the number of women in leadership positions at German higher education institutions. The objective of the Programme is to further increase the number of female professors and establish conditions that guarantee gender equality at the universities. Grants for newly appointed female professors will be linked to proof of a convincing equal opportunities policy.

- **Stronger incorporation of the gender dimension in national and European research programmes:** Research – for example to solve global challenges – produces better results for society when it more deliberately takes account of the gender perspective. In future the Federal Government will therefore incorporate the gender dimension more systematically into the planning, implementation and evaluation of funding programmes and projects. The EU Framework Programme Horizon 2020 will serve as orientation as it takes particular account of the gender aspect; in fact, it has made 'gender' one of the decisive factors in the selection of project proposals of equal merit. The Federal Government will ensure in the programme committees of Horizon 2020 that the high EU standards for gender equality are safeguarded in programmes, projects and committees.
- **Promotion of young researchers from a gender perspective:** An important requirement for the improvement and assurance of young researchers' career prospects is to achieve a stabilization of women's careers in science and to support family-friendliness within the science system. The Federal Government therefore plans to grant special priority to these aspects in the further development and design of programmes to support young scientists in Germany.
- **Continuation and expansion of programmes and initiatives of the German science organizations to promote gender equality:** The German Research Foundation DFG established "Research-oriented standards on gender equality" in 2008, which many higher education institutions and the science organizations associated with the Pact for Research and Innovation have adopted. The standards serve as an important frame of reference for the development of equal opportunity. All of the science organizations involved in the Pact also established target quotas in keeping with organization-specific cascade models; the quotas are based on the proportion of women at the career level immediately below. The organizations plan to implement specific measures to achieve these target quotas by 2017. Key activities aim to recruit and employ a greater share of female researchers. These activities include the recruitment initiative of the Helmholtz Association; the "Equal Opportunities" funding line of the Leibniz Association for early appointments of highly-qualified female researchers to Leibniz institutes; the W2 Minerva Programme of the Max Planck Society to provide more female researchers with a W2 position; and the Fraunhofer's TALENTA programme for the recruitment and career development of female scientists. A number of organizations have introduced mentoring programmes to prepare highly qualified women for senior positions. These programmes assist women, particularly after they have earned their doctorate degree, to carefully plan their careers, to build networks in their field and to assume leadership duties with confidence (Helmholtz's mentoring programme "Taking the Lead", "Leibniz Mentoring" at the Leibniz Association). The objective of the Max Planck Society's "Minerva-FemmeNet" mentoring programme is to match female mentors with mentees, thus enabling senior researchers to share their experience with the young female researchers. Since 2013 Fraunhofer's 'Wissenschaftscampus' event, which was awarded the "HR Excellence Award", has aimed at encouraging young women students and

graduates in the STEM (Science, Technology, Engineering and Mathematics) subjects to pursue careers in science and take on leadership positions in applied research.

ERA Priority 5: Optimal circulation, access to and transfer of scientific knowledge

Content:

Effective knowledge transfer is one of the key factors for the successful translation of ideas and research results into innovations and the resulting creation of economic value and competitiveness. Because it facilitates the cross-border exchange of knowledge in particular, the European Research Area is one way to better exploit the potential to increase the economic impact of research.

This ERA priority focuses in particular on strengthening the network between science and industry and on the role of public-sector research in "open innovation". This means that higher education institutions and research institutions act in accordance with the European IP Charter and handle intellectual property on the basis of corresponding comprehensive strategies and that they demonstrate professionalism in their knowledge and technology transfer activities so as to enable cooperation with industry on an equal footing.

Since the generation and transfer of knowledge occurs increasingly via digital means, a further focus area of this ERA priority is the expansion of a seamless online space for the free circulation of knowledge and technology ('digital ERA'). In particular this means granting and expanding access to publicly-funded scientific findings and data (Open Access). Open Access is also a major topic at European level within the framework of Horizon 2020. One provision in the legislative act on Horizon 2020 accounts for the special needs of international research cooperation and of industry.

The transfer of scientific knowledge between the public and private sectors enjoys a long and successful tradition in Germany. It is one of the cornerstones of Germany's economic strength. The Federal Government has given generous support to 'Open Innovation' and the transfer of knowledge and technology for many years, and it has done so since 2006 under the umbrella of its High-Tech Strategy. The Strategy includes in particular measures to strengthen the strategic cooperation between science and industry and to accelerate the efficient commercialization of scientific knowledge such as the Leading-Edge Cluster Competition, the funding initiative "Research Campus – Public-Private Partnership for Innovation", the "Entrepreneurial Regions" innovation initiative for the New *Länder*, the funding programmes "Validation of the Innovation Potential of Scientific Research - VIP", "go-Cluster - Promotion of Innovation Clusters", "EXIST - University-Based Business Start-Ups", "SIGNO – Protection of Ideas for Commercial Use", and the SME Central Innovation Programme (ZIM). The research and transfer activities of the non-university scientific organizations which are carried out within the Pact for Research and Innovation are also key elements in the dissemination of new findings and methods.

Germany's research system supports the development of a digital ERA through a great number of initiatives to improve access to scientific information, for example the Priority Initiative "Digital Information" of the Alliance of Science Organizations in Germany. Germany already has a well-appointed landscape of repositories and open access journals. One important step towards

creating more science and research-friendly copyright law was achieved in the last legislative term by the introduction of an indefeasible right to secondary publication (Article 38 Para 4 Copyright Act – *UrhG*). This provides the authors of scientific texts with legal protection when they grant open access to their research publications upon expiry of twelve months after first publication, for example by placing it on the Internet.

Other key aspects of the priority include policy advice for government and society as well as science communication which, because of the many diverse activities of the science institutions and the National Academy of Sciences Leopoldina, have gained in importance and visibility.

Objectives:

Drawing on the progress made so far, the Federal Government will continue to further encourage and promote networking and transfer between science and industry – at both national and international level – in its efforts to develop the High-Tech Strategy into a comprehensive interdepartmental strategy of innovation.

In addition, the Digital Agenda 2014-2017, which is also designed to be an interdepartmental strategy, aims to address the various aspects of digitization. An important objective in this context is to make great steps forward in the development of the opportunities which digitization offers to establish, secure and promote a national and transborder exchange of information in science and research.

Measures:

- ***Intensifying networking and improving exchange between science, industry and society:*** *The Federal Government will – in addition to ongoing successful measures such as the Leading-Edge Cluster Competition and the "Research Campus" funding initiative – further develop funding activities for the validation of research results on the basis of a broad concept of innovation which encompasses technological and societal challenges in equal measure. The Federal Government also plans to introduce a new funding measure to drive the internationalization of leading-edge clusters, forward-looking projects and other similar networks. The aim is to strengthen the management skills and expertise of outstanding clusters and networks in Germany for international cooperation.*
- ***Strategy for Digital Transformation in Science and Research*** *The Federal Government will draw up a strategy for digital transformation in science in order to take advantage of the opportunities which rapid digitization offers.*
- ***Open Access Strategy:*** *The Federal Government will develop a comprehensive open access strategy which improves the basic conditions for effective and long-term access to publicly financed publications and information (open data).*
- ***Pro-science copyright law:*** *The Federal Government is striving to improve copyright law and thus take greater consideration of the needs of science, research and education in the digital age and to tap the potential of digitization in these areas. Specifically, it aims to introduce a blanket exemption for teaching and research purposes.*
- ***Establishment of a Council for Information Infrastructures:*** *Germany is in a very strong position, also on international scale, as concerns information infrastructures and their links with*

research infrastructures. To further enhance its position and to increase the transparency of development processes in this rapidly developing area and support the integration of external expertise and linkages with European and international debates, the ministers and senators of the Federal Government and the Länder in the Joint Science Conference voted to establish a Council for Information Infrastructures in November 2013. This council will act as a strategic body to further improve coordination among players in the science system and to increase the efficiency of the use of information infrastructures.

- **Continuation of activities and initiatives by the German science organizations in the area of knowledge and technology transfer:** All the German science organizations adopt a strategic approach to the implementation of transfer. For example, Max Planck Innovation GmbH, the technology transfer organization of the Max Planck Society, evaluates whether the intellectual property of the research of its institutes merits protection and supports researchers in the commercialization of results. All of the centres of the Helmholtz Association have transfer agencies for the commercialization of technologies. Helmholtz also has the Validation Fund with which to bridge gaps in financing for promising technologies and their commercial applications and the "Helmholtz Enterprise" initiative to support new spin-offs from its centres. The Leibniz Association supports transfer and commercialization activities by means of a transfer department based at its headquarters, through transfer representatives in Leibniz institutions and through the establishment of Leibniz research groups. At the Fraunhofer-Gesellschaft, maintaining close ties to industry is an integral part of its mandate: more than one third of its funding volume for contract research is sourced from funded research projects which involve business enterprises. Many researchers continue their careers in the private sector after completing their research activity at Fraunhofer. Most of the programmes of the German Research Foundation DFG incorporate a funding option for researchers to cooperate with application partners in the framework of 'transfer projects'. In addition, large-scale events such as the "Innovation Days" and "Start-up Days" which cut across institutions take place at regular intervals and are designed to strengthen the partnership between science and industry and to provide entrepreneurs with possibilities for networking and further training.
- **Continuation of activities and initiatives by the science organizations to promote open access:** All the large research organizations, the German Rectors' Conference and many other institutions signed the "Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities" of 2003. The joint priority initiative "Digital Information" of the Alliance of Science Organizations in Germany also strives to improve access to information in research and teaching on a long-term basis. The large science organizations also support the online platform "open-access.net", which has a wealth of information on the topic of open access. The German Research Foundation DFG funds projects to promote open access journals and repositories and helps higher education institutions to establish so-called publication funds which cover the costs of publication of articles in open access journals. The DFG also adopted an open access clause in its terms and conditions for funding. The Max Planck Society publishes several open access journals, signs contracts with open access publishers on the payment of publication costs from a central budget and regularly organizes the "Berlin Open Access" conference. This conference is one of the most important international forums for the exchange of experience and debate about open access. The Leibniz Association's Science 2.0 interdisciplinary research collaboration currently has 35 partners who focus on the use of modern Internet technologies in all phases of

research and explore the impact of Science 2.0 on science and society. Its "LeibnizOpen" portal provides a central point of access to open access publications of the Leibniz institutes. The Open Science Coordination Office of the Helmholtz Association supports Helmholtz centres in their implementation of open access to publications, and Fraunhofer supports "Gold Open Access" publications through an internal fund.

ERA Priority 6: International Dimension of the European Research Area

Content:

More than 70% of the knowledge worldwide is generated outside of Europe. International cooperation must ensure the greatest possible access to this knowledge potential for research and innovation processes in Europe. It is the only way that Europe can secure its global competitiveness in the long term. Effective international cooperation and networking with third countries in the area of research and innovation is also necessary to be able to master the great societal challenges, to increase the attractiveness of the European Research Area for talented minds and investors, and to ease access to new emerging markets.

It is against this background that the EU Commission's Green Paper on the European Research Area of 2007 first introduced an international dimension of the European Research Area as a priority, with a focus on third countries. The international dimension was developed into an overall strategic approach in a Commission Communication of 2012 ("Enhancing and focusing EU international cooperation in research and innovation") and in Council conclusions in 2013.

A central component of this approach – besides a principal openness to international cooperation with third countries – is a closer partnership between Member States and the European Commission. Priorities for cooperation with third countries will be jointly identified in this partnership, and coherent strategies for internationalization will be drawn up to better coordinate national activities and instruments. The platform for the evolution of this partnership is the Strategic Forum for International Cooperation in Science and Technology (SFIC). SFIC fosters strategic cooperation with selected partner countries outside of Europe (e.g. USA, China, Brazil), for example through specific third-country initiatives. Establishing links to third-country cooperation under the EU's Framework Programme for Research and Innovation (Horizon 2020) also plays an important role in this context. Germany chaired the SFIC in its first two years (2009/2010) successfully and with international visibility.

The Federal Government adopted the Strategy for the Internationalization of Science and Research in 2008, which will be further developed in this legislative term under the leadership of the BMBF and on the basis of a BMBF action plan. Following this strategy, Germany has made great strides in international cooperation by implementing a broad range of measures and through networking at bi- and multilateral level and in the EU context. Furthermore, in recent years the German Research Foundation DFG, the Fraunhofer-Gesellschaft, the Helmholtz Association, the Max Planck Society, the Leibniz Association, and the German Rectors' Conference have devised their own internationalization strategies and measures for their implementation and thereby expanded their international activities.

Significantly increased funding from the BMBF for area studies is also playing an important role. This funding will improve the availability of knowledge about distant regions. It will support research in Germany through an orientation of doing research *with* instead of research *on* – which, as a result, will create new approaches to transborder cooperation.

Objectives:

For the reasons stated above, the Federal Government considers it very important to strengthen the international dimension of the European Research Area. The objective is to improve cooperation between Member States and third countries, to make systematic use of synergies, and to plan strategic actions in partnership with the EU Commission. The Federal Government regards SFIC as a key platform for this purpose and therefore supports a strengthening of the forum.

At the same time, bilateral cooperation in science and research within the European Research Area including its associated countries (as expressed in joint forums and research collaborations with France, Greece and Israel, for example) and with European neighbouring countries and other third countries continues to be of key importance to the German Federal Government. Direct cooperation makes projects possible which accommodate the needs of every country and its ties to Germany. Bilateral cooperation generates new networks and thematic fields which also lay the groundwork for future multilateral cooperation.

Measures:

- ***Strengthening the role of the Strategic Forum for International Cooperation in Science and Technology (SFIC):*** Strengthening SFIC will foster coherence between the policies of the EU and the Member States on scientific and technological (S&T) cooperation. The Federal Government will therefore continue to support SFIC country initiatives for cooperation with selected third countries and take these into consideration in bilateral S&T cooperation negotiations and in the development of German country and regional strategies for scientific cooperation. The Federal Government will also endeavour to ensure that the EU's multi-annual roadmaps for cooperation with key partner countries and regions under Horizon 2020 are interlinked with SFIC initiatives and make appropriate use of these roadmaps for bilateral measures.
- ***Systematic promotion of multilateral S&T cooperation approaches in variable geometry:*** In the course of the further development of the European Research Area, the Federal Government sees the need to expand on the traditionally bilateral approach to S&T cooperation with third countries and, when appropriate, to shift to a multilateral dimension based on a system of variable geometry. The Member States must therefore be granted much more opportunity to participate and cooperate in the EU's S&T cooperation negotiations with third countries, in particular through SFIC.
- ***Increasing the international dimension of Joint Programming Initiatives (JPIs):*** The introduction of Member State-driven JPIs has established an important instrument for the strategic alignment of research agendas which address grand challenges. The Federal Government is in favour of implementing the JPIs with a greater focus on structure building. This includes the development of the JPIs into a platform for research cooperation with third countries.

- **Third country cooperation with other Member States in Horizon 2020:** *The Federal Government attaches great importance to targeted, thematic collaborations of EU Member States with third countries, in particular in the area of global challenges. It will campaign for targeted calls for proposals under Horizon 2020 on specific challenges with a regional and specific focus on developing and emerging countries in particular.*
- **Continuation of activities and initiatives by Germany's science organizations and higher education institutions to strengthen the international dimension of the European Research Area:** *The German science organizations pursue mainly two strategies to strengthen research cooperation with third countries. Firstly, they establish local offices in selected partner countries and regions. The Helmholtz Association, for example, has branch offices in Moscow and Beijing which support the work of the Helmholtz centres in these focus regions. The Max Planck Society operates Max Planck Centers and partner institutes in many countries, including Canada, India, Japan, South Korea and USA. The Fraunhofer-Gesellschaft operates research centres in North and South America under the umbrella of different legal entities. In Asia and the Middle East, Fraunhofer Representative Offices and Fraunhofer Senior Advisors create links with local markets. The German Research Foundation DFG has five offices outside Europe (Brazil, India, Japan, Russia, USA) and the German-Chinese Centre in Beijing which provide support for international cooperation with the respective local partner organizations. Many of Germany's higher education institutions now also have representative offices abroad.*

Secondly, the scientific organizations provide special support to international research cooperation through measures whose aim is to attract young scientists and promote exchanges of researchers. The International Research Groups of the Helmholtz Association, for example, provide young researchers with the opportunity to gain initial experience with international cooperation. The Max Planck Society has a similar programme in which its partner groups abroad support young researchers who are interested in engaging in more intensive international research cooperation. The Leibniz Association and the German Academic Exchange Service offer a one-year, full-time fellowship for excellent post-docs from abroad; the German Research Foundation DFG awards special grants for young German researchers to do a period of research abroad.

Cooperation with outstanding scientists from all the non-European countries is also promoted among others through the Fraunhofer-Bessel Research Award, which is granted jointly every year by the Alexander von Humboldt Foundation and Fraunhofer. Award winners are invited to spend a period of up to one year and pursue their own research projects at one of the Fraunhofer institutes in Germany.

The Alexander von Humboldt Foundation plays a major role in driving the internationalization of the European Research Area through its network of 26,000 alumni from all over the world who maintain lively exchange with Germany and Europe. The research fellowships and awards which the Foundation grants allow universities and research establishments to visibly internationalize their faculty and thus take advantage of different perspectives and methods.

Global networking between young scientists is also promoted through the annual meetings in Lindau between Nobel laureates and selected young researchers from all over the world and through the Global Young Academy.