Deutsche
Forschungsgemeinschaft

Funding Atlas 2015

Key Indicators for Publicly Funded Research in Germany

WILEY-VCH

DFG

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The Funding Atlas, along with a large number of Excel spreadsheets including analyses as well as printable graphic files containing illustrations, can be viewed at www.dfg.de/fundingatlas.

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Foreword

Through the Funding Atlas, the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) has been providing a continually expanded set of key indicators on publicly funded research at German universities and non-university research institutions since 1997. The seventh German edition, published in September 2015, appeared at a time when important decisions were being prepared in relation to German research – for example by the so-called "Imboden" Commission. Composed of internationally prominent members, this commission was tasked with evaluating the implementation and progress of the Excellence Initiative of the federal and state governments, funded between 2007 and 2012 (phase 1) and between 2013 and 2017 (phase 2) with a total budget of €4.3 billion, and developing proposals for its continuation. The German Council of Science and Humanities and the DFG, the two organisations jointly responsible for implementing the programme, supported the work of the commission with a substantial data-based report. The Imboden Commission also used the DFG Funding Atlas to reach conclusions about the performance of Excellence Initiative-funded universities with the aid of relevant indicators.

The commission presented its report in January 2016, and a little later, in June of this year, the federal and state governments decided in favour of continuing the programme. As of 2019 it will be known as the Excellence Strategy and will comprise two funding lines: Clusters of Excellence and Universities of Excellence.

The continuation of the programme provides striking confirmation of the success of the Excellence Initiative – a success which is also clearly demonstrated by the figures presented in the DFG Funding Atlas. Universities participating in the programme are attractive destinations for internationally renowned visiting researchers and they are also well networked with other universities and non-university research institutions within their own regions. They create spaces for both disciplinarily focussed and interdisciplinary networked research and attract an above-average amount of third-party funding, not just from the DFG but also from other major funding providers (in particular the ministries of the federal government and the EU). Bibliometric studies reveal that publication output and the impact of this output (measured by citations) are also outstanding.

Furthermore, as the Funding Atlas also demonstrates, the programme has not widened the gap between universities which receive Excellence Initiative funding and those which do not. Instead, a positive effect can be seen for the German research system as a whole: never have researchers from so many research institutions submitted proposals to the DFG as during the reporting period of this Funding Atlas (2011 to 2013). Demand for third-party funding offered by providers other than the DFG has further increased, as has the interest of leading foreign researchers in working, at least temporarily, at a German research institution.

The DFG Funding Atlas, published every three years, provides an overview of the German research landscape through the key indicators it presents on publicly funded research. The emphasis is on data relating to third-party funding by the DFG. The Funding Atlas also analyses the participation of German institutions in the funding programmes of other national and international research funding organisations as well as bibliometric data. Less emphasis is placed on the question of quantitative success; rather, the figures presented in the Funding Atlas 2015 paint a picture of the key subject areas and thematic areas at German universities and non-university research institutions.

This English edition of the Funding Atlas 2015 presents a selection of the findings contained in the German edition. There is a special focus on analyses which shed light on the Excellence Initiative. The English edition of the Funding Atlas also takes a more in-depth look at the 'internationalisation of research'.

The comprehensive picture of current research funding in Germany presented in the Funding Atlas 2015 informs national and international target groups about 'places of research' in Germany and thus contributes to the international visibility of German research in its breadth and height.

Dorothee Dzwonnek
Secretary General
of the Deutsche Forschungsgemeinschaft

1 Introduction

20 Years of the Funding Atlas

With the Funding Atlas 2015, the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is presenting the seventh edition of this reporting system. In terms of reporting years, the series now covers a period of 23 years (1991 to 2013).

During this period, both the German and international research systems have undergone a number of changes. In Germany, there have been two key developments. In the 1990s, the main aim was to address the challenges of reunification, establish an essentially restructured research system in the 'new' federal states of the former East Germany and integrate this into the system as a whole. In the more recent past, the Excellence Initiative introduced by the federal government and the state governments in 2005 has been and continues to be a major initiator of important changes.

On an international level, particular mention will also be made of only two changes, both in connection with the European Research Area. Firstly, the pan-European competition for research grants acquired a new dimension with the establishment of the European Research Council (ERC), based on the model of the DFG, in Brussels in 2006. Secondly, the growing importance of international cooperation was underlined by the establishment of Science Europe in 2011. This new form of self-organisation currently brings together more than 50 national funding institutions and research organisations in order to develop and coordinate joint activities with the aim of strengthening the European Research Area.

Special Focus on the Excellence Initiative

The Excellence Initiative currently plays a key role in Germany. It was launched in 2005 with the primary aim of sending out a highly visible signal of the capabilities of the German research system. Additional resources in excess of €4.6 billion were deployed to fund outstanding research projects and intensify the training of particularly talented early career researchers in Graduate Schools (GSC) and Clusters of Excellence (EXC), which were selected through a rigorous competitive process. The third funding line, Institutional Strategies (*Zukunftskonzepte*, ZUK), helps to further develop the profile of selected universities.

In addition to the main objective of Excellence Initiative funding – to enable research that meets the highest theoretical and methodological standards – secondary objectives relating to research policy are playing an important role in the development and concrete implementation of programmes (and, ultimately, the evaluation of their success): equality, early career support, internationalisation, interdisciplinarity, profile building and structural development, and finally, cooperation between institutions, regions and countries, between higher education institutions (HEIs) and non-university institutions, as well as between academia, industry and society.

The latest edition of the Funding Atlas presents a wealth of data on all of these topics, providing a statistical examination of the Excellence Initiative and of the developments in the German research system as a whole during the period under review.

The Funding Atlas – Data Sourced from Funding Providers, not Recipients

In essence, the Funding Atlas is a reporting system based on figures relating to third-party funding and the (international) funding of individuals. A large majority of the data presented originates from the funding institutions named in the report. The statistics gen-

erated from this data are therefore based not on complex, error-prone surveys of funding recipients, but on information extracted directly from the databases maintained by funding providers.

Along with the DFG, this includes the ministries of the German federal government (especially the Federal Ministry of Education and Research and the Federal Ministry for Economic Affairs and Energy) and the EU (through the EU's 7th Framework Programme for Research and Technological Development). This Funding Atlas gives greater attention to the measures in the EU's *Ideas* programme implemented through the European Research Council (ERC).

As indicators of the international visibility and attractiveness of institutions, data has been sourced from the Alexander von Humboldt Foundation (AvH) and the German Academic Exchange Service (DAAD). As the funding profile of these organisations is geared towards international exchange, it is not the awarded amounts that are of interest here but the number of supported research visits to Germany.

The data on staff and available financial resources compiled annually by the State Statistical Offices, which is then centrally processed by the Federal Statistical Office (DESTATIS) and published in official statistics. Finally, the bibliometric analyses presented in Chapter 5.3 use data from generally accessible publication databases.

English Edition of the DFG Funding Atlas as an International Research Marketing Tool

This English edition of the *DFG-Förderatlas* summarises the key findings of the more detailed German edition in compact form. It is primarily aimed at researchers abroad and the staff of international research and funding institutions with a special interest in 'places of research' in Germany. Member institutions of the DFG can order a limited number of printed copies of the English version from the DFG Head Office.

Funding Atlas Online Material Provides Extensive Table Data

The publication of the Funding Atlas 2012 saw the introduction of the parallel online publication of all tables and figures in the report as individual files on the DFG website. There is also high demand for the data on which the tables are based in XLS format. Over 40,000 downloads of these files over the course of one year, which were made available along with the publication of the 2015 edition in September 2015, testify to the active use of this material. The online material is supplemented by a dedicated website for the Funding Atlas 2015, which presents the focal themes of the publication and illustrates the individual research profiles of German HEIs on the basis of the key figures for each institution (www.dfg.de/fundingatlas).

Funding Atlas Supported by Stifterverband and Various Cooperation Partners

Since the third edition, the DFG Funding Atlas has been actively supported by the Stifterverband. This support and the continuing close cooperation with various funding institutions makes it possible to continually develop the spectrum of the report. The numerous network diagrams in this Funding Atlas were made possible by the collaboration with Lothar Krempel of the Max Planck Institute for the Study of Societies in Cologne. The findings based on bibliometric data presented in Chapter 5.3 benefit from the collaboration with the team led by Matthias Winterhager at the Institute for Interdisciplinary Studies of Science at the University of Bielefeld.

2 Publicly Funded Research in Germany – An Overview

The following chapter provides firstly a comparative international overview of the staff resources and financial resources allocated to research and development (R&D). Special attention is given to the different research structures in the countries compared. This is followed by a more detailed examination of the structure and funding of the German research landscape. Finally, the chapter provides a compact overview of the main public funding providers in Germany, which support the DFG Funding Atlas by making funding data available.

2.1 Research and Research Funding: an International Comparison

As an area of policy, research and development has a high profile both in the public perception and in politics. This is clearly demonstrated by the fact that all EU member states have set themselves the target of spending 3% of gross domestic product (GDP) on R&D. Figure 2-1 shows expenditure on R&D in 2011 and what proportions were associated with the private sector, higher education institutions (HEIs) and non-university research. In accordance with the OECD source[1], R&D expenditure for each country is expressed in terms of US dollar purchasing power parities as a basis for comparison. The left-hand side of Figure 2-1 shows the absolute GDP expenditure on R&D.

Germany has the highest expenditure on R&D of any country in the European Union with US$97 billion. It is followed by France with US$53 billion and the UK with almost US$40 billion. Germany therefore accounts for close to 30% of all R&D expenditure of the EU-28 countries, a further increase compared with 2009 (DFG, 2012: 22). Around 58% of European expenditure on R&D comes from Germany, France and the UK. Internationally, only the USA, China and Japan have invested more money in R&D than Germany.

The comparison presented here uses absolute figures. Complementarily, the right-hand side of Figure 2-1 shows R&D expenditure as a relative proportion of GDP and therefore takes into account the differences in size and economic power between different countries. The statistics include OECD states which invested at least 1.8% of GDP on R&D in 2011. The shares of different sectors in research and development expenditure are also illustrated.

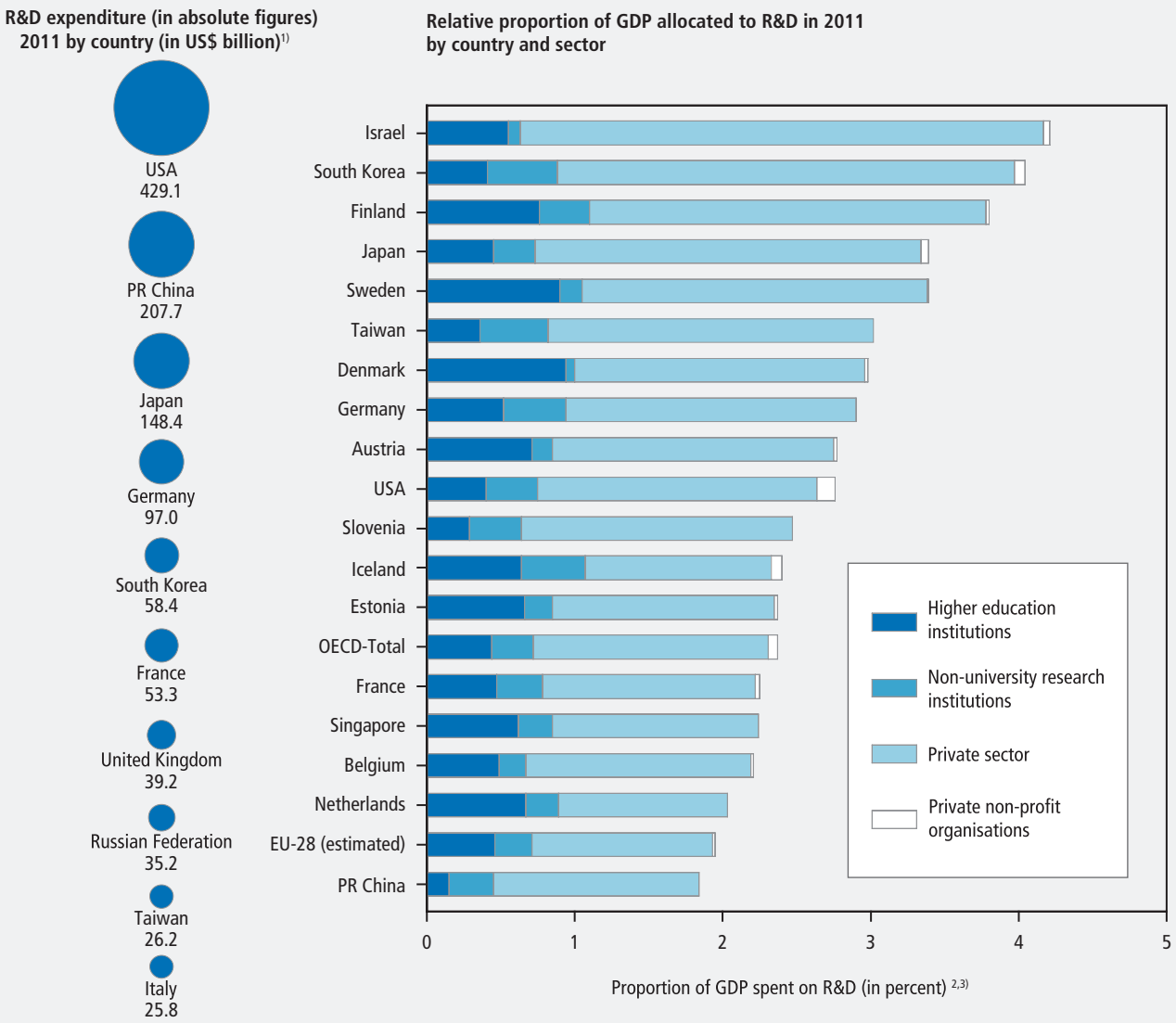
Israel spends the highest proportion of GDP on R&D at 4.2%. In the EU, the Nordic countries of Finland, Sweden and Denmark are notable leaders. Outside of Europe, South Korea, Japan and Taiwan allocate particularly high proportions of GDP to R&D. With an R&D expenditure of 2.9%, Germany is within the upper range in this comparison and has almost achieved the 3% target. Germany is therefore clearly above the OECD average and also the average for the EU-28 (2.4% and 2% respectively).

Countries Show Large Differences in Sectoral R&D Participation

In addition to research and development as a proportion of gross domestic product (GDP), Figure 2-1 shows the proportions of R&D expenditure associated with different sectors. There are clear structural differences in the distribution between the private sector, HEIs and non-university research institutions. The private sector accounts for a particularly large share in Israel, Japan, South Korea and China. In Germany, too, companies contribute around 68% of expenditure on R&D, placing

1 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "OECD statistics".

Figure 2-1:
Expenditure on R&D in Germany and abroad in 2011



1) Nominal expenditure, converted to US$ purchasing power parities.
2) Includes provisional data and OECD estimates.
3) This reporting sample is restricted to countries whose expenditure on R&D was equivalent to or greater than 1.8 percent of their gross domestic product in 2011.

Note: Corresponds to Abbildung 2-1 of the DFG Förderatlas 2015.
Data basis and source: Organisation for Economic Co-operation and Development (OECD): Main Science and Technology Indicators 2013/2. Calculations by the DFG.

Germany above the EU average of around 62%.

R&D spending by HEIs as a proportion of GDP is especially high in the Nordic countries, but also in Austria and the Netherlands. In comparison with these countries, state research institutions account for a considerably larger proportion in France, Iceland and South Korea, for example. In Germany, HEIs and publicly funded research organisations such as the Fraunhofer-Gesellschaft (FhG), the Helmholtz Association (HGF), the Leibniz Association (WGL) and the Max Planck Society (MPG), referred to in an OECD context as the state sector, account for approximately equal shares.

The varying forms of organising national research systems can also be seen in each country's participation in the EU's 7th Framework Programme for Research and Technological Development (FP7), which is examined in more detail in Chapter 2.3.

2.2 Financial and Staff Resources for German Research

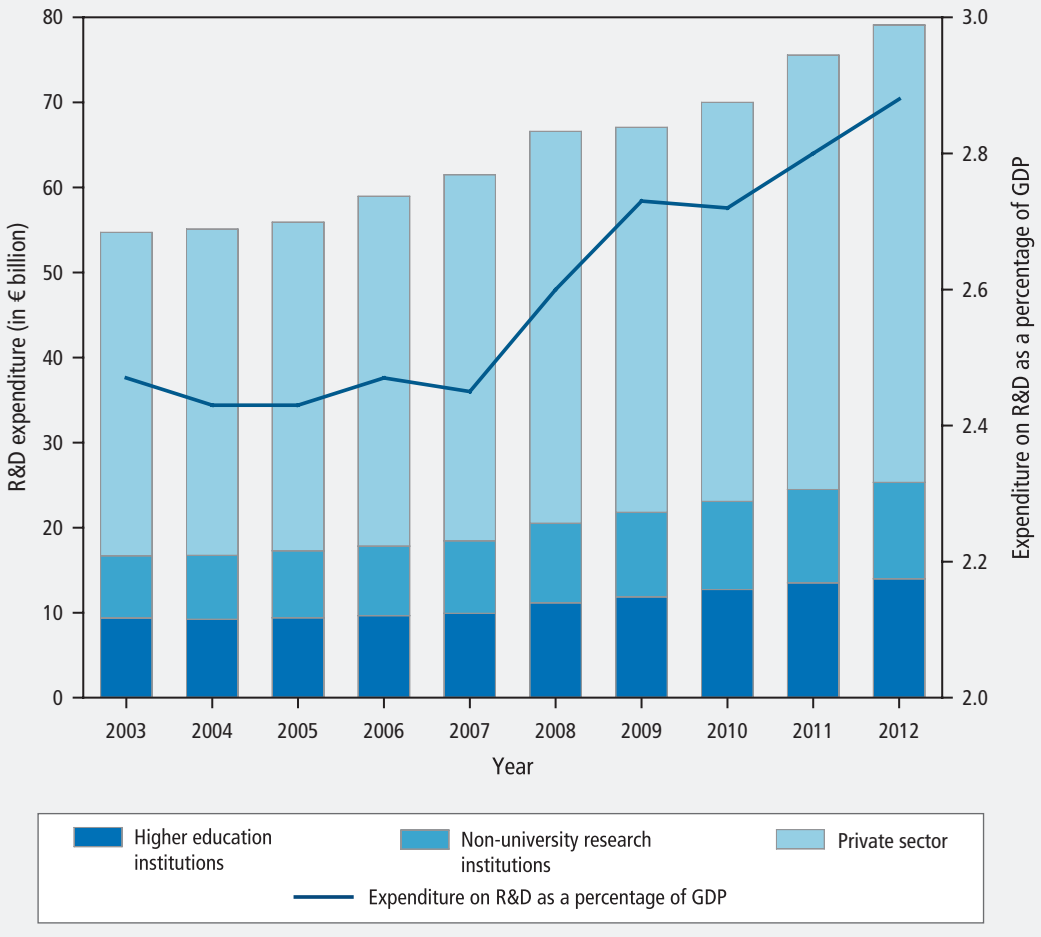
Figure 2-2 shows the trend in R&D expenditure in Germany. The nominal expenditure level increased by more than 40% within ten years, from €54.7 billion in 2003 to €79.1 billion. The greatest increase in R&D expenditure as a proportion of GDP has been seen since 2007. In 2012, the private sector accounted for €53.8 billion, publicly funded non-university research €11.3 billion and the university sector €14 billion.

Figure 2-3 provides an overview of the funding structure of German research in 2012. The outer part of the diagram shows the funding provision structure. Of the €79.1 billion in research funding made available in 2012, 30% was provided by the state and 66% by the private sector. Around 4% of funding came from abroad.

The inside circle of the diagram shows the sectors which carry out research. The largest budget for R&D belongs to the private sector, which also funds the vast majority of its R&D activities (91%) itself. For HEIs and non-university research institutions, on the other hand, most of the budget comes from the state. It should be noted that the proportion of HEI funding provided by the private sector, at 14%, is considerably higher than the corresponding figure for non-university research institutions.

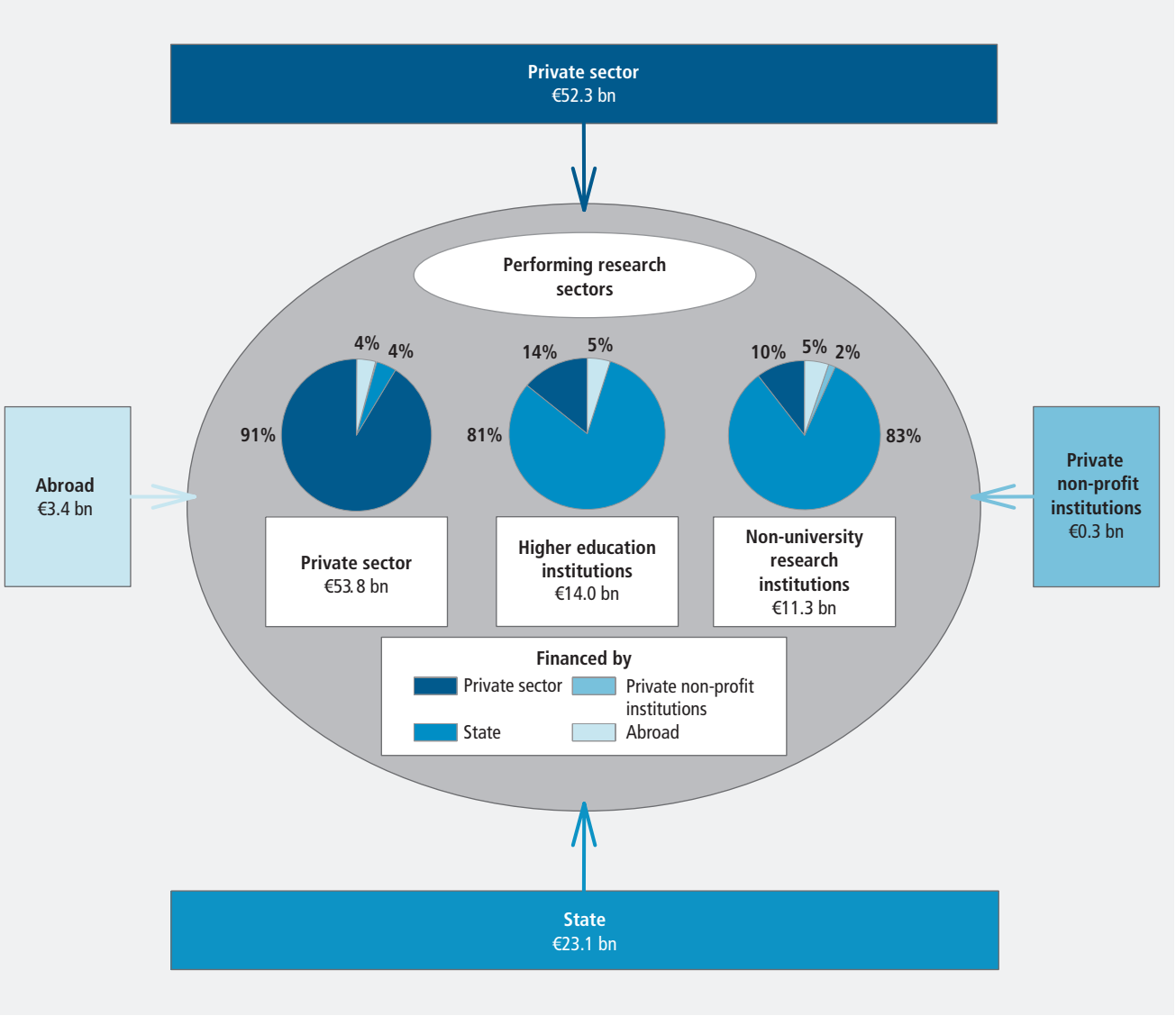
Following this general overview of the finance structures of German research, the financial resources available to HEIs and non-university research will now be examined in more detail. For an overview of the

Figure 2-2:
Trend in R&D expenditure in Germany by type of institution 2003 to 2012



Note: Corresponds to Abbildung 2-2 of the DFG Förderatlas 2015.
Data basis and source:
Federal Ministry of Education and Research (BMBF): Federal Government Report on Research and Innovation 2015, Table 1.1.1. Calculations by the DFG.

Figure 2-3:
Funding of German research in 2012 by sector



Note: Corresponds to Abbildung 2-3 of the DFG Förderatlas 2015.
Data basis and source:
Federal Ministry of Education and Research (BMBF): Federal Government Report on Research and Innovation 2015, Table 1.1.1. Calculations by the DFG.

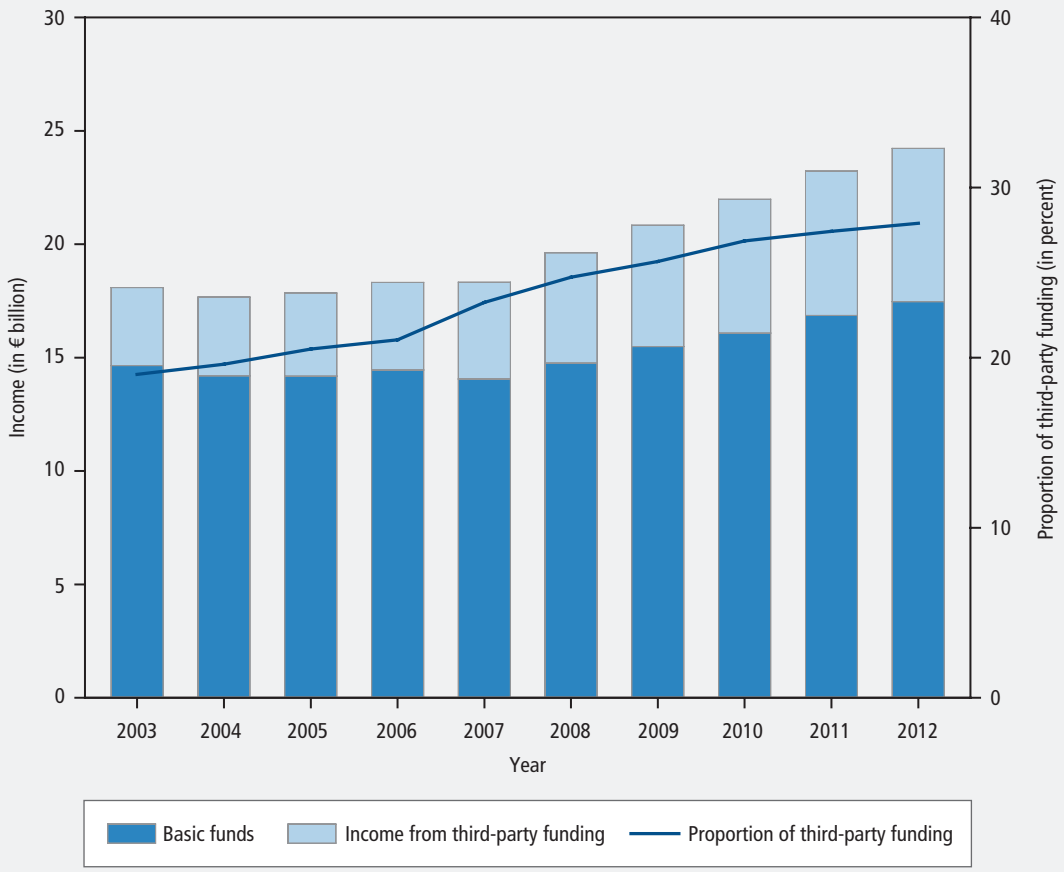
revenues of HEIs and the revenues of non-university research institutions in 2012, please refer to Tables Web-38 and Web-39 at www.dfg.de/fundingatlas. There is also infora mation available about the revenues of individual HEIs (cf. Table Web-3 at www.dfg.de/fundingatlas.)

Continued Growth in Importance of Third-party Research Funding

As noted in the DFG Funding Atlas 2012, the proportion of HEI research funding covered by third-party funding has risen continuously over time (DFG, 2013: 21). The continuation of this development in Figure 2-4 demonstrates that the growth trend is ongoing. To make their relative weight clearer, administrative revenues, mainly from the operation of hospitals, are excluded and only the relationship between ongoing basic funding and third-party funding is taken into account.

In 2012, HEIs received €6.8 billion in third-party funding revenues. By comparison, ongoing basic funding contributed €17.5 billion in the same year. In the current reporting year, the 'proportion of third-party funding', i.e. the ratio of third-party funding to total

Figure 2-4:
Trend in basic and third-party funding of higher education institutions 2003 to 2012



Note: Corresponds to Abbildung 2-4 of the DFG Förderatlas 2015.
Data basis and source: Federal Statistical Office (DESTATIS): Education and Culture. Finances of Higher Education Institutions 2012. Special analysis of Subject-Matter Series 11, Series 4.5. Calculations by the DFG.

HEI revenues (not including administrative revenues), was 28%. In 2003 it was just 19%. The trend over time shown in Figure 2-4 demonstrates that ongoing basic funding for HEIs, after falling between 2003 and 2007, has increased again in recent years. However, this increase is much smaller than the increase in third-party funding.

The DFG's Share of HEI Third-party Funding Revenues Remains Stable

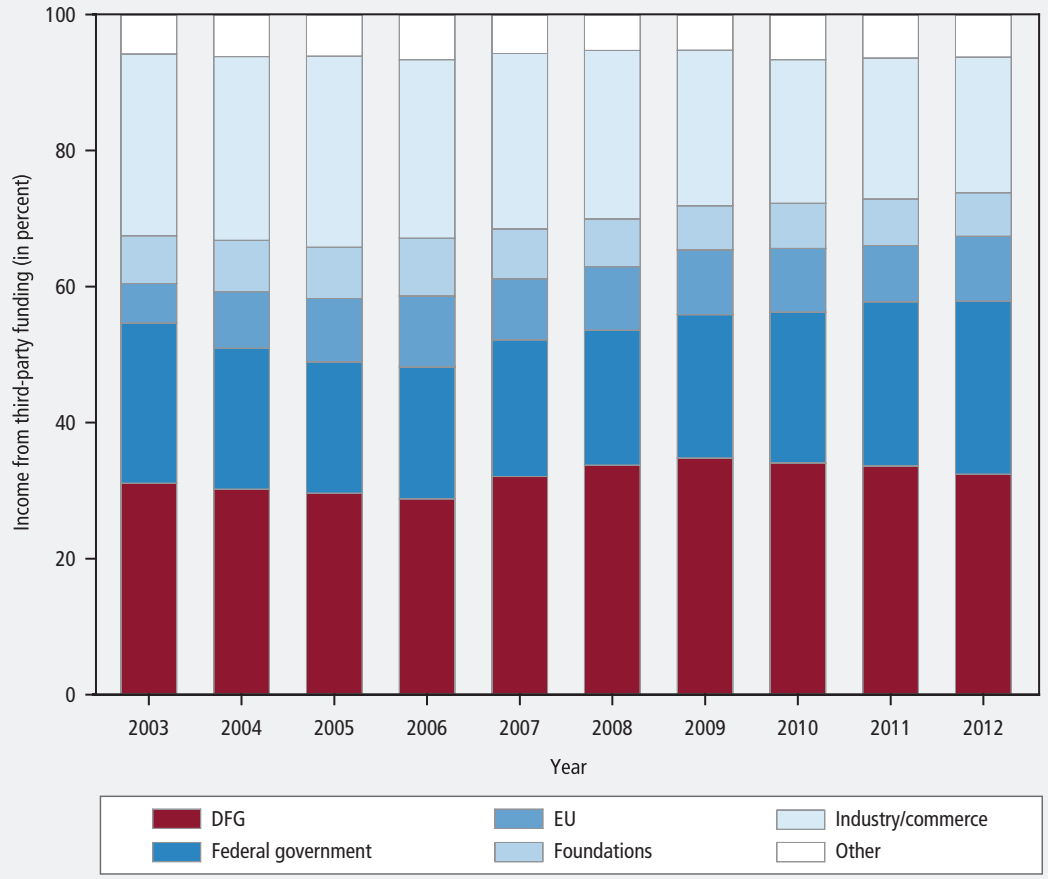
Of the €6.8 billion in third-party funding revenues received by HEIs in 2012, a good third came from the DFG. DFG funding therefore accounts for the largest individual share of HEI revenues from third-party funding (cf. Figure 2-5). 25% are provided by the federal government and 20% by industry and the private sector. Another important funding provider is the EU at just short of 10%. In the period between 2003 and 2012, the proportion of third-party funding provided by the DFG remained at a stable level with slight fluctuations.

For information about third-party funding for non-university research institutions, please refer to Table Web-39 at www.dfg.de/fundingatlas.

Growing Staff Resources in Public Research in Germany

In 2012, around 225,000 people were employed by higher education institutions (cf. Table Web-40 at www.dfg.de/fundingatlas). Most of these, approximately 85%, were employed by universities (*Universitäten*). In the same year, nearly 31,500 people were employed by universities of applied sciences (*Fachhochschulen*). Most of the research staff

Figure 2-5:
Trends in higher education institutions' income from third-party funding 2003 to 2012 by funding source



Note: Corresponds to Abbildung 2-5 of the DFG Förderatlas 2015.
Data basis and source: Federal Statistical Office (DESTATIS): Education and Culture. Finances of Higher Education Institutions 2012. Special analysis of Subject-Matter Series 11, Series 4.5. Calculations by the DFG.

employed by non-university research institutions, namely 70%, work for one of the four research organisations which are jointly funded by Germany's federal and state governments. Most are employed by the Helmholtz Centres, followed by the institutes of the Fraunhofer-Gesellschaft, the Max Planck Society and the Leibniz Association.

2.3 Funding Providers and Programmes Included in the Funding Atlas

The previous sections outlined the staff and financial resources available to German research. They also revealed the considerable and continually growing significance of third-party funding. This type of funding and the HEIs which obtain it are the main focus of the sections that follow. However, the reporting scope of the Funding Atlas is much bigger than this: it encompasses all third-party funding obtained by institutions in receipt of public funding, not only HEIs but also the member organisations of the major research organisations (FhG, HGF, MPG, WGL). Where research in the private sector also benefits from a significant level of public funding (federal government or EU), relevant figures are also presented.

The DFG Funding Atlas is based on data from several different sources. The most important source is the DFG's own funding database, which is used for a range of statistical services. Some of this data is also used as the basis for information services published on the Internet (cf. overview in Figure 2-6).

Through cooperation with other national and international research funding bodies, it is also possible to present data documenting the funding activities of these bodies in the

Figure 2-6:
DFG information services on research funding

GEPRIS – Information system on DFG-funded projects

GEPRIS (German Project Information System) is an online database made available by the DFG to provide information on current and completed DFG-funded research projects. Visitors to **www.dfg.de/gepris** can access information on over 100,000 DFG-funded projects involving more than 60,000 researchers at around 30,000 institutes at higher education institutions and non-university research institutions. The main objectives of each project are detailed according to the proposal submitted by the applicants.

For several years GEPRIS has regularly published data on the outcomes of DFG-funded projects in the form of abstracts and selected publication details. This information is sourced from the final reports submitted to the DFG. An English language interface enables international users to access the database with ease.

▶ **www.dfg.de/gepris**

Research Explorer (REx) – Research Directory

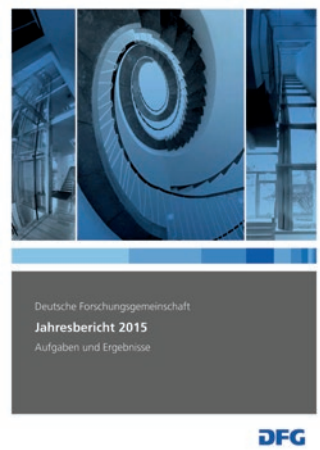
The Research Explorer, the research directory of the DFG and the German Academic Exchange Service (DAAD), contains information on 25,000 institutes at German universities and non-university research institutions, searchable by geographic location, subject and other structural criteria. The Research Explorer is linked to the Higher Education Compass offered by the German Rectors' Conference, allowing users to also access information about doctoral research at German institutions.

▶ **www.research-explorer.de**

The DFG Annual Report

As well as providing a general overview of research funding, the DFG Annual Report (available only in German) presents in-depth statistical information.
The chapter "Funding activities – facts and figures" explores the distribution of DFG funding by subject area, the scope of funding within individual programmes, the participation of women in the proposal process, and trends in proposal success rates. The Annual Report therefore complements the regularly updated statistics, analyses and evaluation studies available at **www.dfg.de/facts-figures**.

▶ **www.dfg.de/annual_report**



Note: Corresponds to Abbildung 2-6 of the DFG Förderatlas 2015.

DFG Funding Atlas. The following sections describe which funding providers and instruments are taken into consideration and what their specific orientations are.

2.3.1 Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)

The German Research Foundation is the main funding organisation for research in Germany. Its core task is to fund knowledge-driven/basic research projects conducted by researchers at HEIs and non-university research institutions. The DFG fulfils its central mandate, anchored in its statutes, to serve "all branches of science and the humanities by funding research projects and facilitating national and international collaboration among researchers" (DFG, 2014: §1), as a self-governing organisation of the German research community. The DFG is funded by the federal and state governments, represented on all of the DFG's decision-making bodies, which are nonetheless mostly made up of academic representatives.

One important characteristic of DFG funding is that research projects are primarily supported in 'response mode'. DFG funding does not concentrate on thematically focussed programme lines; instead, it is open to all subject areas and research questions. All of the DFG's decisions are therefore based solely on scientific quality criteria. Scientific quality is evaluated in a multi-stage process, the initial stage of which is largely based on appraisal by expert volunteer reviewers (peer review). Every year, the expertise of some 15,000 reviewers provides an essential foundation for the decision-making process which takes place in the statutory bodies of the DFG. In the second stage, the members of the review boards elected every four years by the scientific communities take responsibility for the quality assurance and evaluation of the reviews and the review process as a whole, and prepare the final decision in the DFG's statutory bodies.[2]

2 A detailed explanation of the work of the review boards can be found at www.dfg.de/review_boards; an overview of the DFG's decision-making process is available at www.dfg.de/quo_vadis_proposal.

Extended Range of DFG Funding Instruments Covered

The DFG funding instruments covered in the Funding Atlas account for 98% of the total sum awarded by the DFG between 2011 and 2013. For the funding instruments listed in Table 2-1, a total of almost €7.7 billion was awarded in the three-year period under consideration. The first two categories of funding instruments in Table 2-1 (Individual Grants and Coordinated Programmes) have always featured in the Funding Atlas. The 2012 edition was the first to include the Excellence Initiative, then still a recent introduction, which forms an important focal topic in this edition (cf. Chapter 5). This Funding Atlas has been further expanded to cover infrastructure funding instruments, which include two funding lines: 'Major Research Instrumentation' and 'Scientific Library Services and Information Systems'.

2.3.2 EU Framework Programme for Research and Technological Development

The European Union's funding measures for research and innovation are combined in multi-year framework programmes. The programme considered here, the EU's 7th Framework Programme for Research and Technological Development (FP7), ran from 2007 until 2013 and had a budget of €55.8 billion. The aim of the framework programmes, as set out in the EU agreements, is to boost European competitiveness in science and technology. This is primarily achieved by supporting international research and development projects (so-called group research projects), and since FP7 also through the awarding of grants to individual researchers by the European Research Council (ERC).

The successor to FP7, HORIZON 2020, launched in 2014, will run for another seven years (until 2020). It has resources of approximately €75 billion, of which around €13 billion is earmarked for the ERC, whose budget has therefore almost doubled in comparison with FP7.

FP7 is mainly composed of four 'specific programmes': *Cooperation*, *Ideas*, *People* and *Capacities*. The available resources are distributed very differently across the individual specific programmes. In the data basis of the Funding Atlas, the *Cooperation* pro-

Table 2-1:
DFG funding instruments: awards for the years 2011 to 2013

Funding instrument	Awards[1]	
	€m	%
Individual Grants[2]	**2,635.2**	**33.7**
Research Grants[3]	2,313.8	29.6
Emmy Noether Programme	203.0	2.6
Heisenberg Programme	52.8	0.7
Reinhart Koselleck Projects	30.2	0.4
Clinical Trials	35.3	0.5
Coordinated Programmes	**3,369.0**	**43.0**
Research Centres	125.9	1.6
Collaborative Research Centres[4]	1,675.2	21.4
Priority Programmes	592.7	7.6
Research Units[5]	516.6	6.6
Research Training Groups	458.6	5.9
Excellence Initiative of the German federal and state governments	**1,211.9**	**15.5**
Graduate Schools	152.7	2.0
Clusters of Excellence	713.3	9.1
Institutional Strategies	345.9	4.4
Infrastructure funding[6]	**459.1**	**5.9**
Major Research Instrumentation[7]	292.1	3.7
Scientific Library Services and Information Systems	167.0	2.1
Total	**7,675.2**	**98.0**
Programmes not covered by the Funding Atlas	**154.6**	**2.0**
Prizes, other forms of funding[8]	154.6	2.0
Overall	**7,829.8**	**100.0**

[1] Including programme allowance for indirect project costs, not including non-institutional funding recipients and funding recipients abroad.
[2] Not including research fellowships where these relate to non-institutional recipients.
[3] Including publication grants, workshops for early career investigators and Scientific Networks.
[4] Including the variations of Transregios, Transfer Units and Research Groups.
[5] Including the variation of Clinical Research Units.
[6] Not including central research facilities.
[7] Including Scientific Instrumentation - Information Technology equipment initiative and major research instrumentation according to Art. 91b of the Basic Law (GG). DFG awards including applications for additional costs for procurement. Excluding state government funding.
[8] Including non-institutional funding recipients and funding recipients abroad.

Note: Corresponds to Tabelle 2-4 of the DFG Förderatlas 2015.

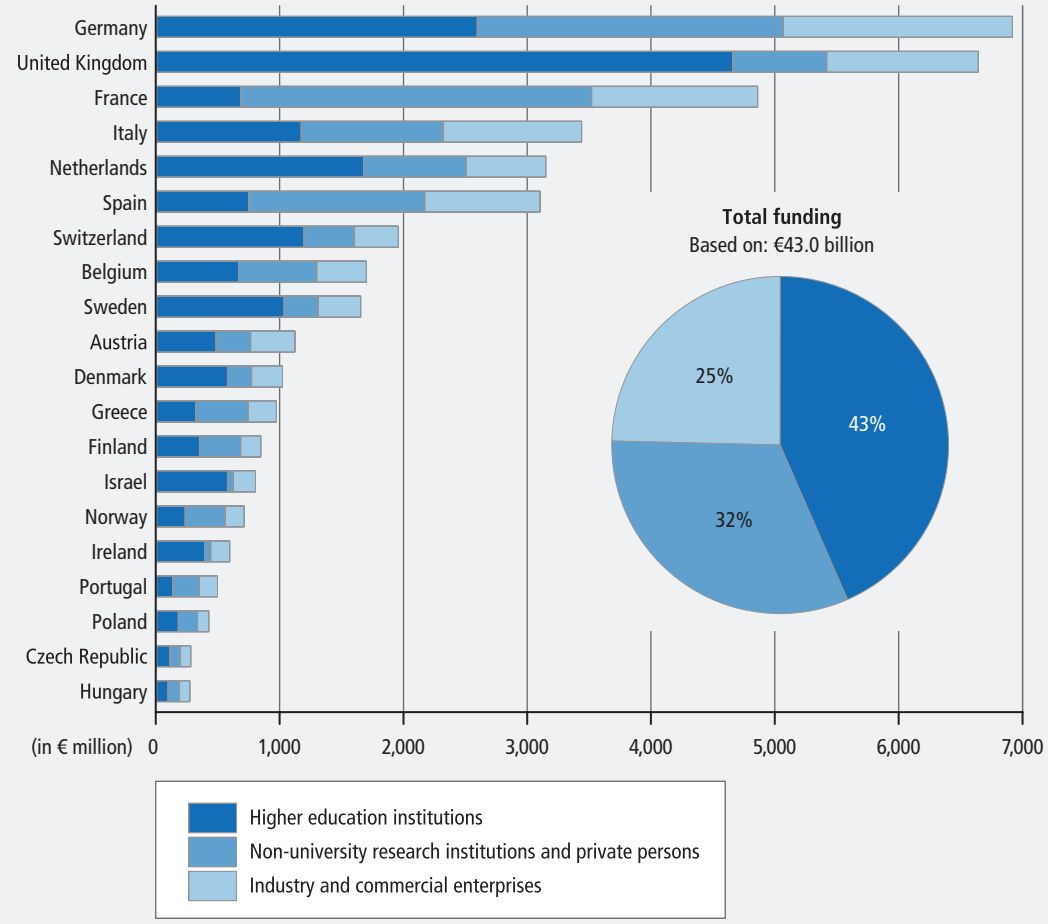
Data basis and source:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Calculations by the DFG.

gramme (for the funding of international group projects) receives the largest share of overall funding with a total of more than €27 billion, around two thirds of the available resources. The *Ideas* programme (as the basis of the ERC) comprises €6.9 billion, while the *People* programme (mobility and early career support) and the *Capacities* programme (e.g. for research infrastructures) have access to €4.5 billion and €3.7 billion respectively (cf. Table Web-42 at www.dfg.de/fundingatlas).

For the DFG Funding Atlas, data is available on a total of around 23,000 grant agreements with close to 130,000 participations on the part of HEIs, research institutions and companies between the beginning of FP7 in 2007 and the start of 2014[3]. These encompass around €43 billion.

3 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "EU funding".

Figure 2-7:
R&D funding in the EU's Seventh Framework Programme 2007 to 2013 by country and type of funding recipient



This calculation is based on funding for R&D provided to higher education institutions, non-university research institutions, and industrial and commercial enterprises within the EU's Seventh Framework Programme (not including international funding for the European Commission's Joint Research Centre). Countries with a funding volume of more than €200 million in the reporting period are shown here.

Note: Corresponds to Abbildung 2-8 of the DFG Förderatlas 2015.
Data basis and source: EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).

Marked National Differences in Sectoral Participation in FP7

An examination of the different sectors in receipt of research grants (HEIs, non-university research institutions, industry and the private sector) in which project partners conduct their research projects reveals information about the relative importance of the different sectors in each country.

FP7 supports cooperation between academia and industry in many ways, be it through international cooperation projects or the exchange of staff. Particular emphasis is given to the integration and fostering of research and innovation measures by small and medium-sized enterprises (SMEs). Overall, the average proportion of funding awarded to commercial companies across all the countries considered here is around 25%. In Germany the figure is slightly higher at almost 27%. The other two major recipient groups account for 38% (HEIs) and 36% (non-university research institutions) (cf. Figure 2-7).

A comparative examination reveals that these levels of participation vary considerably between EU countries. In the UK, Israel, Switzerland and Sweden, far more than half (in some cases up to 70%) of EU funding is awarded in the university sector, while in France, for example, non-university research institutions (such as CNRS, INRA and INSERM) account for a considerably higher proportion. In the UK, a significant part of the university sector's large share is due to a small number

of internationally highly regarded universities such as Oxford and Cambridge.

Cooperation Programme – International Collaborations in Thematic Priority Areas

In the specific programme *Cooperation*, funding is (mostly) awarded to large-format international group projects shared between HEIs, industry and research institutions, normally with cooperation partners from at least three countries. The specific programme *Cooperation* is structured in ten thematic priorities with special emphasis on the life sciences and information and communication technologies (measured by grant volumes).

Figure 2-8 shows the distribution of all funding awarded in the various thematic areas and for the other specific programmes for all countries with a funding volume of more than €50 million.

The country-specific funding profiles reveal that in Germany, information and communication technology accounts for a disproportionately high share of the funding volume, which is mainly due to industrial participations. In the UK, Switzerland and Israel, the cross-thematic and cross-sectoral funding areas account for a high proportion of the total, mainly due to the *Ideas*, *People* and *Capacities* programmes. This is primarily due to these countries' outstanding performance in the acquisition of ERC grants (cf. chapter 2.3.3).

People Programme – Focus on Early Career Researchers and Career Development

The support of early career researchers is particularly important to the ongoing development of the European Research Area. The Marie Curie Actions within the *People* programme are designed to foster international mobility for doctoral and postdoctoral researchers and to create a European research job market. Individual fellowships are awarded to experienced (postdoctoral) researchers, while Initial Training Networks promote the development and expansion of structured doctoral training in Europe. COFUND allows national fellowship programmes with an international orientation to obtain European co-funding.

The analyses in the Funding Atlas are based on a total of around 9,900 awards of Marie Curie Actions. In terms of the number of contracts, they represent over 40% of all awards made during the reporting period. Most of these are individual fellowships awarded to promote the geographical or sectoral mobility of researchers.

2.3.3 European Research Council (ERC)

As a constituent of FP7, the European Research Council (ERC) is responsible for the funding of frontier research at European level. In the current framework programme, HORIZON 2020 (2014 to 2020), the ERC will have around €13 billion at its disposal.

Project proposals are reviewed and approved solely in accordance with the criterion of the scientific excellence of both the applicant researchers and the intended research project. The aim of the ERC programme lines considered here (Starting Grants, Consolidator Grants and Advanced Grants) is to provide individual support to outstanding researchers. The ERC Starting Grant is aimed at younger researchers. Researchers who have already progressed further in their careers can apply for the ERC Consolidator Grant. The ERC Advanced Grant, meanwhile, is designed for established researchers.

Researchers of any nationality can apply to the ERC, but recipients of ERC grants must be at least partly based at a research location in an EU member state or an associated country (e.g. Switzerland, Norway or Israel). It is also possible to move to another research institution within Europe while in receipt of an ERC grant.

ERC awards for the reporting period 2007 to 2013 are depicted in two ways:

- By country of origin (nationality)[4] of recipients: this depiction serves to indicate the capacities of national research systems in the training and support of young researchers.
- By destination country of recipients: this depiction illustrates the attractiveness and competitiveness of host research institutions in an international comparison.

4 Here, the term 'country of origin' refers to the nationality of the recipients. In most cases the country of their nationality is the same as the country in whose research system they were trained.

Figure 2-8:
R&D funding in the EU's Seventh Framework Programme 2007 to 2013 by country and funding area

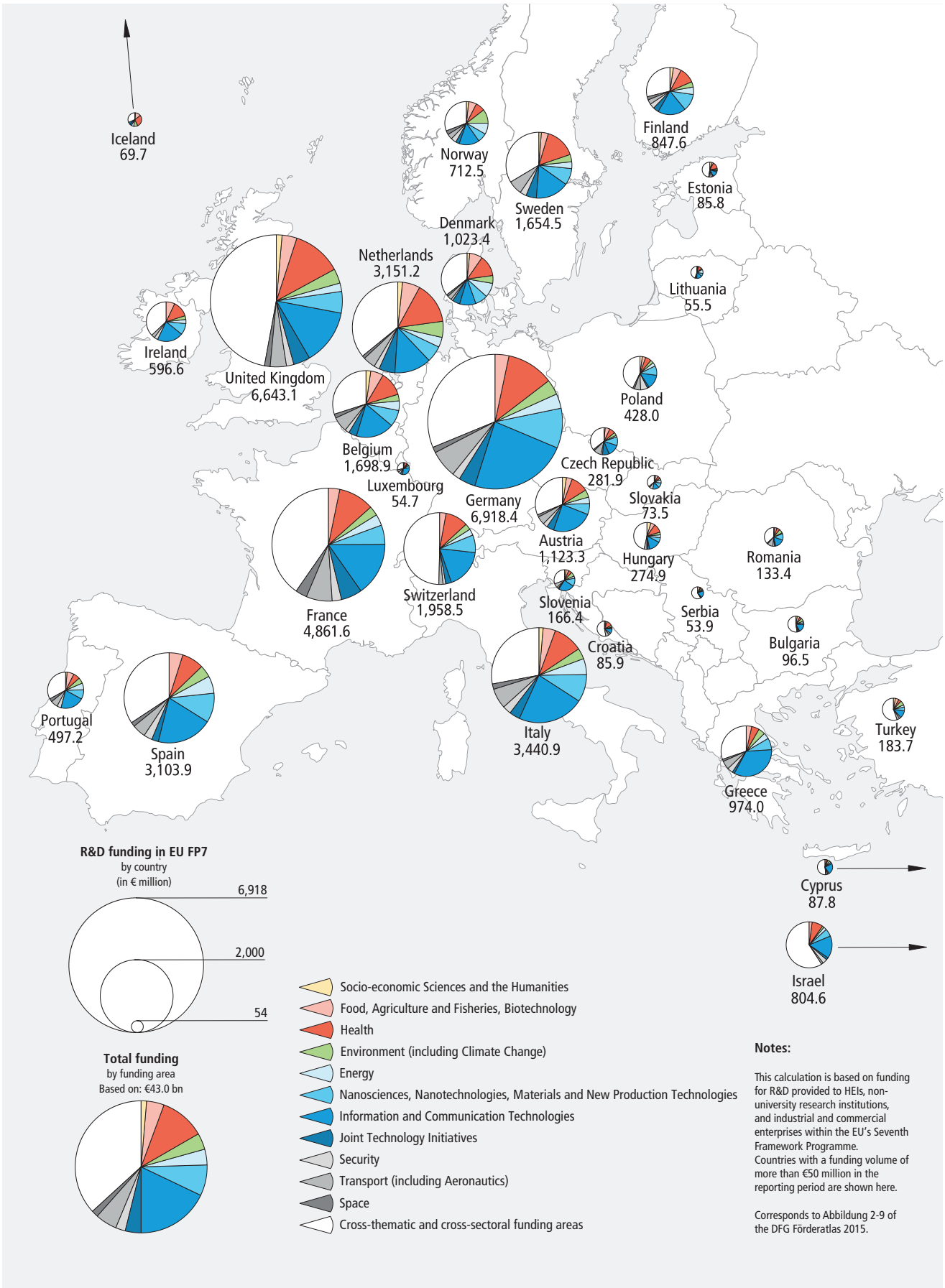


Table 2-2:
The most frequent countries of origin and destination of ERC-funded researchers 2007 to 2013

Number of funding recipients by countries of origin						Number of recipients by countries of destination				
Country of origin	Total	Including				Country of destination	Total	Including		
		Starting Grants	Advanced Grants	Consolidator Grants	Destination Germany			Starting Grants	Advanced Grants	Consolidator Grants
	No.	No.	No.	No.	No.		No.	No.	No.	No.
Germany	654	385	250	19	424	**Germany as country of origin**				
United Kingdom	569	226	332	11	17	Germany	424	231	176	17
France	453	264	181	8	7	United Kingdom	74	56	18	
Italy	358	216	130	12	18	Switzerland	55	28	26	1
Netherlands	302	169	127	6	12	Austria	36	28	8	
Israel	241	150	83	8	5	**Total**	**589**	**343**	**228**	**18**
Spain	203	132	67	4	6	**Other**	**65**	**42**	**22**	**1**
Belgium	161	113	46	2	2	**Overall**	**654**	**385**	**250**	**19**
Sweden	129	63	64	2	14	**Based on: No. countries**	**14**	**11**	**12**	**3**
USA	117	59	58		3					
Switzerland	102	48	48	6	5	**All funding recipients**				
Greece	72	45	27		6	United Kingdom	897	494	384	19
Finland	72	36	36		2	Germany	579	323	234	22
Austria	62	38	22	2	1	France	516	306	200	10
Denmark	61	32	29		15	Netherlands	320	187	128	5
Hungary	49	29	18	2	4	Switzerland	299	146	146	7
Portugal	44	34	9	1	3	Israel	231	141	82	8
Total	**3,649**	**2,039**	**1,527**	**83**	**544**	**Total**	**2,842**	**1,597**	**1,174**	**71**
Other	**356**	**252**	**94**	**10**	**35**	**Other**	**1,163**	**694**	**447**	**22**
Overall	**4,005**	**2,291**	**1,621**	**93**	**579**	**Overall**	**4,005**	**2,291**	**1,621**	**93**
Based on: No. countries	**64**	**56**	**45**	**22**	**34**	**Based on: No. countries**	**29**	**27**	**28**	**17**

Note: Corresponds to Tabelle 2-7 of the DFG Förderatlas 2015.

Data basis and source:
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014). Figures include Starting Grants (not including ERC Starting Grants 2014), Advanced Grants and Consolidator Grants.
Calculations by the DFG.

Germany – Still the Leading Country of Origin of ERC Grantees

In terms of the country of origin of ERC grantees, as in previous reporting periods Germany is still in first place with a total of 654 ERC-funded researchers (cf. Table 2-2), still followed by the UK (569 ERC grantees) and France (453 ERC grantees).

It is also worth mentioning that in the reporting period, 117 ERC funding recipients came to Europe from the USA. This is partly due to information campaigns conducted by the ERC in North America and other selected target regions (Australia, Brazil, China, India, New Zealand and South Africa).

Notable once again is the high number of ERC grantees from comparatively small countries which nonetheless have strong research profiles, such as the Netherlands (302 ERC grantees) and Israel (241 ERC grantees) – these two countries alone account for approximately 13% of all ERC grant recipients.

A separate representation by funding line shows that Germany's leading position in terms of the nationality of ERC grantees is mainly due to younger top-level researchers (who obtained 385 ERC Starting Grants). In terms of ERC funding for established researchers in the form of Advanced Grants, the UK takes first place (332 ERC grantees).

The large proportion of ERC Starting Grantees from Germany is an indicator of the out-

standing international competitiveness of the German research system with regard to the training of excellent young researchers.

Destinations of ERC grantees: Germany in 2nd Place

A look at the destinations of ERC grantees reveals that, as in the previous reporting period, research locations in the UK are once again in first place with a total of 897 ERC grants (around one fifth of all ERC awards, cf. Table 2-2). The top five ERC host institutions include three UK HEIs (Cambridge, Oxford and UC London with a total of 315 ERC grants).

Germany follows with 579 grants and France with 516 grants, including 210 grants to institutes of the CNRS. Compared with the previous reporting period, Germany has therefore risen to second place as a destination for ERC grantees (cf. Table Web-27 at www.dfg.de/fundingatlas).

This underlines the attractiveness of German research locations at international level, but is also a result of the intensification and professionalisation of information and advice measures on ERC funding opportunities in Germany in recent years.

Table 2-2 provides information about the destinations of German ERC grantees. Around two in three of these ERC grantees opt for a research institution in Germany. As far as other destinations are concerned, the UK, Switzerland and Austria (36 grants) are especially attractive to German researchers who receive ERC grants.

Distribution of ERC Grants by Scientific Discipline and Country Reveals Clear Differences

The distribution of ERC grants within the individual destination countries, broken down by scientific discipline, reveals another differentiated picture (cf. Figure 2-9).

The UK, for example, has a relatively even distribution and therefore high participation in all four areas. By contrast, ERC grantees in Germany and France are relatively frequently active in the life or natural sciences.

A large proportion of them also work in the engineering sciences, although this proportion is still lower than the UK figure of 20%. In contrast, with 8% of grantees in this scientific discipline Switzerland exceeds its average share of ERC grants.

2.3.4 Federal Government Funding for R&D Projects

Federal government funding for research and development can be divided into three essentially distinct mechanisms. Firstly, there is medium- to long-term institutional funding, through which an entire research institution receives funding from the federal government or the federal and state governments over an extended period of time. These include the institutions of the Fraunhofer-Gesellschaft (FhG), the Helmholtz Association (HGF), the Leibniz Association (WGL) and the Max Planck Society (MPG) (cf. also Chapter 3).

Secondly, there is contract research, with which research contracts are awarded to third parties under public procurement law, and thirdly there is project-based funding.

Project funding from the federal government is available to HEIs, non-university research institutions and commercial companies. These organisations may submit proposals for research projects with a defined time frame as part of funding and specialist programmes. Funding is offered for both individual projects and group projects involving several partners. A distinction is made between direct and indirect project funding.

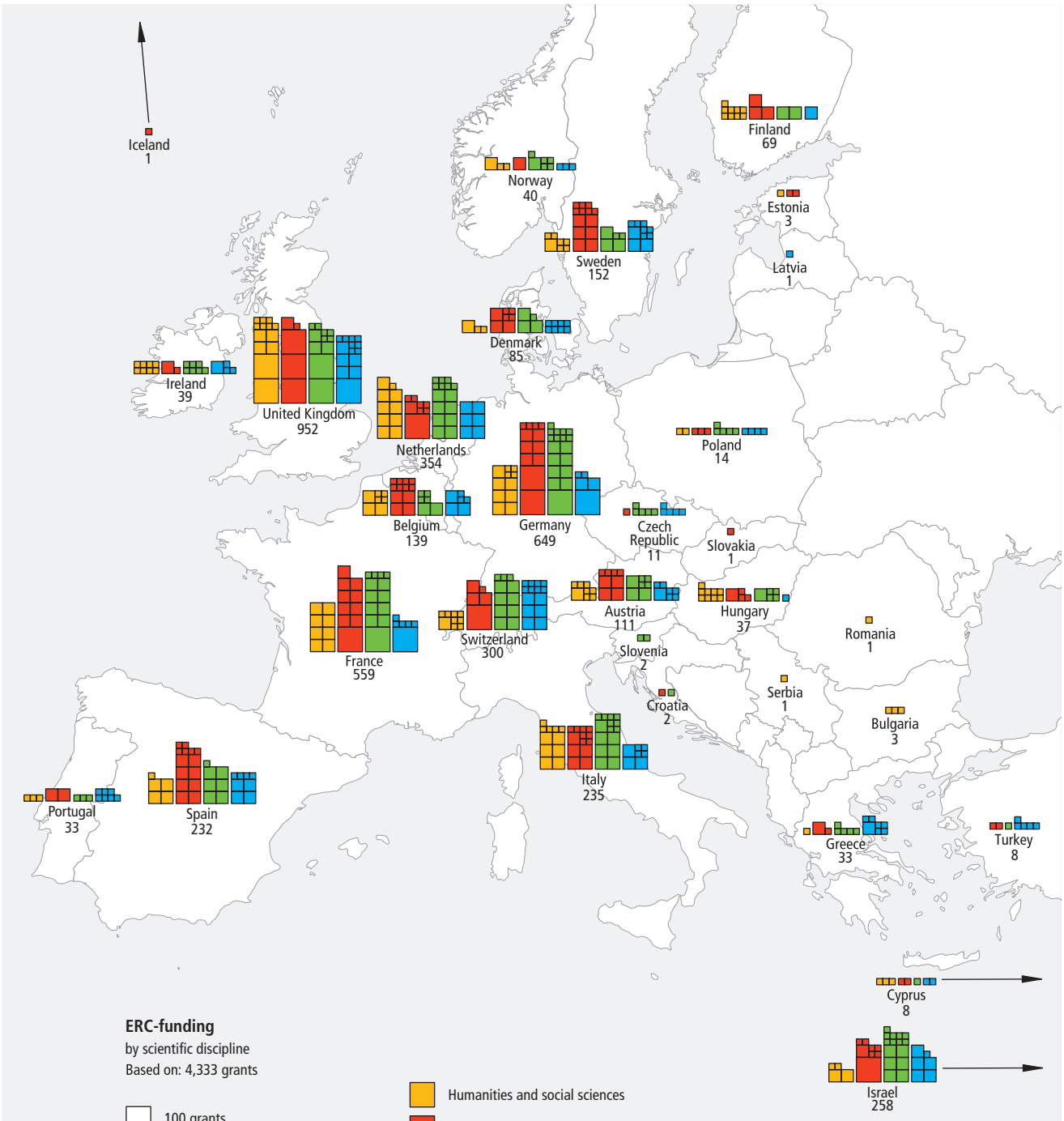
With indirect project funding, research institutions and companies receive financial grants for R&D-related projects such as research infrastructure, research cooperations and innovative networks.

Direct project funding relates to specific areas of research and technology defined in topic-based calls. Project funding in funding programmes or specialist programmes is offered for projects with a defined time frame (BMBF, 2014: 53ff.). The analyses in the Funding Atlas focus on this project-based funding.

The data used in the Funding Atlas is taken from the BMBF's PROFI database (Project Funding Information System), which covers most of the federal government's direct project funding in the civilian sector[5]. In addition to BMBF funding measures, funding programmes of other ministries are also recorded – in particular those of the Federal Ministry for Economic Affairs and Energy (BMWi), the Federal Ministry of Transport and Digital Infrastructure (BMVI), the Federal Ministry of Food and Agriculture (BMEL) and the Feder-

5 Cf. also www.foerderkatalog.de.

Figure 2-9:
ERC-funded researchers 2007 to 2013 by country of destination and scientific discipline



Note:
Corresponds to Abbildung 2-10 of the DFG Förderatlas 2015.

Data basis and source:

EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Figures include Starting Grants (including 2014), Advanced Grants and Consolidator Grants.

Calculations by the DFG.

al Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). In total, the funds taken into account in the Funding Atlas within the scope of federal R&D funding measures amount to €9.2 billion for the years 2011 to 2013[6].

2.3.5 Alexander von Humboldt Foundation (AvH)

The aim of the Alexander von Humboldt Foundation is to support top-level researchers from abroad who wish to work at a German research institution. It also supports researchers based in Germany who want to spend time researching abroad. Through its funding programmes the AvH sponsors both fellowships for which individuals can apply themselves and research awards. Awards are only offered following nomination by recognised academics. The AvH supports four academic career stages: postdoctoral researchers, junior research group leaders, experienced researchers and internationally recognised cutting-edge researchers. No quotas are applied, either for individual disciplines or for individual countries of origin. Instead, the decisions made by the selection committees are based solely on the academic quality of the applicants. As well as financial grants, an important aspect of AvH funding is non-material support, which includes alumni support and a worldwide network.

In the Funding Atlas, figures relating to the international attractiveness of German research institutions have been developed on the basis of AvH data. In the sections that follow, only visits in AvH programmes enabling foreign researchers to work in Germany have been taken into account.

Countries of Origin of AvH-funded Researchers

The countries of origin of AvH funding recipients vary considerably depending on the target group of the awards and fellowships. In terms of award recipients, the USA dominates with almost 50%, followed by other countries with strong research profiles such as France, Canada, Japan and Israel. The ten numerically most important countries of origin account for over 80% of award recipients. By contrast, the countries of origin of fellowship recipients are much more widely distributed and include a notable number of emerging science nations such as China, India, Poland and Hungary (cf. Table Web-44 at www.dfg.de/fundingatlas)[7]. Figure 2-10 provides an overview in cartographic form of countries of origin underneath the following information on the DAAD.

2.3.6 German Academic Exchange Service (DAAD)

The German Academic Exchange Service is one of the largest funding organisations supporting the international exchange of students and researchers. Like the DFG, it is an association under private law. Its members are HEIs and their student bodies. In addition to individual funding, an essential task of the DAAD is to strengthen the internationalisation of German HEIs through institutional funding (project funding). Individuals funded through DAAD projects are another focal point in the roll of DAAD funding recipients. The DAAD's annual report provides detailed information about the various projects and figures relating to DAAD funding.

The DFG Funding Atlas considers recipients of DAAD individual awards who completed a research visit to an institution in Germany. For this reason, only visits by graduates, doctoral researchers and established researchers are included. Undergraduates are not taken into account.[8] Of the 37,000 foreign recipients of DAAD funding who fall into these categories, approximately 32,000 are graduates or doctoral researchers and a good 5,000 are established researchers (cf. Table Web-45 at www.dfg.de/fundingatlas).

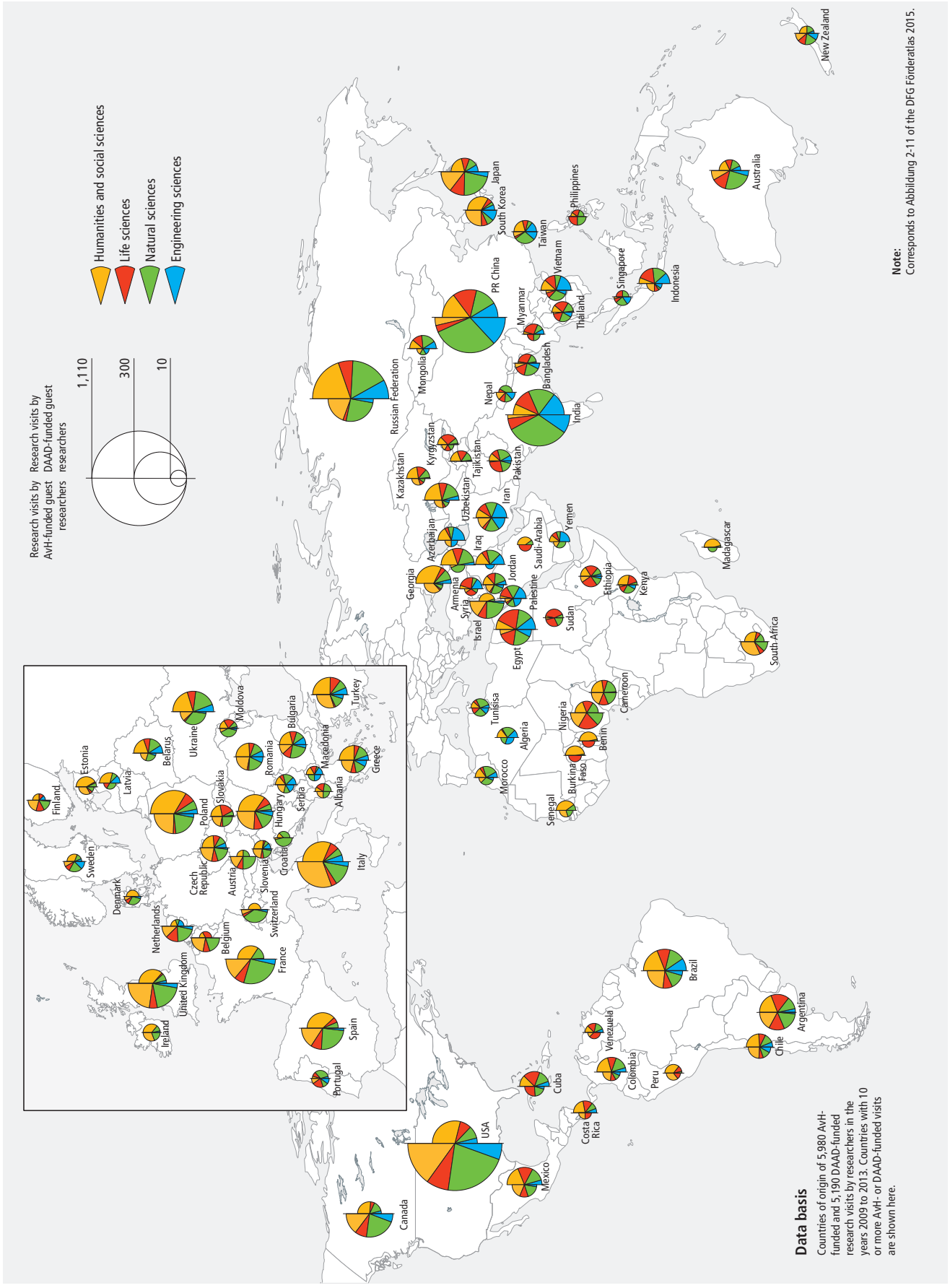
For the comparative analysis of funding-based figures for each scientific discipline in Chapter 4, only established researchers are taken into account. Together with recipients of AvH and ERC funding, these provide a suitable indicator of the international attractiveness of German research institutions.

6 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Federal funding".

7 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "AvH funding".

8 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "DAAD funding".

Figure 2-10:
AvH- and DAAD-funded researchers 2009 to 2013 by country of origin and scientific discipline



Countries of Origin of AvH- and DAAD-funded Researchers

The number of AvH- and DAAD-funded researchers is an important indicator of the attractiveness of the German research system.

The world map in Figure 2-10 shows the DAAD- and AvH-funded visits by visiting researchers by country of origin and scientific discipline. DAAD grants are shown in the right half of each circle and AvH grants in the left half.

Funded visits are distributed worldwide and have different focal areas, whereby DAAD funding exhibits a wider geographical spread. The map clearly shows that European recipients of DAAD funding mostly come from Central and Eastern Europe, while AvH recipients tend to come from Western and Central Europe and Asia. African recipients mainly come from Egypt, but Nigeria, Cameroon and South Africa are also common countries of origin.

A wide range of figures on the internationality of study and research in Germany is available in the annually updated report *Wissenschaft weltoffen*, funded by the BMBF (cf. www.wissenschaft-weltoffen.de).

3 Institutions and Regions of Research in Germany

Following the overview of the various providers of research funding in Germany, in this chapter we will now turn our attention to the institutions that receive funding and the research regions of which they form a part. In both cases the figures described in Chapter 2 are used.

3.1 Places of Research in Germany

The DFG Funding Atlas focusses on publicly funded research at higher education institutions (HEIs) and non-university research institutions. Figure 3-1 gives an impression, in cartographic form, of the diversity of this research landscape. It shows the locations of over 420 HEIs (110 universities, around 230 universities of applied science / HEIs without the right to confer doctorates and over 80 schools of theology, music and art) and the institutes of the four science organisations jointly funded by the federal and state governments through institutional funding: the Fraunhofer-Gesellschaft (FhG), the Helmholtz Association (HGF), the Leibniz Association (WGL) and the Max Planck Society (MPG). These four organisations have institutes at over 250 locations throughout Germany. Research is also carried out at some 60 federal research institutions, which are also shown on the map.

This cartographic representation is based on Research Explorer, the directory of German research institutions jointly developed by the DFG and the DAAD, which contains data on more than 23,000 institutes at HEIs and non-university research institutions and offers a wide range of search options in both German and English (cf. Figure 2-6).

The map also clearly reveals in which regions the publicly funded infrastructure for research and development (R&D) is well developed and the cooperation between HEIs and non-university research institutions has a particularly strong foundation. This topic is examined in more detail in the following sections.

3.2 Institution-related Figures at a Glance

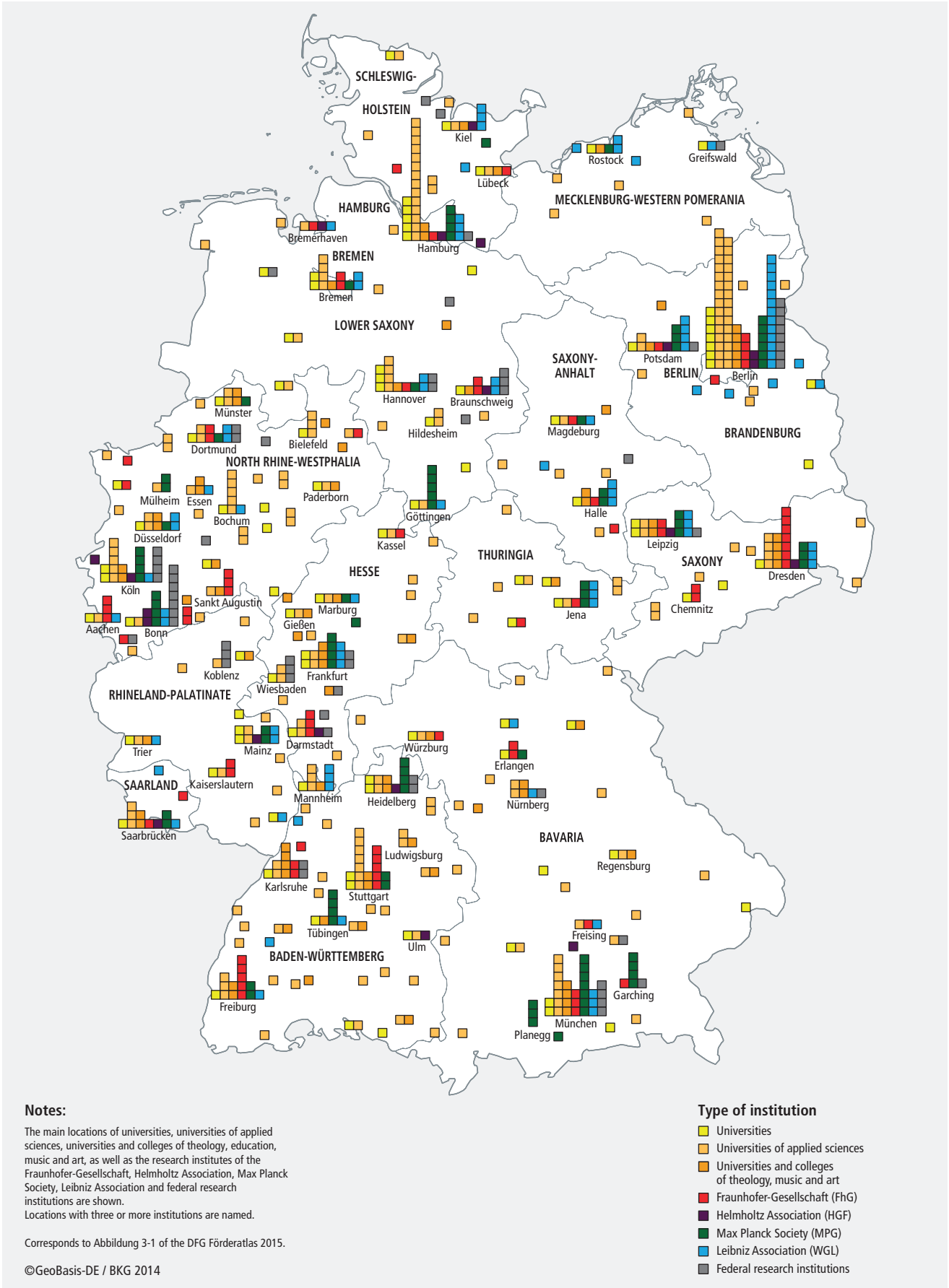
Table 3-1 provides an overview of participation in the third-party funding programmes of the DFG, the federal government and the EU. A very great similarity in profiles can be noted for direct project funding from the federal government and EU funding through the EU's 7th Framework Programme for Research and Technological Development (FP7). In both cases the funding awarded is divided approximately equally into thirds between HEIs, non-university research institutions, and industry and the private sector. Comparisons with corresponding illustrations in previous editions of the Funding Atlas reveal that this distribution pattern is highly stable. Among non-university research institutions, the Fraunhofer-Gesellschaft (FhG) and the Helmholtz Association (HGF) are dominant in both cases.

At www.dfg.de/fundingatlas, Table Web-28 shows in detail the participation of the named non-university science organisations in the various funding programmes of FP7, while Table Web-26 shows the same information for the participating German HEIs.

Funding Providers Differ Significantly in Their Institution-specific Customer Groups

Similarly to the situation described above for the EU and the federal government, the institutional composition of the body of DFG applicants has remained very constant over the years. The greatest demand for this funding comes from HEI-based researchers, with close

Figure 3-1:
Locations of research institutions in Germany



Notes:

The main locations of universities, universities of applied sciences, universities and colleges of theology, education, music and art, as well as the research institutes of the Fraunhofer-Gesellschaft, Helmholtz Association, Max Planck Society, Leibniz Association and federal research institutions are shown.
Locations with three or more institutions are named.

Corresponds to Abbildung 3-1 of the DFG Förderatlas 2015.

Type of institution

- Universities
- Universities of applied sciences
- Universities and colleges of theology, music and art
- Fraunhofer-Gesellschaft (FhG)
- Helmholtz Association (HGF)
- Max Planck Society (MPG)
- Leibniz Association (WGL)
- Federal research institutions

Table 3-1:
Participation[1] in DFG, federal government and EU funding programmes for research by type of institution

Type of institution	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Higher education institutions	**6,746.2**	**87.9**	**3,460.6**	**37.6**	**1,113.6**	**37.6**
Non-university research institutions	**929.0**	**12.1**	**2,879.8**	**31.3**	**1,057.5**	**35.7**
Fraunhofer-Gesellschaft (FhG)	22.6	0.3	721.9	7.8	242.4	8.2
Helmholtz Association (HGF)	198.3	2.6	684.8	7.4	243.3	8.2
Leibniz Association (WGL)	181.0	2.4	239.7	2.6	67.4	2.3
Max Planck Society (MPG)	240.8	3.1	191.9	2.1	176.0	5.9
Federal research institutions	50.8	0.7	137.3	1.5	34.5	1.2
Other research institutions	235.6	3.1	904.2	9.8	293.7	9.9
Industry and commercial enterprises	**0.0**	**0.0**	**2,870.3**	**31.2**	**793.9**	**26.8**
Overall	**7,675.2**	**100.0**	**9,210.7**	**100.0**	**2,965.0**	**100.0**

[1] This data only includes German and institutional funding recipients.
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €6,918.4 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 3-1 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (project database PROFI).
Deutsche Forschungsgemeinschaft (DFG): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013, project data as of 21 February 2014).
Calculations by the DFG.

to 88% of DFG awards being attributable to this segment. Among non-university research institutions, members of the MPG account for the largest share of DFG funding, while the FhG has only a small participation. The DFG does not award funding for projects in industry and the private sector.

The differences revealed here show how important it is to examine not only the specific orientation of the institutions in receipt of funding but also the specific profile of the funding providers. The DFG is strongly oriented towards knowledge-driven/basic research and primarily funds the university sector. The federal government and the EU have a greater focus on application and the economic usability of scientific findings. As a result, research institutions with close links to industry, such as technical universities, and also the private sector and industry itself, are important target groups for these types of funding. Conversely, institutions which receive a large amount of DFG funding have a strong profile in knowledge-driven/basic research. In contrast, institutions which obtain much of their funding from the federal government and the EU are more geared towards research with immediate applications and direct economic usability.

Data on the amount of third-party funding obtained by universities from the federal government and the EU can be found in Tables Web-23 and Web-26 at www.dfg.de/fundingatlas.

AvH and ERC GrantRecipients Show Similarities in Their Choice of Research Organisation

The two indicators of international attractiveness and international competitive success have also remained very stable over the years in terms of their distribution across different types of institution. The figures of interest here are the number of researchers who complete a longer research visit to a location with funding from the Alexander von Humboldt Foundation (AvH) and the number of people who obtained a Starting Grant or Advanced Grant from the European Research Council (ERC) during the reporting period of 2007 to

Table 3-2:
Number of AvH and ERC funding recipients by type of institution

Type of institution	AvH funding recipients		ERC funding recipients[1)]	
	No.	%	No.	%
Higher education institutions	**4,575**	**76.5**	**426**	**65.6**
Non-university research institutions	**1,405**	**23.5**	**223**	**34.4**
Fraunhofer-Gesellschaft (FhG)	25	0.4	1	0.2
Helmholtz Association (HGF)	209	3.5	45	6.9
Leibniz Association (WGL)	204	3.4	12	1.8
Max Planck Society (MPG)	749	12.5	127	19.6
Federal research institutions	75	1.3	2	0.3
Other research institutions	143	2.4	36	5.5
Overall	**5,980**	**100.0**	**649**	**100.0**

[1)] ERC funding recipients in Germany are shown.

Note: Corresponds to Tabelle 3-2 of the DFG Förderatlas 2015.

Data basis and sources:
Alexander von Humboldt Foundation (AvH): Research visits by AvH guest researchers from 2009 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014). Figures include Starting Grants (including 2014), Advanced Grants and Consolidator Grants.
Calculations by the DFG.

2014[1]. As was the case in the Funding Atlas 2012, three out of every four AvH funding recipients choose HEIs for their research visit (cf. Table 3-2). Among non-university research institutions, the MPG is clearly the dominant destination.

The situation with regard to ERC grantees is very similar, although on a numerically smaller basis (649 people compared with 5,980). Here, two out of three internationally renowned researchers use their ERC grants to conduct a research project at an HEI. Again, the MPG is the second most popular destination for ERC grantees with almost 20%, followed by the HGF with a share of nearly 7%.

The Funding Atlas Focusses on HEIs With a High Volume of Third-party Funding

The importance of the various third-party funding providers for the HEI sector has already been outlined in Chapter 2, on the basis of data provided by the Federal Statistical Office (cf. Figure 2-5). Figure Web-1 and Table Web-2 at www.dfg.de/fundingatlas provide an overview for 40 and 115 HEIs respectively by third-party funding provider. These tables show that the proportions represented by the various third-party funding providers vary considerably from one location to the next.

The following tables and charts only show data for the 40 HEIs with the highest volume of third-party funding in each case. At www.dfg.de/fundingatlas there are also detailed overviews in table form for each topic, categorised into HEIs and non-university research institutions.

3.3 DFG Awards to Higher Education Institutions

In the DFG-Förderatlas 2012, the fact that the report now covered a total period of 20 years (1991 to 2010) was taken as an opportunity for a comprehensive examination of the changes in the ranking orders over this period (DFG, 2012: 73ff.). The main finding was that the ranking orders had remained remarkably stable across the various editions of the report. Between the 2012 and 2009 editions in particular, there were virtually no notable differences, which is expressed statistically in strikingly high correlations between the compared ranking orders. The ranking order of the DFG Funding Atlas 2015 once again correlates strongly with the pattern seen in previous

1 The number of DAAD funding recipients was not used for the comparison of types of institution because the annual volume of DAAD funding for non-university research institutions is low. See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "DAAD funding".

years. The Spearman's rank correlation coefficient, calculated by comparing the ranking orders for 2015 and 2012, is 0.97 (a coefficient of 1.0 would indicate that both ranking orders were completely identical; a value of -1.0 would indicate two completely opposite ranking orders)[2].

Leading Trio for DFG Awards to HEIs in Absolute Terms

A detailed look at the HEIs which lead the ranking order reveals two notable changes. In 2012 it was noted that **LMU Munich** and **TH Aachen** had led the ranking order by a noticeable distance since reporting began, but they now form a leading trio along with **U Heidelberg** (cf. Figure 3-2). These three universities attract the most DFG funding with only slight differences between them in funding volume, but clearly ahead of the next highest institutions.

The second notable change relates to **TU Dresden.** In the Funding Atlas 2012 it was noted that this university had experienced exceptional development since reporting began, from rank 35 in the first half of the 1990s to rank 13 in the reporting period 2008 to 2010. It is now among the top ten recipients of DFG funding. Finally, there have been further significant changes for **TU Berlin** (which has risen 5 places in the ranking), **U Marburg** (which has risen 6 places) and, especially, **U Leipzig** (which has risen 7 places).

The Number of HEIs with DFG-funded Projects Continues to Increase as Differences in Funding Volumes per Location Become Smaller

DFG awards are distributed non-uniformly across the approximately 420 higher education institutions in Germany. Between 2011 and 2013, the DFG funded research projects at 210 HEIs, including 105 universities, 82 universities of applied science and 23 schools of music and art. However, these institutions exhibit very different degrees of participation in DFG funding. Together, researchers at all HEIs obtained €6,746 million from the DFG. Of this, €6,713 million was awarded to universities, which therefore secured 99.5% of the funding volume within the higher education sector. The 40 HEIs with the highest amount of funding received €5,841 million. This corresponds to 86.6% of DFG awards for the higher education sector considered in the Funding Atlas 2015.

An interesting trend can be observed: in the Funding Atlas 2012, the total amount of DFG funding received by TH Aachen in first place was 4.52 times higher than the university in 40th place (TU Braunschweig). The values in the 2009 edition produce a quotient of 4.92. In the current overview, the factor calculated by comparing rank 1 (LMU Munich) and rank 40 (U Halle-Wittenberg) is much lower at 4.06. In other words, the 'bastions' of third-party funding are not increasing their lead on smaller institutions: rather, the latter are closing the gap.

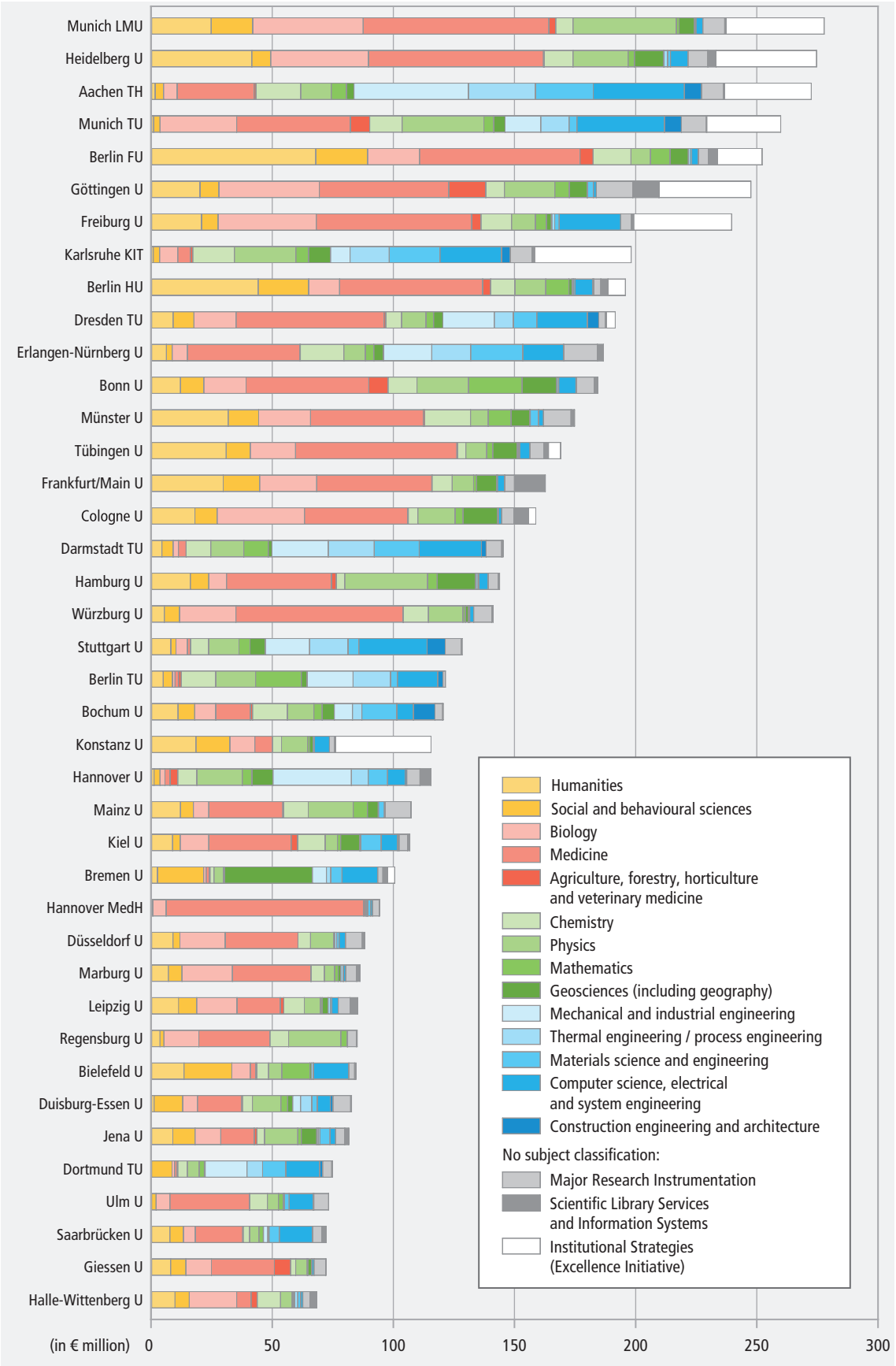
It is too early as yet to identify a trend. For the moment, however, it can be noted that although there is unequal institutional participation in the Excellence Initiative, there are no signs of a drifting apart of increasingly high-volume and increasingly low-volume institutions – at least in terms of DFG funding.

DFG Ranking Orders of HEIs Comparing Scientific Disciplines at www.dfg.de/fundingatlas

Figure 3-2 illustrates that the DFG funding volume of the listed universities is distributed very differently across the various subject areas. This demonstrates how important it is, with research statistics in general and especially with statistics based on third-party funding data, to take into account the very different significance of third-party funding in the various subject cultures (cf. also Chapter 4). In terms of DFG awards, for example, it should be noted that HEIs with a focus on university medicine and technical universities generally benefit from an above-average level of DFG funding. Medicine in general tends to attract a large proportion of DFG awards (cf. Figure 4-2), while very high per-capita awards are typical for the engineering sciences (cf. Figure 4-1). To take account of the subject focusses of HEIs, Table Web-46 at www.dfg.de/fundingatlas shows separate ranking orders for the four scientific disciplines defined in the DFG's classification system. In Chapter 4 this subject-based analysis is continued in more depth and HEI-spe-

2 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Correlation coefficient".

Figure 3-2:
DFG awards for 2011 to 2013 by higher eduaction institution and research area[1)]



[1)] Only the 40 leading recipients (higher education institutions) of DFG awards are presented here.

Note: Corresponds to Abbildung 3-3 of the DFG Förderatlas 2015.
Data basis and source: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013. Calculations by the DFG.

cific funds are further differentiated by fields of research. For non-university research institutions, subject-specific funding profiles with respect to the DFG and other funding providers are presented in Figure Web-2 at www.dfg.de/fundingatlas.

DFG Awards to HEIs Corrected for Subject Structure Reveal a Changed Ranking Order

The analyses below provide another approach to the question of how to take account of the different subject profiles of HEIs in the calculation of third-party funding statistics. The underlying methodology was first used in the DFG-Förderatlas 2012 to answer as simply as possible the question of how successfully HEIs were achieving their equality targets (DFG, 2012: 93ff.). Using data on academic staff at HEIs, the 2012 report calculated how many female professors and research assistants an institution would need in order to employ the same number of women in each research area represented at the institution as the national average for the given area. With due regard for the subject mix at each HEI, a 'statistically expected' proportion of women was calculated from the maximum of 12 individual values and then compared with the actual proportion of female staff members. With this very simple method it was possible to distinguish which HEIs were averagely successful, above average or below average. In response to the high level of interest, in 2014 this form of 'monitoring equal opportunity' was also featured in more frequent updates in the DFG publication series of the same name (cf. www.dfg.de/facts-figures).

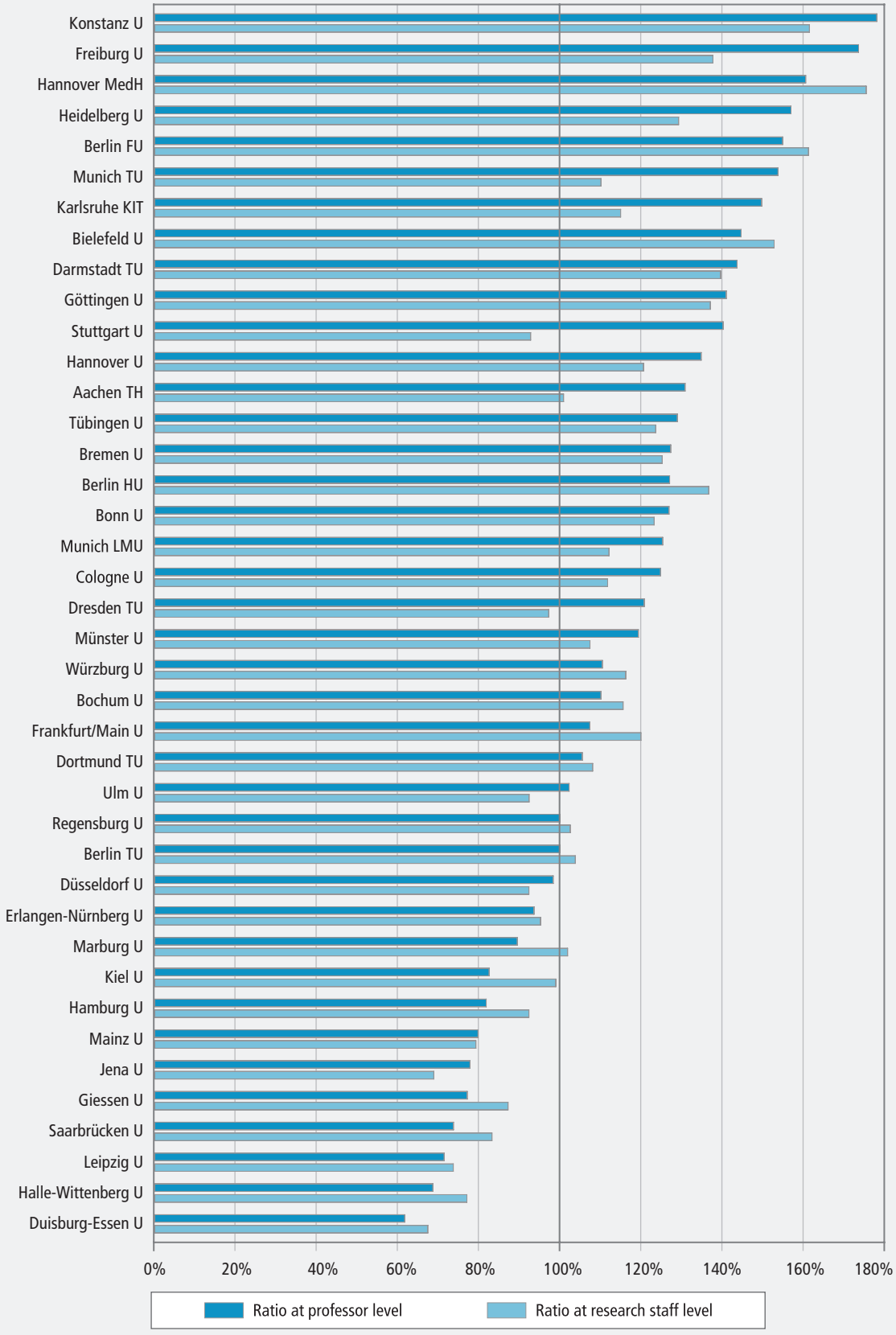
Similarly, to work out what DFG funding totals would be expected for a university in purely statistical terms, using the per-capita awards for universities shown in Table Web-34 (at www.dfg.de/fundingatlas) the 'statistically expected' third-party funding volume corrected for subject structure was calculated according to the institutional average. The calculation is limited to the universities sector because, as stated at the beginning of this chapter, this sector attracts the majority of DFG funding. The allocation of DFG awards to staff data was based on the 14 research areas listed in Table 4-1. In relation to DFG awards, these aggregate the funding activity broken down into 48 review boards (cf. Chapter 4.1). In terms of staff at higher education institutions, the allocation is based on the classification system used by the Federal Statistical Office (a concordance is provided in Table Web-32 at www.dfg.de/fundingatlas). The calculated figures vary within a sometimes smaller and sometimes larger tolerance range according to the subject focusses within these research areas at a particular university. However, as a contribution to the discussion regarding the relative DFG activity of a university, the figures provide very sound starting points[3].

Figure 3-3 shows the 40 universities which receive the most third-party funding and indicates the third-party funding ratios with respect to the professorships based there in comparison with the statistically expected value corrected for subject structure. If we consider this diagram firstly as a ranking order, the differences at the top are noticeable as significant differences from the absolute view. Here, medium-sized universities such as **U Konstanz** and **MedH Hannover,** which accordingly appear in middle ranks in the absolute DFG view, tend to appear higher up the ranking. Even the small **U Bielefeld,** with its strong focus on the humanities and above all the social sciences, appears among the ten universities with the highest DFG funding volume corrected for subject structure when its very specific subject profile is taken into account.

A closer examination also reveals that overall, the distribution exhibits only a few differences from the ranking shown in Figure 3-2 and Table Web-46 at www.dfg.de/fundingatlas. Six of the ten universities that lead the absolute ranking are also among the ten leading universities here; when the list is expanded to 20 cases, there are 15 correspondences. In relation to all 80 of the HEIs on which the calculation is based, there is a very high Spearman's rank correlation coefficient of 0.85. Essentially, it can be noted that HEIs with a high volume of DFG funding in absolute terms generally also have above-average values in relative per-capita terms. The method chosen here therefore confirms a finding that was repeatedly highlighted in previous editions of the Funding Atlas.

3 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Funding corrected for subject structure".

Figure 3-3:
Ratio of DFG awards for 2011 to 2013 to statistically expected values, corrected for subject structure, of the 40 higher education institutions with the highest awards volume



Note: Corresponds to Abbildung 3-4 of the DFG Förderatlas 2015.
Data basis and sources:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Federal Statistical Office (DESTATIS): Education and Culture. Personnel at Higher Education Institutions, 2012.
Special analysis of Subject-Matter Series 11, Series 4.4. Calculations by the DFG.

The Relative View Shows That Universities in the Excellence Initiative Rank Especially Highly

The absolute view already showed a clear connection between a university's participation in the Excellence Initiative and its positioning in the ranking order for DFG funding awards. This is especially true for those universities which were successful with an Institutional Strategy in the first phase of the Excellence Initiative and therefore obtained a greater amount of funding in the reporting period considered here (2011 to 2013). However, in hardly any case do funds obtained through the Excellence Initiative – for either Institutional Strategies or the two funding lines managed by the DFG – exert a significant influence on a university's positioning. The absolute ranking of the universities would look very similar even if these funds were not taken into account. Hence, nine of the ten universities that lead the total absolute ranking order are also in the top ten in a ranking order that ignores Excellence Initiative funds (though with a few changes in position within this segment). Expanding the list to 20 ranks results in 19 universities which lead the ranking order in both cases. Mathematically, the Spearman's rank correlation coefficient of 0.95 expresses the great similarity of the ranking order with and without Excellence funding (cf. also Table Web-12 at www.dfg.de/fundingatlas).

If we again look at the figures relative to staff size and subject profile, once more the universities with Institutional Strategies prove to be far above average in terms of obtaining DFG funding. It should be noted that Institutional Strategies funding (like awards for infrastructure programmes) were not included in this relative calculation because they are not linked to specific subjects.

All universities with Institutional Strategies in the first or second phase (the second not being decided until 2012) are also in leading places in the relative view, with six of them ranking among the ten universities with the most DFG funding in relative terms. Of 40 successful universities in relative terms, only five are *not* participating in the Excellence Initiative. Among the 20 leading universities, nearly all have two or more Graduate Schools or Clusters of Excellence and 12 also successfully proposed an Institutional Strategy.

Figure 3-3 is derived from calculations based on data documented in Tables Web-34 and Web-4 at www.dfg.de/fundingatlas.

3.4 International Attractiveness of Higher Education Institutions

Through cooperation with the Alexander von Humboldt Foundation (AvH), the German Academic Exchange Service (DAAD) and the EU Office of the Federal Ministry of Education and Research (BMBF), which provided data on the EU's 7th Framework Programme for Research and Technological Development (FP7) and the programmes of the European Research Council (ERC), it was once again possible in this DFG Funding Atlas to complement figures based on monetary data with indicators relating to people. In this case, the figures presented indicate the number of people who chose German HEIs and non-university research institutions for their visits as an AvH- or DAAD-funded visiting researcher or who are conducting ERC-funded research projects at a German research institution.

Table 3-3 shows firstly which universities are particularly attractive to recipients of AvH and DAAD funding. As far as visiting researcher programmes are concerned, the ranking orders are clearly led by **FU Berlin** and **HU Berlin,** while **TU Berlin** also has very high values in both cases. In other words, Berlin is an especially attractive destination for internationally renowned visiting researchers. The ten most popular universities for both AvH and DAAD still include **U Göttingen, LMU Munich, U Heidelberg** and **U Bonn.** The tradition-rich universities **U Münster, U Freiburg** and **TU Munich** are still very popular with AvH funding recipients, while a large number of DAAD funding recipients also head for Leipzig, Tübingen and Dresden.

The number of grantees in ERC programmes creates a somewhat different picture. On the basis of a seven-year window (2007 to 2013), 426 Starting, Advanced and Consolidator Grants were awarded in a highly competitive process for research projects carried out at German universities (cf. Table 3-4). We are therefore dealing with a much smaller number of people compared with the visiting researcher programmes. Visits by visiting researchers are also not the focus of the programmes in this case. The ERC funds internationally recognised leading researchers regardless of national origin, including for example German researchers who apply for an ERC grant at their home university or in their home country (cf. Table Web-43).

Table 3-3:
The most frequently selected host universities by AvH- and DAAD-funded researchers 2009 to 2013

AvH funding recipients		DAAD funding recipients	
Host institution	No.	**Host institution**	No.
Berlin FU	296	Berlin FU	374
Berlin HU	278	Berlin HU	317
Munich LMU	261	Göttingen U	190
Bonn U	182	Munich LMU	179
Heidelberg U	182	Leipzig U	158
Munich TU	168	Berlin TU	152
Göttingen U	148	Heidelberg U	150
Freiburg U	144	Tübingen U	148
Münster U	140	Dresden TU	147
Frankfurt/Main U	125	Bonn U	135
Aachen TH	123	Freiburg U	132
Berlin TU	119	Aachen TH	125
Cologne U	119	Giessen U	116
Karlsruhe KIT	106	Cologne U	113
Erlangen-Nürnberg U	105	Hamburg U	110
Bochum U	102	Münster U	105
Hamburg U	97	Potsdam U	105
Tübingen U	91	Munich TU	100
Dresden TU	86	Hannover U	91
Darmstadt TU	82	Karlsruhe KIT	91
Ranked 1–20	**2,954**	**Ranked 1–20**	**3,038**
Other HEIs[1)]	**1,621**	**Other HEIs[1)]**	**2,152**
HEIs overall	**4,575**	**HEIs overall**	**5,190**
Based on: No. of HEIs	**112**	**Based on: No. of HEIs**	**72**

[1)] Please see Tables Web-29 and Web-30 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Corresponds to Tabelle 3-4 of the DFG Förderatlas 2015.

Data basis and sources:
Alexander von Humboldt Foundation (AvH): Research visits by AvH guest researchers from 2009 to 2013.
German Academic Exchange Service (DAAD): Funding for researchers from abroad from 2009 to 2013.
Calculations by the DFG.

ERC grantees have a clear preference for the Bavarian capital Munich: **LMU Munich** and **TU Munich** jointly lead the ranking of the most attractive ERC locations. Taken together with the numbers of AvH and DAAD funding recipients, however, **U Heidelberg, U Bonn** and **FU Berlin** are again among the ten most frequently chosen universities.

Complete overviews of the destinations of AvH- and DAAD-funded visits to German HEIs can be found in Tables Web-29 to Web-31 at www.dfg.de/fundingatlas. The tables are differentiated by gender. A corresponding overview for the number of ERC grantees can be found in the same place in Table Web-27. Also at www.dfg.de/fundingatlas, in Table Web-47, is a summary overview of ERC grantees at non-university research institutions.

3.5 Research Profiles of Regions

Germany's research and development infrastructure is characterised by a multitude of regional hubs. Research in Germany is polycentric – not focussed on a single main centre but with a structuring influence in many regions. The regional importance of research and development and in particular the importance of HEIs in this area has attracted growing attention in recent years. In 2014, the 57th annual meeting of the chancellors of

Table 3-4:
The most frequently selected host universities by ERC-funded researchers 2007 to 2013

Host institution	Number of recipients
	No.
Munich LMU	41
Munich TU	31
Heidelberg U	24
Freiburg U	21
Bonn U	16
Hamburg U	16
Tübingen U	16
Aachen TH	15
Berlin FU	15
Erlangen-Nürnberg U	15
Frankfurt/Main U	15
Göttingen U	13
Berlin HU	12
Dresden TU	11
Konstanz U	11
Mainz U	10
Münster U	10
Würzburg U	9
Berlin TU	8
Karlsruhe KIT	8
Ranked 1–20	**317**
Other HEIs[1)]	**109**
HEIs overall	**426**
Based on: No. of HEIs	**57**

[1)] Please see Table Web-27 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Corresponds to Tabelle 3-5 of the DFG Förderatlas 2015.

Data basis and source:
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014). Figures include Starting Grants (including 2014), Advanced Grants and Consolidator Grants.
Calculations by the DFG.

Germany's universities took as its theme "Universities and Regions: Effects of Universities for Regional Development"[4]. In its outlook paper on the German research system, the German Council of Science and Humanities also stressed the ever-increasing importance of regional cooperation (WR, 2013: 15).

This edition of the Funding Atlas uses a new region concept. The previously chosen method of using districts and in some cases consolidated areas of urban agglomerations (e.g. the Ruhr region) as analytical units has been replaced with the spatial development regions (RORs) used by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR)[5]. With a total of 96 such regions, the analysis in this Funding Atlas deals with large areas (as at 31.12.2012, the number of districts was 402).

The density of research locations in the regions is represented in Figure 3-4 as a 'heat map', based on the addresses of all institutes of HEIs and non-university research institutions listed in the DFG institutions database[6] (approximately 28,000 entities, January 2015). This makes it possible to see, for example, whether a region is characterised by locally very focussed individual locations or has a broad scatter of research locations across a wide area.

To take one example, **LMU Munich** is not only shown in the cartographic representation with its central address of Geschwister-Scholl-Platz 1, as in Figure 3-1; instead, it features with the addresses of all its faculties, institutes, institutions and other sites recorded at the time. This includes for example the teaching and research farm of Oberschleissheim, which is situated approximately 23 kilometres north of the central administration as the crow flies. As well as **LMU Munich,** the Munich region includes all other HEIs and also non-university research institutions listed in the database with their various addresses. The analysis for the Munich region (München) is therefore based on a total of around 1,600 addresses.

Berlin, München (Munich) and Hamburg are easily identified as regions with a high density of institutions, as is the Rhine-Ruhr area with the regions of Bochum/Hagen, Dortmund, Köln (Cologne) and Bonn. The regions of Stuttgart, Neckar-Alb and Unterer Neckar (including the cities of Mannheim and Heidelberg) and the region around Dresden (Oberes Elbtal/Osterzgebirge) also have a high research infrastructure density. Moving from north to south, the same is true for the regions of Hannover, Münster, Göttingen, Westsachsen (West Saxony), Halle/Saale, Ostthüringen (East Thuringia), Rhein-Main

4 Cf. www.uni-kanzler.de or Pasternack, 2014: 27.

5 Cf. www.bbsr.de or www.raumbeobachtung.de.

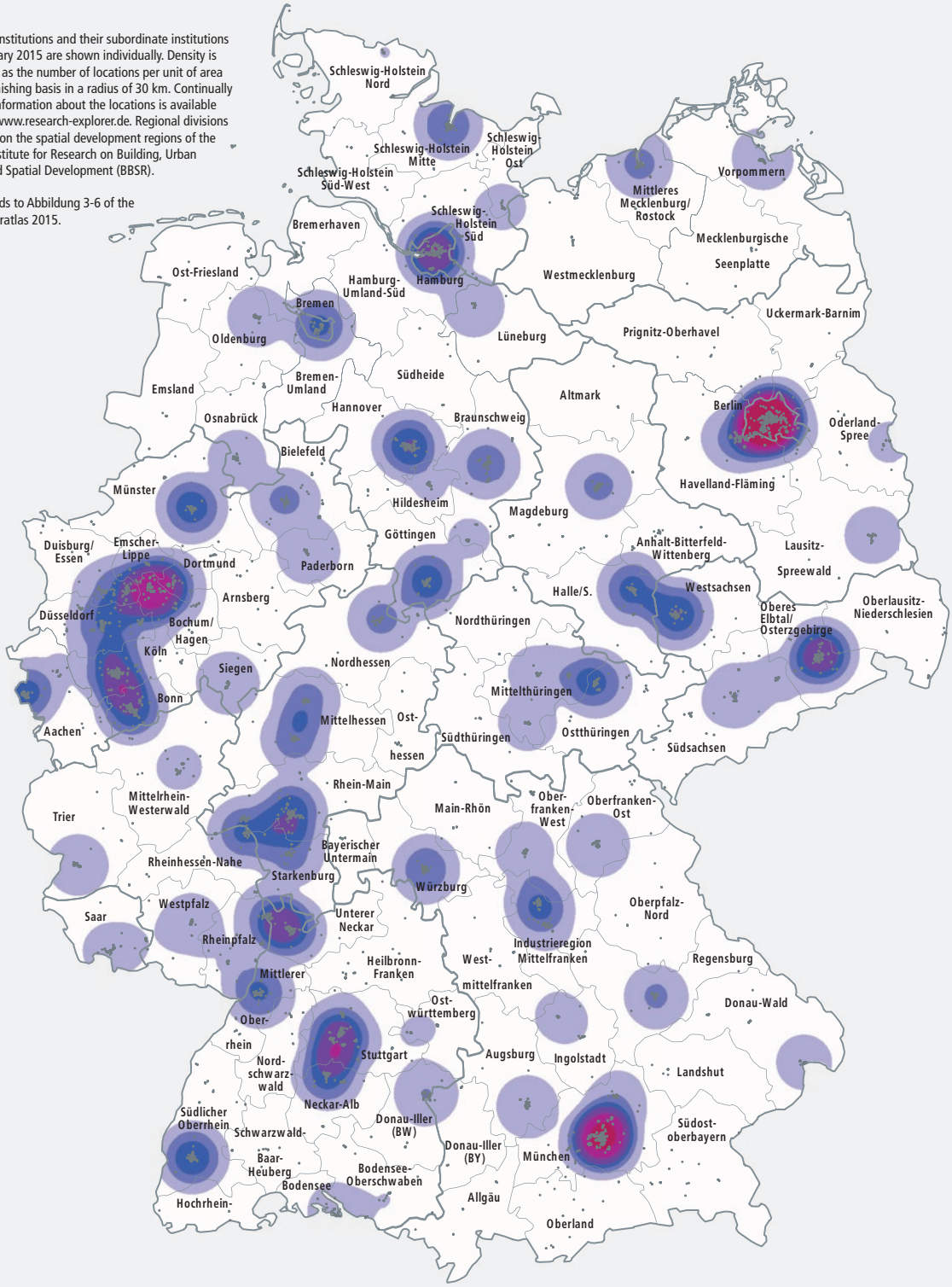
6 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "DFG institutions database".

Figure 3-4:
Location density of research institutions in German regions in 2015

Notes:

Research institutions and their subordinate institutions as in January 2015 are shown individually. Density is calculated as the number of locations per unit of area on a diminishing basis in a radius of 30 km. Continually updated information about the locations is available online at www.research-explorer.de. Regional divisions are based on the spatial development regions of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR).

Corresponds to Abbildung 3-6 of the DFG Förderatlas 2015.



(with its centre in Frankfurt) and Südlicher Oberrhein (around Freiburg).

The polycentric character of the German research system is also evidenced by the multitude of other, smaller centres which are home to a smaller number of research institutions.

DFG Funding in Virtually All Regions

The cartographic representation in Figure 3-5 indicates how DFG awards by research area are distributed between various regions and research locations in Germany. The diagram shows which regions are particularly active in terms of DFG funding and Excellence Initiative funding. A cartographic representation by funding instrument is available as Figure Web-3 at www.dfg.de/fundingatlas. The analysis is based on a total funding amount of €7,675 million for the period between 2011 and 2013.

Firstly, the diagram shows that the DFG is used as a provider of third-party funding in virtually all regions with a developed research infrastructure. The Berlin and München (Munich) regions stand out as attracting a particularly high level of funding. HEIs and non-university research institutions in Berlin obtained a funding volume of more than €720 million. The München (Munich) region successfully attracted over €640 million in research grants. The Unterer Neckar region (Heidelberg / Mannheim) and the regions of Aachen, Göttingen, Südlicher Oberrhein (Freiburg), Oberes Elbtal/Osterzgebirge (Dresden) and Hannover, each of which received over €200 million in DFG awards during the three years in question, follow at some distance[7].

It is noticeable that the regions have very different subject profiles. As the DFG strongly emphasises knowledge-driven/basic research at HEIs, this picture of the regions largely corresponds to the DFG profile of the universities based there. The added value provided by this illustration is the fact that it allows a comparison to be made with the regional profiles for federal government and EU funding (cf. Figures 3-6, 3-7 and Web-5). This makes it possible to draw conclusions about the subject and funding area focusses and interfaces in the various regions across different funding providers.

Here – limited to a brief description of the focal areas of DFG funding – it is possible first of all to identify a large number of regions which obtain a substantial part of their funding for medical research projects. Overall, just under a quarter of the DFG funding volume is associated with this research area. As expected, the proportion is higher in the Hannover region due to the medical schools based there, as well as in Würzburg and the Neckar-Alb region (around Tübingen).

Regions with a strong engineering sciences profile can be found in Aachen, Stuttgart, Mittlerer Oberrhein (around Karlsruhe), Südsachsen (around Freiberg and Chemnitz), Oberes Elbtal/Osterzgebirge (Dresden) and Industrieregion Mittelfranken (Erlangen and Nuremberg). The same applies to the regions of Mittelthüringen (around Erfurt, Gotha and Weimar), Starkenburg (around Darmstadt) and Dortmund.

Examples of regions with a focus on the geosciences include Bremen and Schleswig-Holstein Mitte (around Kiel) in the north, as well as Havelland-Fläming with the **Helmholtz Centre Potsdam – GFZ German Research Centre for Geosciences.**

Finally, the profile of a selected sample of small research regions can also be identified, such as Trier and Oberfranken-West (around Bamberg), whose universities have a strong emphasis on the humanities and social and behavioural sciences.

Direct R&D Project Funding From the Federal Government With a Focus on 'Hard Sciences'

Figure 3-6 shows which regions are particularly active in attracting direct R&D project funding from the federal government and in which thematic focus areas. It is based on the classification of federal R&D funding into funding areas as shown in Table Web-22 at www.dfg.de/fundingatlas. It is already clear from this table that direct R&D project funding from the federal government has a particular focus on the 'hard sciences', especially information technologies and other areas of technology. Researchers in HEIs, non-univer-

7 Owing to the change in the regional divisions explained at the beginning of Chapter 3.5 to bring them into line with the system of spatial development regions and the inclusion in the analysis of infrastructure programmes as explained in Chapter 2.3, it is not possible to directly compare this and the following cartographic representations with the corresponding figures in the Funding Atlas 2012.

Figure 3-5:
Regional distribution of DFG awards for 2011 to 2013 by research area

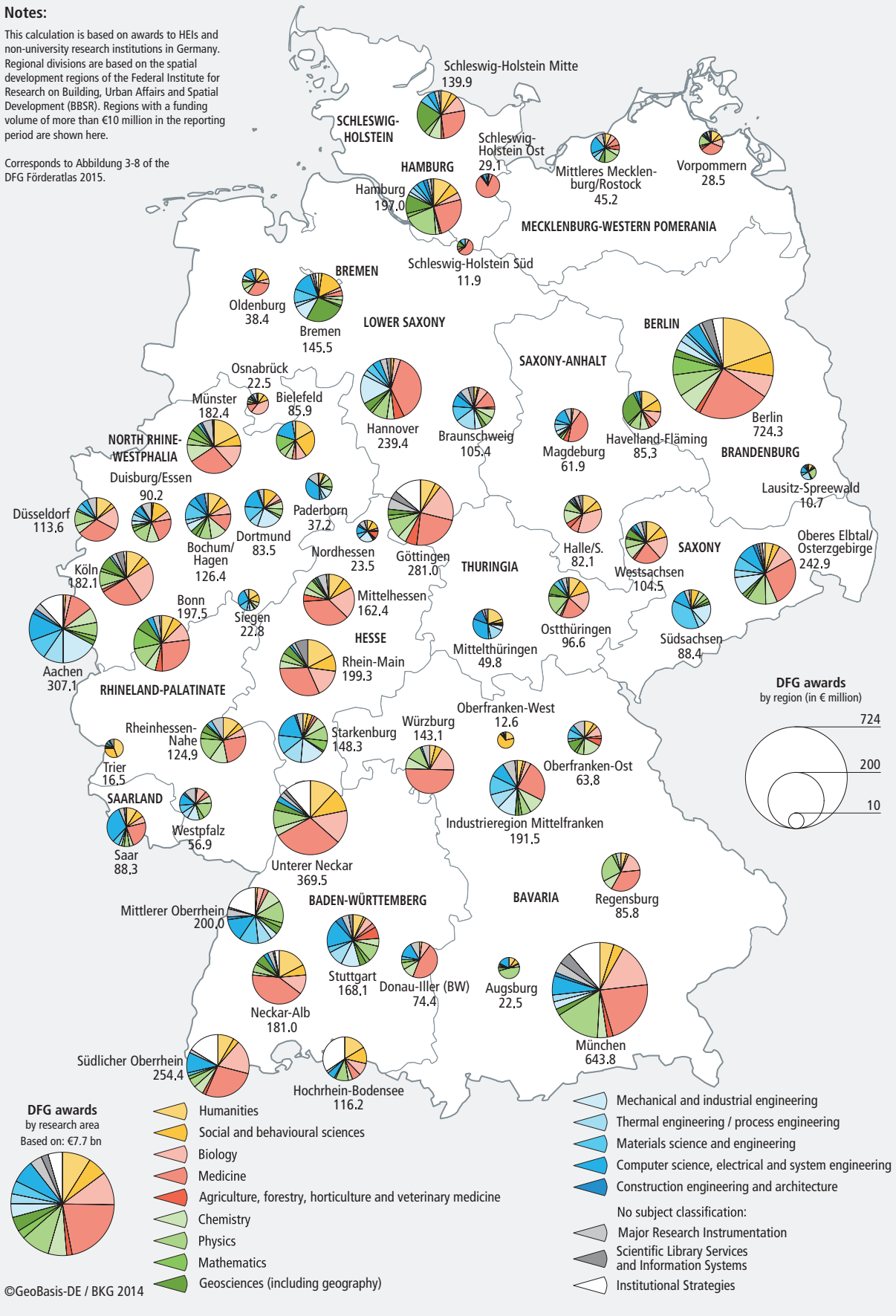
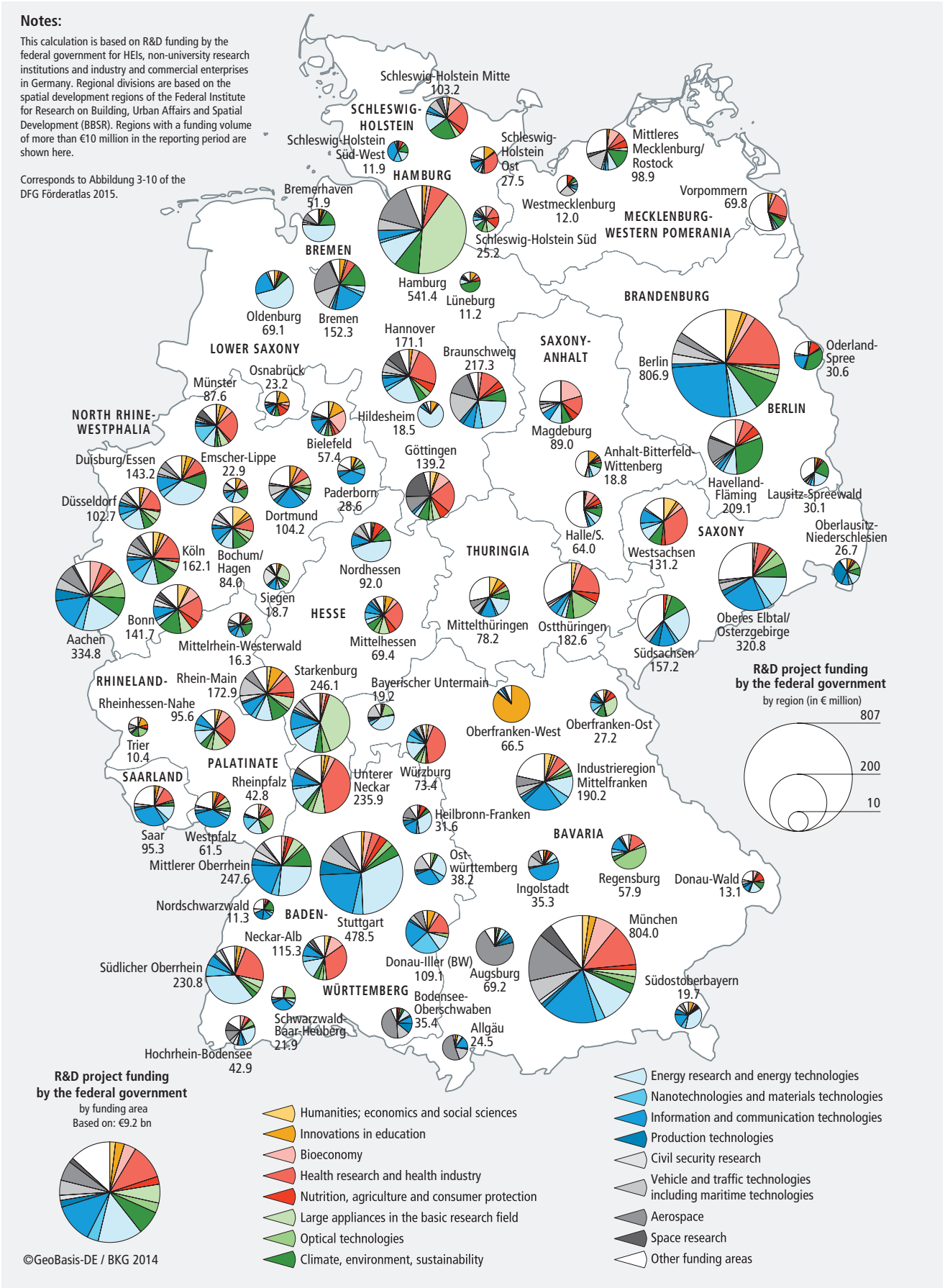


Figure 3-6:
Regional distribution of R&D project funding by the federal government 2011 to 2013 by funding area



sity research institutions, and industry and the private sector each receive approximately one third of federal project funding. The regional view therefore provides a picture of directly government-funded research activities which crosses all types of institutions.

Large-scale Use of Direct Project Funding From the Federal Government in the Regions

With over 77 funded regions in receipt of more than €10 million in research grants, federal funding is distributed very widely over the 96 spatial development regions.

Especially high funding amounts can be seen in the regions of Berlin, München (Munich), Hamburg, Stuttgart and Aachen; with the exception of the city-state of Hamburg, all of these regions are home to HEIs with a strong engineering sciences profile, which are also successful in obtaining DFG funding. In the case of federal funding, however, the non-university research institutions located around these HEIs as well as industry and the private sector also have a strong influence on regional profiling. In Hamburg, for example, this applies to Airbus Industries, which together with many other companies and non-university research institutions with a focus on aerospace engineering obtains a large amount of funding from the federal government's direct R&D project funding programme. Also influential in the case of Hamburg, however, is the federal funding for major instrumentation in basic research – the construction of the European X-ray laser XFEL at the **Deutsches Elektronen-Synchrotron (DESY)** accounts for a large proportion of the awarded funding.

Many Regions Have a Strong Focus on Individual Funding Areas

The Stuttgart region has a clear focus on the funding area of energy research and energy technology. This is due to a series of research projects relating to renewable energies, in some cases with the participation of companies based in the region such as Daimler AG.

In the Berlin region, as is the case with DFG funding, the most strongly represented funding area in absolute terms is the humanities and the economic and social sciences. But with its very low share of the total volume, both generally and in this location, this funding area is not really significant in profiling terms. Funding for projects in the funding area of information and communication technologies plays a much greater role here, for example in the form of the **Gauss Centre for Supercomputing (GCS),** which is based in the capital[8].

Many other regions also focus on a small number of funding areas. One example is Oberfranken-West, which through the National Educational Panel Study (NEPS)[9] based at U Bamberg is very active in the funding area of innovations in education. Another example is the Unterer Neckar region (Heidelberg and Mannheim), which is mainly active in health research and health industry. This is partly due to the **Bernstein Network Computational Neuroscience**[10], which has other centres in Berlin, Freiburg, Göttingen, München (Munich) and Tübingen.

High participation by the university sector in EU funding through FP7

Using the example of funding through the EU's 7th Framework Programme for Research and Technological Development (FP7), Figure 3-7 shows in what proportions the various institutional actors – HEIs, the four major non-university research organisations, and industry and the private sector – characterise the regional EU funding profile. A cartographic representation of the subject-based EU funding profile of the regions is provided by Figure Web-5 at www.dfg.de/fundingatlas.

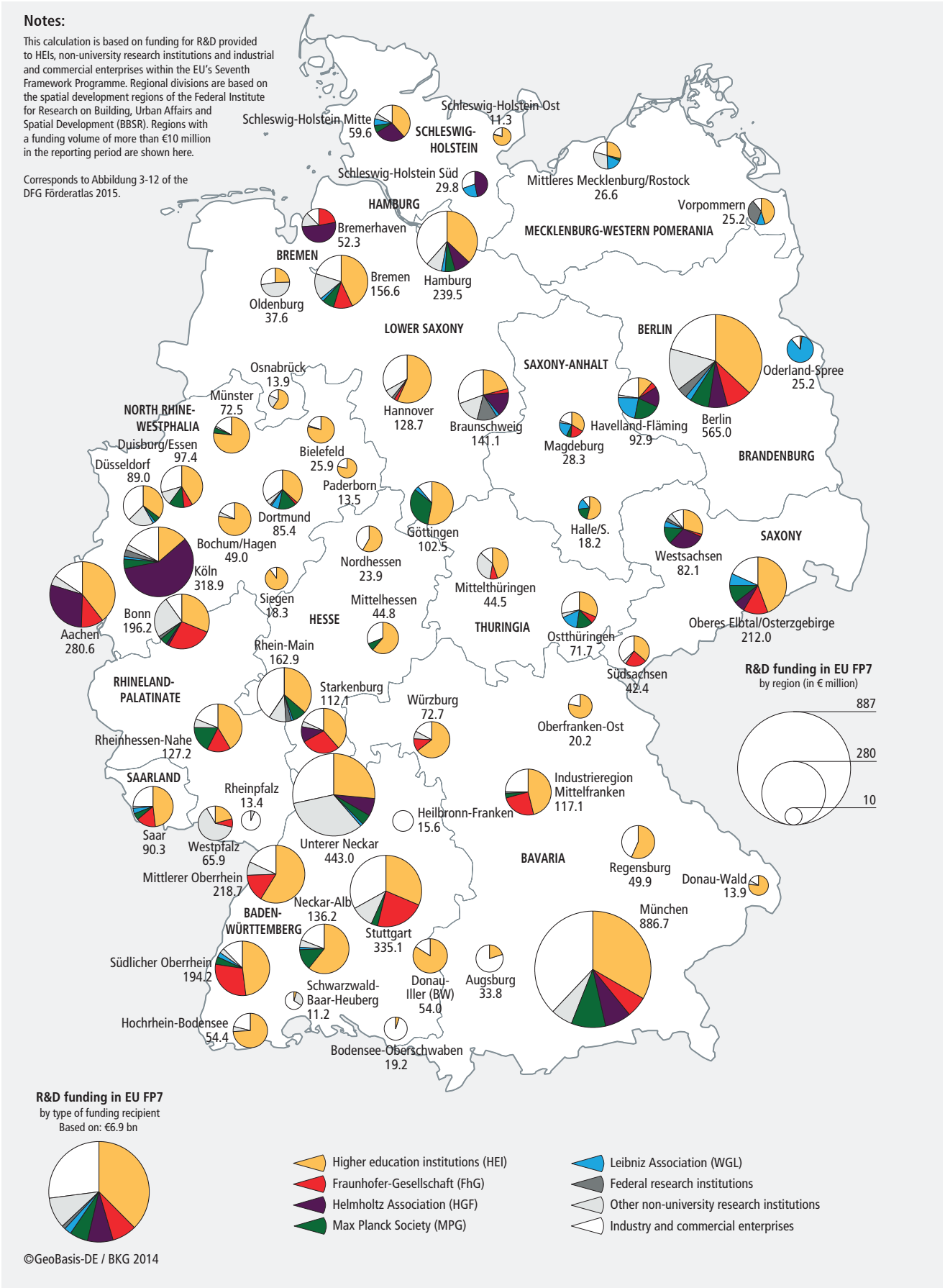
The five regions with the highest participation in FP7 are München (Munich), Berlin, Unterer Neckar (Heidelberg and Mannheim), Stuttgart and Köln (Cologne). The significant success of the Cologne region is especially noticeable, and is largely thanks to the **German Aerospace Center (DLR)** in Cologne. In the Unterer Neckar region (including the univer-

8 The Gauss Centre for Supercomputing (GSC) unites the three national supercomputing centres in Stuttgart, Jülich and Garching near Munich. In addition to federal funding, it is financed by the ministries responsible for research in the states of Baden-Württemberg, Bavaria and North Rhine-Westphalia (cf. www.gauss-centre.eu).

9 Since January 2014, the National Educational Panel Study has been managed by the newly established Leibniz Institute for Educational Trajectories (LIfBi).

10 Cf. www.nncn.de/en/.

Figure 3-7:
Regional distribution of R&D funding in the EU's Seventh Framework Programme 2007 to 2013 by type of funding recipient



sity towns of Heidelberg and Mannheim), the **European Molecular Biology Laboratory (EMBL)** accounts for a large share of the region's success in FP7. However, the region's HEIs also attract a good quarter of its EU funding.

What is generally noticeable is the finding noted in Chapter 3.2 of a comparatively high participation of the university sector in the EU programmes. We can see here that this is generally true for the majority of the regions considered. In Berlin and Munich, two regions that attract especially high EU funding, the full spectrum of institutions participates in FP7. While industry and the private sector play a very substantial role in Munich, Berlin also exhibits a very diverse non-university research market. HEIs represent approximately equal proportions in each case.

In an overall comparison, the findings presented so far provide a good overview of the very different subject and funding area focusses of the different regions. However, it is important to note that only research activities supported by third-party funding are considered here, and that in the case of the federal government and the EU in particular, attention is only given to selected funding areas, usually ones with direct applicability. The concept of spatial development regions introduced in this Funding Atlas examines larger spatial units than in previous editions of the report, which for the most part analysed districts and urban agglomerations.

4 Subject-based Funding Profiles of Research Institutions

The following chapter describes the subject profiles of higher education institutions (HEIs) and non-university research institutions as well as their networking in the context of DFG funding instruments. The data used is the information provided by selected research funding providers described in Chapter 2. The printed version of the report concentrates mainly on the HEIs that obtain the highest amount of funding from these providers. The additional tables and figures in the online material accompanying the Funding Atlas also provide data for other HEIs as well as non-university research institutions.

By way of introduction, the subject focusses of the various funding providers are compared by means of key figures. This is followed by a detailed examination of the profiles – in terms of subjects and funding areas – of HEIs that attract especially high amounts of funding from these providers.

Following the system of categorisation into four scientific disciplines – humanities and social sciences, life sciences, natural sciences and engineering sciences – Chapter 4.4 begins a detailed examination of the funding profiles of HEIs and non-university research institutions. For each discipline, attention is also given to the networking effects between institutions arising from joint participation in DFG Coordinated Programmes, Graduate Schools and Clusters of Excellence.

4.1 The DFG Subject Classification System

The figures reported in the DFG Funding Atlas focus on subject areas and therefore take account of the fact that the meaningfulness of these figures varies greatly from one subject to another. With respect to the DFG, the series has always benefited from the fact that DFG funding for research projects is very much organised along the lines of individual subjects. Most DFG funding instruments are managed by specialist departments at the organisation's Head Office. The academic staff in these departments are highly trained in the subject areas for which they are responsible (to at least doctorate level) and in many cases have many years of research experience themselves. The reviewers who assess funding proposals are chosen for their expertise in a particular field. If a proposal 'crosses' subjects, this affects the choice of reviewers. A DFG study published in English at the beginning of 2016 demonstrates that these interdisciplinary reviews of DFG proposals are in fact more the rule than the exception (DFG, 2016).

The review boards used by the DFG are a very good example of the subject orientation of the DFG's funding activities. The review boards are panels which play an important role in the processing and review of proposals submitted to the DFG. They evaluate proposals on the basis of the prepared reviews and if necessary prioritise them according to the available budget. Another important function of the review boards is the quality assurance of the review process and the selection of reviewers. If the available review documents do not satisfy the necessary standards or there is reason to suspect a conflict of interest, review board members will put a proposal on hold until further reviews are presented[1].

The structuring element used for all the subject- and topic-based analyses presented in this chapter is the DFG subject classification system. Depending on the available data and where relevant to the question, some figures relate solely to the level of scientific disciplines. Where possible, the report also cov-

1 There are 48 review boards with a total of 609 members, who are elected by the scientific community on a four-yearly basis. Each review board focusses on one of 209 subject areas which are allocated to the review boards in a hierarchical system. More information about the function, election and composition of the review boards and their subject areas is available at www.dfg.de/review_boards.

Table 4-1:
DFG system of review boards, research areas and scientific disciplines

Review board		Research area		Scientific discipline
101	Ancient cultures	Humanities	HUM	Humanities and social sciences
102	History			
103	Fine arts, music, theatre and media studies			
104	Linguistics			
105	Literary studies			
106	Non-European languages and cultures, social and cultural anthropology, Jewish studies and religious studies			
107	Theology			
108	Philosophy			
109	Education sciences	Social and behavioural sciences	SOC	
110	Psychology			
111	Social sciences			
112	Economics			
113	Jurisprudence			
201	Basic biological and medical research	Biology	BIO	Life sciences
202	Plant sciences			
203	Zoology			
204	Microbiology, virology and immunology	Medicine	MED	
205	Medicine			
206	Neurosciences			
207	Agriculture, forestry, horticulture and veterinary medicine	Agriculture, forestry, horticulture and veterinary medicine	AFV	
301	Molecular chemistry	Chemistry	CHE	Natural sciences
302	Chemical solid state and surface research			
303	Physical and theoretical chemistry			
304	Analytical chemistry, method development (chemistry)			
305	Biological chemistry and food chemistry			
306	Polymer research			
307	Condensed matter physics	Physics	PHY	
308	Optics, quantum optics and physics of atoms, molecules and plasmas			
309	Particles, nuclei and fields			
310	Statistical physics, soft matter, biological physics, nonlinear dynamics			
311	Astrophysics and astronomy			
312	Mathematics	Mathematics	MAT	
313	Atmospheric science and oceanography	Geosciences (including geography)	GEO	
314	Geology and palaeontology			
315	Geophysics and geodesy			
316	Geochemistry, mineralogy and crystallography			
317	Geography			
318	Water research			
401	Production technology	Mechanical and industrial engineering	MIE	Engineering sciences
402	Mechanics and constructive mechanical engineering			
403	Process engineering, technical chemistry	Thermal engineering / process engineering	TPE	
404	Heat energy technology, thermal machines, fluid mechanics			
405	Materials engineering	Materials science and engineering	MSE	
406	Materials science			
407	System engineering	Computer science, electrical and system engineering	CES	
408	Electrical engineering			
409	Computer science			
410	Construction engineering and architecture	Construction engineering and architecture	CEA	

As at 2015. Table Web-69 at www.dfg.de/fundingatlas shows further differentiation by 209 subject areas.
Note: Corresponds to Tabelle 4-1 of the DFG Förderatlas 2015.

ers the second level of the classification system in detail (14 research areas or the comparable level in the classification used by other funding providers). For the DFG funding profiles an evaluation is also given down to the third level, which comprises 48 research fields. The top three levels in the classification system are shown in Table 4-1. At www.dfg.de/fundingatlas the reader can consult Table Web-69, which also includes the fourth level comprising 209 subject areas[2].

4.2 An Overview of Subject-related Indicators

The division of the chapter into scientific disciplines and research areas reflects the fact that the meaningfulness of research indicators usually varies significantly from one research area to another. Previous editions have already illustrated the wide range in the normal per-capita awards of third-party funding for different research areas. This Funding Atlas also includes tables which present this information – firstly relating to total third-party funding revenues (data according to the Federal Statistical Office (DESTATIS) and secondly relating to DFG awards – in the online material accompanying the Funding Atlas (cf. Tables Web-33 and Web-34 at www.dfg.de/fundingatlas).

To illustrate this wide range, Figure 4-1 depicts the per-capita figures shown in the above-mentioned tables for professor level in relation to university revenues from third-party funding in 2012 and the corresponding per-capita awards from the DFG (2011 to 2013) in a scatter diagram. In three funding years the DFG approved almost the same amount as is recorded by DESTATIS for one year as the average per-capita revenues per professor (€254,000 compared with €266,000).

As can be seen from the diagram, the values for most research areas are very close together along the diagonal. A perfect alignment on the diagonal would indicate that DFG awards followed exactly the same distribution logic as total revenues from third-party funding. The Spearman's rank correlation coefficient produced by the ranking of the research areas is 0.83, which indicates a very high similarity of distribution. However, the visualisation reveals some small variations. For example, the research area of biology obtains a comparatively high proportion of its income from DFG funding. Conversely, the research areas grouped under mechanical engineering[3] and the research area of construction engineering and architecture have a somewhat greater affinity with other third-party funding providers.

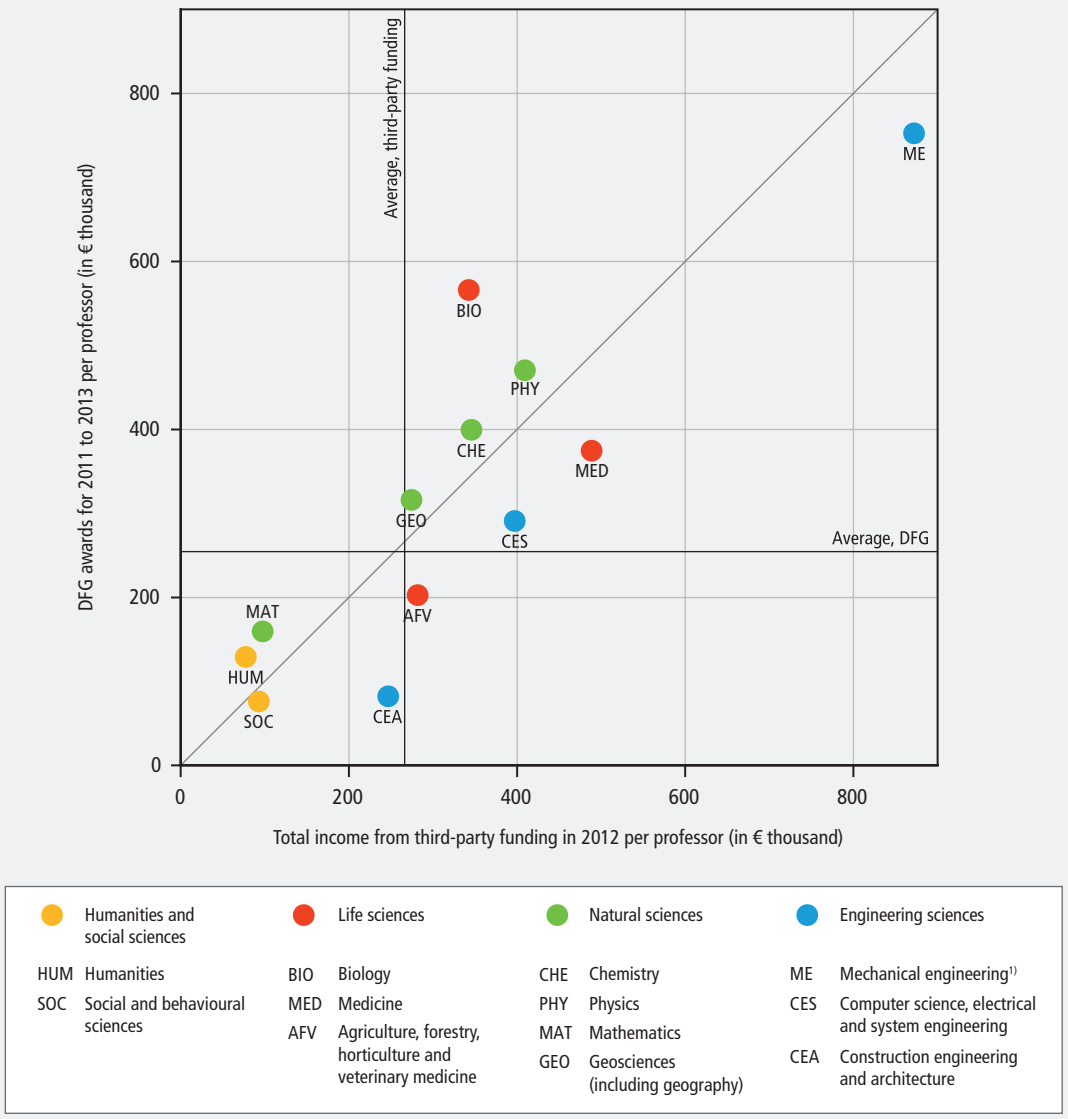
It can also be noted that there is a wide range in the per-capita values depending on the research area in which a professorship is classified. While the humanities and the social and behavioural sciences have values of around €100,000 (DFG awards for 2011 to 2013 / total revenues from third-party funding in 2012), professors in the mechanical engineering research areas achieve values 9 to 11 times higher (cf. in detail Tables Web-33 and Web-34 at www.dfg.de/fundingatlas).

Although mechanical engineering clearly exceeds the values usual in other research areas, as the diagram shows, there are also notable differences between these other areas. The use of third-party funding as a performance indicator, as is the norm in virtually all federal states for performance-based funding allocation (LOM), for example (KMK, 2011), should therefore take into account where possible the subject area affiliation of the applicant. In concrete terms, different yardsticks must be applied to the humanities, social sciences and mathematics at one extreme, the engineering sciences at the other, and the life sciences and natural sciences positioned between these extremes. This applies at the level of individual persons and institutes and at the level of entire institutions (such as HEIs), which have a very different third-party funding affinity depending on their subject profile (cf. Chapter 3.3).

2 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "DFG subject classification system".

3 The classification system used by the Federal Statistical Office for financial statistics does not allow a subdivision into the DFG-defined research areas of mechanical and industrial engineering, thermal engineering / process engineering, and materials science and engineering. For statistical purposes these are here combined into the single research area of mechanical engineering, in contrast to the usual DFG classification.

Figure 4-1:
DFG awards for 2011 to 2013 and total income from third-party funding in 2012 by research area and per professor at universities



1) The classification system applied by the Federal Statistical Office does not allow for an adequate differentiation between the following three research areas distinguished by the DFG: "Mechanical and industrial engineering", "Thermal engineering / process engineering" and "Materials science and engineering". For statistical purposes these research areas have been treated as a single entity and listed under "Mechanical engineering".

Note: Corresponds to Abbildung 4-1 of the DFG Förderatlas 2015.
Data basis and sources: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Federal Statistical Office (DESTATIS): Education and Culture. Finances of Higher Education Institutions, 2012.
Special analysis of Subject-Matter Series 11, Series 4.5. Calculations by the DFG.

Funding Providers Have Very Different Subject Emphasis

The compact representations that follow provide an overview as to how the key figures used in the Funding Atlas vary in importance for different subjects according to the funding organisation.

Firstly, Table 4-2 compares the monetary figures based on third-party funding data. In accordance with the goal set out in its statutes, the DFG funds research "in all of its branches". In line with this goal, the funds made available for research projects are distributed relatively equally over the four major disciplines in the comparison of funding providers. The proportion of funding allocated by the other funding providers considered here to the humanities and social sciences is only between 1% and 5%, whereas the DFG allo-

cates almost 15%. With a share of close to 34%, the life sciences enjoy a clear focus at the DFG, mainly due to medical research (cf. Table Web-7 at www.dfg.de/fundingatlas). Both funding from the federal government and the EU's 7th Framework Programme for Research and Technological Development (FP7) place a clear emphasis on the engineering sciences with 46% in each case. The totals labelled in the table as "No subject classification" cannot be definitely assigned to any one particular scientific discipline for various reasons. At the DFG, these include for example infrastructure funding and the university-wide Institutional Strategies within the framework of the Excellence Initiative (cf. Table 2-1).

R&D project funding from the federal government (cf. Table Web-43 at www.dfg.de/fundingatlas also includes infrastructure programmes and interdisciplinary programmes. EU funding in FP7 can only be classified under a particular subject in the specific programme Cooperation (cf. Table Web-42 at www.dfg.de/fundingatlas), which is why only this appears in Table 4-2. All other specific programmes cannot be classified in such a way. Within the specific programme Cooperation, there are however certain areas which cannot be classified by subject, namely security research and cross-cutting activities.

In terms of indicators of international attractiveness (cf. Table Web-48 at www.dfg.de/fundingatlas), there are some striking differences. AvH funding for longer research visits focusses on researchers in the natural sciences (44%) and the humanities and social sciences (30%). In Germany, the ERC funds to a special extent researchers in the life sciences (41%), with the natural sciences forming another key area (29%). By contrast, visiting researchers who participate in DAAD programmes often represent the humanities and social sciences (42%), followed at a distance by the natural sciences (24%).

Both generally and in a comparison of individual instruments, this confirms once again what has already been stated: every indicator measures something specific and its meaningfulness varies from one scientific discipline to another and from one subject area to another (even if this cannot be represented in detail for every indicator).

4.3 Overall View of Subject and Funding Area Profiles of Higher Education Institutions

Figure 4-2 shows the subject profiles of the 40 HEIs that attracted the most DFG funding between 2011 and 2013, categorised by the 14

Table 4-2:
Participation[1] in DFG, federal government and EU funding programmes for research by scientific discipline

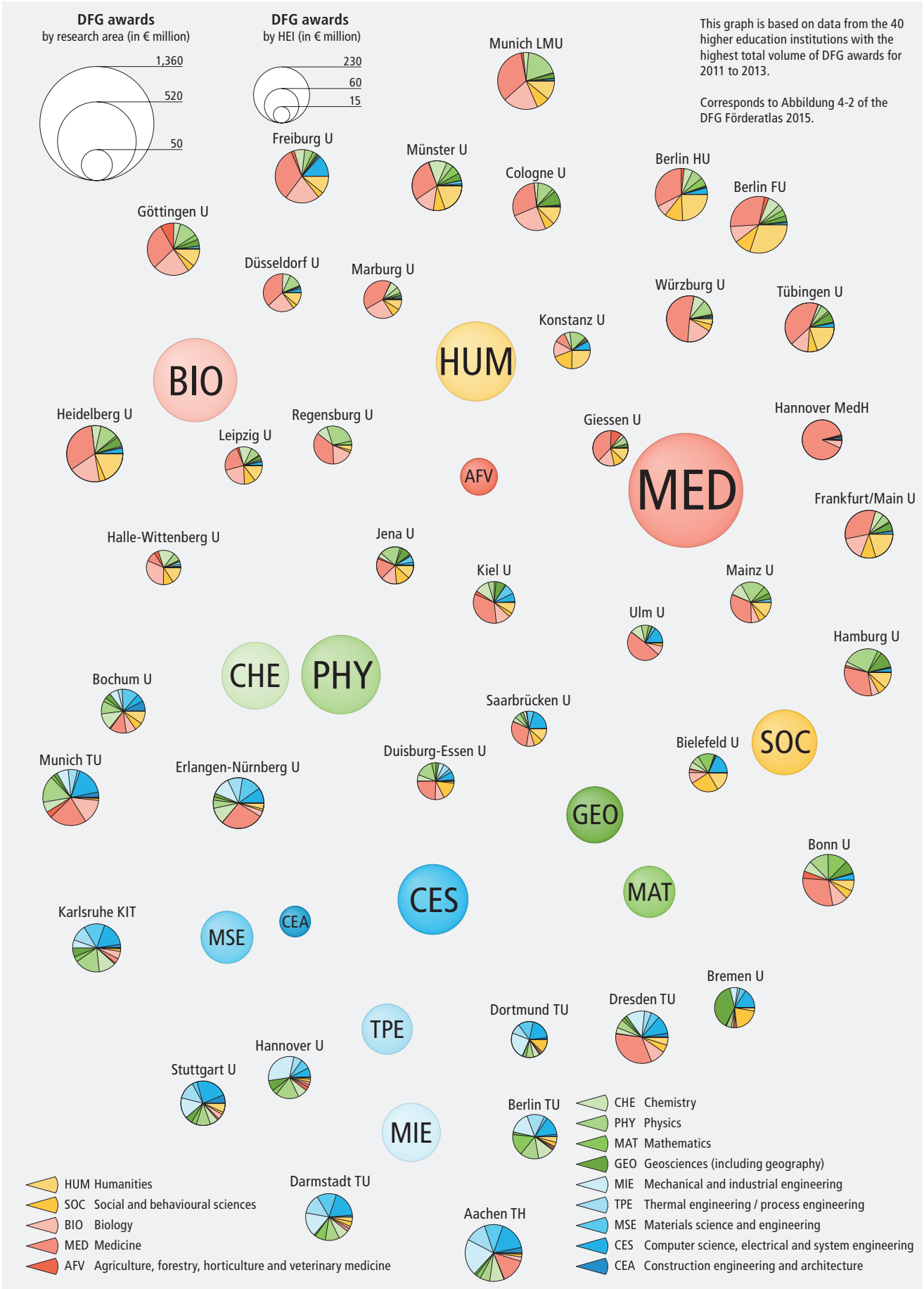
Scientific discipline	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Humanities and social sciences	1,129.5	14.7	434.6	4.7	28.8	1.0
Life sciences	2,574.3	33.5	1,631.8	17.7	428.8	14.5
Natural sciences	1,679.6	21.9	1,699.7	18.5	106.8	3.6
Engineering sciences	1,486.8	19.4	4,225.2	45.9	1,365.8	46.1
No subject classification	805.0	10.5	1,219.4	13.2	1,034.8	34.9
Overall	**7,675.2**	**100.0**	**9,210.7**	**100.0**	**2,965.0**	**100.0**

[1] Funding for German and institutional recipients only (including industry and business).
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €6,918.4 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 4-2 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

Figure 4-2:
Funding profiles of HEIs: subject map based on DFG awards for 2011 to 2013 (ranks 1–40)



research areas defined in the DFG's subject classification system. For comparison, places 41 to 80 are shown in Figure Web-7 at www.dfg.de/fundingatlas. This visualisation, generated with an algorithmic method, was developed at the Max Planck Institute for the Study of Societies in Cologne. By depicting the percentages of funding obtained by the different research areas, it allows the subject profiles of these HEIs to be compared and, with graphic assistance, the focal areas and similarities to be identified.

Research areas are represented by circles and HEIs in receipt of funding are represented in the form of pie charts. The size of the circle varies to reflect the volume of funding in a given research area. The amount of funding awarded across all subjects for a particular HEI is indicated by the size of the pie chart for that institution. The proximity of an HEI to a particular research area correlates with a research focus in this area. The closer together two HEIs are, the more similar they are in terms of their subject orientation and/or a specific subject emphasis. Two HEIs which are far away from each other in the diagram will usually be very different in their subject profiles[4].

Figure 4-2 compares the subject profiles of the 40 HEIs which attract the highest amount of DFG funding. The volume of DFG funding considered therein ranges from around €63 million **(U Halle-Wittenberg)** to €228 million **(LMU Munich).**

The algorithm used for this analysis arranges the 40 HEIs with the greatest amount of DFG funding according to subject emphasis. At the top are universities with a focus in university medicine and at the bottom are institutions with a stronger engineering orientation. In line with its emphasis on both fields, **TU Munich** is in the middle between the two poles, marked at the top by **LMU Munich** with a particularly large medical component and at the bottom by **TH Aachen,** with a particularly strong focus on the engineering sciences.

The universities on the right of the diagram have a comparatively high proportion of DFG projects in the social and behavioural sciences, for example **U Bielefeld,** while those in the top right (also) tend to give plenty of room to the humanities, such as **U Tübingen, HU Berlin** and **FU Berlin.** The latter are very close together due to the high proportion of DFG-funded projects in the humanities, but also generally have very similar profiles. This, as well as the geographical proximity of the two Berlin universities, explains why inter-institutional cooperation is so fruitful here in many fields of research (cf. in particular the cartographic network analyses of cooperative relationships in the individual scientific disciplines in Chapters 4.4 to 4.7).

The natural sciences subjects of physics and chemistry, shown in green, are in the middle. This is due to the fact that they form a key element of DFG-funded research at most of the universities considered here. Funding recipients which are strong in mathematics and geosciences are located on the right of the diagram and somewhat lower down. Thus, for example, **U Bremen** has a very strong emphasis on the geosciences while **U Bonn** and **U Bielefeld** place a similarly strong accent on mathematics.

Now that a distinction is made between five different engineering research areas instead of three, the subject emphasis of an HEI can be more clearly identified. While **U Hannover, TU Dortmund** and also **TH Aachen** focus on mechanical and industrial engineering, **TU Munich** has a strong DFG profile in computer science, electrical and system engineering. This research area is also strong at **U Saarbrücken,** which has less of a technical orientation overall.

If we again examine the complete portfolio taking the example of the technical universities, **TU Dortmund, TU Darmstadt** and **TH Aachen** deserve particular notice. At each of these institutions, research areas in the engineering sciences account for over 60% of DFG funding. **U Stuttgart** also belongs in this group with a similarly high proportion. At **TU Munich** and **U Erlangen-Nürnberg** the proportion of technical subjects is much lower, the overall profile being characterised by a large proportion of medical research projects. Finally, at **KIT Karlsruhe** and **U Hannover** a strong orientation towards engineering sciences research is combined with a comparatively high proportion of DFG projects in the natural sciences.

Special analyses in the German edition of this Funding Atlas demonstrate that HEIs vary enormously in terms of whether they concentrate on particular subject areas in their profile, and if so on which. Analyses of DFG funding activity in 48 different research fields over an 11-year period (2003 to 2013)

4 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Funding profile analyses".

also reveal a remarkable stability in the spectrum of subjects covered by German HEIs over time (cf. DFG 2015: 107ff.). The results of these analyses are available in English in Figures Web-8 and Web-9 at www.dfg.de/fundingatlas.

Such location-specific settings, which are generally also stable over time, each provide their own framework for interdisciplinary cooperation within universities. We will return to this topic in Chapter 5 when we examine the question of the interdisciplinarity of DFG-funded programmes with a focus on Graduate Schools and Clusters of Excellence in the Excellence Initiative.

Greater Focus on Application in HEIs' Funding Profiles With Federal and EU Funding

The funding profiles of HEIs which attract federal government and EU funding are illustrated using the same methods as for DFG funding in Chapter 4.3 and are represented in Figures Web-10 and Web-11 at www.dfg.de/fundingatlas and in table form in Tables Web-23 and Web-26. We have seen from Table 4-2 in Chapter 4.2 that both of these funding providers have a much stronger focus on application-oriented research, especially in the engineering sciences, than the DFG. Application-oriented research also includes medicine, which in the case of the EU mainly comes under the well-financed funding area of health and in the case of the federal government the equally large funding area of health research and health industry.

4.4 Funding Profiles in the Humanities and Social Sciences

The humanities and social sciences enjoy a strong position in German HEIs, which is reflected in the number of students: more than half of students in Germany are enrolled on courses in this spectrum of subjects (DESTATIS, 2014: 33). Of 44,000 professors and 225,000 research assistants based at HEIs, 47% of professors and 30% of assistants belong to these subject groups (cf. Table Web-4 at www.dfg.de/fundingatlas).

Although the humanities and social sciences appear to attract less third-party funding than other disciplines, both in absolute terms and in terms of per-capita amounts (cf. Chapter 4.2), third-party funding is gaining in importance in this area. During the reporting period of this Funding Atlas (2011 to 2013) the DFG awarded €1,130 million (cf. Table 4-3) for research in the humanities and social sciences, an increase of €156 million on the period 2008 to 2010 (DFG, 2013: 26). This represents an increase of 16%, far higher than the growth experienced by the other three DFG-defined scientific disciplines.

The DFG is the biggest provider of third-party funding for the humanities and social sciences compared with the EU and the federal government (cf. Table 4-3). Of the €1,130 million awarded between 2011 and 2013, over 90% was awarded to HEI-based researchers. Among the funding providers considered in the Funding Atlas, the federal government is also growing in importance as a source of funding for the humanities and social sciences.

German researchers in the humanities and social sciences benefit on only a small, although growing, scale from EU funding. The sum of €28 million, converted for a 3-year period, is almost 44% higher than the 3-year figure documented in the last DFG-Förderatlas (DFG, 2012: 112). Similarly to federal government funding, non-university research institutions, especially the Leibniz Association and Other research institutions, participate on a large scale in EU programmes.

Tables Web-8, Web-19, Web-23, Web-24, Web-26 and Web-28 at www.dfg.de/fundingatlas provide information about the amount of third-party funding awarded to HEIs and non-university research institutions by the DFG, the federal government and the EU, broken down by research area.

Structure-forming Effects of DFG Funding Instruments

One aim of the structure-forming funding instruments offered by the DFG and through the Excellence Initiative is to support cooperation between individual researchers, especially researchers from different institutions. The cartographic network diagrams in the Funding Atlas are designed to illustrate this cooperation on the basis of joint awards. Between 2011 and 2013, in the humanities and social sciences researchers from around 140 institutions held leadership roles in relevant

Table 4-3:
Participation[1] in DFG, federal government and EU funding programmes for research by type of institution in the humanities and social sciences

Type of institution	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Higher education institutions	**1,038.5**	**91.9**	**292.6**	**68.2**	**16.4**	**57.9**
Non-university research institutions	**91.0**	**8.1**	**136.3**	**31.8**	**11.9**	**42.1**
Fraunhofer-Gesellschaft (FhG)	0.2	0.0	2.1	0.5	0.4	1.5
Helmholtz Association (HGF)	0.3	0.0	1.1	0.3	1.5	5.4
Leibniz Association (WGL)	26.3	2.3	15.7	3.7	4.3	15.2
Max Planck Society (MPG)	8.6	0.8	5.7	1.3	0.6	2.3
Federal research institutions	14.6	1.3	10.3	2.4	0.8	2.8
Other research institutions	41.1	3.6	101.4	23.6	4.2	15.0
Institutions overall	**1,129.5**	**100.0**	**428.9**	**100.0**	**28.3**	**100.0**

[1] Funding for German and institutional recipients only (not including industry and business).
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €66.1 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 4-4 of the DFG Förderatlas 2015. Corrected online 01 December 2016.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

DFG funding instruments, including the Excellence Initiative. In the case of Collaborative Research Centres, for example, these would be project leaders, and in the case of Research Training Groups the lecturers who are members of the group's teaching staff. For the Excellence Initiative, Graduate Schools and Clusters of Excellence are included along with the principal investigators named in the proposal and their respective institutions.

The network within the humanities and social sciences arising from these joint participations is shown in Figure 4-3. The diameter of the circles reflects the number of joint participations in the funding instruments, while the connecting lines indicate two or more joint participations between specific institutions[5].

The diagram shows which HEIs have secured funding for an especially large number of projects in the humanities and social sciences through the DFG's Coordinated Programmes and the Excellence Initiative. In addition to **FU Berlin** and **HU Berlin,** these include for example **LMU Munich, U Tübingen, U Göttingen** and **U Münster.** The first two universities in this list, but also **TU Berlin, U Potsdam** and **U Frankfurt/Oder,** as well as **Charité Berlin,** which is shown separately here and in the network analyses that follow, form a cooperation cluster in the Berlin region which is exceptionally dense for this discipline. In addition to the HEIs named, a large number of non-university research institutions participates in DFG-funded groups; particularly visible are the **Max Planck Institute for Human Development** and the **Berlin Social Science Center (WZB).**

Research Institutions in the Humanities and Social Sciences With a High Level of DFG Funding

Between 2011 and 2013, many HEIs secured more DFG funding than in the previous reporting period. At the same time, there was a broader distribution of resources: the number of HEIs which obtained DFG awards in the humanities and social sciences rose from 142 to 150. The ranking of universities calculated on the basis of the DFG award volume has

5 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Cartographic network analyses".

Figure 4-3:
Joint participations by research institutions in DFG-funded joint programmes and resulting collaborative relationships 2011 to 2013 in the humanities and social sciences

Abbreviations

BBAW	Berlin-Brandenburg Academy of Sciences and Humanities
DAI	German Archaeological Institute
DIW	German Institute for Economic Research
GWZ	Humanities Research Centres Berlin
ITB	Institute for Theoretical Biology
IZA	Institute for the Study of Labor
MPI WG	Max Planck Institute for the History of Science
SWP	German Institute for International and Security Affairs

Table 4-4:
The higher education institutions with the highest DFG awards for 2011 to 2013 in absolute figures and relative to staff size in the humanities and social sciences

DFG awards (absolute)		DFG awards[1] relative to staff size					
Higher education institution	Total	Higher education institution	Professorial staff		Higher education institution	Researchers	
	€m		No.	€ thousand per prof.		No.	€ thousand per res.
Berlin FU	89.3	Berlin FU	305	293.3	Berlin FU	1,374	65.0
Berlin HU	65.1	Konstanz U	118	276.3	Konstanz U	546	59.5
Heidelberg U	49.4	Heidelberg U	190	260.3	Heidelberg U	997	49.5
Frankfurt/Main U	44.8	Stuttgart U	41	249.4	Berlin HU	1,400	46.5
Münster U	44.4	Berlin HU	294	221.3	Tübingen U	930	44.0
Munich LMU	41.9	Bielefeld U	152	219.2	Bielefeld U	762	43.8
Tübingen U	40.9	Berlin TU	45	195.3	Berlin TU	220	40.1
Bielefeld U	33.3	Tübingen U	210	194.9	Frankfurt/Main U	1,381	32.4
Konstanz U	32.5	Freiburg U	144	191.8	Freiburg U	872	31.7
Göttingen U	28.0	Bremen U	118	183.6	Bremen U	685	31.7
Freiburg U	27.6	Mannheim U	149	161.2	Göttingen U	974	28.8
Cologne U	27.3	Münster U	276	160.6	Münster U	1,552	28.6
Mannheim U	24.0	Frankfurt/Main U	301	148.8	Bonn U	780	27.9
Hamburg U	23.8	Darmstadt TU	64	142.1	Darmstadt TU	335	27.1
Bonn U	21.8	Göttingen U	204	137.3	Stuttgart U	393	26.1
Bremen U	21.7	Potsdam U	139	135.1	Saarbrücken U	539	24.8
Leipzig U	18.9	Munich LMU	325	129.0	Munich LMU	1,727	24.3
Potsdam U	18.8	Dresden TU	138	128.5	Jena U	781	23.2
Jena U	18.1	Saarbrücken U	111	120.2	Potsdam U	827	22.7
Bochum U	18.0	Bonn U	182	119.3	Mannheim U	1,064	22.6
Ranked 1–20	**689.7**	**Ranked 1–20**	**3,506**	**196.7**	**Ranked 1–20**	**18,140**	**38.0**
Other HEIs[2]	**348.8**	**Other HEIs[2]**	**17,025**	**20.5**	**Other HEIs[2]**	**48,025**	**7.3**
HEIs overall	**1,038.5**	**HEIs overall**	**20,531**	**50.6**	**HEIs overall**	**66,165**	**15.7**
Universities incl.	**1,026.7**	**Universities incl.**	**10,217**	**100.5**	**Universities incl.**	**48,825**	**21.0**
Based on: No. of HEIs	**150**	**Based on: No. of HEIs**	**396**	**150**	**Based on: No. of HEIs**	**411**	**150**

[1] Only HEIs which employed more than 20 professors and/or 100 or more researchers in the scientific discipline under consideration during 2012 were included within the scope of this calculation.
[2] Please see Table Web-7 and Web-8 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Abridged excerpt of corresponding Tabelle 4-5 of the DFG Förderatlas 2015.

Data basis and sources:
Deutsche Forschungsgemeinschaft (DFG): DFG awards for 2011 to 2013.
Federal Statistical Office of Germany (DESTATIS): Education and Culture. Personnel at Higher Education Institutions. 2012. Special analysis of Subject-Matter Series 11. Series 4.4. Calculations by the DFG.

changed little compared with the previous period, both in absolute terms and relative to staff size. As in the overall consideration (cf. Chapter 3.5), **U Heidelberg** has climbed to third place to rank directly below the Berlin universities (cf. Table 4-4).

As was clearly illustrated on the basis of shared interaction in DFG-funded programmes, HEIs in Berlin are particularly successful at obtaining DFG funding in the humanities and social sciences. Between 2011 and 2013, **FU Berlin** and **HU Berlin** obtained over €89 million and €65 million respectively from the DFG.

Relative to staff size, **TU Berlin** also has a strong profile. The numerically small professorial staff in the humanities and social sciences at **U Stuttgart** attracts high award amounts relative to staff size, and as in the last Funding Atlas, **U Konstanz** also has high per-capita awards due to its exceptional success in the Excellence Initiative.

Detailed analyses for individual research areas and research fields in the humanities and the social and behavioural sciences are available in table form at www.dfg.de/funding atlas (Tables Web-50 and Web-51). Similarly to the DFG funding profiles of HEIs shown in Chapter 4.3, broken down into 14 research areas, Figure Web-12 at www.dfg.de/funding atlas provides an insight into profiles within the humanities and social sciences. The figures on which the diagram is based, as well as overviews for HEIs in receipt of DFG funding and non-university research institutions in the humanities and social sciences which are not shown here, can also be found online (Tables Web-8 and Web-19).

Top-level Researchers in Cities and Traditional University Towns

Almost a third of visiting researchers whose visits to German research institutes were funded by the Alexander von Humboldt Foundation – namely around 1,800 out of 6,000 – work in the humanities and social sciences. Naturally, large universities can attract a large number of visiting researchers. For international top-level researchers, universities in cities and traditional university towns are particularly attractive (cf. Table Web-29 at www.dfg.de/fundingatlas). **FU Berlin** and **HU Berlin,** which both have a large staff and attract a high level of DFG funding, recorded the most visits by visiting researchers (186 in each case). Recipients of DAAD awards are also particularly attracted to Berlin. Both **U Heidelberg** and **U Freiburg** are internationally famous university towns which are also popular with visiting researchers.

The 64 ERC-funded researchers in the humanities and social sciences are distributed over 23 different HEIs. There is a particular concentration at **U Hamburg.** A total of nine ERC projects in these fields are being carried out at this North German university, including three at the **Asien-Afrika-Institut** (Institute of Asian and African Studies). After Hamburg, **LMU Munich** and **U Konstanz** have an unusually large number of ERC grants in the humanities and social sciences, namely six each.

Data on the number of DAAD, AvH and ERC award recipients at these and other HEIs as well as non-university research institutions can be found in Tables Web-27, Web-29, Web-30 and Web-31 at www.dfg.de/fundingatlas.

4.5 Funding Profiles in the Life Sciences

At close to €2.6 billion, the life sciences account for nearly a third of all DFG awards between 2011 and 2013, making this a focus of DFG funding in monetary terms, particularly the research areas of medicine and biology. The data provided by the Federal Statistical Office (DESTATIS) presented in Chapter 4.2 showed that this scientific discipline makes a significant contribution to the third-party funding revenues of HEIs, and not just that from the DFG. In 2012, the proportion was around 37%. This discipline is also strongly represented in terms of HEI staff numbers. 34% of academic staff work in the life sciences, with medicine alone accounting for 27% (cf. Table Web-4 at www.dfg.de/fundingatlas).

As in all disciplines, in the life sciences the majority of DFG funding is awarded to HEI-based researchers. However, non-university research is comparatively strong in the life sciences with 14% of awarded funding (cf. Table 4-5). Compared with the period examined in the previous Funding Atlas, 2008 to 2010, the award volume in the life sciences increased by almost €300 million (13%).

In the life sciences, direct project funding from the federal government comprises the funding areas of bioeconomy; health research and health industry; and nutrition, agriculture and consumer protection. Here too growth has been evident, in this case by almost 18%.

By contrast, the budget for life sciences research projects awarded to researchers in the relevant EU programmes is comparatively stable (€326 million compared with €305 million) (DFG, 2012: 123).

The significant role played by non-university research institutions in the acquisition of DFG funding in the life sciences is largely due to the institutes of the MPG, the HGF and the WGL. These include, for example, the **German Cancer Research Centre (DKFZ)** in Heidelberg, the **Max Delbrück Center for Molecular Medicine (MDC)** in Berlin, the **Max Planck Institute of Biochemistry (MPIB)** in Munich, the **Max Planck Institute for Biophysical Chemistry (MPIB-PC)** in Göttingen and the **Leibniz-Institut für Molekulare Pharmakologie** (Leibniz Institute for Molecular Pharmacology) in Berlin.

Table 4-5:
Participation[1] in DFG, federal government and EU funding programmes for research by type of institution in the life sciences

Type of institution	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Higher education institutions	**2,211.3**	**85.9**	**991.9**	**69.8**	**199.2**	**61.2**
Non-university research institutions	**363.0**	**14.1**	**428.9**	**30.2**	**126.4**	**38.8**
Fraunhofer-Gesellschaft (FhG)	2.0	0.1	76.7	5.4	10.0	3.1
Helmholtz Association (HGF)	95.7	3.7	91.8	6.5	26.2	8.1
Leibniz Association (WGL)	80.3	3.1	57.6	4.1	11.9	3.7
Max Planck Society (MPG)	117.5	4.6	52.0	3.7	22.3	6.9
Federal research institutions	17.1	0.7	49.3	3.5	10.8	3.3
Other research institutions	50.3	2.0	101.4	7.1	45.0	13.8
Institutions overall	**2,574.3**	**100.0**	**1,420.8**	**100.0**	**325.6**	**100.0**

[1] Funding for German and institutional recipients only (not including industry and business).
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €759.8 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 4-9 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

In the life sciences, non-university research institutions mainly obtain funding through direct project funding from the federal government, and account for 30% of total funding awards from this source. The institutes of the FhG are particularly active in this regard. The **Fraunhofer Institute for Toxicology and Experimental Medicine (ITEM)** in Hannover, for example, secured almost €15 million in direct project funding from the federal government.

Among the institutes of the HGF, the **German Cancer Research Centre (DKFZ)** in Heidelberg is once again very strongly represented with over €30 million. At the WGL, the **Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)** in Gatersleben plays a prominent role in the life sciences.

An overview of the HEIs and non-university research institutions which obtain DFG, federal government and EU funding in the life sciences can be found in Tables Web-9, Web-19, Web-23, Web-24, Web-26 and Web-28 at www.dfg.de/fundingatlas.

Structure-forming Effects of DFG Funding Instruments

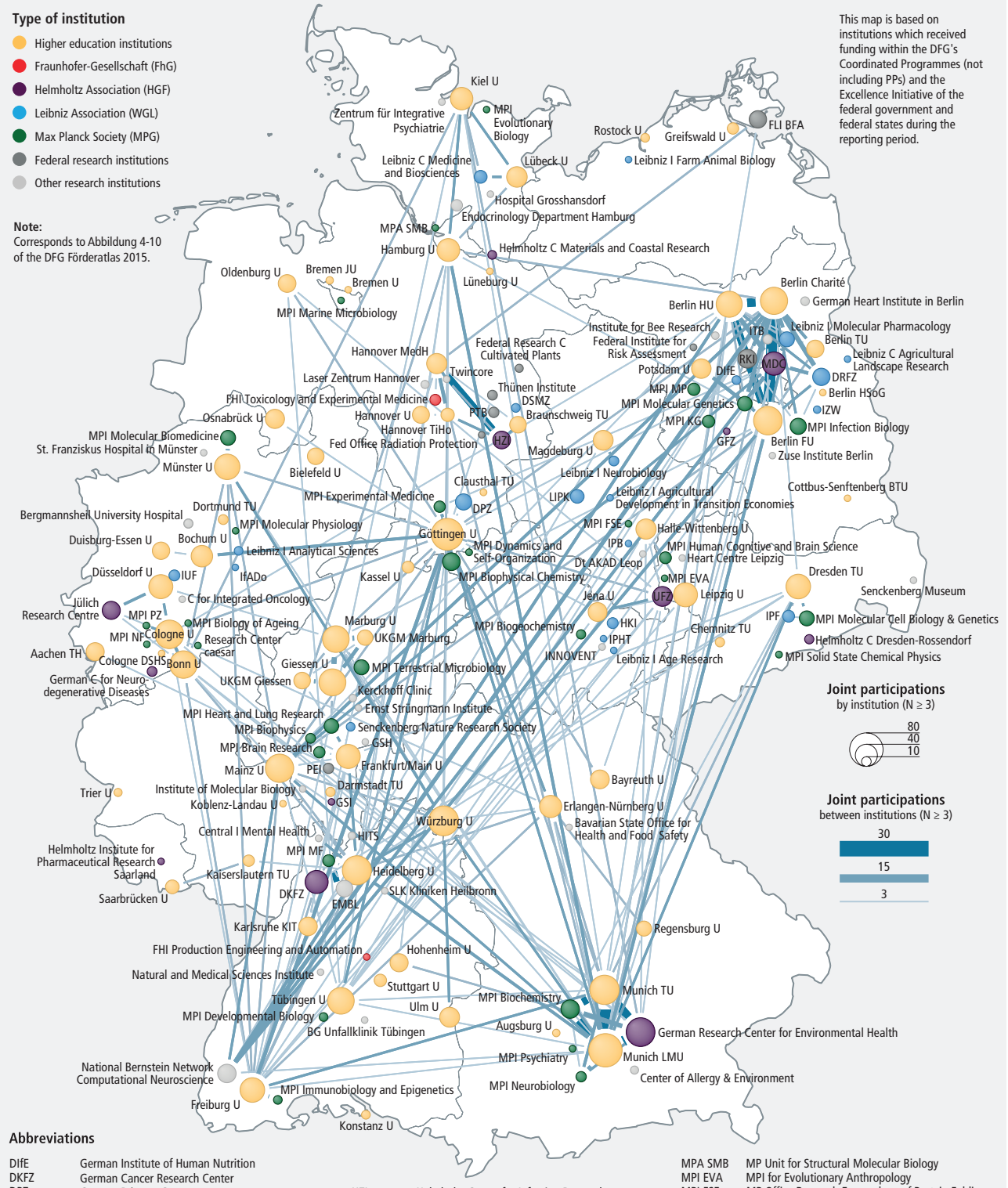
Following the method explained in Chapter 4.4 taking the example of the humanities and social sciences, the networking effects created for HEIs and non-university research institutions by the participation of researchers in DFG-funded groups are also illustrated for the life sciences (cf. Figure 4-4). In the network diagrams, unlike the practice adopted elsewhere in the Funding Atlas, the three university hospitals of **Charité Berlin, Giessen-Marburg** and **Schleswig-Holstein** are shown separately to illustrate their significance in regional and national networking[6].

In total, researchers from 190 institutions, including 123 non-university institutes, are involved in leadership roles in projects carried out by the groups under consideration here.

The analysis reveals an extremely dense network of relationships between institutions

6 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Cartographic network analyses".

Figure 4-4:
Joint participations by research institutions in DFG-funded joint programmes and resulting collaborative relationships 2011 to 2013 in the life sciences



Abbreviations

DIfE	German Institute of Human Nutrition
DKFZ	German Cancer Research Center
DPZ	German Primate Center
DRFZ	German Rheumatism Research Centre
DSMZ	German Collection Microorganisms and Cell Cultures
Dt AKAD Leop	German National Academy of Sciences Leopoldina
EMBL	European Molecular Biology Laboratory
FLI BFA	Federal Research Institute for Animal Health
GFZ	German Research Centre for Geosciences
GSH	Institute for Tumor Biology and Experimental Therapy
GSI	Helmholtz Centre for Heavy Ion Research
HITS	Heidelberg Institute for Theoretical Studies
HKI	Leibniz I Natural Product Research & Infection Biology
HZI	Helmholtz Centre for Infection Research
IfADo	Leibniz R C Working Environment and Human Factors
INNOVENT	INNOVENT Technology Development Jena
IPB	Leibniz Institute of Plant Biochemistry
IPF	Leibniz Institute of Polymer Research
IPHT	Leibniz Institute of Photonic Technology
ITB	Institute for Theoretical Biology
IUF	Leibniz Research I for Environmental Medicine
IZW	Leibniz Institute for Zoo and Wildlife Research
LIPK	Leibniz I Plant Genetics and Crop Plant Research
MDC	Max Delbrück Center for Molecular Medicine
MPA SMB	MP Unit for Structural Molecular Biology
MPI EVA	MPI for Evolutionary Anthropology
MPI FSE	MP Office Research Enzymology of Protein Folding
MPI KG	MPI of Colloids and Interfaces
MPI MF	MPI for Medical Research
MPI MP	MPI of Molecular Plant Physiology
MPI NF	MPI for Metabolism Research
MPI PZ	MPI for Plant Breeding Research
PEI	Paul-Ehrlich-Institut
PTB	National Metrology Institute of Germany
RKI	Robert Koch Institute
UFZ	Helmholtz Centre for Environmental Research
UKGM	University Hospital Giessen and Marburg

active at regional and national level. Several regions form a very dense cluster of university and non-university institutions which conduct research jointly in DFG-funded groups. Mention should be made of the Munich region, which includes institutions such as **LMU Munich, TU Munich,** the **Helmholtz Zentrum München – German Research Center for Environmental Health (HMGU)** and the **Max Planck Institute for Biochemistry (MPIB).** As underlined in the DFG-Förderatlas 2012 (DFG, 2012: 125), the Berlin region with **Charité Berlin, FU Berlin, HU Berlin** and the **Max Delbrück Center for Molecular Medicine (MDC)** continues to maintain a strongly interacting DFG-funded network that brings together these and other institutions. The Giessen and Lower Neckar (Heidelberg / Mannheim) regions, including the **German Cancer Research Centre (DKFZ),** the **European Molecular Biology Laboratory (EMBL)** and **U Heidelberg** form a close regional network through DFG-funded groups and also integrate many Max Planck Institutes. Finally, researchers at **U Göttingen** (again in close regional collaboration with Max Planck Institutes), **U Würzburg** and **U Bonn** have a particularly strong nationwide integration in DFG-funded networks.

LMU Munich Obtains the Most Funding in the Life Sciences

Table 4-6 shows the absolute figures and the figures relative to staff size for the 20 HEIs with the highest amount of DFG funding between 2011 and 2013. The table of absolute DFG funding is led by **LMU Munich,** followed by **U Heidelberg, U Göttingen** and **U Freiburg,** which differ only slightly in the funding volume obtained. **U Göttingen,** in particular, has improved its position compared with the Funding Atlas 2012 (DFG, 2013: 61).

In terms of the figures relative to staff size, some changes were caused by a methodological modification compared with the Funding Atlas 2012, which is mainly visible in the now leading position of **U Konstanz.** Three years ago only HEIs with 30 or more professors or 250 or more researchers were included in the figures adjusted for staff size, but in the present Funding Atlas this limit was lowered to 20 and 100 respectively[7]. At **U Konstanz** an award volume of €17.7 million is allotted to 25 professors in this scientific discipline. Although this is less than 15% of the amount recorded for **LMU Munich,** for instance, in per-capita terms it results in a value of over €700,000 per professorship in three years. **U Bayreuth** (23 professorships), **TU Braunschweig** (25 professorships) and **U Osnabrück** (28 professorships) also achieve a high position in the ranking order when the figures are adjusted for staff size.

Detailed analyses for individual research areas and research fields in the life sciences are available in table form at www.dfg.de/fundingatlas (Tables Web-53, Web-54 and Web-55). Similarly to the DFG funding profiles of HEIs shown in Chapter 4.3, broken down into 14 research areas, Figure Web-13 at www.dfg.de/fundingatlas provides an insight into funding profiles within the seven research fields of the life sciences. The figures on which the diagram is based, as well as overviews for HEIs and non-university research institutions in receipt of DFG funding in the life sciences which are not shown, can also be found online (Tables Web-9 and Web-19).

Special Evaluation for University Medical Institutions

In the DFG-Förderatlas 2012, a separate chapter was devoted to awards for university medical institutions (DFG, 2012: 165ff.). In cooperation with the German Medical Faculty Association[8], DFG awards were shown in relation to figures on scientific staff at these institutions. Updated analyses can be found in this Funding Atlas in Tables Web-20 and Web-21 at www.dfg.de/fundingatlas.

ERC Grantees in Germany Often Work in the Life Sciences

Between 2009 and 2013, a total of 59 HEIs welcomed AvH-funded visiting researchers in the life sciences and 58 HEIs played host to DAAD funding recipients (cf. Table Web-56 at

7 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "University staff".

8 Cf. www.mft-online.de and www.landkarte-hochschulmedizin.de.

Table 4-6:
The higher education institutions with the highest DFG awards for 2011 to 2013 in absolute figures and relative to staff size in the life sciences

DFG awards (absolute)		DFG awards[1] relative to staff size					
Higher education institution	Total	Higher education institution	Professorial staff		Higher education institution	Researchers	
	€m		No.	€ thousand per prof.		No.	€ thousand per res.
Munich LMU	125.1	Konstanz U	25	702.5	Konstanz U	235	75.0
Heidelberg U	112.9	Freiburg U	156	694.6	Karlsruhe KIT	209	65.5
Göttingen U	110.2	Dresden TU	124	638.1	Oldenburg U	244	62.1
Freiburg U	108.6	Cologne U	126	626.2	Bayreuth U	200	61.9
Berlin FU	93.1	Tübingen U	144	595.6	Osnabrück U	209	59.3
Würzburg U	92.3	Hannover MedH	152	577.2	Kaiserslautern TU	142	57.6
Hannover MedH	87.7	Munich TU	155	558.2	Braunschweig TU	223	49.7
Munich TU	86.5	Heidelberg U	205	551.3	Stuttgart U	132	46.1
Tübingen U	85.6	Würzburg U	170	543.1	Göttingen U	2,478	44.5
Dresden TU	79.1	Göttingen U	203	542.8	Würzburg U	2,096	44.0
Cologne U	78.8	Bayreuth U	23	534.9	Bochum U	550	43.5
Bonn U	76.0	Munich LMU	256	488.8	Dresden TU	1,940	40.8
Berlin HU	75.1	Frankfurt/Main U	147	484.0	Hannover MedH	2,191	40.0
Frankfurt/Main U	71.2	Berlin FU	195	477.1	Darmstadt TU	139	38.4
Münster U	68.5	Oldenburg U	32	471.6	Hannover U	198	36.8
Marburg U	53.3	Braunschweig TU	25	441.0	Frankfurt/Main U	1,946	36.6
Erlangen-Nürnberg U	52.9	Osnabrück U	28	440.7	Freiburg U	2,992	36.3
Hamburg U	52.6	Münster U	157	437.1	Cologne U	2,221	35.5
Düsseldorf U	48.7	Marburg U	125	428.3	Munich TU	2,447	35.4
Kiel U	48.5	Ulm U	94	411.5	Berlin FU	2,636	35.3
Ranked 1–20	**1,606.7**	**Ranked 1–20**	**2,542**	**632.1**	**Ranked 1–20**	**23,428**	**68.6**
Other HEIs[2]	**604.6**	**Other HEIs[2]**	**4,062**	**148.8**	**Other HEIs[2]**	**53,378**	**11.3**
HEIs overall	**2,211.3**	**HEIs overall**	**6,604**	**334.8**	**HEIs overall**	**76,806**	**28.8**
Universities incl.	**2,209.5**	**Universities incl.**	**5,547**	**398.3**	**Universities incl.**	**74,747**	**29.6**
Based on: No. of HEIs	**83**	**Based on: No. of HEIs**	**174**	**83**	**Based on: No. of HEIs**	**184**	**83**

[1] Only HEIs which employed more than 20 professors and/or 100 or more researchers in the scientific discipline under consideration during 2012 were included within the scope of this calculation.
[2] Please see Table Web-7 and Web-9 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Abridged excerpt of corresponding Tabelle 4-10 of the DFG Förderatlas 2015. Corrected online 01 December 2016.

Data basis and sources:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Federal Statistical Office (DESTATIS): Education and Culture. Personnel at Higher Education Institutions, 2012. Special analysis of Subject-Matter Series 11, Series 4.4.
Calculations by the DFG.

www.dfg.de/fundingatlas). For both funding providers, **U Göttingen** has the highest number of visits. Also notable is the high degree of attractiveness of **U Giessen** and **U Hohenheim** for DAAD-funded visits.

In a comparison of all disciplines, the life sciences at German HEIs obtain a particularly high number of ERC grants with 132 recipients. As well as leading the field in the life sciences in terms of absolute DFG funding volume, as revealed by the previous table, **LMU Munich** is also a preferred destination for ERC-funded researchers.

Detailed information on the number of AvH, DAAD and ERC funding recipients per HEI and non-university research institution can be found in Tables Web-27, Web-29, Web-30 and Web-31 at www.dfg.de/fundingatlas.

4.6 Funding Profiles in the Natural Sciences

With over €1,400 million in funding over a 3-year period, the DFG is the biggest provider of third-party funding for the natural sciences at German HEIs. Research in the natural sciences plays an essential role at the majority of HEIs (cf. Figure 4-2 and Figure Web-7 at www.dfg.de/fundingatlas). There are numerous collaborative relationships both within the spectrum of natural sciences subjects and with the engineering and life sciences. In Chapter 5, which is devoted to the question of the interdisciplinary orientation of Graduate Schools and Clusters of Excellence, the specific role played by natural sciences subjects is examined in more detail.

Compared with the previous Funding Atlas, the total funding made available by the DFG in the natural sciences has risen by almost 7% (DFG, 2013: 26). Not only the DFG but also the federal government has expanded its project funding in the natural sciences. With a total of nearly €1,430 million, it now provides a level of funding in this scientific discipline similar to the DFG. By contrast, EU funding converted for a comparable 3-year period is much lower at €90 million (cf. Table 4-7).

The two biggest funding providers in the natural sciences, the DFG and the federal government, serve somewhat different recipient groups: while the DFG mainly supports HEI-based research, with over 85% of awards, the federal government awards 54% of its funding to non-university research institutions.

Among non-university research institutions, the institutes of the Max Planck Society receive the most DFG funding, a total of €85 million, including for example the **Fritz Haber Institute of the Max Planck Society** in Berlin. The institutes of the Helmholtz Association attract only a little less, namely €79 million. One example is the **Helmholtz Centre for Ocean Research (GEOMAR)**[9] in Kiel.

With regard to non-university institutions, the institutes of the Helmholtz Association participate very actively in direct R&D funding from the federal government, attracting almost €350 million. The most prominent of these are large research institutions such as

9 In the previous Funding Atlas, the Helmholtz Centre for Ocean Research (GEOMAR) was still counted as part of the Leibniz Association. In this report it is included in the Helmholtz Association for the full period of 2011 to 2013.

Table 4-7:
Participation[1] in DFG, federal government and EU funding programmes for research by type of institution in the natural sciences

Type of institution	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Higher education institutions	**1,430.0**	**85.1**	**656.3**	**46.0**	**27.3**	**30.2**
Non-university research institutions	**249.7**	**14.9**	**770.6**	**54.0**	**62.9**	**69.8**
Fraunhofer-Gesellschaft (FhG)	2.9	0.2	65.2	4.6	7.1	7.8
Helmholtz Association (HGF)	79.4	4.7	348.7	24.4	23.5	26.0
Leibniz Association (WGL)	50.4	3.0	79.4	5.6	8.7	9.7
Max Planck Society (MPG)	85.0	5.1	98.2	6.9	6.0	6.7
Federal research institutions	10.9	0.7	13.7	1.0	1.9	2.1
Other research institutions	21.0	1.3	165.5	11.6	15.7	17.4
Institutions overall	**1,679.6**	**100.0**	**1,426.9**	**100.0**	**90.2**	**100.0**

[1] Funding for German and institutional recipients only (not including industry and business).
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €210.5 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 4-15 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

the **Deutsches Elektronen-Synchrotron (DESY)** in Hamburg and the **Helmholtzzentrum für Schwerionenforschung** (Helmholtz Centre for Heavy Ion Research**)** in Darmstadt.

Several institutes of the Max Planck Society also participate in direct federal project funding, for example the **Max Planck Institute for Extraterrestrial Physics** in Garching. In total, the MPG secured almost €100 million in funding in the natural sciences. Other specialised non-university research institutions received a total of €166 million in the natural sciences – chief among them is the **Facility for Antiproton and Ion Research in Europe (FAIR)** in Darmstadt with a funding volume of €49 million.

Overviews of the HEIs and non-university institutions in receipt of DFG, federal government and EU funding in the natural sciences can be found in Tables Web-10, Web-19, Web-23, Web-24, Web-26 and Web-28 at www.dfg.de/fundingatlas.

Structure-forming Effects of DFG Funding Instruments

Figure 4-5 shows the relationships between institutions based on joint participations in DFG-funded groups. Networking is especially pronounced in the natural sciences. The network is made up of 170 institutions, including 100 in the non-university sector. The diagram shows institutions which were jointly involved in groups with at least three collaborating partner institutions. Cross-institutional collaborations, represented by connecting lines, are shown where at least three joint participations between individual institutions are documented.

As well as HEIs, the institutes of the Max Planck Society are especially well integrated in the network. This applies particularly in the Munich and Göttingen areas, but also in several other regions. An especially dense cluster of DFG-funded research has developed in Berlin, where researchers at the three major **Berlin universities** and **U Potsdam** collaborate very actively with researchers at **Leibniz Institutes**. The **GFZ German Research Centre for Geosciences of the Helmholtz Association** in Potsdam, a non-university institution, is also very actively involved here.

The HGF also plays an important role in a regional network centred on **U Leipzig** through the **Helmholtz Centre for Environmental Research (UFZ)** as well as the **Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI)** in Bremerhaven, which has more than 10 participations in DFG-funded groups. Finally, researchers at **Forschungszentrum Jülich** participate in a particularly wide range of DFG-funded groups in the natural sciences: they are involved in more than 20 of them. Among HEIs, the Berlin universities **FU Berlin** and **HU Berlin,** the Munich universities **LMU Munich** and **TU Munich, U Bonn, U Heidelberg** and **U Hamburg** have the largest number of participations.

U Bonn Obtains the Most Funding in the Natural Sciences

During the reporting period, researchers at 97 HEIs participated in DFG funding in the natural sciences – six more than between 2008 and 2010, the reporting period of the Funding Atlas 2012. As in the last Funding Atlas, the largest share of DFG awards in the natural sciences went to **U Bonn** (cf. Table 4-8). Mathematics research makes an important contribution in this regard. The Hausdorff Center for Mathematics, funded through the Excellence Initiative, gives Bonn international visibility and enables it to attract many visiting researchers[10]. The next institutions in the ranking are **U Hamburg, LMU Munich** and **KIT Karlsruhe. U Hamburg** and **KIT Karlsruhe,** as well as **TH Aachen** and **TU Darmstadt**, significantly increased the amount of DFG funding obtained compared with the previous edition of the Funding Atlas (DFG, 2013: 64).

Relative to research staff size, professors at **KIT Karlsruhe** obtain the highest per-capita funding volumes and **TU Berlin** is also somewhat better positioned in this view. With a comparatively small staff, **U Regensburg** is able to obtain high per-capita volumes from the DFG, in this case even without participation in a Graduate School or Cluster of Excellence. Nevertheless, the Excellence Initiative plays an important role in

10 This applies not only to visits funded by the AvH (cf. Table Web-29), but also, as the data from the DFG's internal monitoring shows, to visits funded through the Excellence Initiative: the Hausdorff Center leads the field by some distance in terms of the number of visits by researchers from all over the world.

Figure 4-5:
Joint participations by research institutions in DFG-funded joint programmes and resulting collaborative relationships 2011 to 2013 in the natural sciences

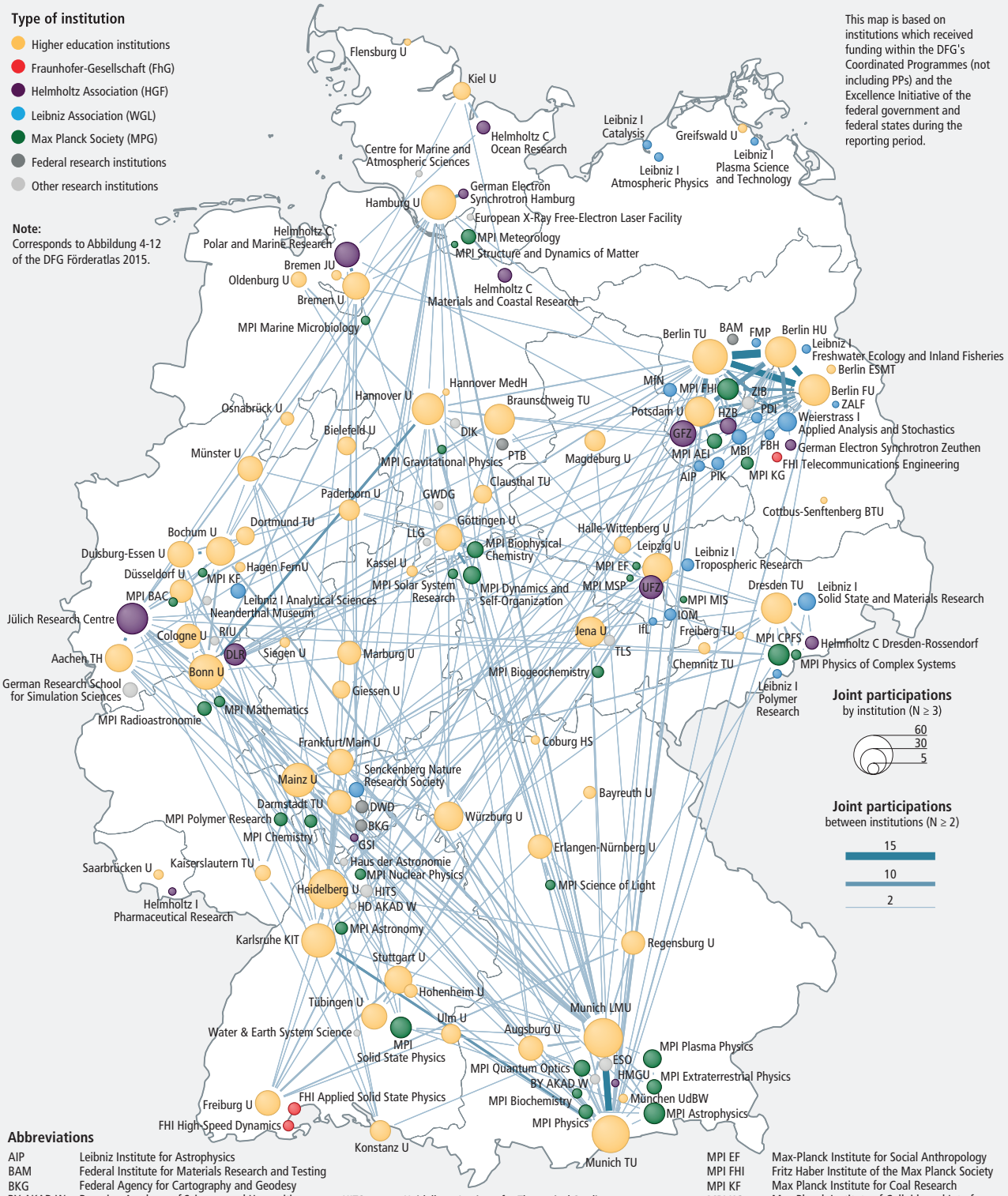


Table 4-8:
The higher education institutions with the highest DFG awards for 2011 to 2013 in absolute figures and relative to staff size in the natural sciences

DFG awards (absolute)		DFG awards[1] relative to staff size					
Higher education institution	Total	Higher education institution	Professorial staff		Higher education institution	Researchers	
	€m		No.	€ thousand per prof.		No.	€ thousand per res.
Bonn U	69.7	Karlsruhe KIT	91	623.0	Berlin TU	718	72.4
Hamburg U	57.5	Berlin TU	87	595.2	Bonn U	1,038	67.1
Munich LMU	57.1	Regensburg U	54	589.4	Regensburg U	483	66.1
Karlsruhe KIT	56.8	Heidelberg U	85	577.9	Bielefeld U	346	65.3
Munich TU	55.9	Bonn U	126	551.2	Bremen U	652	64.8
Berlin TU	51.9	Bremen U	79	535.5	Heidelberg U	776	63.6
Heidelberg U	49.3	Stuttgart U	58	527.7	Karlsruhe KIT	918	61.9
Münster U	43.4	Munich TU	118	474.9	Darmstadt TU	610	58.1
Bremen U	42.2	Konstanz U	35	473.9	Freiburg U	504	57.5
Göttingen U	41.8	Munich LMU	123	464.5	Göttingen U	739	56.6
Aachen TH	40.4	Göttingen U	94	445.7	Berlin HU	607	55.2
Berlin FU	39.3	Freiburg U	66	439.5	Hannover U	716	54.8
Hannover U	39.3	Bielefeld U	54	417.8	Cologne U	685	53.8
Mainz U	39.1	Cologne U	89	413.1	Hamburg U	1,073	53.6
Cologne U	36.9	Hannover U	97	404.7	Berlin FU	751	52.4
Darmstadt TU	35.5	Hamburg U	146	394.6	Munich LMU	1,114	51.3
Erlangen-Nürnberg U	34.3	Darmstadt TU	90	394.0	Mainz U	789	49.6
Bochum U	33.7	Mainz U	99	393.6	Düsseldorf U	309	49.4
Berlin HU	33.5	Berlin FU	105	373.9	Bayreuth U	495	49.0
Regensburg U	31.9	Aachen TH	109	371.1	Kiel U	527	48.6
Ranked 1–20	**889.5**	**Ranked 1–20**	**1,805**	**492.8**	**Ranked 1–20**	**13,850**	**64.2**
Other HEIs[2]	**540.5**	**Other HEIs[2]**	**3,155**	**171.3**	**Other HEIs[2]**	**19,170**	**28.2**
HEIs overall	**1,430.0**	**HEIs overall**	**4,960**	**288.3**	**HEIs overall**	**33,020**	**43.3**
Universities incl.	**1,427.2**	**Universities incl.**	**4,256**	**335.4**	**Universities incl.**	**31,765**	**44.9**
Based on: No. of HEIs	**97**	**Based on: No. of HEIs**	**140**	**97**	**Based on: No. of HEIs**	**146**	**97**

[1] Only HEIs which employed more than 20 professors and/or 100 or more researchers in the scientific discipline under consideration during 2012 were included within the scope of this calculation.
[2] Please see Tables Web-7 and Web-10 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Abridged excerpt of corresponding Tabelle 4-16 of the DFG Förderatlas 2015.

Data basis and sources:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Federal Statistical Office (DESTATIS): Education and Culture. Personnel at Higher Education Institutions, 2012. Special analysis of Subject-Matter Series 11, Series 4.4.
Calculations by the DFG.

natural sciences research in Germany: with the exception of **U Münster** and **U Regensburg,** all of the 20 HEIs with the highest amount of DFG funding successfully proposed a Graduate School or Cluster of Excellence in the natural sciences.

Detailed analyses for individual research areas and research fields in the natural sciences are available in table form at www.dfg.de/fundingatlas (Tables Web-57, Web-58, Web-59 and Web-60). Similarly to the DFG funding profiles of HEIs shown in Chapter 4.3, broken down into 14 research areas, Figure Web-14 at www.dfg.de/fundingatlas provides an insight into profiles within the 18 research fields of the natural sciences. The figures on which the diagram is based, as well as overviews for HEIs and non-university research institutions in receipt of DFG funding in the natural sciences which are not shown, can also be found online (Tables Web-10 and Web-19).

Max Planck Society Successful Among ERC Grantees in the Natural Sciences

Natural sciences faculties in Germany attract a large number of researchers from abroad. Close to 2,000 visits by foreign visiting researchers funded by the Alexander von Humboldt Foundation are documented in this scientific discipline (cf. Table Web-56 at www.dfg.de/fundingatlas).

A total of 138 ERC grantees in the natural sciences are carrying out their projects at German HEIs. Another 51 ERC-funded projects are based at non-university research institutions. The Max Planck Society is the most successful such institution with 36 ERC grantees (cf. Table Web-47 at www.dfg.de/fundingatlas).

The major **universities in Munich, U Heidelberg** and **U Bonn** are very attractive to both ERC and AvH funding recipients. **U Erlangen-Nürnberg** is very attractive to foreign researchers and also succeeds in obtaining many ERC grants (cf. Table Web-56 at www.dfg.de/fundingatlas). The international engagement of this university is based on a strategic concept known as the FAU Open Research Challenge, for which **U Erlangen-Nürnberg** won an award in the DFG's International Research Marketing Ideas Competition in 2014.

Detailed information on the number of AvH, DAAD and ERC funding recipients per HEI and non-university research institution can be found in Tables Web-27, Web-29, Web-30 and Web-31 at www.dfg.de/fundingatlas.

4.7 Funding Profiles in the Engineering Sciences

Research in the engineering sciences is often very application-oriented and in many cases takes place within companies or is financially supported by them. DFG funding, however, focusses on the funding of knowledge-driven/basic engineering research at universities. Between 2011 and 2013, the DFG awarded close to €1,500 million for research projects in the engineering sciences – around a fifth of the total amount. The engineering sciences play a special role in the R&D programmes of the federal government and the EU owing to their direct relevance to applications and development. In the period 2011 to 2013, the EU awarded approximately €1,370 million (around 46% of the total volume) to projects and groups in the engineering sciences (cf.

Table 4-9:
Participation[1] in DFG, federal government and EU funding programmes for research by type of institution in the engineering sciences

Type of institution	DFG awards		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Higher education institutions	**1,342.7**	**90.3**	**960.8**	**44.0**	**381.1**	**45.2**
Non-university research institutions	**144.1**	**9.7**	**1,222.1**	**56.0**	**461.7**	**54.8**
Fraunhofer-Gesellschaft (FhG)	17.4	1.2	465.3	21.3	208.4	24.7
Helmholtz Association (HGF)	21.9	1.5	207.6	9.5	85.0	10.1
Leibniz Association (WGL)	14.6	1.0	42.4	1.9	18.9	2.2
Max Planck Society (MPG)	28.3	1.9	25.1	1.1	15.0	1.8
Federal research institutions	6.4	0.4	46.3	2.1	11.8	1.4
Other research institutions	55.4	3.7	435.3	19.9	122.6	14.6
Institutions overall	**1,486.8**	**100.0**	**2,182.9**	**100.0**	**842.8**	**100.0**

[1] Funding for German and institutional recipients only (not including industry and business).
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €1,996.5 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 4-22 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

Table 4-2). This is approximately €180 million more than in the period 2008 to 2010. A further €2,200 million was awarded for engineering research at HEIs and non-university research institutions through direct R&D funding from the federal government.

Table 4-9 shows the distribution of funding from the DFG, the federal government and the EU for research in the engineering sciences, broken down by the different types of research institution. Around 90% of DFG awards in the engineering sciences go to projects at HEIs and roughly 10% to projects at non-university research institutions. Both in absolute terms and by percentage, the importance of non-university research institutions has increased compared with the previous DFG-Förderatlas (DFG, 2012: 151).

The majority of federal government and EU project funding which is awarded to publicly funded institutions goes to non-university research institutions, with 56% and 55% respectively, while HEIs receive 44% and 45% respectively. The proportion of direct R&D funding from the federal government awarded to HEIs in the engineering sciences has increased slightly compared with the last reporting period by 3.5 percentage points. Awards to non-university research institutions are similarly distributed for the federal government and the EU: around one fifth of funding goes to the FhG and 10% to the institutions of the HGF. In the engineering sciences there is therefore a clear difference in the funding profile of the federal government and the EU on the one side and the DFG on the other. In the case of the federal government there is also a recognisable emphasis on renewable energies in the institutes supported. Thus, for example, the **Fraunhofer Institute for Solar Energy Systems (ISE)** received over €68 million and the **Fraunhofer Institute for Wind Energy and Energy System Technology (IWES)** in Braunschweig around €53 million in federal funding. Among the other institutions, the **Centre for Solar Energy and Hydrogen Research (ZSW)** in Stuttgart occupies a special position with almost €51 million. However, the institutions of the Helmholtz Association also obtained significant amounts of direct project funding from the federal government, for example the **German Aerospace Center (DLR)** in Cologne with €121 million and **Forschungszentrum Jülich** with close to €38 million. The biggest single recipient among the Other research institutions is the **Gauss Centre for Supercomputing (GCS)** in Berlin with €105 million.

Structure-forming Effects of DFG Funding Instruments

Figure 4-6 shows the relationships between institutions based on joint participations in DFG-funded groups.

In total, 152 HEIs and 85 non-university research institutions participate in this engineering sciences network. Approximately half of these have only one joint participation in a DFG-funded group; these are not shown in Figure 4-6 for technical reasons. As explained for the previous cartographic network diagrams, relationships between institutions are represented by lines, the thickness of which corresponds to the number of joint participations. The diameter of a circle indicates the number of joint participations in the programmes. For technical reasons, the diagram only shows locations with three or more partners. Joint participations between specific institutions are indicated by lines as of a frequency of two or more.

As far as HEIs are concerned, the network is dominated by the technical universities of **TH Aachen, KIT Karlsruhe, TU Darmstadt, TU Dresden** and **U Erlangen-Nürnberg.** Aachen's university, in particular, has numerous collaborative relationships both regionally and nationally through its participation in DFG-funded groups, including with a dense cluster in the neighbouring Ruhr region which has formed around **U Bochum** and **TU Dortmund.** A strongly regional collaboration, primarily with institutes of the Fraunhofer-Gesellschaft, is characteristic of the Saxony area around **TU Dresden** and **TU Chemnitz.** There is a similar picture in the Berlin area. Researchers at Fraunhofer institutes also play an important role in a cooperation cluster which stretches over a wide area centred on **KIT Karlsruhe, U Stuttgart** and **TU Darmstadt.**

Technical Universities Dominate DFG Funding in the Engineering Sciences

Table 4-10 shows the 20 HEIs with the highest volume of DFG funding in absolute terms and per capita in the engineering sciences. The relative figures are based on the number of professorships or researchers at a given HEI.

Figure 4-6:
Joint participations by research institutions in DFG-funded joint programmes and resulting collaborative relationships 2011 to 2013 in the engineering sciences

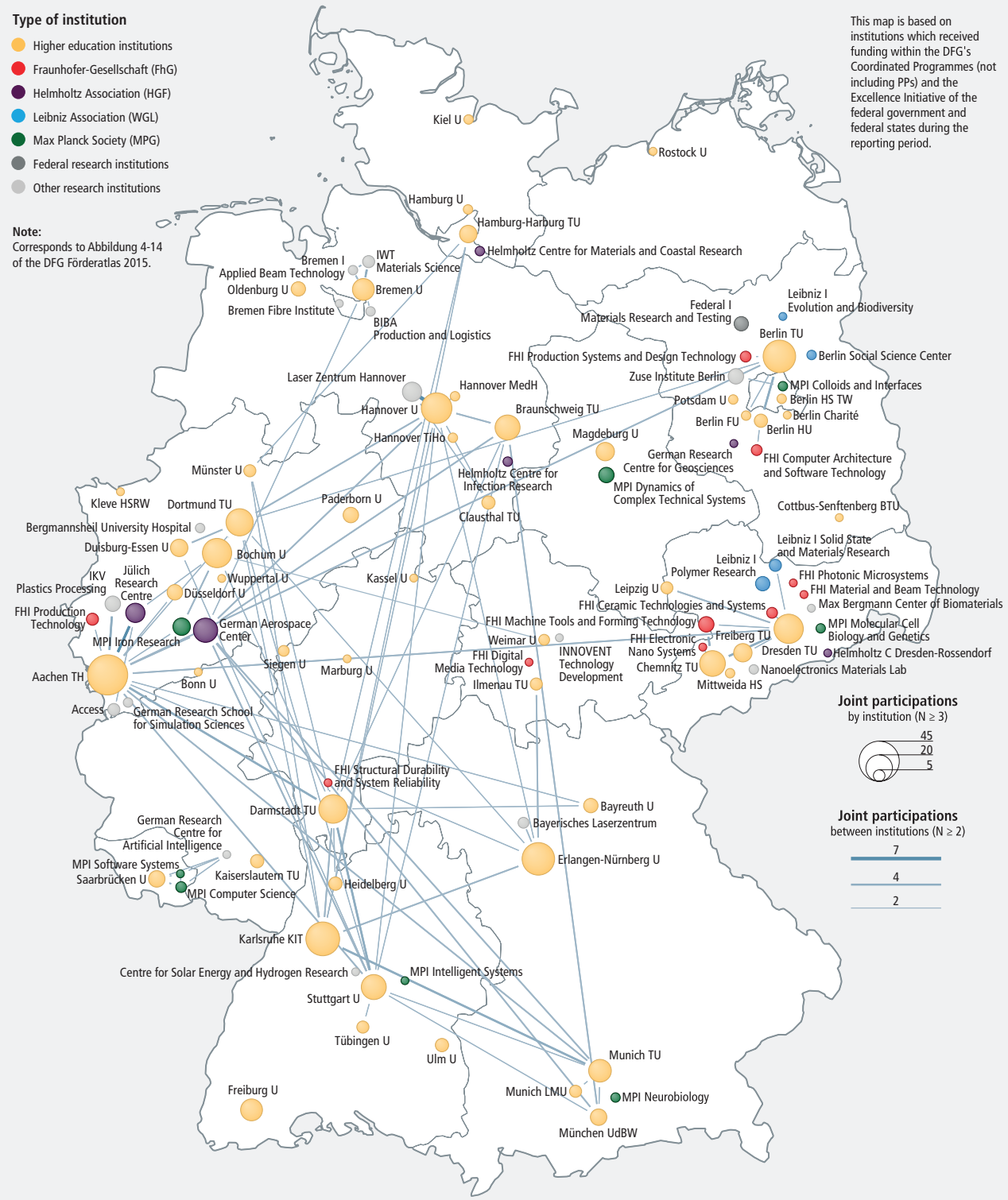


Table 4-10:
The higher education institutions with the highest DFG awards for 2011 to 2013 in absolute figures and relative to staff size in the engineering sciences

DFG awards (absolute)		DFG awards relative to staff size[1]					
Higher education institution	Total	Higher education institution	Professorial staff		Higher education institution	Researchers	
	€m		No.	€ thousand per prof.		No.	€ thousand per res.
Aachen TH	143.5	Aachen TH	164	872.9	Berlin HU	104	86.9
Darmstadt TU	88.4	Erlangen-Nürnberg U	98	758.0	Bielefeld U	196	78.8
Erlangen-Nürnberg U	74.4	Freiburg U	40	724.2	Freiburg U	435	66.0
Stuttgart U	74.3	Darmstadt TU	131	674.8	Bonn U	130	62.3
Karlsruhe KIT	74.2	Freiberg TU	42	655.1	Jena U	126	61.5
Munich TU	72.8	Chemnitz TU	51	649.8	Erlangen-Nürnberg U	1,233	60.3
Dresden TU	64.4	Bochum U	65	641.0	Darmstadt TU	1,500	58.9
Berlin TU	56.1	Hannover U	93	593.9	Oldenburg U	107	56.8
Hannover U	55.2	Karlsruhe KIT	144	515.7	Saarbrücken U	362	56.3
Dortmund TU	48.5	Stuttgart U	146	510.4	Bochum U	743	55.9
Bochum U	41.5	Bremen U	55	494.4	Aachen TH	2,662	53.9
Chemnitz TU	33.1	Dortmund TU	100	485.7	Kiel U	312	52.0
Braunschweig TU	30.4	Bayreuth U	23	467.8	Dortmund TU	935	51.9
Freiburg U	28.7	Munich TU	167	435.6	Hannover U	1,102	50.1
Freiberg TU	27.5	Saarbrücken U	49	415.8	Ulm U	266	47.3
Bremen U	27.0	Paderborn U	51	405.2	Paderborn U	449	45.8
Ilmenau TU	24.0	Dresden TU	165	389.9	Bremen U	620	43.5
Kaiserslautern TU	22.2	Ilmenau TU	64	377.6	Bayreuth U	249	43.4
Paderborn U	20.6	Kiel U	44	369.0	Freiberg TU	642	42.8
Saarbrücken U	20.4	Jena U	22	352.3	Tübingen U	130	41.3
Ranked 1–20	**1,027.2**	**Ranked 1–20**	**1,714**	**599.3**	**Ranked 1–20**	**12,303**	**83.5**
Other HEIs[2]	**315.5**	**Other HEIs[2]**	**10,053**	**31.4**	**Other HEIs[2]**	**36,820**	**8.6**
HEIs overall	**1,342.7**	**HEIs overall**	**11,767**	**114.1**	**HEIs overall**	**49,123**	**27.3**
Universities incl.	**1,333.4**	**Universities incl.**	**3,540**	**376.7**	**Universities incl.**	**34,549**	**38.6**
Based on: No. of HEIs	**121**	**Based on: No. of HEIs**	**216**	**121**	**Based on: No. of HEIs**	**228**	**121**

[1] Only HEIs which employed more than 20 professors and/or 100 or more researchers in the scientific discipline under consideration during 2012 were included within the scope of this calculation.
[2] Please see Tables Web-7 and Web-11 at www.dfg.de/fundingatlas for data on other higher education institutions.

Note: Abridged excerpt of corresponding Tabelle 4-23 of the DFG Förderatlas 2015.

Data basis and sources:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
Federal Statistical Office (DESTATIS): Education and Culture. Personnel at Higher Education Institutions, 2012. Special analysis of Subject-Matter Series 11, Series 4.4.
Calculations by the DFG.

Compared with the period covered by the last Funding Atlas, the number of HEIs in receipt of DFG funding in the engineering sciences has increased from 108 to 121.

The 20 HEIs which received the most funding secured €1,027 million out of the total funding volume of more than €1,340 million. For obvious reasons, there is a very strong concentration on large technical universities. In addition to this, HEIs with smaller DFG funding volumes in this discipline do not tend to obtain funding in traditional technical subjects but in computer science and related fields, which the DFG classifies under engineering sciences but which are often based in non-technical faculties at these institutions.

In the engineering sciences, **TH Aachen** receives the highest amount of funding in absolute and relative terms. As in the last reporting period, **TU Darmstadt, U Stuttgart, KIT Karlsruhe** and **TU Munich** are also among the biggest funding recipients. **U Erlangen-**

Nürnberg has increased its share of the funding volume compared with the period 2008 to 2010. All of the named universities also participate in the Excellence Initiative in the field of engineering sciences, usually through several groups.

There is less of a clear correlation between absolute and relative funding success than in previous reporting periods. Smaller HEIs such as **TU Freiberg, TU Chemnitz** and **U Freiburg,** whose funding profiles are clearly focussed on selected areas within the engineering sciences, are well positioned in terms of the figures relative to staff size.

Detailed analyses for individual research areas and research fields in the engineering sciences are available in table form at www.dfg.de/fundingatlas (Tables Web-63, Web-64, Web-65, Web-66 and Web-67). Similarly to the DFG funding profiles of HEIs shown in Chapter 4.3, broken down into 14 research areas, Figure Web-15 at www.dfg.de/fundingatlas provides an insight into profiles within the ten research fields of the engineering sciences. The figures on which the diagram is based, as well as overviews for HEIs and non-university research institutions in receipt of DFG funding in the engineering sciences, can also be found online (Tables Web-11 and Web-19).

International Attractiveness of Research Institutions

In the comparison of the different disciplines, the engineering sciences have the smallest number of AvH- and DAAD-funded visiting researchers. In both cases, many international researchers in the engineering sciences opt for **TH Aachen,** with **KIT Karlsruhe** and **TU Munich** also being important destinations for both groups of funding recipients. **TU Munich** and **TH Aachen** also lead the field in terms of the number of ERC grantees; 19 of the total of 92 grants in this scientific discipline between 2007 and 2013 were awarded to individuals at these universities (cf. Table Web-61 at www.dfg.de/fundingatlas).

Detailed information on the number of AvH, DAAD and ERC funding recipients per HEI and non-university research institution can be found in Tables Web-27, Web-29, Web-30 and Web-31 at www.dfg.de/fundingatlas.

5 Focus on the Excellence Initiative

This edition of the DFG Funding Atlas places a special thematic focus on the Excellence Initiative. This initiative of the federal and state governments, which has attracted a great deal of international attention, was launched in 2005 with the primary aim of supporting outstanding research at German universities and making it internationally visible. So far, the initiative has been implemented in two phases. In the first phase, 2007 to 2012, the federal and state governments made €1.9 billion available for the programme, and for the period 2012 to 2017 a total of €2.4 billion.

The Excellence Initiative comprises three funding lines: Graduate Schools to promote young researchers, Clusters of Excellence to promote top-level research, and Institutional Strategies to promote top-level university research through project funding.

Graduate Schools (GSC) are a crucial instrument for the support of early career researchers in Germany. They help to make the country's universities internationally competitive and support them in developing their individual profiles. They are founded on the principle that outstanding doctoral researchers should be able to qualify within an excellent research environment. They are intended to provide optimum conditions for doctoral research in a broad research area and are led by established researchers. Following the decision made in the second phase, 45 Graduate Schools were funded in 2015.

Clusters of Excellence (EXC) are designed to establish visible and competitive research and training institutions at German universities. They focus the research potential of a university and provide opportunities for scientific networking and collaboration in research fields of special future relevance. In addition to cooperation between the various institutions within universities, non-university research institutions also participate in Clusters of Excellence. Clusters of Excellence give universities the chance to focus on thematic priority areas and develop their strategic profiles. Following the decision made in the second phase, 43 Clusters of Excellence were funded in 2015.

Institutional Strategies (*Zukunftskonzepte*, ZUK) strengthen universities as whole institutions. They are designed to enable universities to compete among the leading players in the international research arena. Universities develop long-term strategies to boost top-level research and early career support. In order to receive funding for an Institutional Strategy, they must also have at least one Graduate School and at least one Cluster of Excellence. Following the decision made in the second phase, 11 universities received funding for their Institutional Strategies.

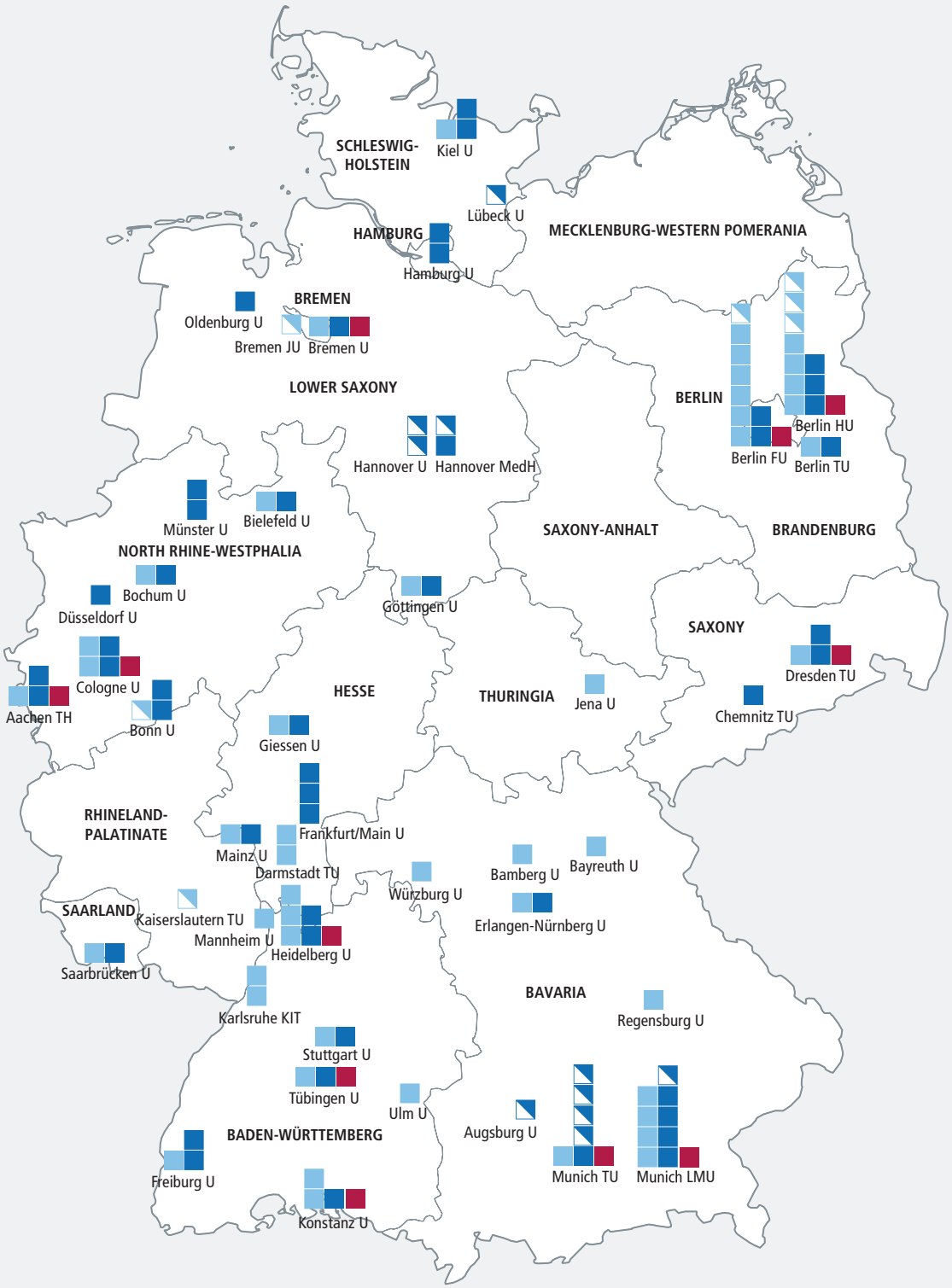
On 16 June 2016 the heads of the federal and state governments decided to continue the Excellence Initiative in the shape of the Excellence Strategy. The key point of the agreement is the unlimited continuation of funding for top-level research at universities with an annual sum of €533 million in the form of the Excellence Strategy. There are two different funding lines: 45 to 50 Clusters of Excellence will be funded for two seven-year periods; approximately €385 million per year is available in this funding line. In addition, funding will be offered for 8 to 11 Universities of Excellence, which will be subject to an external evaluation every seven years. This funding line will provide around €148 million.

The first funding decisions in this third phase of funding for top-level university research will be made in 2018 (BMBF, 2016: 36f. and N.U., 2016).

More information on the three funding lines and the decisions relating to the Excellence Initiative in the first and second phases is available at www.dfg.de/excellence-initiative.

Figure 5-1 shows the institutions funded in accordance with the decisions made in the second programme phase of the Excellence

Figure 5-1:
Results of the second phase of the Excellence Initiative: funded institutions 2012 to 2017



Note:
Corresponds to Abbildung 2-7 of the DFG Förderatlas 2015.

Initiative as a cartographic overview. The host universities are differentiated by the three funding lines. Co-applicant universities are also shown according to the respective funding line[1].

The following analyses examine the Excellence Initiative with the aid of a typology which allows individual aspects of the system impact of the initiative to be statistically evaluated. The typology focusses not on programmes but on the institutions which largely comprise those programmes and, more narrowly, on the 45 universities introduced as Excellence Initiative universities in the section that follows.

First, the considerations that underpin the typology are presented. On this basis we then show the extent to which type-specific emphases can be identified for universities for the most important of the key figures reported in this Funding Atlas.

5.1 Appraising the Excellence Initiative with an Institution Typology

Institution-based typing is a method which can be used to statistically identify systematic relationships between Excellence Initiative funding and the performance of research institutions. The focus of the examination is therefore not on individual institutions or programmes, but on groups of institutions with shared characteristics.

Account is taken of successes in both funding periods, i.e. including universities which established a collaborative institution in the first period but did not achieve a renewal in the second stage. Thus, a total of 45 universities are defined as Excellence Initiative institutions, participating or having participated in at least one approved Graduate School or Cluster of Excellence. An overview of these institutions by means of a cartographic representation is provided by Figure 5-1 for the funding period 2012 to 2017 (for the complete overview, cf. Table Web-70 at www.dfg.de/fundingatlas).

In the typology these 45 universities are further subdivided and compared with the totality of all higher education institutions (HEIs). Table 5-1 shows the defined subgroups. Within the type "University participating in the Excellence Initiative", universities which successfully proposed Institutional Strategies are shown separately and a distinction is made between universities with more active and less active participation in the funding lines of Graduate Schools and Clusters of Excellence. The typology also makes it possible to compare universities with and without participation in the Excellence Initia-

1 The decisions relating to the Excellence Initiative can be seen in Table Web-70 at www.dfg.de/fundingatlas.

Table 5-1:
Personnel and third party funding of higher education institutions in 2012 by type of participation in the Excellence Initiative

Type of institution	Total	Research staff					Third-party funding 2012	
		Total		Professorial staff			Total	
	No.	No.	%	No.	%	Avg.	€m	%
Universities	**110**	**189,886**	**84.4**	**23,559**	**53.7**	**214.2**	**6,269.1**	**92.7**
Of which participating in the Excellence Initiative	**45**	**147,924**	**65.7**	**16,677**	**38.0**	**370.6**	**5,140.5**	**76.0**
Universities with Institutional Strategies	14	64,198	28.5	6,589	15.0	470.6	2,536.0	37.5
Universities with two or more EXC/GSC	17	56,052	24.9	6,715	15.3	395.0	1,850.9	27.4
Universities with one EXC or one GSC	14	27,674	12.3	3,373	7.7	240.9	753.6	11.1
Of which not participating in the Excellence Initiative	**65**	**41,963**	**18.6**	**6,882**	**15.7**	**105.9**	**1,128.5**	**16.7**
Other higher education institutions	**317**	**35,228**	**15.6**	**20,303**	**46.3**	**64.0**	**490.7**	**7.3**
Higher education institutions overall	**427**	**225,114**	**100.0**	**43,862**	**100.0**	**102.7**	**6,759.8**	**100.0**

Note: Corresponds to Tabelle 3-7 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Statistical Office (DESTATIS): Education and Culture. Finances of Higher Education Institutions 2012. Special analysis of Subject-Matter Series 11, Series 4.5.
Federal Statistical Office (DESTATIS): Education and Culture. Personnel at Higher Education Institutionn 2012. Special analysis of Subject-Matter Series 11, Series 4.4.
Calculations by the DFG.

tive, and universities and HEIs overall. 110 HEIs are treated as universities in accordance with the classification used by the German Rectors' Conference (HRK)[2].

The information shown in Table 5-1 on the absolute and average number of professorships, which is given as reported, quantifies the known relationship between the size of the institutions combined under one heading and their participation in the Excellence Initiative. Universities with Institutional Strategies are clearly concentrated in the segment of large universities with a large staff. The question as to how many Graduate Schools or Clusters of Excellence were successfully established also correlates with the size of a university, for obvious reasons. The comparison group of universities not participating in the Excellence Initiative therefore tends to be made up of smaller institutions.

It should nonetheless be noted that there are sometimes considerable variations behind the average figures. The groups in this typology are therefore not without overlap in terms of institution size; there are both smaller and larger universities in each category.

In 2012 there were almost 150,000 researchers working at the 45 universities participating in the Excellence Initiative, or about two thirds of the academic staff of German HEIs. In terms of professorships, the figure is 38%. The difference in these percentages already indicates a generally important finding: universities, particularly the large ones participating in the Excellence Initiative, have more middle-ranking staff. Here there is a direct relationship with the acquisition of third-party funding, as much of this is used to fund temporary project posts. Because the figures for academic staff are to some extent dependent on the amount of third-party funding obtained, the following comparisons concentrate on the figures for professorial staff.

The comparison with the DESTATIS figures for the third-party funding revenues of HEIs in Table 5-1 reveals a high concentration in institutions participating in the Excellence Initiative. €5,141 million out of a total of €6,760 million of third-party funding revenues in 2012 went to this segment, a good three quarters of the total amount. The 14 universities with Institutional Strategies account for close to 38% of all third-party funding. This is more than double the figure that would be expected given the proportion of professorships at these universities. Universities with Institutional Strategies therefore attract an above-average level of third-party funding.

2 Cf. www.hochschulkompass.de/en (as at June 2014).

Table 5-2:
Participation in DFG, federal government and EU funding programmes for research by type of participation in the Excellence Initiative

Type of institution	DFG awards[1]		Direct R&D project funding by the federal government		R&D funding within EU FP7[2]	
	€m	%	€m	%	€m	%
Universities	**6,712.5**	**99.5**	**3,190.6**	**92.2**	**1,096.2**	**98.4**
Of which participating in the Excellence Initiative	**5,839.8**	**86.6**	**2,534.1**	**73.2**	**954.1**	**85.7**
Universities with Institutional Strategies	2,953.7	43.8	1,196.8	34.6	518.8	46.6
Universities with two or more EXC/GSC	2,049.9	30.4	916.8	26.5	318.8	28.6
Universities with one EXC or one GSC	836.2	12.4	420.5	12.2	116.5	10.5
Of which not participating in the Excellence Initiative	**872.7**	**12.9**	**656.5**	**19.0**	**142.1**	**12.8**
Other higher education institutions	**33.8**	**0.5**	**270.0**	**7.8**	**17.4**	**1.6**
Higher education institutions overall	**6,746.2**	**100.0**	**3,460.6**	**100.0**	**1,113.6**	**100.0**

[1] Including €1,076.1 million through the Excellence Initiative by the federal government and the federal states.
[2] The funding totals shown here for the EU's Seventh Framework Programme have been converted to a three-year period corresponding to the reporting years taken into account by the DFG and the federal government. The funding recipients considered here were allocated a total of €2,598.5 million in the EU's Seventh Framework Programme. For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Tabelle 3-8 of the DFG Förderatlas 2015.

Data basis and sources:
Federal Ministry of Education and Research (BMBF): Direct R&D project funding by the federal government 2011 to 2013 (PROFI project database).
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): DFG awards for 2011 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014).
Calculations by the DFG.

Table 5-3:
Number of AvH, DAAD and ERC funding recipients at higher education institutions by type of participation in the Excellence Initiative

Type of institution	AvH funding recipients		DAAD funding recipients		ERC funding recipients[1)]	
	No.	%	No.	%	No.	%
Universities	**4,542**	**99.3**	**36,547**	**98.2**	**426**	**100.0**
Of which participating in the Excellence Initiative	**4,011**	**87.7**	**28,468**	**76.5**	**395**	**92.7**
Universities with Institutional Strategies	2,102	46.0	14,839	39.9	231	54.2
Universities with two or more EXC/GSC	1,383	30.2	9,860	26.5	128	30.0
Universities with one EXC or one GSC	526	11.5	3,769	10.1	36	8.5
Of which not participating in the Excellence Initiative	**531**	**11.6**	**8,079**	**21.7**	**31**	**7.3**
Other higher education institutions	**33**	**0.7**	**665**	**1.8**	**0**	**0.0**
Higher education institutions overall	**4,575**	**100.0**	**37,212**	**100.0**	**426**	**100.0**

[1)] ERC funding recipients in Germany are indicated.

Note: Corresponds to Tabelle 3-9 of the DFG Förderatlas 2015.

Data basis and sources:
Alexander von Humboldt Foundation (AvH): Research visits by AvH guest researchers from 2009 to 2013.
German Academic Exchange Service (DAAD): Funding for researchers from abroad from 2009 to 2013.
EU Office of the BMBF: Participation in the EU's Seventh Framework Programme (term: 2007 to 2013; project data as of 21 February 2014). Figures include Starting Grants (including 2014), Advanced Grants and Consolidator Grants.
Calculations by the DFG.

With respect to the other categories in the typology, universities with two or more GSC/EXC (not including Institutional Strategies) also account for a proportion of third-party funding revenues (27%) which is almost double the expected value in line with the number of professorial staff (15%). In the case of universities with one Graduate School or Cluster of Excellence, the proportion is in line with expectations; for other higher education institutions it is lower.

Table 5-2 shows a comparison of three indicators based on third-party funding: DFG awards (including the Excellence Initiative), direct R&D project funding from the federal government and R&D funding within the EU's 7th Framework Programme for Research and Technological Development (FP7). Again starting with Institutional Strategies universities, these attract 44% of all DFG awards. It should be noted that this high figure is partly an effect of participation itself, because these universities not only apply for funding in the third funding line of Institutional Strategies but also funding for at least one Graduate School and at least one Cluster of Excellence. Thus, around 25% of DFG awards for universities with Institutional Strategies are directly related to success in the Excellence Initiative.

When this data is compared with the data on direct R&D project funding from the federal government and EU participation, however, a very similar picture emerges. With regard to participation in FP7, the third-party funding income of Institutional Strategies universities at 47% is even slightly above the DFG figure, with the figure for federal government funding being similarly high at 35%.

The last comparison in Table 5-3 includes AvH and DAAD programmes for the recruitment of foreign visiting researchers and the ERC programme for the support of leading international researchers. Here too, the proportions for the different types of institutions distinguished in the typology are similar to those above. Particular note should be made of the high proportion of ERC grantees at Institutional Strategies universities. 231 out of 426 ERC grantees at German universities (54%) benefit from the research environment at these institutions, while all universities participating in the Excellence Initiative taken together attract close to 93% of all ERC grantees who work at German universities.

All in all, the figures shown reveal concentration effects in favour of universities participating in the Excellence Initiative, in very different dimensions. There is a close relationship between the number of researchers who work at a university and its degree of participation in the Excellence Initiative. The relationships shown in the tables are therefore less due to the initiative and more due to the size of the universities participating in

these programmes. Large universities generally have better resources (e.g. instrumentation and libraries) and because they are usually located in metropolitan regions, they often have a wide choice of potential cooperation partners nearby. These regions are popular destinations for foreign visiting researchers and also offer attractive opportunities for top researchers with ERC funding. Various factors combine and complement one another to create good conditions for research – and thus also for participation in the Excellence Initiative.

5.2 International Cooperation in Graduate Schools and Clusters of Excellence

One important motive for the Excellence Initiative was and still is to create new opportunities for international cooperation through its programmes. In Graduate Schools (GSC) and Clusters of Excellence (EXC), this is achieved in various ways. Whether it is through cooperation with internationally distinguished working groups, the recruitment of leading international researchers for new professorships or other leadership positions established with the Excellence Initiative, international congresses and workshops, or other measures, internationality has many facets and possible manifestations.

For this Funding Atlas, one aspect is considered in more detail, again using DFG monitoring data: the staff composition of Graduate Schools and Clusters of Excellence funded through the Excellence Initiative. These groups recruit their research personnel internationally. In 2013, through DFG monitoring, data was collected on around 2,400 researchers involved in GSCs and around 1,600 involved in EXCs who worked in another country prior to joining these programmes. Some of these researchers who came from abroad were nationals of the country they were coming from and some were German nationals who took advantage of the Excellence Initiative to return to Germany, usually after a longer period abroad.

In total, 23% of researchers participating in GSCs and EXCs came to Germany from abroad. When the groups are classified under the four scientific disciplines defined by the DFG according to their main subject focus, a certain spread emerges: the proportion of participants who came to Germany from other countries ranges from 10% in the life sciences to 43% in the engineering sciences.

The main European countries of origin for participants in the Excellence Initiative are the UK, Italy and France, as well as smaller countries such as the Netherlands and the neighbouring German-speaking countries of Austria and Switzerland. Outside Europe, Excellence programmes recruit many young researchers from India, China and the USA.

Figure 5-2 shows all countries which were stated as the country of origin for at least five participants in Excellence Initiative groups in the DFG monitoring data for 2013. In each case the diagram distinguishes between GSCs and EXCs and the four scientific disciplines.

5.3 A Bibliometric Examination of the Excellence Initiative

Research output is most fruitful when it is published, and high-quality publications are an internationally recognised measure of research success. When proposals for Excellence Initiative funding were being reviewed, outstanding publications therefore served as an important indicator of scientific efficiency; their evaluation was based solely on the appraisal of internationally recognised experts in the relevant area. The evaluation of the content was decisive. Quantifying indicators were not decisive, neither for the reviewers nor for the statutory bodies responsible for the subsequent decision.

However, in order to examine the progress of the Excellence Initiative and to answer the question of what 'measurable' successes it has produced so far, it is nonetheless appropriate to draw on bibliometric data. The analysis here focusses on developments in two subjects selected as examples: chemistry and physics. These subjects were chosen because they are typical 'journal sciences' with a predominantly English-language publication culture which are well represented in bibliometric databases (Moed, 2006). An impression of this was given by the last edition of the Funding Atlas, which highlighted research and networking profiles in chemistry with the aid of bibliometric methods (DFG, 2013: 71ff.).

The period under consideration is 2002 to 2013. Excellence locations are considered in relation to various national and international comparison groups. Although this does not

Figure 5-2
Internationality of Graduate Schools and Clusters of Excellence – countries of origin of participants 2013

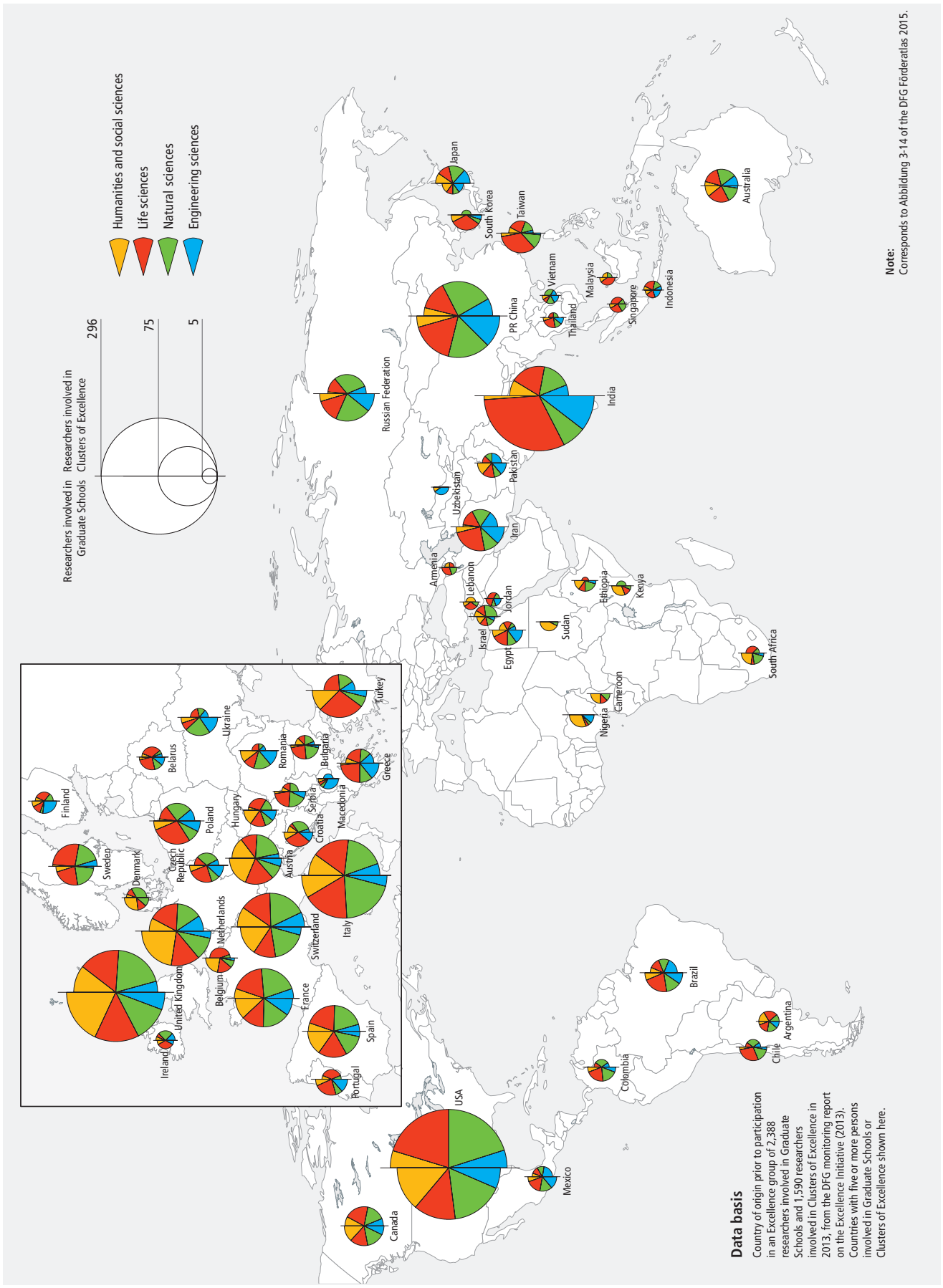
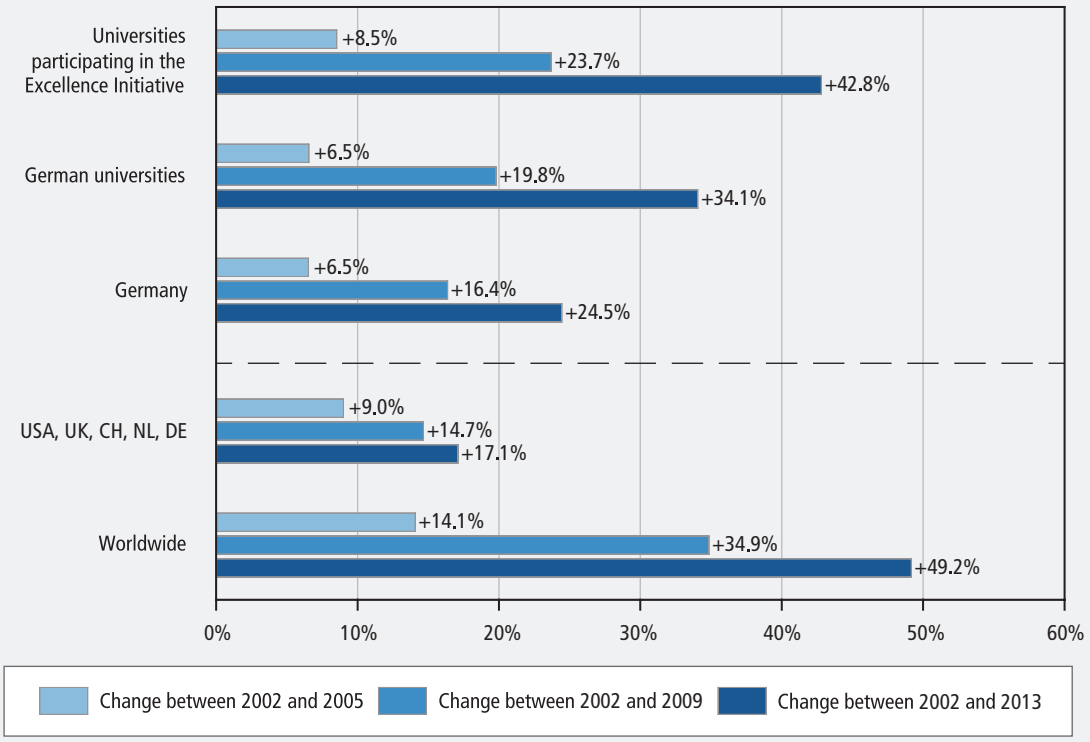


Figure 5-3:
Trend in publication output (chemistry/physics), 2002 to 2013, globally, in countries with high research activity, and in Germany



For further information on the underlying methodology, please see the Glossary of Methodological Terms at www.dfg.de/fundingatlas.

Note: Corresponds to Abbildung 3-15 of the DFG Förderatlas 2015.
Data basis and source:
SCIE, publications in the subject categories of chemistry and physics with at least one author from a research institution in the relevant category. Publications may be classified in more than one category. Calculations by the DFG.

directly quantify the funding effect of the Excellence Initiative, it does illustrate how these locations, already outstanding centres of research in chemistry and physics at the beginning of funding, have developed over the last 12 years. The analysis presented here therefore makes it possible to identify whether the publication activity of universities participating in the Excellence Initiative was different from that of the comparison groups prior to the commencement of funding.

The analysis takes account of publications associated with the research areas of chemistry and physics and recorded in the bibliometric database Web of Science. Within the category of Excellence universities, all universities funded through the Excellence Initiative for which a core research area in chemistry and physics was identified were included in the analysis. Of a total of 45 Excellence universities, this applies to 21 institutions. The allocation of publications to universities was based on the addresses of the participating authors. The institutions are not regarded singly, but as a group.[3]

Figure 5-3 shows the trend in publication output in Germany compared with the trend globally and in countries with particularly high research activity. Between 2002 and 2013, the global publication output in the research areas under consideration and also in relation to the full continuum of subject areas and core research areas increased dramatically.

This is in accordance with growth laws for scientific productivity discovered many years ago (De Solla Price, 1963), but also with the continuing growth in the number of publishing researchers worldwide. China has quadrupled its share of the global publication output in recent years (OECD, 2014). Changing communication and incentive structures are

3 See also the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "Bibliometrics".

also increasingly being discussed as a growth factor.

Publication activity at German research institutions has also intensified during the period under consideration. In 2002 approximately 22,000 publications appeared in chemistry and physics but in 2013 this figure was nearly 28,000 papers. This equates to a growth of around 25%. In purely quantitative terms, growth in Germany is below the global comparison value of 49%, but above the value of the comparison group of countries with particularly high research activity (17%).

Universities funded through the Excellence Initiative were responsible for a significant proportion of this growth. While the publication output for all German universities has risen by 34%, the increase for the 21 universities participating in the Excellence Initiative considered here was around 43%.

It can therefore be said that publication output in Germany in the research areas under consideration has increased significantly over the last 12 years and more rapidly than in other countries with high research activity. Locations in receipt of Excellence Initiative funding have made an especially important contribution to this increase. In 2006, the 21 locations considered here were already amongst those with the highest publication output – the intensity of research activity being an essential criterion for funding. By 2013, however, these locations had not only maintained their lead but increased it, their share of the total publication output in chemistry and physics significantly increasing in proportional terms.

More in-depth analyses of the reception of publications resulting from the Excellence Initiative carried out by the German Centre for Higher Education Research and Science Studies (DZHW) produced similar results (cf. Möller 2016: 30f.). These considered the trend in Germany's share and the share of Excellence Initiative universities in the 10% most cited publications in a given subject area. Here too it can be seen that 'Excellence locations' were already significantly above the comparison value for this indicator for all institutions in Germany at the start of the period under consideration and increased their contributions over time. Universities with Institutional Strategies achieve significantly above-average figures. At the beginning of the period, the share of publications in the thus-defined '10% segment' is 14.5% of total publication output, rising to 17.0% at the end of the period. The overall figure for Excellence Initiative universities at the start of the period is the same as the figure for Germany as a whole of around 13%, but over time rises above the national level to reach 15.6% in 2011 (the figure for the whole of Germany being 14.8%). By comparison, universities not participating in the Excellence Initiative also saw an increase throughout the period from 11.7% in 2003 to 13.2% in 2011. However, the figure is continually below the figures for the two comparison groups of Excellence Initiative institutions and Germany as a whole.

In summary, it can be said that universities participating in the Excellence Initiative already had above-average publication output prior to their participation in the programme and this output already had above-average visibility, i.e. was frequently cited. They capitalised on the funding to increase both their publication activity and the quality of their publications.

5.4 Interdisciplinary Cooperation in the Excellence Initiative

Some of the most commonly asked questions in public discussion on research relate to individual fields. What kind of research is done in chemistry? What contribution does computer science make to X? How much money is spent on the study of particular diseases in medical research? Questions like these are received every day by the press offices of HEIs, ministries, research organisations and funding bodies. Answering them is usually more difficult than the simplicity of the questions might suggest.

Chapter 4 presented the subject profiles of HEIs and non-university research institutions in detail. The analyses presented there are described in terms of the DFG's subject classification system or the funding areas defined by the federal government or the EU. This made it possible to identify the subject focusses of institutions in the context of third-party funding.

This final chapter approaches the topic of 'subject affiliation' from a different perspective. Instead of asking *within* which subject areas institutions receive an especially high level of third-party funding (and therefore have a special focus), it examines the ques-

tion of how Excellence Initiative funding is used to support interdisciplinary cooperation *between* subject areas.

The question focusses on the funding lines of Graduate Schools (GSC) and Clusters of Excellence (EXC). The selection criteria applied to these funding lines included not only the academic excellence of research and the support of early career researchers but also the creation of structures for intra- and inter-institutional cooperation. Special attention was given to the networking of disciplines – frequently also emphasised by funding recipients, as demonstrated for example by interviews with spokespersons (cf. DFG/WR 2015).

It may be a simple matter to formulate an objective of fruitful exchange across subject boundaries, but it is usually difficult to obtain reliable data which indicate how successfully this is achieved. The analyses presented in this chapter examine the form that interdisciplinary research takes using simple methods and a purely descriptive approach. The data used here was gathered mainly for public relations use, and is here used for statistical analysis for the first time.

5.4.1 Data Basis and Method

Questions on the subject orientation of DFG-funded research can be answered on the basis of fairly solid data. The analyses mainly presented in Chapter 4 benefit in particular from the fact that the DFG records its funding activities using a very detailed subject classification system (cf. Chapter 4.1). However, this should not conceal the fact that categorisations using systems like these can never be understood in absolute terms. When a data-based DFG report discusses computer science projects, for example, this generally refers to projects processed in the review board for computer science. This by no means rules out the possibility that projects processed in other review boards might intersect to a greater or lesser degree with this subject area. It is also difficult to find data to answer the question as to the subject areas represented by the individuals who submit computer science projects to the DFG or who carry them out as research assistants. Equally difficult is the answer to the question of whether and to what extent 'computer scientists' are in fact only funded by the DFG within computer science projects or also obtain funding for projects with a different subject focus.

Finally, the complexity of assigning funding volumes to subjects is made clear by the question of the subject orientation of the DFG's major Coordinated Programmes – especially given the fact that interdisciplinary cooperation is characteristic of these programmes and should, where possible, be statistically represented[4].

In order to adopt a perspective that allows a comparative examination of the interdisciplinarity of the two funding lines in the Excellence Initiative while also allowing a comparison with the DFG's established Coordinated Programmes, this chapter draws on a data basis not previously used for analytical purposes. Since 2001, as part of an annual survey of newly established research groups conducted for public relations purposes, the spokespersons of these groups have been asked to provide information about the subject areas involved in a given group. This data is used to publish information about the groups in the project information system GEPRIS (cf. http://gepris.dfg.de/en). This allows interested members of the public to find out about the topics of DFG-funded research and the scientific communities that interact to carry it out.

The survey is designed to be open, i.e. without a defined, structured subject classification system. Respondents can provide information on a highly individual and if necessary highly specific basis on the participation of different subject areas, be they large or small, established, new or in the process of developing. Although this is beneficial for the purposes of external communication, it also has the disadvantage that the subject areas as stated by the respondents, with different spellings, the synonymous use of terms, a lack of hierarchisation and so on, do not always lend themselves readily to statistical analysis.

For the analyses presented below, the subject areas quoted by spokespersons were therefore classified in their turn and then as-

4 The Funding Atlas uses a variety of methods to prepare the underlying data for the purposes of subject-related reporting. Information about the statistical handling of the interdisciplinary orientation of Coordinated Programmes (for example Research Units and Collaborative Research Centres) can be found in the Glossary of Methodological Terms at www.dfg.de/fundingatlas, under the headword "DFG funding".

signed to exactly one of the 14 research areas[SA] defined in the DFG's subject classification system[5].

5.4.2 Cooperation Between Research Areas

In the survey from which the data was drawn, the spokespersons of 49 Graduate Schools and 49 Clusters of Excellence named exactly 233 different subject areas in the case of EXCs and 234 in the case of GSCs. This equates to an average of 8.6 subject areas per programme. The classification of these subject areas according to the DFG subject classification system as described above allows these responses to be statistically examined in terms of four scientific disciplines[SA] (cf. Figure 5-4).

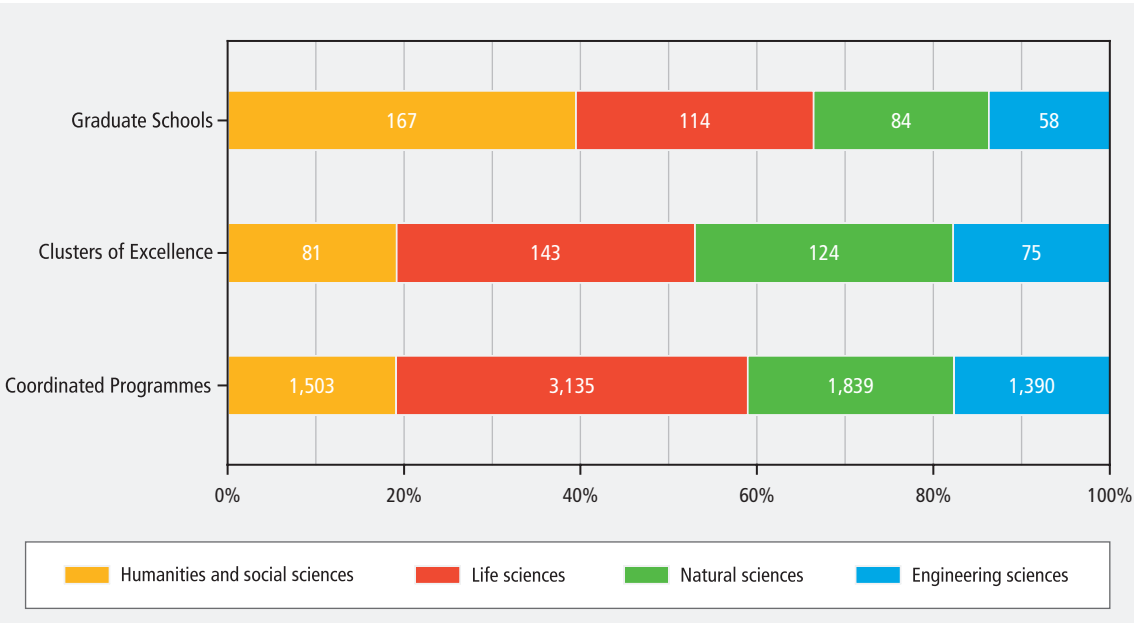
What is immediately striking is the finding that, among Graduate Schools, a large share of subject areas are concentrated in the humanities and social sciences spectrum. 167 out of the 423 subject areas named, or nearly 40%, fall under this scientific discipline[SA]. In Clusters of Excellence, however, the natural and life sciences dominate (with 29% and 34% respectively).

If we compare these proportions with the distribution shown in the third bar in the diagram for all of the DFG's Coordinated Programmes (not including the Excellence Initiative), we can see a further correspondence: the Clusters of Excellence funding line shows a high similarity in profile to the overall typical pattern for the DFG. Graduate Schools, on the other hand, have an above-average affinity with the humanities and social sciences.

The findings presented in Figure 5-5 and Figure 5-6 provide an answer to the question as to the extent of interdisciplinary research in Graduate Schools and Clusters of Excellence. The figures shown indicate the number of research areas[SA] covered on average by the

5 For the sake of clarity, where statements are made in this chapter on the research areas and scientific disciplines of the subject areas (SA) named by spokespersons, the terms 'research area[SA]' and 'scientific discipline[SA]' are used. This is distinct from the research area (and thus the scientific discipline) assigned to a research group (RG) by the staff at DFG Head Office to classify its subject focus. In the interests of clarity, these are referred to as 'research area[RG]' and 'scientific discipline[RG]'.

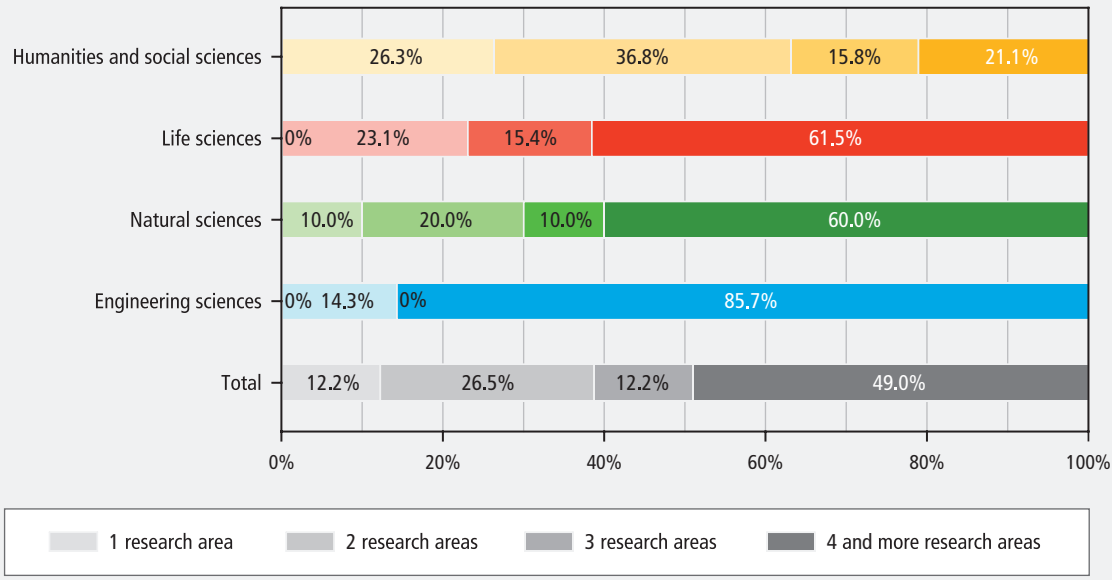
Figure 5-4:
Comparison of the number of standardised subject areas, specified for each funding line, per scientific discipline for Graduate Schools[1)], Clusters of Excellence and Coordinated Programmes



1) Not including GSC 81 (TU München) and GSC 98 (U Bochum), which are cross-faculty / cross-institution Graduate Schools without a core subject area.

Note: Corresponds to Abbildung 5-1 of the DFG Förderatlas 2015.
Data basis and source: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): Annual survey of spokesperons of new groups on subject areas. Calculations by the DFG.

Figure 5-5:
Interdisciplinary collaboration in Graduate Schools[1]: number of research areas involved in individual groups, by scientific discipline of the group



[1] Not including GSC 81 (TU München) and GSC 98 (U Bochum), which are cross-faculty / cross-institution Graduate Schools without a core subject area.

Note: Corresponds to Abbildung 5-2 of the DFG Förderatlas 2015.
Data basis and source: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): Annual survey of spokesperons of new groups on subject areas. Calculations by the DFG.

subject areas in a research group. A distinction is made between the overall distribution and the distribution per scientific discipline[RG].

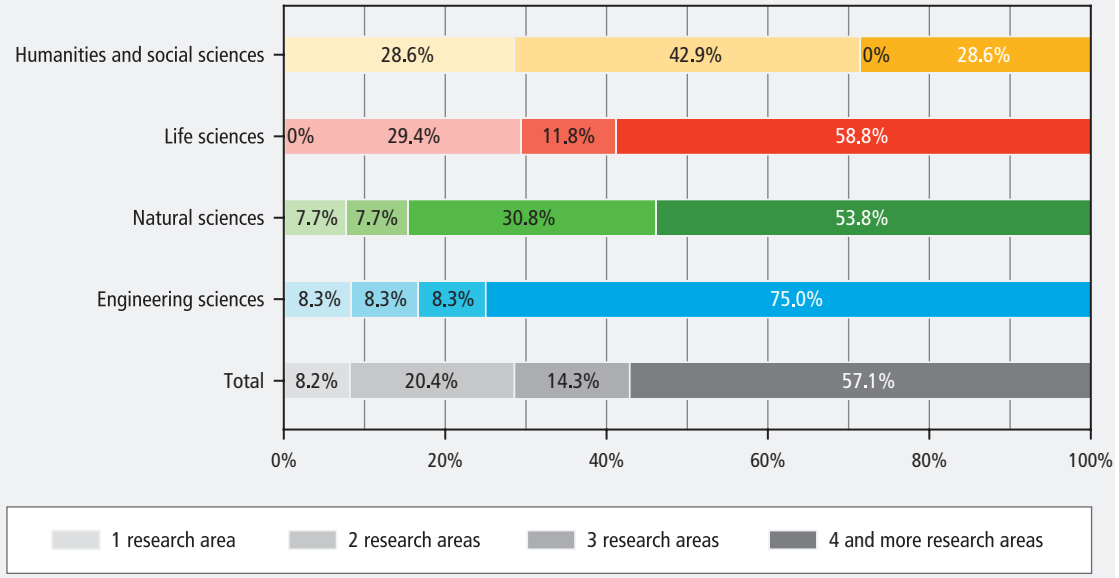
By way of explanation, here is an example. A Graduate School was primarily assigned by staff at DFG Head Office to the research area[RG] of physics and therefore the scientific discipline[RG] of natural sciences. For this and all other Graduate Schools in the natural sciences, Figure 5-5 shows over how many research areas[SA] the subject areas mentioned in the survey of spokespersons are distributed. If all subject areas belonged to physics, it would be one research area[SA]; if chemistry subject areas were also involved, it would be two and so on.

A look at the overall distribution reveals that it is unusual for Graduate Schools to cover only one research area[SA]. A concentration of this type is found in only five out of 49 schools (12%). About one in four Graduate Schools covers exactly two research areas[SA], and one in eight covers three research areas[SA]. Finally, Graduate Schools covering four or more different research areas[SA] clearly characterise the overall picture, with nearly one in every two schools belonging to this 'interdisciplinarity class'.

There are striking differences between the scientific disciplines[RG]. The peak value for cooperation between research areas is seen for Graduate Schools in the engineering sciences. Of the seven Graduate Schools in this scientific discipline[RG], six belong to the category that covers four or more research areas[SA]. This equates to a proportion of almost 86%. The picture for the life sciences and natural sciences is very similar, with the emphasis again being on a very broad coverage of research areas[SA]. The humanities and social sciences do not fit this picture, with a comparatively high proportion of schools concentrating on subject areas belonging to exactly one research area[SA] (26%).

A comparison with the distribution for Clusters of Excellence reveals a strikingly high correspondence (cf. Figure 5-6). Here, groups with a very broad basis covering four or more research areas[SA] tend to have even more weight than is the case with Graduate Schools (57% compared with 49%). In both funding lines we see the very similar finding of a particularly high significance of broad subject coverage in the engineering sciences; on the other hand there is a greater concentration on one or two research areas[SA] in the humanities and social sciences.

Figure 5-6:
Interdisciplinary collaboration in Clusters of Excellence: number of research areas involved in individual groups, by scientific discipline of the group



Note: Corresponds to Abbildung 5-3 of the DFG Förderatlas 2015.
Data basis and source: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): Annual survey of spokesperons of new groups on subject areas. Calculations by the DFG.

5.4.3 The Most Frequently Occurring Subject Areas

The analyses presented above provide a first impression of the importance of interdisciplinary cooperation in the two Excellence Initiative funding lines considered here. However, the chosen method of simply counting the number of research areas covered does not take into account the fact that the very different structures of the individual research areas result in equally different preconditions for interdisciplinary networking. Thus, small research areas like geosciences or mathematics are much more likely candidates for cooperations between research areas than medicine or the humanities, for instance. In relation to the latter, we might also ask whether a cooperation between a germanist and an archaeologist, for example, which is within one research area, in fact transcends a similar or even greater scholarly distance than a cooperation between a food chemist (research area chemistry) and a plant scientist (research area biology).

To get to the bottom of the question of exactly which subjects characterise research activity in Graduate Schools and Clusters of Excellence and also have a particular affinity with interdisciplinary cooperation, the subject areas named by spokespersons will now be considered in more detail.

For a total of 1,244 groups, the survey of subject areas produced a substantial 2,194 different subject areas with an overall frequency of 8,713 mentions. This corresponds to a frequency of an average of 3.8 mentions per subject area. This high number is largely due to the fact that respondents were free to formulate their own answers, resulting in different spellings (geographie, geografie), singular/plural variations (education science, education sciences) and largely synonymous terms (materials research, materials science). For the analyses that follow, the original terms have therefore been largely standardised.

With the aim of achieving a sufficiently differentiated data basis, there was no explicit intent to remove hierarchical relationships between subjects and subordinate subjects. Thus, if a subject area was mentioned sufficiently often (guideline value 5 mentions), it was retained. The advantage of an examination that also reveals subordinate facets of interactions between subjects also has the

drawback that the weight of individual 'subject families' is not uniformly recorded. This can be illustrated by taking the examples of sociology and history. For the former, 17 'kinds' of sociology (industrial sociology, educational sociology, occupational sociology etc.) were found across all funding lines, each with one to four mentions, and combined into the single subject area of sociology. In addition to the umbrella term history (85 mentions), at least eight subject areas also belonging to the spectrum of history subjects with five or more mentions were retained (for example history of medicine, prehistory and early history, and history of law).

In the final result, the standardisation across all funding lines results in exactly 402 different subject areas. Compared with the starting figure (2,194 subject areas), this equates to a compression of just under 20%.

Table 5-4 shows the most frequently occurring subject area names for Graduate Schools, Clusters of Excellence and all Coordinated Programmes (not including the Excellence Initiative) resulting from the standardisation. For both Excellence Initiative funding lines the selection is limited to subject areas with at least four allocations. For Graduate Schools this is 28 and for Clusters of Excellence, 27.

Among the generally most frequent subject areas in both funding lines are biology, chemistry, physics and computer science – taking into account in each case the fact that these would always include a larger number of subject areas, which in the logic of a hierarchically structured subject classification would be designated as sub-disciplines. The overview does however also give an indication of the high importance of interdisciplinary research activity insofar as it shows with comparative frequency subject areas which combine traditional disciplines in their names – for example bioinformatics, physical chemistry and biochemistry, itself already a 'traditional' subject.

The comparison of the entirety of the DFG's Coordinated Programmes shows that these are somewhat more strongly characterised by subject areas in the life sciences. Biochemistry has a very important role here, as do molecular biology and cell biology, which are not listed among the most frequently occurring subject areas in the two Excellence Initiative lines.

5.4.4 Structural Effects of Interdisciplinary Cooperation

Finally, the network analyses shown here give an impression of the structural effects resulting from the joint participation of subject areas in Graduate Schools and Clusters of Excellence.

The network analysis is a method that makes it possible to investigate the relationships between entities and visualise them using graphical techniques. Figure 5-7 and Figure 5-8 are based on cross-tabulations which list 167 and 180 subject areas for GSCs and EXCs respectively in their rows and columns. The matrix cell shows in how many groups two subject areas linked in such a way occur jointly. The size of the symbol for a subject area corresponds to the number of relationships it has with other subject areas. This shows at a glance which subject areas are especially important within the overall structure. The thickness of the connecting lines between two subject area symbols ('nodes') represents the frequency with which the two subject areas are jointly involved in funded groups. The algorithm used to create the diagrams groups subject areas with especially intensive networking into 'subject area clusters', so the local positioning of 'nodes' in the diagram also provides important information: the closer together they are, the more clearly there is a substructure of very frequently interacting subjects[6].

When Figure 5-7 and Figure 5-8 are compared, it should firstly be noted that both diagrams incorporate all subject areas participating in a funding line in a common subject network. There are no isolated subject areas and also no isolated subject area clusters, and thus no 'subject islands' which are only linked within themselves but not to other subject environments. Both networks also reveal clear substructures. On the right of the diagram are subject areas on the humanities and social sciences spectrum (yellow), in the top left and closely interconnected are the natural and engineering sciences (green and blue) and at the bottom left are the life sciences (red).

6 The visualisations were created using a method developed at the Max Planck Institute for the Study of Societies in Cologne by L. Krempel (cf. Krempel, 2011, and Krempel, 2005, also de Nooy/Mrvar/Batagelj, 2011). The solution presented here was generated with Gephi and the ForceAtlas algorithm (cf. www.gephi.org).

Table 5-4:
The most frequent standardised subject areas[1] for each programme line under the Excellence Initiative compared with the DFG's Coordinated Programmes

Graduate Schools[2]			Clusters of Excellence			Coordinated Programmes not including the Excellence Initiative		
Subject area	No.	% cumul.	**Subject area**	No.	% cumul.	**Subject area**	No.	% cumul.
Biology	20	4.7	Physics	24	5.7	Biochemistry	223	2.8
Informatics	14	8.0	Biology	18	9.9	Physics	169	5.0
Chemistry	13	11.1	Chemistry	16	13.7	Medicine	166	7.1
Physics	13	14.2	Informatics	16	17.5	Molecular biology	148	9.0
History	11	16.8	Medicine	14	20.8	Informatics	144	10.8
Mathematics	11	19.4	Biochemistry	12	23.6	Immunology	142	12.6
Sociology	11	22.0	Mathematics	10	26.0	Cell biology	133	14.3
Biochemistry	10	24.3	Biophysics	7	27.7	Chemistry	131	16.0
Political science	10	26.7	Electrical engineering	7	29.3	Biology	122	17.5
Medicine	8	28.6	Mechanical engineering	7	31.0	Materials science	113	19.0
Economics	7	30.3	Philosophy	7	32.6	Genetics	108	20.3
Electrical engineering	7	31.9	Neurosciences	6	34.0	Mathematics	108	21.7
Psychology	7	33.6	Physiology	6	35.5	Biophysics	98	22.9
Neurosciences	6	35.0	Ethnology	5	36.6	Microbiology	96	24.2
American Studies	5	36.2	Process engineering	5	37.8	Sociology	93	25.3
Astrophysics	5	37.4	Sociology	5	39.0	Physiology	89	26.5
Bioinformatics	5	38.5	History	4	40.0	Economics	83	27.5
Jurisprudence	5	39.7	Immunology	4	40.9	Pharmacology	73	28.5
Mechanical engineering	5	40.9	Inorganic chemistry	4	41.8	History	69	29.3
Particle physics	5	42.1	Jurisprudence	4	42.8	Mechanical engineering	68	30.2
Philosophy	5	43.3	Literary studies	4	43.7	Electrical engineering	67	31.1
Religious studies	5	44.4	Materials engineering	4	44.7	Physical chemistry	67	31.9
Theatre studies	5	45.6	Materials science	4	45.6	Psychology	67	32.8
Biophysics	4	46.6	Microbiology	4	46.6	Neurobiology	66	33.6
Ethnology	4	47.5	Oceanography	4	47.5	Jurisprudence	65	34.4
Finance	4	48.5	Psychology	4	48.5	Bioinformatics	62	35.2
Geosciences	4	49.4	Quantum physics	4	49.4	Organic chemistry	59	36.0
Neurobiology	4	50.4	–			–		
139 other subject areas	**210**	**49.6**	**153 other subject areas**	**214**	**50.6**	**375 other subject areas**	**5,038**	**64.0**
Overall	**423**	**100.0**	**Overall**	**423**	**100.0**	**Overall**	**7,867**	**100.0**

[1] Further information on the standardising of subject areas is available in Chapter 5.4.
[2] Not including GSC 81 (TU Munich) and GSC 98 (U Bochum), which are cross-faculty / cross-institution Graduate Schools without a core subject area.

Note: Corresponds to Tabelle 5-2 of the DFG Förderatlas 2015.

Data basis and source:
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): Annual survey of spokespersons of new groups on subject areas.
Calculations by the DFG.

Finally, standing apart yet firmly integrated into the overall structure, in the diagrams for both Graduate Schools and Clusters of Excellence, subject areas in the geosciences spectrum are positioned bottom centre.

The picture produced here largely corresponds to a structure generated previously on a completely different data basis and with a different thematic focus for interdisciplinary reviews of proposals for DFG individual grants (DFG, 2016). This subject network also exhibits marked cluster formation within the four scientific disciplines and through connections between specific 'bridge subjects'

Figure 5-7:
Network of subject areas involved in Graduate Schools

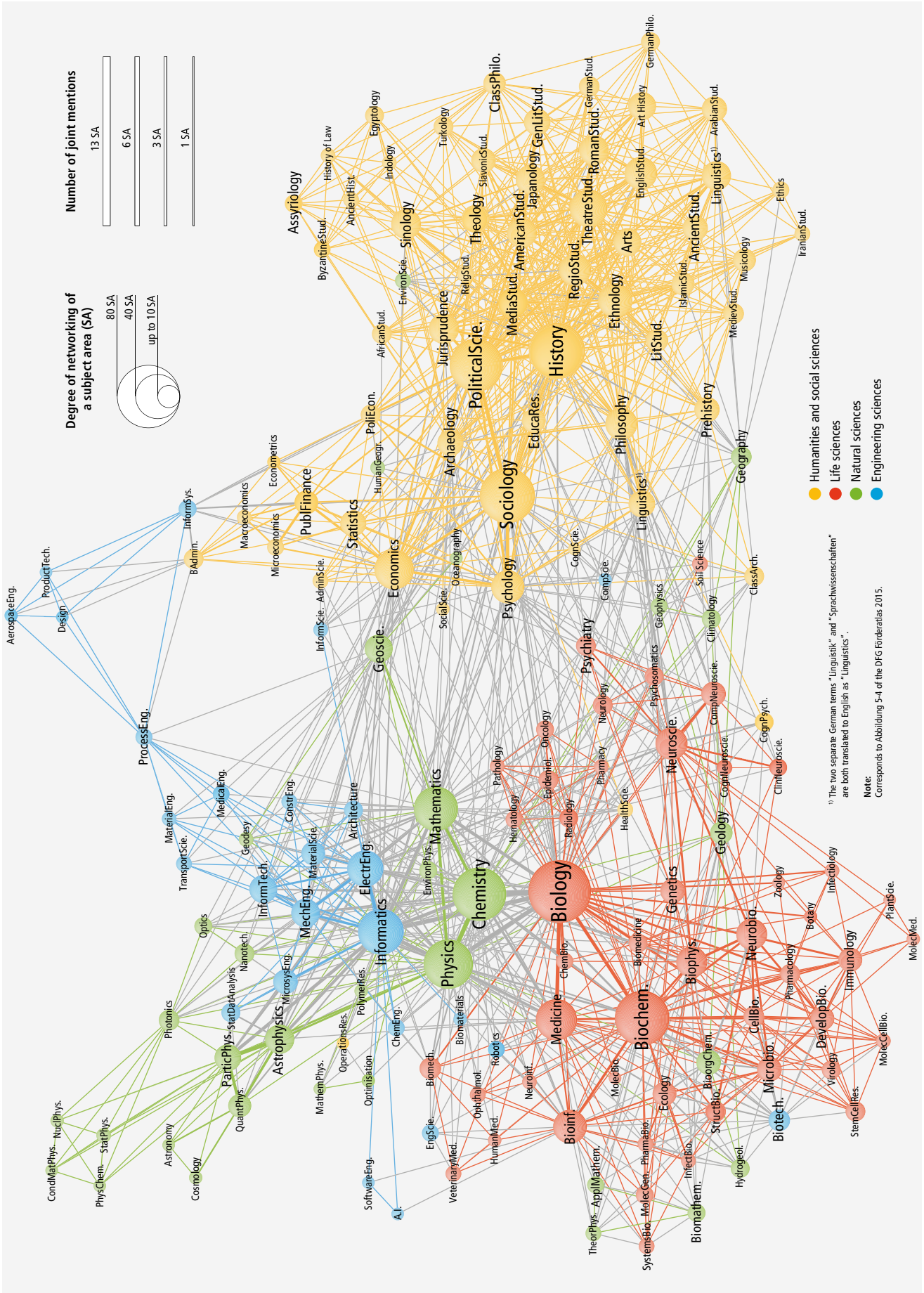
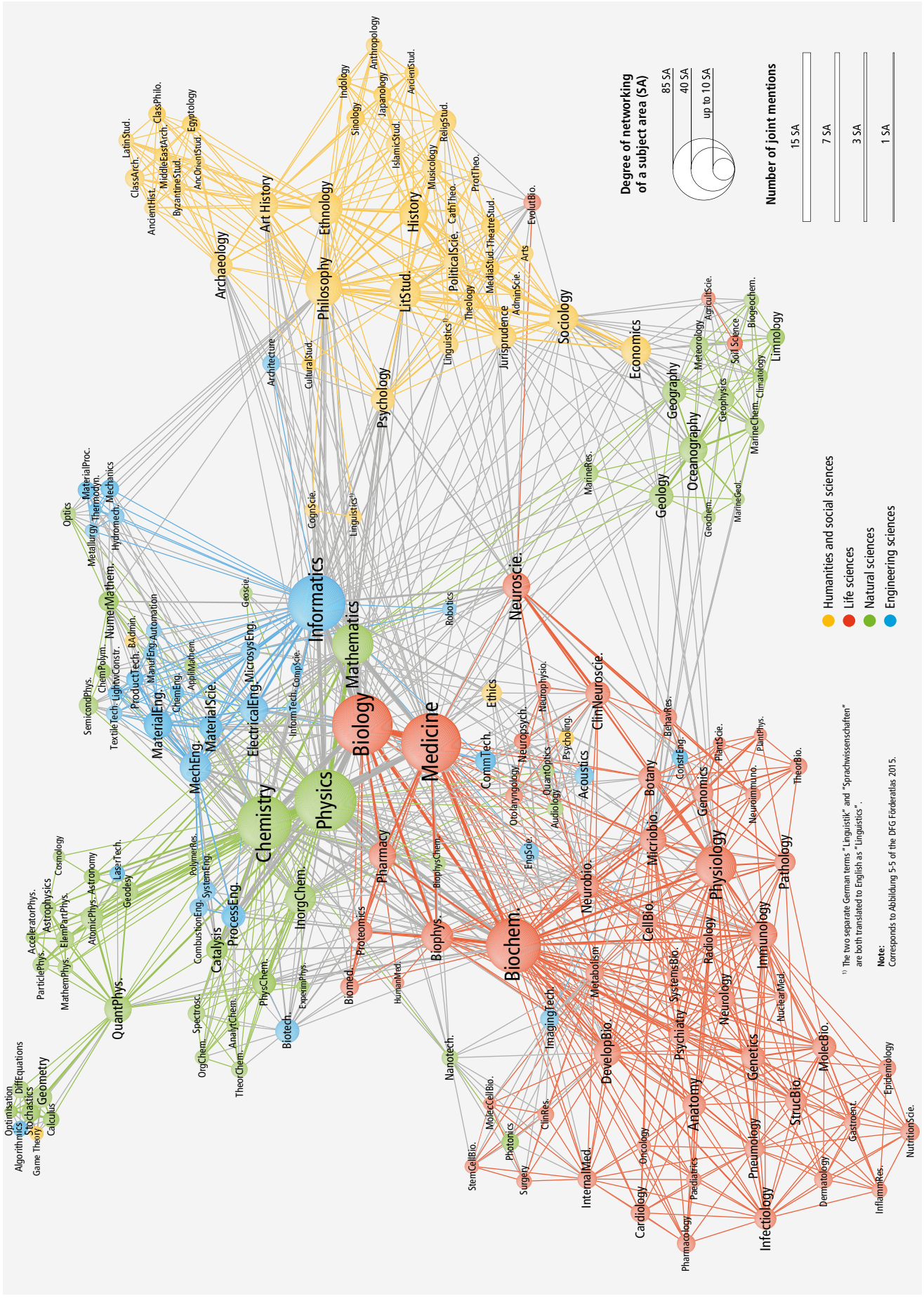


Figure 5-8:
Network of subject areas involved in Clusters of Excellence



which link these disciplines into an overall structure.

What characteristics and differences are revealed in detail when the networks for Graduate Schools and Clusters of Excellence are compared?

For the Graduate Schools funding line, the subject network is characterised by a strong position of the humanities and social sciences subject spectrum. The corresponding subject area cluster is very close-knit, directly demonstrating that varied interactions in very different constellations are characteristic within this substructure. Yet the arrangement within this cluster is not random: it places mainly subject areas on the linguistics and literature spectrum on the right of the diagram; subject areas with varied contacts with these, such as theology, jurisprudence and ethnology, as well as media studies, in the centre; and finally the major humanities subject areas of philosophy, archaeology and history on the left of the tight-knit structure.

What is notable is that it is mainly social sciences which act as the 'bridge' to the 'hard sciences' on the left of the diagram. Economics (as well as the separately shown sub-areas of political economy, business administration and public finance) mark the transition to the mainly engineering sciences subject spectrum. Psychology, philosophy and linguistics are linked via neuroscience to the life sciences – as is sociology, which acts as a main link between these social sciences subject areas[7].

On the spectrum of the engineering sciences, which are comparatively little involved in Graduate Schools, informatics is clearly predominant. Close beside mathematics, which in the logic of the DFG subject classification system comes under the natural sciences, these two so-called formal sciences virtually form the core of the entire structure along with biology, chemistry and physics. In quantitative terms, this can be seen from the fact that these subject areas have 50 to 80 connections with other subject areas and therefore particularly high network centrality compared with the average of 16 connections.

Biology, together with biochemistry, forms the core of the life sciences cluster. In addition to the fairly indistinct general term of medicine, there is a multitude of other subject areas here defining medical sub-areas, but also (less frequently) traditional biological subject areas such as botany, zoology and plant sciences.

Finally, the central position of physics already identified is further strengthened by the fact that it forms its own substructure at the top left of the diagram with a large number of specialised areas (astrophysics, quantum physics, particle physics etc.).

Although there are many commonalities in the basic structure, the subject area network for the Clusters of Excellence funding line (Figure 5-8) does show a few striking differences. The humanities and social sciences subject spectrum here is much more discrete, comprises fewer subjects and is also somewhat less interconnected internally. Ethnology occupies a central position within the substructure, while philosophy is clearly positioned as the subject area with the most internal and external relationships (with 36 other subject areas, of which six are not on the humanities and social sciences spectrum). As in the case of Graduate Schools, psychology serves primarily as a bridge subject to neuroscience and therefore the life sciences cluster, but compared with the network diagram for Graduate Schools, economics and sociology are more clearly positioned as a bridge to the life sciences and, in particular, the geosciences subject spectrum, which also forms a more clearly recognisable substructure here.

On the life sciences subject spectrum, the two generally defined subject areas of biology and medicine form the bridge to the natural sciences and engineering sciences subject clusters. The substructure is dominated by biochemistry, which also plays an important role in Graduate Schools with a life sciences focus. The life sciences cluster is structured, starting on the left, by subject areas in internal medicine (e.g. surgery, anatomy, cardiology), at the bottom by subject areas in molecular biology (structural biology, genetics) and on the right by a small botany block (plant physiology, plant sciences).

In the case of Clusters of Excellence, physics dominates the overall structure by some distance. With exactly 85 direct connections to other subject areas, it forms the centre of the subject network far ahead of chemistry (55) and biophysics (32), which is also on the physics spectrum. Again, note the high degree of differentiation in the subject spectrum, which also shows strong positions for quan-

7 Similar relationships between the natural and social sciences are frequently found in global networking maps of science, regardless of whether the analysis is based on expert statements, (co-)citations or journal relationships (Klavans/Boyack, 2009).

tum physics and physical chemistry and reveals the structural effect of other small physics subjects.

The establishment of the Excellence Initiative was associated with two main aims in terms of disciplines: the funding instrument was to a) be open to all subject areas and b) specifically promote interdisciplinary exchange. The analyses presented in this final chapter of the Funding Atlas indicate that both aims have been achieved. The spectrum of participating subjects is broad, covering all scientific disciplines and a large number of research areas. The cooperation funded by the DFG does not take place in 'disciplinary islands', but – as demonstrated by the network analyses – is characterised by many different focus-forming interactions between researchers in wide-ranging subject contexts. Representatives of different subject areas do not cooperate randomly, but within cluster-like subject substructures with clearly defined centres and open areas of exchange with other substructures. In addition to close networking between subject areas within the scientific disciplines, there is a large number of subject areas – in both Graduate Schools and Clusters of Excellence – which form interdisciplinary relationships between scientific disciplines and thus serve as bridge subjects between the major subject cultures.

Graduate Schools and Clusters of Excellence are characterised by a generally wide-ranging spectrum of subject participations, usually across multiple research areas. The two funding lines have their own focusses but a comparable structured arrangement. Local, self-organised interdisciplinarity follows rules which provide a framework for cooperation between subject areas, but this framework is not rigid and also allows room for unconventional cooperations.

6 Appendix

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Federal Ministry of Education and Research (BMBF): Federal Government Report on Research and Innovation 2015, Table 1.1.1.

Federal Statistical Office (DESTATIS): For HEIs, the current basic funds and third-party funding 2003-2012, changes in R&D expenditure 2003-2012, scientific and artistic personnel working full-time, and income of HEIs and non-university research institutions 2012.

German Academic Exchange Service (DAAD): Funding for researchers as well as students and graduates from abroad from 2009 to 2013.

German Federation of Industrial Research Associations (AiF): Funding for Industrial Collective Research (IGF) and the Central Innovation Program for SME Cooperation (ZIM-KOOP) from 2011 to 2013.

Organisation for Economic Co-operation and Development (OECD): Main Science and Technology Indicators 2013/2.

Index of Abbreviations

General Abbreviations

% cumul.	Cumulative percent
bn	Billion
BW	Baden-Württemberg
BY	Bavaria
CH	Switzerland
DE	Germany
EXC	Cluster of Excellence
FP7	EU's 7th Framework Programme for Research and Technological Development
GDP	Gross domestic product
GEPRIS	German Project Information System
GSC	Graduate School
HEI	Higher education institution
incl.	Including
LOM	Performance-based funding allocation
m	Million
MedH	Medical school
NL	The Netherlands
No.	Number
N.U.	Name unknown
PI	Principal investigator
prof.	Professor
PROFI	Project-funding information system of the federal government
R&D	Research and development
res.	Researcher
RG	Research group
ROR	Spatial development region
SA	Subject area
SME	Small and medium-sized enterprises
TU/TH	Technical University
U	University
UK	United Kingdom
USA	United States of America
ZUK	Institutional Strategies

Institutions and Organisations

AvH	Alexander von Humboldt Foundation
BBSR	Federal Institute for Research on Building, Urban Affairs and Spatial Development
BKG	Federal Agency for Cartography and Geodesy
BMBF	Federal Ministry of Education and Research
BMEL	Federal Ministry of Food and Agriculture
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BMVI	Federal Ministry of Transport and Digital Infrastructure
BMWi	Federal Ministry for Economic Affairs and Energy
CNRS	Centre national de la recherche scientifique
DAAD	German Academic Exchange Service
DESTATIS	Federal Statistical Office
DFG	Deutsche Forschungsgemeinschaft (German Research Foundation)
ERC	European Research Council
EU	European Union
FH	University of applied sciences
FhG	Fraunhofer-Gesellschaft
GWK	Joint Science Conference
HGF	Helmholtz Association of National Research Centres
HRK	German Rectors' Conference
INRA	Institut national de la recherche agronomique
INSERM	Institut national de la santé et de la recherche médicale
KMK	Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany
MPG	Max Planck Society
MPI	Max Planck Institute
OECD	Organisation for Economic Co-operation and Development
WGL	Gottfried Wilhelm Leibniz Association of Science
WR	German Council of Science and Humanities

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