DG Research

Monitoring Policy and Research Activities on Science in Society in Europe (MASIS)

National Report, Germany

November 2011

COWI A/S

Parallelvej 2
DK-2800 Kongens Lyngby
Denmark

Tel +45 45 97 22 11
Fax +45 45 97 22 12
www.cowi.com

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Written by

Armin Grunwald

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0 Introduction

The EU recognises the importance of ensuring that European research and research in Member States is firmly rooted in the needs of society, particularly in light of the constantly changing Europe. Efforts to reinforce the societal dimension of research are channelled through the 'Science in society' (SIS) programme. The SIS programme supports activities focusing on the governance of the research system, research ethics, public engagement in science, women in science and the promotion of scientific education and science communication.

The Monitoring Policy and Research Activities on Science in Society in Europe (MASIS) initiative is a major undertaking under the SIS programme. Its aim is to map, steer and monitor the SIS landscape in the European Research Area (ERA) (http://ec.europa.eu/research/era/index_en.htm), in order for EU citizens and society to benefit the most from SIS efforts. MASIS also covers the eleven Associated Countries.

The national MASIS reports are cornerstones in this endeavour, as they contain the knowledge gathered by a network of national correspondents on SIS. The reports will be updated every six months. The reporting format was developed on the basis of advice from the network of national correspondents, as well as discussions with authors of the initial MASIS report (see this LINK, ftp://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf). In addition, the Commission and a network of national validators offered comments and advice.

In total, 38 national reports covering 38 (EU and associated) countries have been produced. This is the report on Germany. It consists of four main sections:

1. National context
2. Priority setting, governance and use of science in policy-making
3. Research related to SIS
4. Activities related to SIS
5. The Fukushima accident.

The intention of this report is to provide a good general overview of the SIS situation in Germany, including public engagement in science, different models and use of scientific advice and expertise for policy-making, activities related to assessment and ethical issues of science and technology, SIS research activities and scientific culture as well as trends, policies, actors and activities. The last

chapter on the Fukushima accident was added later to the original report and contains information on the national coverage and the role of scientific advice in connection with the accident.

Please note, in accordance with the terms of reference for the MASIS project, that the issue of ‘women in science’ is **not included** in the mapping as this has been extensively mapped and reported in other European projects. Please note also that the present report follows the initial MASIS report in using the term ‘science’ in its broadest sense, as in the German ‘Wissenschaft’, covering also the social, economic and human sciences. A few subsections are concerned only with the natural sciences, and in these cases it is explicitly indicated.

Statistical data sheet, Germany

	2000	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*EU27 average/total, 2008*
Research and development								
Gross domestic expenditure on R&D (GERD), in % of GDP[1]	2,45	2,49	2,53	2,53	2,63	-	-	1,89
GERD by source of funds, % of total GERD[1]:								
- Business enterprise sector	66,0	67,6	68,2	67,9	-	-	-	55,0
- Government sector	31,4	28,4	27,7	27,7	-	-	-	33,5
- Higher education sector	-	-	-	-	-	-	-	0,9
- Private non-profit sector	0,4	0,3	0,4	0,4	-	-	-	1,6
- Abroad	2,1	3,7	3,8	4,0	-	-	-	8,9
GPD (million current PPP $)	2132962	2586531	2710222	2853157	2909687	2816116	2885358	15285005
Total researchers (FTE) per thousand labour force	6,5	6,6	6,8	7,0	7,2	-	-	6,3
Total researchers (FTE) per thousand total employment	6,6	7,0	7,2	7,3	7,5	-	-	6,6
Gross Domestic Expenditure on R&D -- GERD (million current PPP $)	52348,3	64298,8	68515,1	72241,9	76796,9	-	-	276734,4
Public R&D expenditures (% of GDP)	0,73	0,76	0,76	0,76	0,76*	0,76*	-	0,66*
Business R&D expenditures (% of GDP)	1,73	1,72	1,77	1,77	1,77*	1,77*	-	1,16*
Number of R&D personnel[1], % 1000	12,4	12,2	12,5	12,7	-	-	-	
Number of R&D personnel by sector of performance[1], % of total R&D personnel:	484.734	475.278	487.935	506.450	517.000	-	-	2.455.192

	2000	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*EU27 average/total, 2008*
- Business enterprise sector	64%	64%	64%	64%	63%	-	-	52%
- Government sector	15%	16%	16%	16%	16%	-	-	14%
- Higher education sector	21%	20%	20%	21%	21%	-	-	33%
- Private non-profit sector	-	-	-	-	-	-	-	1%
Innovation indicators								
- S&E and SSH graduates per 1000 population aged 20-29	-	20,3	25,9	33,1*	42,2*	-	-	41,5*
- S&E and SSH doctorate graduates per 1000 population aged 25-34	1,32	1,57	1,56	1,55*	1,54*	-	-	1,26*
- Public-private co-publications per million population	-	50,1	41,8	-	-	-	-	-
- SMEs introducing product or process innovations (% of SMEs)	-	53,6**	52,8	52,0*	51,3*	-	-	32,0*
- Employment in medium-high & high-tech manufacturing (% of workforce)	11,19	10,40	10,72	10,72	10,72*	10,72*	-	6,78*
- Employment in knowledge-intensive services (% of workforce)	13,58	15,01	15,43	15,58	15,73*	15,88*	-	14,80*
Patents								
Patent applications to the EPO, total[2]	22021	23387	24078	24432	-	-	-	
Patent grants at the USPTO, total[2]	17715	20664	22369	23608	-	-	-	
Triadic patent families, total[2]	6079	6270	6224	6283	-	-	-	
Patent applications filed under the PCT, total[2]								

	2000	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*EU27 average/total, 2008*
Human resources in science and technology								
Total, % of labour force[1]	15	16	16	16	17	-	-	16
- Scientists and engineers, % of labour force[1]	-	6,3	-	-	-	-	-	-
Networks and projects								
National share of FP6 SiS budget	-	17%	21%	14%	-	-	-	-
No. of FP6 SiS projects managed in Germany	-	38	51	10	-	-	-	-
National share of FP7 SiS budget	-	-	-	7%	14%	57%	-	-
No. of FP7 SiS projects managed in Germany	-	-	-	2	23	26	-	-
Tertiary/higher education								
Students at ISCED levels 5-6 enrolled in the following fields: science, mathematics, computing, engineering, manufacturing, construction - as % of all students[1]	28,6	30,7	31,0	30,8	-	-		24,9[4]
Academic staff (ISCED 5-6), total in full time unit[1]								
Public Understanding of Science (only 2005 og 2010 data) se pdf dokumenterne								
% of population very interested in new scientific discoveries and technological developments	-	38	-	-	-		32	

	2000	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*EU27 average/total, 2008*
% of population very well informed about new scientific discoveries and technological developments		11	-	-	-	-	10	
% op population regularly or occasionally attend public meetings or debates about science and technology	-	13	-	-	-	-	10	
% op population regularly or occasionally sign petitions or join street demonstrations on matters of nuclear power, biotechnology or the environment	-	16	-	-	-	-	16	
% of population 'agree' and % of population 'disagree' that thanks to science and technology, there will be more opportunities for future generations	-	77/7	-	-	-	-	80/7	
% of population 'agree' and % of population 'disagree' that science makes our ways of life change too fast	-	53/28	-	-	-	-	46/30	
% of population 'agree' and % of population 'disagree' that we depend too much on science and not enough on faith	-	40/34	-	-	-	-	39/38	
% of population 'agree' and % of population 'disagree' that because of their knowledge, scientists have a power that makes them dangerous	-	70/15	-	-	-	-	65/19	

	2000	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*EU27 average/total, 2008*
% of population 'agree' and % of population 'disagree' that in my daily life, it is not important to know about science	-	35/50	-	-	-	-	32/51	

Notes: 1) Data from EUROSTAT, 2) Data from the OECD, 3) Data from EuroBarometer 73.1 (2010) and EB 63.1 (2005) 4) Data from 2007

*: extrapolation of data

**: imputed data

1 National context

This section sets the scene and describes political developments, public debates and policy initiatives of major relevance to the place of science in society in Germany.

Germany, with nearly 82 million inhabitants, has the largest population of all EU member states. Germany is a federal, parliamentary, representative democratic republic consisting of sixteen states (Bundesländer or Länder) where responsibilities are divided between the federal and state level. Following the organising principle of subsidiarity and regulated by the Grundgesetz (German constitution), education policy including the school and university system is one of the competencies of the German states, whereas education beyond the school system, the scientific system outside of universities, and issues of European or international cooperation in education and science are competencies of the BMBF. Similarly, many other areas related to priority setting in science and technology (e.g. food safety, public health, energy, and data privacy) have different competencies allocated at the federal and at the state level.

The German research system is divided into the following pillars with differing missions and different funding schemes:

- the system of universities and Fachhochschulen (universities of applied sciences) (funded by the states, see above), aiming at research and education;[1]
- the Helmholtz Association of German Research Centres[2] (90% federal funding, 10% from the states), dedicated to addressing grand societal challenges on political request (16 centres);
- the Leibnitz Society[3] (50% federal and 50% state funding) with 86 thematically highly diverse institutes influential in specialised areas;
- the Max Planck Society[4] (50% federal and 50% state funding), aiming at excellent basic science research in natural sciences and social sciences (80 institutes);

[1] http://www.ger-net.de/kuehn/fk_uni.htm
[2] www.helmholtz.de/
[3] http://www.wgl.de/

- the Fraunhofer Society[5] (federal funding with the obligation to a high share of additional funding from industry), dedicated to applied research in close cooperation with partners from industry (60 institutes).

The Deutsche Forschungsgemeinschaft (DFG, German Science Foundation) is the major funding agency and an influential actor in Germany. DFG is the self-governing organisation of science and research; therefore usually scientists from all disciplines decide upon funding measures and grants. Its main focus is to select the best research projects by scientists and academics at universities and research institutions on a competitive basis and to finance these projects.

Due to Germany's size and federal structure, a large number of political initiatives, public debates, research projects, and communication activities relevant to Science in Society (SiS) can be found at the federal level and the level of the individual states (Länder). Completely covering all aspects and activities is by far beyond the scope of this report. However, to give the reader an overview of the situation in Germany, this report focuses on examples from the federal level, e.g. the activities of the Bundesministerium für Bildung und Forschung (BMBF, German Federal Ministry of Education and Research), national organisations such as the Helmholtz-Gemeinschaft (Helmholtz Association), and activities of a nationwide scope.

1.1 The place of science in society - current debates

The role(s) of science in society have been discussed in Germany to an increasing extent over the last years. The relevance of science for meeting grand challenges such as demographic change, climate change, health, employment, and ensuring economic competitiveness has become a more and more important issue. Research and education have received much more public and political attention than in earlier times. An indicator of this development is that research and education was the only policy field in which funding at the federal level was not shortened during the economic crisis. In the coalition agreement for the current legislative period, the governing parties agreed to invest €12 billion euros more than previously planned in the key areas of education and research between 2010 and 2013.[6] In addition, the second round of the Exzellenzinitiative (Excellence Initiative – a joint effort of the Federal and State governments) will provide additional funding for research of about 2.7 billion euros/year for German universities until 2017 – which is an increase compared to the first round of 30%. The share of young people going for an academic education is increasing and leads together with other developments to an increasing demand for education places at universities. With the Higher Education Pact, which is to run until 2020, the Federal Government and the Länder want to give an additional 275,000 new university entrants the opportunity to take up their studies.[7] Public funding and political measures as well as media awareness demonstrate

[4] http://www.mpg.de/
[5] http://www.fraunhofer.de/
[6] www.bmbf.de/en/6075.php
[7] http://www.bmbf.de/en/6142.php

that science today has a much more prominent place in German society than before.

One particularly important issue is the field of innovation and competitiveness. Science is regarded as the main driver to enable and provide knowledge and technology for innovation. The growing relevance of this field is a response to changing geo-political and global economic developments, in particular an increasing competition also at the level of high-tech based products and services. Germany's position in Europe and in the world, in particular with respect to economic competitiveness and political reputation, is regarded highly dependent on its performance in science and technology. This holds for education as well because knowledge and human capital are regarded as the main resources of Germany for shaping future development.

With its long tradition and outstanding achievements of individual researchers and engineers today and in the past, science in general, but also issues directly related to technology are receiving extensive media coverage in Germany. The many innovative industries and globally acting enterprises located in Germany, which account for a large share of employment, and several internationally leading trade fairs, where in some cases also latest research is on display, like CeBIT (ICT), Hannover Messe (industry), IAA (automotive) or IFA (consumer electronics), generate considerable public attention in science and technology. The media show increased interest in science and put emphasis on chances as well as on risks of new and emerging science and technology. In the field of nanotechnology, for example, newspapers and TV programmes reported already at early stages of development and contributed considerably to public debate.

Civil society organisations, some with decades of tradition, are closely watching scientific and technological progress in certain fields. They aim, on the one hand, at increasing awareness of potential risks to the individual, to society as a whole, to the environment, and to future generations. On the other, they want to initialise scientific research with stronger emphasis on societal demands. They thus postulate better opportunities for engaging themselves in determining the scientific agenda, in particular concerning science for sustainability, equity, food safety, and privacy. Generally, improved possibilities of participation are an issue in Germany, also in science and technology.

In science itself we can observe a greater awareness of being part of a society with increasing interest in science but also with criticisms and concerns. The trend towards "reflexive science"[8] - with "reflexive" meaning being more aware of impacts of science and technology on society - can be verified by considering the increasing importance of respective interdisciplinary research such as technology assessment and applied ethics. In many BMBF programmes and activities inter- and transdisciplinary research on societal impacts of technical developments is included. Examples are: Forschung für Nachhaltige Entwick-

[8] ftp://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf, Ch. 2.2.3

lungen (FONA, Research for Sustainable Development)[9], Innovations- und Technikanalysen (ITA, Innovation and Technology Analyses)[10], and the innovation partnership Technik für ein selbstbestimmtes Leben (Ambient Assisted Living)[11]. The Deutsche Akademie der Technikwissenschaften (acatech, National Academy of Science and Engineering)[12] appointed philosophers and ethicists as members and involves them in interdisciplinary projects. The Helmholtz-Gemeinschaft as the largest German research organisation in 2010 implemented the programme "Technology, Innovation and Society", which directly addresses issues of science, technology, and society.[13] Technical universities currently put more effort into a better cooperation between engineering R&D and their competencies in social sciences and in the humanities.[14] Also the BMBF is strengthening the role and involvement of social sciences and the humanities in current debate.[15]

There are also trends towards using science in policy making to a larger extent. Committees including scientists give advice to policymakers at all levels, at the federal level in particular to the Government, to ministries and agencies. Frequently, the committees include members coming from different societal groups, with scientists from different disciplines being one of them. Examples are Deutscher Ethikrat (German Ethics Council),[16] Rat für Nachhaltige Entwicklung (Council of Sustainable Development)[17] and Ethikkommission für eine sichere Energieversorgung (Ethics Committee for a Safe Energy Supply) chaired by former UNEP director Prof. Klaus Töpfer.[18] In a nutshell, these committees demonstrate that science is regarded as *Science in Society* not only because scientists give advice to policymakers, but also because scientific experts sit together with representatives from other societal groups in committees and councils providing integrated advice.

In spite of the fact that the uses of science in and for society mostly are thematised with respect to innovation and economic competitiveness, there are also debates warning against narrowing the perspective on Science in Society to an economic one. In particular, voices from social sciences and humanities emphasise that there are much broader uses of Science in Society,[19] and that the

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[9] http://www.fona.de/ and http://www.bmbf.de/en/2559.php: The Programme was announced on 2 February 2010. Until the year 2015, the BMBF will be providing funds of over 2 billion euros for the development of sustainable innovations.

[10] http://www.innovationsundtechnikanalysen.de/ and http://www.bmbf.de/en/1324.php

[11] http://aal-deutschland.de/deutschland/bmbf-vde-innovationspartnerschaft-aal

[12] http://www.acatech.de/

[13] http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/

[14] See as examples: Karlsruhe Institute of Technology, KIT-Schwerpunkt "Mensch und Technik" (Focus "Humans and Technology", http://www.mensch-und-technik.kit.edu/) and Technical University of Berlin, operating the Centre of Technology and Society (http://www.tu-berlin.de/ztg).

[15] http://www.bmbf.de/en/4630.php

[16] http://www.ethikrat.org/

[17] http://www.nachhaltigkeitsrat.de

[18] http://de.wikipedia.org/wiki/Ethikkommission_für_eine_sichere_Energieversorgung

[19] ftp://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf, Ch. 2.3.1

cultural richness and the diverse perspectives of different kinds of sciences and humanities should be exhaustingly integrated in debates on how to approach the future.[20]

However, there are also some controversies and tensions, in particular concerning the impacts of scientific evaluations on Science in Society issues. Evaluations increasingly determine institutional funding and scientific careers, which highlights the relevance of the evaluation criteria. The focus of most evaluation schemes on quantitative and science-internal evaluation criteria (such as the number of ISI publications per researcher) motivated concerns that work at the science/society interfaces could be hindered and that the more traditional self-understanding of an autonomous science could revive. Some observers diagnose a gap between a mere proclamation of the importance of reflective science operating in inter- and transdisciplinary modes on the one hand, and the crude reality in evaluations, on the other.

Debates with respect to Science in Society issues generally involve actors from different fields, such as science, policymakers, funding agencies, the media, the economy, and civil society organisations. Usually they cover a broad spectrum of topics reaching from debates on particular fields of research (e.g. stem cell research, climate change, future energy supply, and nanotechnology) to structural issues such as the MA/BA system of university education, the school system, measures of better integrating children of immigrants, and gender issues. For this report, the following examples have been chosen to give an idea of current debates. With this selection it is not intended to rank these examples in any way over examples not chosen.

Climate change, environment and new energies: Climate change, consequences of global warming to the local environment (e.g. hurricanes and flooding), political actions to reduce the national CO_2 output, and the personal consequences of environmental policies are subject to a continuing debate in public, scientific, and political arenas. While individuals are mostly informed by media, several civil society organisations have entered the public debate with political stakeholders and scientists, building up political pressure concerning renewable energies and environmental and climate protection. In the political arena, individual parties are competing with their strategies to e.g. reduce the national CO_2 footprint, advance new and renewable energies, and align national policies with international ones. Events like the Climate Summit often stimulate the public discussion, as all stakeholders including industry put their individual positions and achievements into the debate. The role of scientists in this discussion is manifold as on the one hand they conduct research to identify the individual reasons for climate change, and on the other they carry out research on possible solutions. Both are in turn publicly discussed, in particular the relations between and the advantages and disadvantages of mitigation, adaptation, and, very recently, climate engineering strategies. After the Fukushima disaster, the energy debate in Germany made a U-turn and now aims at quickly phasing out nuclear power. The importance of Science in Society issues is taken serious in looking at the future infrastructure of energy supply, in particular because

[20] http://www.wissenschaftsrat.de/download/archiv/7068-06.pdf

there will be an increasing relevance of user behaviour, of participation needs, and of acceptance issues.

ICT, data security and data privacy: The continuing increase of Internet and mobile phone usage in all parts of daily life and by a very large - and still growing - part of Germany's population leads to a continuing and multifaceted public debate of ICT in general. It covers issues related to basic technical infrastructures, like nation-wide broad-band access as a location factor or possible risks of mobile phone radiation,[21] but also cyber crime, privacy and data security have been put onto the agenda rather frequently for several years. There are, on the one hand, threats by criminals (e.g. theft of personal identification information, credit card numbers and account data) fuelling the public debate about security of ICT in the (home)banking sector. Particular attention raised the theft of personal data of millions of customers of large companies such as SONY and TELECOM. On the other hand, also technical counter measures taken by law enforcement authorities, examples of companies collecting and selling personal data, potential security issues involved with biometric information stored on passports, personal mobility information collected by surveillance cameras and telecom companies, and privacy issues related to social networks are discussed. Citizens are regularly informed about the prospects of new scientific results and products in the ICT sector and of political or administrative initiatives related to ICT (e.g. changes to privacy laws or new means of e-Government, like the introduction of a new official passport or an electronic identity card to be used with medical services). Civil society organisations and public and federal research institutes specialised in ICT and security issues are participating in the public discussion, often raising awareness or providing scientific insight to the public.

Food safety, public health: Fostered by a number of initiatives raising awareness for a healthy lifestyle and nutrition and a reduction of health risks, as well as a result of challenges to public health by pandemics issues related to different aspects of food safety have been covered in public debates intensely during recent years. This includes debates on policies and systems for quality control (e.g. circulation of spoilt food), epidemic animal diseases with risks to human health (e.g. mad cow disease), and harmful ingredients or poisonous substances in food. The debates mostly take place in the public arena, where citizens are informed about risks, countermeasures, and political initiatives. In cases where food safety issues are caused by mass production, civil society organisations (e.g. environmental or consumer organisations) are trying to set the agenda and mobilise consumers to put public pressure on political stakeholders and industry. Here, scientists and experts generally play an advisory role. Debates in the political arena are sometimes also caused when national policies are adapted to EU policies, e.g. with critical values of harmful substances or regulations concerning genetically modified food. In such debates, the role of science is twofold: On one hand there is a scientific interest in carrying out research (publicly or privately funded), and on the other there is a need for scientific risk assessment which places the debates in the scientific and public arenas at the same time. Similar debates took place on threats to (public) health, like pandemics

[21] http://www.izmf.de/

(swine flu, avian influenza etc.) or AIDS. The very recent EHEC virus (which occurred mainly in Germany due to imports from Egypt, cp. http://www.rki.de/EN/Home/homepage__node.html?__nnn=true) showed that information gathering and risk assessment procedures need improvement for better and faster being able to inform the public. Health research has become an increasingly important field also in other respect. Six new centres for health research have been founded.[22]

Demographic change: The German population underlies - as many other European and Asian populations do – a continuous process of demographic change consisting of ageing and migration. Low fertility, in particular among well-educated parts of the population, in combination with increasing average lifespan leads to an ageing population with chances as well as challenges. Science and technology are expected to contribute to constructively dealing with the challenges, in particular with respect to health care.[23] Many activities have been started in the framework of Ambient Assisted Living (AAL), addressing mainly new technologies for the assistance of elderly people but also including accompanying research on ethical, social, and legal issues.[24]

Scientific experts and public participation: The role of scientific experts in public debates changed over the last years. It became clear that in spite of the fact that scientific experts are required to give answers to urgent questions, experts have specific views and perspectives on a particular field which have to be complemented by perspectives of other players. The debate following the Fukushima disaster may serve as an example. Public perception of this event and its consequences was formed by expert opinions but also by many other sources and perspectives such as people concerned in Japan, stakeholders, and representatives of NGOs. Another example of the limits of expertocracy is the Stuttgart21 story[25] which tells about the necessity of more public consultation and even participation in case of establishing large new infrastructures. In general, today there is a widely shared consensus in Germany that more and more open participation is required in order to meet future challenges and democratic requests.

Knowledge society and workforce – in general: The dependency of the German industry on a skilled workforce and on science-based innovation to compensate for Germany's lack of natural resources gives rise to a continuing debate on how the education system and specifically the scientific sector can be advanced and innovation be fostered. Additional requirements of adjustments

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[22] http://www.gesundheitsforschung-bmbf.de/de/2557.php

[23] As an example: the Helmholtz Association founded a new Centre to deal with degenerative diseases such as Alzheimer (Deutsches Zentrum für neurodegenerative Erkrankungen, http://www.dzne.de/

[24] http://aal-deutschland.de/deutschland/bmbf-vde-innovationspartnerschaft-aal

[25] The Stuttgart main station which is a dead-end station shall, according to plans of Deutsche Bahn and the local and regional governments, be replaced by a new two-way and underground station. As soon as the destruction of the old station started massive public protest emerged which led to the necessity of a widely perceived mediation procedure. Cp. http://de.wikipedia.org/wiki/Stuttgart_21

of the education system stem from the emerging knowledge society leading to more and more knowledge-based business models and value-added chains, and requiring an adequately educated workforce (knowledge workers). The federal government and the Länder have responded to these challenges by starting the Higher Education Pact 2020 and the Quality of Teaching Pact.[26] At the same time, assessment of the quality of teaching and research at universities and research institutes is being discussed at the national and international level. The debates mostly take place in the scientific and political arenas, but the public is informed by media. In addition, the debate about well-educated workforce to meet future challenges including demographic change also includes issues such as a pro-active immigration policy, improving access of children of migrants to secondary school and academic education, and gender (see below).

Knowledge society and workforce: further improvement of the school system: Recognising an efficient school system which assists children's individual skills and prepares them for a successful career is a key issue for Germany's society. Parents, educators, politicians, and scientists have been leading a public discussion for years on how the German school system can be further improved. While considerable efforts have been undertaken in the past to introduce especially mathematics and natural sciences but also language skills very early in schools and to stimulate children's interest in science in general, the results of German school children in the OECD Programme for International Student Assessment (PISA) in 2001 intensified an already ongoing debate and coined the word "PISA-Schock"(PISA shock). In the following public debate (which still carries on), two main arguments can be identified: (1) about the reasons for the results (which also included the analysis of the differences between German states) and (2) about suitable actions to be taken. The debate led to a number of initiatives for new teaching methods, to intensified support for certain milieus of children in order to give all children equal access to education, and to continued efforts to attract children very early to science in general. In particular, children of immigrants require specific attention because of cultural differences and the need for better integration. Still there is an ongoing and controversial debate on necessary changes to the German school system in general, like reducing the overall duration of schooling (before university) from 13 to 12 years, reorganising the different types of school or harmonising the school systems of the German states.

Knowledge society and workforce: gender issues: In many scientific disciplines the share of female students has considerably increased, also in some natural sciences such as biology. A lot of activities have taken place in Germany to further increase the interest of female students in other MINT disciplines.[27] The effect in classical engineering sciences, however, was low, up to now. The situation at the level of full professors constitutes a permanent challenge. Often the share of female full professors is still considerably lower than the share of female students in the respective disciplines. Many activities are at place which shall further improve the chances for women to get higher posi-

[26] http://www.bmbf.de/en/6142.php and http://www.bmbf.de/en/6075.php
[27] http://www.bmbf.de/de/12563.php

tions in the science system[28], including better child care and the improvement of opportunities to return to a research position after vacancies due to child care.

Summarising the general impression of the "place of science in society" we can conclude that science moved from a subsystem located more at the boundary of societal awareness much closer to its centre. While in earlier times science was more or less regarded as an autonomous system, nowadays the focus is on science *in* society in a twofold way. On the one hand, expectations of society (politics, media, the public, economy, etc.) in science are raised, in particular concerning issues such as health, ageing society, and sustainable development, while, on the other, society is more aware of the fact that scientific and technological developments can and will have dramatic impacts on society - positive, but possibly also negative ones.

1.2 Policy goals and priorities

The importance of science and innovation for the German society is reflected by the fact that investments in the science and education system have grown during recent years and are continuing to do so, despite the economic crisis[29]. Ongoing debates include improving the transfer of scientific knowledge to industry, strengthening the position of German universities in the international competition, reforms to the system of higher education (e.g. the Bologna Process), funding and administration of universities (e.g. study fees or granting universities autonomy and maximum freedom of activity and development), the provision of an environment that motivates highly skilled researchers to stay at or return to the German Science System, and attracting high-potential researchers and students from other countries.

Policy goals were defined in the coalition treaty between Christian Democrats (CDU), Christian Social Union of Bavaria (CSU) and Liberal Democrats (FDP) in 2009.[30] These goals form the basis of the work of the present German Government. However, there is some evidence that many of these goals are more or less agreed upon also by other political parties. They place high priority on issues of education and research, particularly aiming to:

- promote sustainable development and contribute to the decade of education for sustainable development of the United Nations;
- strengthen the education system and improve equal chances for all children;
- implement better participation with stakeholders/citizens (e.g. the citizens' dialogue activity, see below) in debates about key technologies of the future;

[28] http://www.bmbf.de/de/494.php
[29] http://www.bmbf.de/daten-portal/bild-17
[30] http://www.cdu.de/doc/pdfc/091026-koalitionsvertrag-cducsu-fdp.pdf

- improve the conditions for quick and efficient knowledge transfer from research to industrial practice.

The coalition treaty shows that high priority[31] is given to issues of science and technology as response to the diagnosis that Germany is strongly dependent on an excellent performance in these fields. It also makes clear that there are high societal expectations regarding science. Research shall ensure the basis for further wealth and competitiveness, for sustainable development, for responding to the challenges of an ageing society and so forth. These expectations and resulting policy goals shall be reached by a set of activities and programmes, from which some examples are presented in the following, and from which some partially have their origins in former Governments.

High-Tech Strategy 2020: With Germany's economy being the world's fourth largest and primarily based on industrial production and services, the role of innovation for the competitiveness of Germany's industry and for its citizens' living standard is of highest importance. Launched in 2006 and amended in 2010, the High-Tech Strategy[32] of the German Government – coordinated by the Bundesministerium für Bildung und Forschung (BMBF, German Federal Ministry for Education and Research) - was the first comprehensive national innovation strategy bringing together all relevant actors involved in the innovation process and thus encouraging the development of new products and innovative services. The goal of the High-Tech Strategy 2020 is to develop so-called lead markets in areas related to key challenges for society where innovation takes place: Health and nutrition, climate change and energy, mobility, security and communication. A special focus is on strengthening collaboration between business and science and to leverage the vast potential of small and medium-sized enterprises (SMEs). As a prominent example, the Spitzencluster-Wettbewerb (Leading Edge Cluster Competition)[33], brings together companies, scientific institutions and policy-makers and provides a unique combination of factors for success ranging from opportunities for teaching and long-term research strategies to technological development with a market focus, favorable conditions for startups and strategic expansion of international collaborations (see also Sec. 2.2).

Results of the first phase of the High-Tech Strategy[34] show an increase of R&D expenditures of the German industry of 19% between 2005 and 2008 and an increase of R&D personnel (researchers and non-scientific laboratory staff) employed in the private sector by 12%[35] between 2004 and 2008. Supported by the High-Tech Strategy, the percentage of GDP spent on research and development reached around 2.8% in 2009, a total of 67 billion Euros.

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[31] The coalition agreement foresees investing 12 billion euros more than previously planned between 2010 and 2013; http://www.bmbf.de/en/6075.php

[32] http://www.hightech-strategie.de/en/350.php

[33] http://www.bmbf.de/en/10726.php

[34] Research and Innovation for Germany. Results and Outlook. http://www.bmbf.de/pub/forschung_und_innovation_fuer_deutschland_en.pdf

[35] Ideas. Innovation. Prosperity. High-Tech Strategy 2020 for Germany. http://www.bmbf.de/pub/hts_2020_en.pdf

Pakt für Forschung und Innovation (Pact for Research and Innovation): To support an environment where basic research and innovation can take place, Germany's research organisations have to be highly efficient and competitive at the international level. To further leverage the potential of research in Germany and provide planning reliability for the research organisations, federal and state (Länder) governments agreed in 2005 to raise the budget for jointly funded research organisations (Helmholtz Association, Max-Planck Society, Leibniz Association, Fraunhofer Association, see Ch. 2) and the German Research Foundation (DFG) as funding organisation by 3% per year up to the year 2010. This Pact for Research and Innovation[36] is also a consequence of the Lisbon Strategy of the Council of the European Union to strengthen research and development in the member countries and make the EU the most competitive and dynamic knowledge-based economy. By joining the Pact for Research and Innovation, research organisations commit themselves to a number of measures which are monitored: benchmarking and quality control; strategic planning and foresight; creating networks, clusters of excellence and national and international cooperation; promotion of young scientists; better access for women to scientific management positions; transfer of research results with spin-of companies. As a competitive element of the Pact for Research and Innovation, the Leibniz Association distributes around one third of the budget increase to projects from its member institutes which have to undergo successful evaluation. The Pact for Research and Innovation has already entered its second phase (2011 - 2015) with an annual budget increase of 5%. Noteworthy additions to the strategic goals of the pact are to establish sustainable partnerships between science and economy, and to create an environment which keeps high potentials within the country.

Supported by the Pact for Research and Innovation, the number of scientific publications as only one indicator for quality and amount of scientific output increased by 18% (from 2005 to 2009)[37] and ranks Germany No. four in a worldwide ranking. All scientific organizations have implemented competitive elements as part of the internal distribution of federal and state funding which led to a refinement of research programs. Joint appointments of professors with universities increased from 606 in 2005 to 778 in 20010. External funding from industry increased from 465 million Euro in 2005 to 578 million Euro in 20010, funding from EU programs in the same timeframe from 236 million Euro to 274 million Euro. The initiative has already led to intensified networking within the scientific sector and to progress in the recruitment of junior researchers. Also the percentage of women in scientific management positions increased in all organizations while further improvement is necessary in many fields.

Exzellenzinitiative (Excellence Initiative): The Excellence Initiative[38] boosts top-level research, creates excellent conditions for young researchers at universities and improves the international visibility of German research. It supports interdisciplinary cooperation and cooperation across institutions and strength-

[36] http://www.pakt-fuer-forschung.de

[37] Pakt für Forschung und Innovation - Monitoring-Bericht 20110. http://www.pakt-fuer-forschung.de/fileadmin/papers/GWK-Heft-123-PFI-Monitoring-Bericht-20110.pdf

[38] http://www.bmbf.de/de/1321.php

ens international networking. The Excellence Initiative started in 2005 as the counterpart to the Pact for Research and Innovation (see above) targeting directly at Germany's universities. It is funded by federal and state governments, managed by Wissenschaftsrat (German Council of Science and Humanities) and Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), and was equipped in its first round with a budget of 1,9 billion Euro until 2011.[39] Despite the financial crisis the Federal Chancellor and the Minister-Presidents of the Länder signed in June 2009 an agreement on the continuation of the Excellence Initiative. The funding volume was increased by 30% to approximately €2.7 billion until 2017. A decision on the new and follow-up applications will be taken by summer 2012.[40] The Excellence Initiative is a competitive instrument with a multi-stage application procedure for a specific set of activities: graduate schools to promote young scientists; clusters of excellence for leading research; institutional strategies to promote top-level research in Germany.

In the two phases of the first round of the Excellence Initiative 85 institutions were selected for funding: "39 Graduate Schools for the training of young, top-flight scientists and researchers; 37 Clusters of Excellence, in which universities, non-university research institutions, and often business and industry work on particularly promising topics of the future; finally, nine so-called Institutional Strategies that universities draw up to advance their development as a whole"[41]. Around 4.200 researchers have been recruited within the program from which around 25% came from abroad (including a large number of German researchers returning to Germany from abroad, which was one of the central goals of science policies during recent years). Currently, the competitive and science-based selection process for the second round is going on. The applications for excellence clusters, graduate schools and future concepts will be evaluated at the beginning of 2012. The Federal and *Länder* Ministers responsible for science are not involved in the decision-making process until the Approvals Committee phase. Funding of the successful applicants shall start to the end of 2012.

The Excellence Initiative was and is a major step towards a more dynamic research and university system. The first round resulted in many new activities, in particular in improved interdisciplinary cooperation in many fields. Even many of the proposed activities which were not considered eligible for funding by the Excellence Initiative led to new activities, cooperation and projects, partially funded by other sources. In particular, some of the German Länder (states) installed own excellence programmes (such as the LOEWE programme in Hesse[42]).

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[39] http://www.gwk-bonn.de/fileadmin/Papers/exzellenzvereinbarung.pdf
[40] http://www.bmbf.de/pubRD/exzellenzvereinbarung_zwei.pdf
[41] http://www.dfg.de/download/pdf/dfg_im_profil/geschaeftsstelle/publikationen/exin_broschuere_0809_en.pdf
[42] http://www.hessen.de/irj/HMWK_Internet?uid=fa560c0b-ed11-9311-1010-43bf5aa60dfa

1.3 National challenges, opportunities and trajectories

As an implication of Germany's federal system and the complex landscape of research organisations, a variety of aspects related to Science in Society, like political initiatives, research projects, communication activities, and public debates can be found at all federal levels and with different characteristics concerning political responsibilities (state vs. federal) or regional scope (local vs. state vs. national). This multi-faceted structure of actors and activities related to Science in Society aspects is reflected by the media in Germany, which also operate at a nationwide, regional or local level. This holds true for newspapers, radio and TV alike and ensures a broad coverage of issues where, of course, local, regional and nationwide media cover individual issues in varying intensity and reflect and stimulate public debates differently.

The complexity of the many interfaces between state and federal level as well as between the different research organisations frequently leads to debates about efficiency, transparency, and synergy. Responding to earlier criticisms of too little cooperation between universities and non-university research institutions, in particular put forward by the Wissenschaftsrat (German Council of Science and Humanities), ongoing activities are aimed at cross-institutional cooperation. Following a recommendation of the Wissenschaftsrat from the 1990s, directorships of non-university research institutions and departments are usually combined with a professorship at a neighboured university. This model ensures that universities and research institutions enter into close cooperation; students and young researchers can also profit from these constellations.

For a few years, there have been lots of activities which go far beyond institutional borders. Universities and research institutes (Helmholtz, Fraunhofer, Leibniz and Max Planck institutes) increasingly cooperate and form local and regional clusters of research. An example which received high attention in politics and in the media is the Karlsruher Institut für Technologie (KIT, Karlsruhe Institute of Technology)[43] which was founded as a merger between the former Karlsruhe Technical University and the former Research Centre Karlsruhe which was a member of the Helmholtz Association. Similar but not that far-reaching crossings of former borders can be observed also at other places, e.g. in the case of the Jülich Aachen Research Area JARA[44], constituted by Aachen Technical University and Research Centre Jülich which is a member of the Helmholtz Association.

[43] http://www.kit.edu/

[44] http://www.jara.org/

2 Priority setting, governance and use of science in policy-making

This section focuses on the different actors involved in shaping the relationship between science and society and the processes for governing science at national level. This includes government initiatives, institutions and organizations as well as public involvement and policy-making processes at all levels related to science and technology.

Different themes will be elaborated in the German context, including ethics in science and technology, equality, diversity and inclusiveness in scientific institutions, and ethnic or social minority groups in scientific contexts and careers. Moreover, this section will highlight actors in science communication and technology assessment. Public involvement in science and technology decision-making as well as the use of science in policy-making at the national level will be covered in this section.

2.1 Public engagement in priority setting

Because of its tradition as representative democracy and because of its magnitude, Germany is less experienced with public engagement and priority setting compared to some other European countries. However, the situation has been changing for some years. Formalised procedures have been established, opening up more possibilities for means of direct democracy, mostly at the local and regional level, and partially making use of the Internet (see 2.1.1). In the field of science and research, there are ongoing activities of the Bundesministerium für Bildung und Forschung (BMBF, German Federal Ministry of Education and Research) based on earlier experiences of involving citizens in priority setting in research policy. The German FUTUR process of a few years ago belongs to these steps towards more and informal participation. Currently, citizen dialogues are set up according to the coalition treaty (see 2.1.4).

2.1.1 Formalised procedures for citizen involvement

The German constitution (Deutsches Grundgesetz) provides, besides participation in elections at the federal and state (Länder) level, only a limited set of instruments of direct democracy to German citizens. One of them is the means of

petitions to the Petition Committee (Petitionsausschuss[45]) of the German Federal Parliament (Deutscher Bundestag[46]), a right covered by Article 17 of the German constitution.

Petitions can be submitted online[47] or in printed form as an individual petition (submitted by a single person) or a public petition (to be signed by supporters) and may contain an appeal concerning federal laws or a complaint about a federal agency. Though successful petitions have no binding power to the parliament, 18,861 petitions have been submitted in 2009 with several petitions dealing with S&T priority setting or education policy, e.g. guaranty for a university place in a master course for bachelor students (42,720 supporters), or further limitation of embryonic stem cell research (1,714 supporters).

Since 2005, referendums can be initiated by citizens (Bürgerentscheid and Bürgerbegehren are two different forms of referendums initiated by citizens) or local parliaments (Ratsbegehren) in all German states. These referendums are meant to either directly involve citizens into local decisions or to put issues relevant to citizens on the political agenda. As a means of addressing current and local issues (e.g. technology assessment, city and traffic planning), referendums facilitate local parliaments and citizens alike to influence priority setting. Currently, referendums are taking place in 13,153 cities and municipalities. From 1956 to 2010, 5,395 Bürgerbegehren were initiated in 3,051 cities and municipalities and 2,538 Bürgerentscheide were conducted in 1,731 cities and municipalities.[48]

Participation is an essential element in projects for new infrastructures such as highways, railway connections, urban planning, and other major public planning issues. In the framework of Planfeststellungsverfahren (regulated planning procedures),[49] citizens can intervene, can request more information, and can take legal measures.

To better involve citizens in the discussion about themes and projects at the political and administrative level, the Bundesministerium des Inneren (German Federal Ministry of the Interior) established the e-Konsultation[50] portal in 2008, which since then has been used for five public discussions and consultations related to using the Internet for e-governance, secure private communication, and German Internet policy[51].

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[45] http://www.bundestag.de/bundestag/ausschuesse17/a02/index.jsp
[46] http://www.bundestag.de
[47] https://epetitionen.bundestag.de/index.php?action=petition
[48] http://www.datenbank-buergerbegehren.de
[49] http://www.stadtentwicklung.berlin.de/verkehr/politik_planung/planfeststellungen/
[50] http://e-konsultation.de
[51] http://www.e-konsultation.de/netzpolitik

2.1.2 Citizen- or CSO-initiated activities with political impact

In Germany, citizens and civil society organisations have a long tradition in bringing issues related to science and technology to the political agenda. A prominent example are Ostermärsche (Aldermaston marches), starting in Germany in the early 1960s and organised by peace activists to mobilise society against nuclear armament. From the 1970s on and later fuelled by the nuclear accidents in Harrisburg and Tschernobyl, citizens and civil society organisations (environmental organisations) raised awareness for the dangers of nuclear energies. They were successful in stopping the construction of nuclear plants in some locations (e.g. in Wyhl) as well as the construction of the planned German facility for recycling nuclear waste (Wackersdorf) (though there were also legal problems which stopped the project). They also contributed considerably to lowering the acceptance of nuclear power in larger parts of the population.

The environmental movement, reaching back to the 1980s, organised itself in several local and regional civil society organisations, with the Bund für Naturschutz Deutschland (BUND, Friends of the Earth Germany)[52] being the largest one. The environmental movement succeeded in influencing planning processes by many interventions, partially by public actions and demonstrations, partially by legal intervention, and also by political engagement. The fact that Germany is among the leading countries in researching and using renewable energies has by sure something to do with this early continuous and still ongoing engagement. However, a lot of other developments contributed strongly to the German position in this field, such as intensive research in renewable energies and politically installed incentive systems.

There was particular public resistance by the affected population but also by many other people in the context of nuclear waste disposal. The name of the site Gorleben, which was planned to become the national final disposal site for high-level radioactive waste, became a synonym for a specific culture of resistance against political decisions even if they were democratically legitimised by majority decisions. Transports of nuclear waste to Gorleben usually are only possible with thousands of policepersons. Currently, however, a new situation emerges because of the phase-out of nuclear energy in Germany. It seems possible that a new and more participatory approach will be taken in order to decide about the location of a nuclear waste disposal site.

Large-scale projects, in particular on new infrastructures, frequently lead to CSO and citizen engagement. The most recent example is the Stuttgart21 case. The plan to build a new main railway station in Stuttgart underground was debated for years by the local and regional authorities. However, citizens protest started no earlier than at the moment when the destruction of the old main station began and trees in a park were cut. The protest became so massive that a mediation procedure was started and successfully finished. The new state government (green-red coalition with the first German prime minister of the Green Party) will organise a plebiscite on the further development. This case - which

[52] http://www.bund.net/

caught many people by surprise - raised the postulate for more and earlier participation in case of large-scale projects.

2.1.3 Importance of upstream engagement

Citizens and civil society organisations, political parties and churches are promoting upstream engagement. The Wegweiser Bürgergesellschaft[53] (Guide to Civil Society Germany), initiated by the Bundesnetzwerk Bürgerschaftliches Engagement (National Network for Civil Society), is just one example of a national portal promoting civic involvement. The Bundesnetzwerk Bürgerschaftliches Engagement currently has 190 member organisations from the third sector, civil society and industry along with federal and community institutions.

With the first Konsensuskonferenz (Consensus Conference) on genetic diagnostics, organised in 2001 by Deutsches Hygiene-Museum Dresden[54] (German Hygiene Museum) and funded by the BMBF, a platform was initiated which allows citizens to participate in a very early stage of (science) policy making - before actual research or development is carried out. This kind of upstream engagement is currently organised at the national level by the Wissenschaft im Dialog[55] (Science in Dialogue, see Sec. 4.4.4 for details) initiative as Konsensuskonferenzen[56] and Bürgerkonferenzen[57] (Citizens Conferences). Other projects under the initiative's pillar "Wissenschaft debatieren" (Debating Science) are Schülerforum[58] (Student Forum), Schülerparlament[59] (Student Parliament), and Bürgerausstellung[60] (Citizens Exhibition), all of which are aimed at raising awareness for the role of science to society and the individual, and motivating people to form an opinion and actively get involved into the political processes.

The BMBF funding programme on Innovations- und Technikanalysen (ITA, Innovation and Technology Analyses)[61] also performs upstream engagement and considers technological developments during their early phases, with the aim of identifying their potential opportunities and the areas in which relevant research policy should operate. Innovation and technology analyses scrutinise arguments for the design of specific technological developments, aimed at identifying areas of socially desirable technological progress, highlighting the potential for influencing such progress and outlining frameworks for relevant political action. ITA projects frequently provide for user and citizen involvement. Orientation shall be provided which should help to promote technology that is in keeping with human and social needs and environmentally compatible.

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[53] http://www.buergergesellschaft.de
[54] http://www.dhmd.de
[55] http://www.wissenschaft-im-dialog.de
[56] http://www.wissenschaft-debattieren.de/konsensuskonferenz.html
[57] http://www.wissenschaft-debattieren.de/buergerkonferenz.html
[58] http://www.wissenschaft-debattieren.de/schuelerforum.html
[59] http://www.wissenschaft-debattieren.de/schuelerparlament.html
[60] http://www.wissenschaft-debattieren.de/buergerausstellung.html
[61] http://www.bmbf.de/en/1324.php

In the field of nanotechnology, many activities were implemented in a very early stage of development. Following the "acceptance crisis" of nanotechnology - or, at least, the fear of a possible acceptance crisis - at the beginning of the century, the nanodialogue of the NanoKommission was established.[62] Recently, the final report of the commission was published.[63] Participatory events including consumers and young people were organised. These activities, mainly funded by the BMBF, were accompanied by studies on toxicological risks of nanoparticles and on strategies and procedures in risk research, risk assessment and management.

Involving citizens in research policy priority setting

Technology foresight and observation play an important role for a growing number of countries which do not want to fall behind in the international technology race and lose their ability to compete internationally. In particular, priority setting for research policy is an important objective of foresight processes. Foresight activities are generally organised to a greater or lesser extent as a process involving scientists and experts from industry and the administration, but also representatives of other societal groups.

The BMBF began to introduce foresight processes to be better able to plan strategic programmes. First activities such as "Technology at the Beginning of the 21st Century" (1991-1992) and the first German Delphi Study on the development of science and technology (1992-1993) were expert-oriented. However, with its "Futur" research dialogue (2001-2005), the BMBF conducted a foresight process with special emphasis on participative aspects and in cooperation with a large group of stakeholders from all areas of society.[64]

The BMBF's ITA (Innovation and Technology Analyses) concept (see Sec. 1.2) seeks to identify fields of socially accepted technological progress, illustrate potential, identify political scope, and develop options for research and innovation. In doing this, ITA also includes participatory measures in order to involve citizens and stakeholders in determining priorities of research policy and contributing to shaping science and technology.

In the coalition treaty of the current governing parties it was agreed that Bürgerdialoge (citizen dialogues)[65] shall be conducted on different themes of science and technology. According to the Fukushima disaster and its consequences for German energy policy, the first Bürgerdialog is dealing with energy technologies of the future. The BMBF is particularly interested in getting orientation on what citizens think future energy technologies and infrastructures should look like, where acceptance problems might occur, and what could be done to overcome them. The process will end up with a citizens report handed

[62] http://www.bmu.de/chemikalien/nanotechnologie/nanodialog/doc/37262.php
[63] http://www.bmu.de/files/pdfs/allgemein/application/pdf/nano_schlussbericht_2011_bf.pdf
[64] http://www.bmbf.de/de/6502.php
[65] http://www.bmbf.de/de/15609.php

over to the ministry, including recommendations and citizens' conclusions. There will be a series of such Bürgerdialoge over the next years.

2.2 Public - private interaction

Germany's economy is the world's fourth largest and is primarily based on industrial production (approx. 25% of all persons employed) and services (approx. 70% of all persons employed[66]). Therefore, the role of innovation for future competitiveness must not be underestimated. According to the "Innovation Union Scoreboard 2010"[67], Germany is "one of the innovation leaders [...]. Relative strengths are in Intellectual assets, Innovators and Outputs." The report indicates a growth in public R&D expenditures by 4.3% in comparison to 2009, a growth of innovative small to medium-sized enterprises collaborating with others by 1%, and an increase of public-private scientific co-publications by 2.7%. Since 2000, spending for R&D in Germany has grown by 21% to over 78 billion euros in 2007 - the largest budget of all European countries - of which 56% were covered by the private and 44% by the public sector. With an estimated R&D expenditure of around 2.6% of the GDP in 2008, Germany ranks in the top five of European countries.[68]

At the national level, the High-Tech Strategy (see ch. 1.2) is complemented by the Forschungsunion Wirtschaft – Wissenschaft[69] (Research Union Industry - Science), an advisory board of 25 outstanding representatives from science and industry. Several initiatives aim at strengthening public-private partnerships at different levels one of them being Zentrales Innovationsprogramm Mittelstand[70] (ZIM, Central Innovation Programme for SME). Since the start of the programme in 2008, over 12,000 applications with a total budget of 1.5 billion euros were granted (which makes the programme the most successful of the previous 30 years), and the number of projects between SMEs and research organisations tripled within two years. A second example is the programme Validierung des Innovationspotenzials wissenschaftlicher Forschung[71] (VIP, Validating the Innovative Potential of Scientific Research), which started in 2010, allows researchers to apply for projects that prove the technical viability and the market potential of their ideas. A further example are the so called Innovationsallianzen[72] (Innovation Alliances), of which seven started in 2007 and three more in 2008, are means to support strategic alliances between companies and research institutes focusing on a specific application area and following a funding scheme where every euro spent on public R&D is supplemented by

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[66] http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Grafiken/DienstleistungenFinanzdienstleistungen/Diagramme/ErwerbstaetigeSektor,templateId=renderPrint.psml

[67] http://www.proinno-europe.eu/inno-metrics/page/germany

[68] Bundesbericht Forschung und Innovation 2010 (National Report on Research and Innovation) http://www.bmbf.de/pub/bufi_2010.pdf

[69] http://www.forschungsunion.de

[70] http://www.zim-bmwi.de

[71] http://www.hightech-strategie.de/de/691.php

[72] http://www.hightech-strategie.de/de/693.php

five euros from the private sector partners (the planned funding is 600 million euros, which would mobilise as much as 3 billion euros from private companies).

The Spitzencluster-Wettbewerb (Leading-Edge Cluster Competition, see ch. 1.2) as a further instrument of supporting innovation via public-private partnerships is inspired by local cooperation of multiple actors, like Silicon Valley in Northern California. An example is the large software cluster "Softwareinnovationen für das digitale Unternehmen", which is frequently regarded as Europe's "Silicon Valley". It includes the centres of Darmstadt, Kaiserslautern, Karlsruhe, Saarbrücken, and Walldorf, bringing together multiple and divers competencies in that region.

Also at the level of the 16 German states (Länder), considerable efforts are put into stimulating new interactions and interfaces between universities (and research organisations) and industry: The German states account for around 60% of the total public R&D investment. A complete overview of activities at the state level is far beyond the of scope of this report, but for further information the Bundesbericht Forschung und Innovation 2010[73] (National Report on Research and Innovation) may be consulted (pp. 191-310), which also contains links to the relevant portals at state level.

Private foundations in Germany have increasingly funded research programmes and projects over the last years and constitute a growing field of the promotion of science.[74] Some examples are the Fritz Thyssen Stiftung, VolkswagenStiftung, Bertelsmann Stiftung, and Robert Bosch Stiftung.[75] The Stifterverband für die Deutsche Wissenschaft[76] is the business community's innovation agency for the German science system. About 3,000 companies and firms are members of the Stifterverband. All activities aim at supporting the German science system in structural respect or by directly promoting research on specific fields and issues. The Volkswagen Foundation, for example, focuses on selected funding initiatives grouped into the areas "Persons and Structures", "International Focus" and "Challenges - for Academia and Society". "Science, the Public, and Society" is a special funding offer to support researchers who want to communicate the tasks and results of their research or who want to foster the public understanding of science at large.

2.3 Use of science in policy making

Policy advice to support decision and policy making has been increasingly institutionalised in Germany since the 1960s. Some of the Centres of the Helm-

[73] http://www.bmbf.de/pub/bufi_2010.pdf

[74] It is hard to get a complete overview about the funding volume of private foundations. The Stifterverband für die deutsche Wissenschaft (http://www.stifterverband.de) is funding projects and structures with more than 30 mio. euros per anno.

[75] http://www.fritz-thyssen-stiftung.de/; http://www.volkswagenstiftung.de/ ; http://www.bertelsmann-stiftung.de/cps/rde/xchg/bst ; http://www.bosch-stiftung.de/

[76] http://www.stifterverband.info/

holtz Association established departments of risk research, systems analysis and technology assessment from that time on, followed by some universities. Due to more complex decision-making requirements, the emerging knowledge society, and because of the necessity of looking at possible side-effects of decisions, scientific policy advice is increasingly used in all fields of policy making.

Concerning the relations between science, politics, and the public there has been an ongoing debate since the 1960s on chances of policy advice but also on possible dangers of technocracy. The German philosopher Jürgen Habermas pointed to this situation already in 1963 and proposed a "pragmatic" relation between science, politics, and the public in order to arrive at well-informed and carefully reflected decisions. Main tracks of scientific policy advice, such as technology assessment, can be regarded as approaches to realising this ambitious philosophical approach supposing a much more complex relation between science and politics compared to the simple slogan "truth speaks to power". Recently, the Berlin-Brandenburgische Akademie der Wissenschaften[77] (Berlin-Brandenburg Academy of Sciences and Humanities) conducted a project on quality assurance in scientific policy advice and published respective policy recommendations.[78]

Frequently, these approaches include participatory elements at different levels. Many institutions are involved in scientific policy advice such as research institutes, policy institutes, and scientific academies, like Nationale Akademie der Wissenschaften Leopoldina[79] (German Academy of Sciences Leopoldina, the world's oldest academy involved in natural sciences, founded in 1652), Deutsche Akademie der Technikwissenschaften[80] (acatech, German Academy of Science and Engineering), and eight academies at the level of the German states (Länder), which are organised in the Union der deutschen Akademien der Wissenschaften[81] (Union of the German Academies of Sciences and Humanities).

2.3.1 Formal procedures and advisory bodies involved

Formal procedures and institutionalised mechanisms of scientific policy advice can be found at the levels of (1) the Deutsche Bundestag as the German national parliament, (2) the German Government in general, and (3) individual ministries and their departments.

(1) To make use of scientific knowledge in parliamentary policy making, an Enquete Commission[82] can be established by the votes of one quarter of the

[77] http://www.bbaw.de
[78] http://www.bbaw.de/service/publikationen-bestellen/manifeste-und-leitlinien/BBAW_PolitischeLeitlinien.pdf
[79] http://www.leopoldina.org
[80] http://www.acatech.de
[81] http://www.akademienunion.de
[82] http://www.bundestag.de/bundestag/ausschuesse17/gremien/enquete/index.jsp

members of the German Parliament. These expert commissions are normally established to work on long-term problems for which different social, economic, ethical or legal aspects should be considered above party lines. Examples of Enquete Commissions are "Internet und digitale Gesellschaft" (Internet and digital society; current), "Nachhaltige Energieversorgung" (sustainable energies), and "Recht und Ethik in der Medizin" (law and ethics in modern medicine).

The Office of Technology Assessment at the German Bundestag (Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag, TAB)[83] was founded in 1990 and has become a permanent institution of the German legislature. The purpose of the TAB is to provide contributions to the improvement of the legislature's information basis, in particular, of research- and technology-related processes of parliamentary discussion. Among its responsibilities are, above all, drawing up and carrying out TA projects, and – in order to prepare and to supplement them – observing and analysing important scientific and technical trends, as well as societal developments associated with them (monitoring). The TAB is strictly oriented on the German Bundestag's and its committees' information requirements. The TAB's principal is the Committee for Education, Research, and Technology Assessment. The choice of subjects for TA projects as well as their delimitation and specification is the Bundestag's responsibility while the projects are performed under the requirement of scientific independence. The various requests and topics are treated by obtaining a number of expert opinions from scientific institutions on the respective subject. The results of this groundwork are evaluated by the TAB team, are concentrated on the legislature's advisory requirements, and are summarised in the form of a report to the legislature. The TAB is a member of the European Parliamentary Technology Assessment Network EPTA[84] - the work of Parliamentary Technology Assessment in general was regarded part of an emerging "European Model" of Science in Society.[85]

(2) Specific expert committees have been established to give advice to the Government in different respects. The German Ethics Council[86] operates at the basis of an own law which has been approved by the German Parliament in 2007. Its task is to give advice to the Government in morally relevant questions such as stem cell research, experiments on animals, and nutrition of the world population. The Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU, German Advisory Council on Global Change)[87] gives advice to the Government on global change issues such as climate policy, global biodiversity, and phenomena such as mega-urbanisation and migration. The Sachverständigenrat für Umweltfragen (SRU, German Advisory Council on the Environment)[88] has been working on environmental issues from 1971

[83] http://www.tab-beim-bundestag.de; all reports are free for download, summaries are available in English.
[84] http://www.eptanetwork.org
[85] ftp://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf,, Ch. 7
[86] http://www.ethikrat.org/
[87] http://www.wbgu.de/
[88] http://www.umweltrat.de

on. It submits an Environmental Report to the German federal government every four years. The report describes and assesses environmental policy developments and provides in-depth analyses of selected topics. An ad hoc policy-advising committee was the Ethikkommission für eine sichere Energieversorgung (Ethics Committee for a Safe Energy Supply) appointed by Chancellor Angela Merkel after the Fukushima disaster, bringing scientific expertise and stakeholders together to develop recommendations for energy supply in Germany related with a fast phase-out of nuclear power. The Rat für Nachhaltige Entwicklung (German Council for Sustainable Development)[89] advises the government on policy for sustainable development and, by presenting proposals for targets and indicators, seeks to contribute towards the advancement of the strategy of sustainable development as well as to propose projects designed to realise the strategy. Regarding all these committees and councils it can be concluded that a culture of scientific advice related with stakeholders' views and citizens' perceptions has been evolving in inter- and transdisciplinary committees over the last years.

Furthermore, expert commissions are regularly called upon, e.g. in cases where large research or innovation programmes are planned. Current examples include the Forschungsunion Wirtschaft - Wissenschaft[90] (Research Union Industry - Science) which supports the implementation and further development of the Hightech-Strategie 2020 (see Sec. 1.2), and the Kommission "Zukunft der Informationsinfrastruktur " (KII, Commission "Future Information Infrastructures"),[91] where around 130 persons from 60 organisations (science, politics, publishers, and industry) are working on a concept for future information infrastructures for the sciences in Germany. The Innovationsdialog[92] (Dialogue on Innovation), initiated in September 2010 by the German Chancellor, the Federal Minister of Education and Research, and the Federal Minister of Economics and Technology, with representatives from science and industry is expected to not only give insight into areas of innovation for Germany's industry, but also to identify areas where scientific knowledge will be needed for future political decisions.

(3) Policy making in Germany can draw on a large number of institutes (around 40) which are directly connected to ministries and carry out departmental research (see also Sec. 2.4.4). In addition, some ministries cooperate on a permanent basis with (publicly funded) research institutes. The institutes carry out research and political consulting in a broad range of areas, reaching from health, environmental and food safety, transportation and urban planning to nuclear safety (to name just a few areas where technology is concerned). The Arbeitsgemeinschaft der Ressortforschungseinrichtungen[93] (Working Group of Departmental Research Institutes) serves as a network between these institutes, promoting the specifics of their research and high scientific standards. In addi-

[89] http://www.nachhaltigkeitsrat.de/
[90] http://www.forschungsunion.de
[91] http://www.leibniz-gemeinschaft.de/?nid=infrastr&nidap=&print=0
[92] http://www.bundesregierung.de/Content/DE/Pressemitteilungen/BPA/2010/09/2010-09-13-bkin-innovation.html
[93] http://www.ressortforschung.de

tion, there are several scientific advisory boards and expert committees involved in giving advice to federal ministries and their action and research programmes. Many of these boards also include stakeholders and representatives from societal groups.

2.3.2 Trends at national level

In Germany, a well-established infrastructure of e.g. departmental research institutes, scientific academies and advisory bodies has been in place for decades and is continuously improved. Current trends are (1) an increasing inclusion of reflective research in research programmes and institutions, (2) an increasing effort of academies in providing policy advice, (3) debates on techno-visionary sciences, (4), the evaluation procedures, and (5) increasing awareness of the necessity of participation.

(1) Elements of reflective research have been established in many areas close to policy advice. In particular, research programmes of the BMBF address Science in Society issues. The BMBF programme Innovations- und Technikanalysen (ITA, Innovation and Technology Analyses) considers technological developments during their early phases, with the aims of identifying their potential opportunities and the areas in which relevant research policy should operate as well as bringing together research and industry.[94] Another and more recent example is the programme "Technology, Innovation, and Society" of the Helmholtz Association, addressing manifold interrelations within the triangle mentioned by its title.[95] This triangle is one of the central spheres of activity of modernity. Innovation necessarily needs to rely on scientific-technological progress. However, this progress does not automatically result in successful innovation. The decision as to whether and which technologies provide solutions for societal problems is also related to the systemic interaction of technologies and societal aspects like political or economic framework conditions, social acceptance, or ethical questions. The programme was established to accomplish this task by systematically investigating the various interfaces between technology, innovation and society.

(2) Scientific academies in Germany have diversified their fields of activity over the last years. In addition to the classical mission to perform long-lasting and more background work such as editing historical sources, the field of providing policy advice was discovered by some academies, in particular by Berlin-Brandenburgische Akademie der Wissenschaften (BBAW), Leopoldina, and Deutsche Akademie der Technikwissenschaften (acatech, National Academy of Engineering), which have already been mentioned above. These provide a lot of policy- and society-advising work. In particular, they deal with new and emerging science and technology such as synthetic biology and try to participate in the emerging upstream engagement and analysis.

[94] http://www.bmbf.de/en/1324.php

[95] http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/

(3) In the past decade, a considerable increase in visionary communication on future technologies and their impacts on society could be observed. This was and still is the case especially in the fields of nanotechnology, human enhancement, converging technologies, and climate engineering. Far-reaching visions have been put forward by visionary scientists and by science managers. They were partially disseminated by the mass media and have been discussed in science and in the humanities. Visionary futures such as scenarios, expectations, assumptions about future impacts and reflections on possible future risks are full of uncertainties, ambiguities and controversies in all of these fields. Partially, a revival of future research (e.g. a new professorship on "Zukunftsforschung" [Futures research][96] at the Technical University Aachen) was established as a foundation professorship of the Verein Deutscher Ingenieure (VDI, German Association of Engineers).[97]

(4) Scientific evaluation of institutions, programmes, and projects is an issue at all places of science. Concerning Science in Society and in particular scientific policy advice this has included scientific evaluation of departmental research by the Wissenschaftsrat (German Council of Science and Humanities)[98] since 2004. With the "Konzept einer modernen Ressortforschung"[99] (concept of modern departmental research), issued in 2007 by the German Government and currently implemented, departmental research is further strengthened in areas like scientific excellence, science-based services, and early recognition of upcoming issues. In other fields, evaluations also belong to the routines of science. With respect to scientific policy advice, however, it is still controversial in which way the advisory experience and competence of an institution can and should get a place among the criteria of performance, related with the question of adequate and transparent indicators and benchmarks for this type of research providing knowledge for action.

(5) A large part of scientific policy advice is expert-oriented. However, an increasing part relates itself to participatory issues and gives more attention to users, consumers, and citizens. A very recent example is the new Helmholtz alliance "Future infrastructures for meeting energy demands. Requirements of sustainability and social compatibility", which considers the societal side of the infrastructure of future energy supply and asks for user behaviour, conditions of acceptance, and conflict regulation.

2.4 Key actors

There is a huge and diverse landscape of actors being active at the many interfaces between policy making and scientific advice and support in Germany. In this chapter we will categorise these actors along the - partially overlapping - fields of ethics (2.4.1), equality and inclusiveness (2.4.2), science communication (2.4.3), and technology assessment (2.4.4). Because of the richness and

[96] http://www.futures-studies.rwth-aachen.de/
[97] http://www.vdi.de
[98] http://www.wissenschaftsrat.de
[99] http://www.bmbf.de/pubRD/konzept_ressortforschung.pdf

diversity of the actors it is only possible to mention a few examples (in alphabetical order without any ranking among them).

2.4.1 Ethics in science and technology

Ethical issues of science and technology have become more and more important and subject to political and public debate. In particular, ethical challenges emerged from the fields of biomedicine and the life sciences. The following tables include a selection of relevant actors, including research institutes, political institutions, and CSO initiatives. The first table is dedicated to public actors, the second one to private actors.

Examples of public actors operating on ethics in science and technology

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
Deutscher Ethikrat (German Ethics Council) http://www.ethikrat.org	Ethics councils / committees	Public	The German Ethics Council is composed of twenty-six members specialising in scientific, medical, theological, ethical, social, economic, and legal concerns and is independent from governmental bodies
Deutsche Forschungsgemeinschaft, Senatskommission für Grundsatzfragen der Genforschung (German Research Foundation, DFG, Senat committee on the fundamentals of genetic reserach) http://www.dfg.de/dfg_profil/gremien/senat/grundsatzfragen_genforschung	Ethics councils / committees	Public	The Commission is to provide appraisal and foresight in the field of genetics and genomics. Priority is given to issues of research policy and to developments in genetic research that raise scientific, ethical, legal and social questions.
Deutsche Forschungsgemeinschaft, Senatskommission für Klinische Forschung (German Research Foundation, DFG, Senat committee on clinical reserach) http://www.dfg.de/dfg_profil/gremien	Ethics councils / committees	Public	The Commission deals with all aspects of clinical research and aims at contributing to improving clinical research
Deutsches Referenzzentrum für Ethik in den Biowissenschaften (German Reference Centre for Ethics in the Life Sciences DRZE) http://www.drze.de	University / institute of higher education	Public	The Reference Centre is a national documentation and information centre covering the entire field of ethics in the biomedical sciences in Germany.
Enquete-Kommission (Enquete Commission) http://www.bundestag.de/bundestag/ausschuesse17/gremien/enquete/index.jsp	Ethics councils / committees	Public	Commission to work on long-term problems for which different social, economical, ethical or legal aspects should be considered above party lines. From 2000 to 2005 an Enquete Commission on "Ethics and law for modern medicine".
Europäische Akademie zur Erfor-	Research insti-	Public	The Europäische Akademie carries out re-

schung von Folgen wissenschaftlich-technischer Entwicklungen GmbH http://www.ea-aw.org	tute		search on the consequences of scientific and technological advances for individuals, society and the natural environment.
Internationales Zentrum für Ethik in den Wissenschaften (International Centre for Ethics in the Sciences and Humanities IZEW) http://www.uni-tuebingen.de/en/facilities/international-centre-for-ethics-in-the-sciences-and-humanities.html	University / institute of higher education	Public	The IZEW is an internationally oriented and interdisciplinary research centre at the University of Tübingen that explores ethical problems arising from the sciences and humanities
Institut für Wissenschaft und Ethik (Institute for Science and Ethics, IWE) http://www.iwe.uni-bonn.de	University / institute of higher education	Public	The IWE aims to contribute to an ethical reflection of current developments in medicine, science and technology in order to facilitate a responsible use of the new potentials emerging in these fields of human activity.
Zentrale Ethikkommission bei der Bundesärztekammer (Ethics Council of the German Medical Association) http://www.zentrale-ethikkommission.de	Ethics councils / committees	Public	The Bundesärztekammer (German Medical Association) is the central organisation in the system of medical self-administration in Germany.
Zentrale Ethik-Kommission für Stammzellenforschung (Central Ethics Commission for Stem Cell Research, ZES) http://www.rki.de/cln_007/nn_225658/DE/Content/Gesund/Stammzellen/ZES/zes__node.html__nnn=true	Ethics councils / committees	Public	Ethics commission located at Robert Koch-Institute (RKI), the central federal institution responsible for disease control and prevention.

Examples of private actors operating on ethics in science and technology

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
Arbeitskreis Medizinischer Ethik-Kommissionen in der Bundesrepublik Deutschland http://www.ak-med-ethik-komm.de	Civil society organisation	Private	Working group of medical ethics commissions in Germany
Forum InformatikerInnen für Frieden und gesellschaftliche Verantwortung (Forum Computer Scientists for peace and social responsibility) http://www.fiff.de	Other civil society organisation	Private	The Forum Computer Scientists for peace and social responsibility is an initiative from engaged computer scientists, informatics engineers and software engineers
Gen-ethisches Netzwerk	Other civil soci-	Private	The Network provides information and con-

(Gen-ethical Network, GeN) http://www.gen-ethisches-netzwerk.de	ety organisation		tacts on the issues of gene technology and reproduction medicine. Its task is promoting the critical debate about these technologies.
Greenpeace	CSO	Private	Greenpeace frequently intervenes into public debate and policy-making, for instance by campaigns concerning ecological questions
Forschungsstätte der Evangelischen Studiengemeinschaft Heidelberg e.V. http://www.fest-heidelberg.de/	Research institute	Private	FEST is a research institute supported by the Protestant Church in Germany. It is working on the issues "Religion, Law and Culture", "Peace and Sustainable Development" and "Theology and Natural Science"
Katholische Bischofskonferenz http://www.dbk.de/	Roman-Catholic Church	Private	The Deutsche Bischofskonferenz frequently intervenes into public debate on ethical issues, recently at the occasion of the debate on pre-implantation diagnostics (PID)
Vereinigung Deutscher Wissenschaftler VdW (Federation of German Scientists) http://www.vdw-ev.de/	CSO	Private	VdW addresses issues of science and technology on the one hand, and peace and security policy on the other. Also the role of science itself in genesis and in solution of socio-technological problems is subject of examination and expertise.

2.4.2 Equality, diversity and inclusiveness in scientific institutions and in educational systems

The realisation of more equality, diversity and inclusiveness is on the agenda of almost all scientific and funding institutions in Germany as well as in the field of education. The following table gives a few examples of institutions which have high influence in policy-making and in supporting the implementation of more equality, diversity and inclusiveness in the German Science System:

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research) http://www.bmbf.de	Ministry	Public	The ministry is the main actor responsible for education and research at the federal level. It drives many activities for ensuring equality, diversity and inclusiveness in the German science system
Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) http://www.dfg.de	Funding organisation	Public	The DFG is the central, self-governing research funding organisation in Germany.

Hochschulrektorenkonferenz (Rectors' Conference) HRK http://www.hrk.de	Universities, Fachhochschulen (universities of Applied sciences) and other higher education institutions	Public	HRK is the assembly of university rectors and an important player in taking care about university structures and research policy
Gemeinsame Wissenschaftskonferenz (Joint Science Conference) http://www.gwk-bonn.de	Ministry	Public	Joint conference of federal and state ministries responsible for a balanced relation between federal and state level
Kultusministerkonferenz (Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany) http://www.kmk.org	Ministry	Public	In Germany, responsibility for education (and cultural affairs) lies primarily at the level of the Länder (states) which, in the Standing Conference, coordinate matters of e.g. educational policy at school and university level.
Wissenschaftsrat (German Council of Science and Humanities) http://www.wissenschaftsrat.de	Universities and other higher education institutions	Public	The Wissenschaftsrat provides recommendations for further developing the overall German science system.

2.4.3 Science communication

Science communication is a relatively new field in Germany compared to some other countries. However, it has developed quickly over the last years in terms of activities such as science festivals, TV magazines, interactive exhibitions and children's days at universities as well as in terms of research and education. Learning basic skills of science communication belongs to many university courses in science and engineering and to the curriculum of many graduate and research schools. The high importance of science communication is well-perceived by researchers and scientists. Science parks have been installed, and research organisations and institutes developed a lot of initiatives. Because of the large number of activities only few examples can be mentioned here.

Name of actor and web-link if possible	Type of actor	Sector	Domestic or foreign	Brief supplementary description
Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research) http://www.bmbf.de	Ministry	Public	Domestic	The ministry is the main actor responsible for education and research at the federal level. It drives many activities of science communication, in particular the organisation of specific years (of energy, of health, of the humanities, and so forth)

Informationsdienst Wissenschaft http://idw-online.de	Other civil society organisations	Public	Domestic	Information portal founded in 1995 by several German universities, since 2002 publicly funded
Museums and science centres http://www.museumsbund.de/de/links/national/museumsverzeichnisse	Museums	Mixed	Domestic	Museums and science centres have become major players for science publication.
Example: Deutsches Museum http://www.deutsches-museum.de/	Museum	Public	Domestic	The Deutsches Museum is a legally responsible institution incorporated under public law. It conducts a lot of activities towards science communication.
Universities (including Fachhochschulen) and research institutes (public relationship offices)	Universities / research institutes	Public	Domestic	Many universities and research institutions are very active in science communication
Wissenschaft im Dialog (Science in Dialogue) http://www.wissenschaft-im-dialog.de	Other civil society organisations	Mixed	Domestic	Umbrella initiative concerned with science communication
Wissenschafts-Pressekonferenz (WPK) http://www.wpk.org	Media	Private	Domestic	WPK is the professional association for science journalists in Germany

Besides these organisations, a growing number of individual scientists play a role in science communications, e.g. as frequent guests in talk shows, hosts of TV programmes and experts regularly consulted by media.

2.4.4 Technology assessment

Technology Assessment (TA) emerged in the U.S. from the end of the 1960s on. The Office of Technology Assessment at the U.S.-American Congress was founded in 1972 and was the first policy-advising TA body. Discussions in Europe led to the foundation of many parliamentary offices of TA. In Germany the Office of Technology Assessment at the Bundestag was founded in 1990. In parallel, governmental actors increasingly made use of TA approaches and methods and commissioned many TA projects to support decision-making. In 2004, the Netzwerk Technikfolgenabschätzung (network technology assessment) was founded together with institutions from Austria and Switzerlands. It operates a TA communication platform, includes working groups and organises TA-conferences at a bi-annual basis.

In the last years TA became also part of the activities of the Deutsche Akademie der Technikwissenschaften (acatech, National Academy of Engineering and Science) and of the Helmholtz-Gemeinschaft (Helmholtz Association).

The following tables include major actors from the field of technology assessment. They are organised following the distinction between private and public institutions.

Public actors of technology assessment (examples)

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
BIOGUM: Forschungsschwerpunkt Biotechnologie, Gesellschaft und Umwelt an der Universität Hamburg (Research Centre for Biotechnology, Society and the Environment) http://www.uni-hamburg.de/fachbereiche-einrichtungen/biogum/	Research Institute	Public	The Research Centre for Biotechnology, Society and the Environment (FSP BIOGUM) is an institute of the University of Hamburg and is dedicated to technology assessment, in particular in the fields of biomedicine and agriculture.
Bundesamt für Sicherheit in der Informationstechnik (Federal Office for Information Security), BSI http://www.bsi.bund.de	Government and ministries / departmental research	Public	BSI cares about IT security in the fields Security of Applications, Critical Infrastructure and Internet, Cryptography and Counter-Eavesdropping and Certification, Approval and Conformity Testing, New Technologies
Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (Federal Institute for Occupational Safety and Health) http://www.baua.de	Government and ministries / departmental research	Public	The Federal Institute for Occupational Safety and Health (BAuA) as governmental research institution holds a key position in creating a safe and healthy work environment in Germany
Bundesanstalt für Materialforschung und -prüfung (Federal Institute for Materials Research and Testing) http://www.bam.de	Government and ministries / departmental research	Public	BAM has actively undertaken research in key areas of safety engineering and new analysis and test methods such as energy and environmental protection, materials engineering and safety engineering for a number of years.
Bundesinstitut für Arzneimittel und Medizinprodukte (Federal Institute for Drugs and Medical Devices) http://www.bfarm.de	Government and ministries / departmental research	Public	BfArM aims at preventing health risks by continuous improvement in the safety of medicinal products and by risk monitoring of medical devices as well as by monitoring the legal traffic in controlled substances
Bundesinstitut für Risikobewertung (Federal Institut for Risk Assessment) (BfR) http://www.bfr.bund.de	Government and ministries / departmental research	Public	Identifying risk and protecting health are the tasks which are incumbent on the Federal Institute for risk assessment (BfR) when it comes to progressive consumer protection. They encompass the assessment of existing and the identification of new health risks.
Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag (Office of Technology Assessment at the German Bundestag) http://www.tab-beim-bundestag.de	Parliament	Public	The Office of Technology Assessment at the German Bundestag is an independent scientific institution created with the objective of advising the German Bundestag and its committees on matters relating to research and technology.
Fraunhofer Institut für System- und Innovationsforschung (ISI), http://isi.fraunhofer.de/	Research institute	Public	ISI investigates the scientific, economic, ecological, social, organisational, legal and political framework conditions for generating innovations and their implications.
Institut für Technikfolgenabschätzung und Systemanalyse (Institute for Technology Assessment and	Research institute	Public	ITAS creates and communicates knowledge on the impacts of human action and their evaluation in view of the development and use of new

Systems Analysis, ITAS) http://www.itas.fzk.de			technologies. Its work focuses on environmental, economic, social and political-institutional issues. Alternative options for action and design are developed and assessed. In this way ITAS supports politics, science, business and the general public in future decision-making
Institut für Wissenschafts- und Technikforschung an der Universität Bielefeld (Institute of Science and Technology Studies) http://www.uni-bielefeld.de/	Research institute	Public	IWT is concerned with investigating the institutional and epistemic forms of science and technology, their patterns of change, and the accompanying ethical challenges and social consequences
Institut für Zukunftsstudien und Technologiebewertung (IZT) (The Institute for Futures Studies and Technology Assessment) http://www.izt.de/	Research organisation	Public	The main tasks of IZT are the realisation of research projects, delivering expert opinions, and advising political and industrial decision makers. IZT develops strategies and 'tools' in relation to future technologies as well as ecological and social structural changes in the economy and society.
Max Rubner-Institut, Bundesforschungsinstitut für Ernährung und Lebensmittel (Federal Research Institute of Nutrition and Food) http://www.mri.bund.de	Government and ministries / departmental research	Public	Max Rubner institute analyses and assesses developments and products in nutrition and food
Netzwerk der deutschsprachigen Technikfolgenabschätzungs-Community (Network of the German-speaking Technology Assessment Community) http://www.netzwerk-ta.net	Network	Public	Network of organisations concerned with technology assessment in Austria, Germany and Switzerland with around 30 institutional members from Germany.
Technik, Innovation und Gesellschaft (TIG) (Technology, Innovation and Society), research programme of the Helmholtz Association; http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/	Research programme	Public	The goal of the TIG programme is to contribute to target-oriented effective and responsible innovation processes. The main emphasis is on the investigation of application potentials of key technologies and the development of ways towards a sustainable energy supply.

Other public actors of technology assessment (examples)

Name of actor and web-link if possible	**Type of actor**	**Sector**	**Brief supplementary description**
Bund für Umwelt und Naturschutz Deutschland (BUND) (Friends of the Earth Germany), http://www.bund-naturschutz.de/	Civil society organisation	Public	BUND also deals with impacts of new technologies, e.g. nanotechnology; http://www.bund.net/bundnet/themen_und_projekte/nanotechnologie/
Stiftung Warentest	Consumer or-	Public	Non-profit foundation, established in 1964 by

http://www.test.de	ganisations		Deutscher Bundestag (German Parliament) . Ensures quality of consumer products by comparative testing.
Verbraucherschutzzentrale (Consumer Centres in Germany) http://www.verbraucherzentrale.de	Consumer organisations	Public	The consumer centres in the 16 German federal states offer advice and information on issues of consumer protection and represent the interests of consumers at the federal state level.

3 Research related to Science in Society

This section is concerned with research activities related to science in society. The purpose is to describe the efforts in Germany, including the SIS research being undertaken and how SIS issues are embedded in mainstream research. The section will also elaborate on how SIS research is being funded and what the scale of funding is.

A distinction is made between *SIS research* on the one hand and *SIS issues embedded in mainstream research* on the other. SIS research are the studies particularly targeting public understanding of science, governance of science, science policy, science education, science communication, ethics in science and technology, the reciprocal relations of science and culture, young people and science and similar issues. However, SIS issues may also be present in other research activities, in which the main objectives of research are *not* SIS related issues, but in which SIS practices or perspectives are embedded. This could include studies within the natural sciences which apply innovative or extensive use of public involvement in the research process, new ways of communicating research results, ambitious efforts to bring ethical and societal issues into research, innovative ways of involving a variety of stakeholders (politicians, NGOs, industry, social scientists etc.). Such efforts are referred to as SIS issues embedded in mainstream research.

The section provides examples of German research projects and funding programmes related to SIS, cross-cutting and emerging themes of SIS. Moreover, the role of SIS in evaluative practices of research programmes and institutions are elaborated.

It should be noted that this section is concerned with mapping research activities which are **not fully EU funded**. The subsections are concerned with national as well as international research efforts, but not activities funded solely under the European framework programs. Such research activities are already well-documented elsewhere.

3.1 Research on Science in Society

For the MASIS report on Germany, examples of research programmes and projects have been chosen which are initiated or funded at the federal level, e.g. by the Bundesministerium für Bildung und Forschung (BMBF, Federal Ministry of Education and Research). The Bundesbericht Forschung und Innovation 2010[100] (National Report on Research and Innovation) presents an overview of the research programmes and activities at the federal and state (Länder) level and should be consulted for priorities and activities of the German Länder (pp. 191-310).

3.1.1 Research projects

Current research projects on Science in Society in Germany are dealing, besides others, with issues of the relationship between science, politics and society (science in decision-making processes and governance of science), science education, equality and social inclusion in science and ethics, as well as trends and developments in the science system in general ("Wissenschaftsforschung"). Different scientific disciplines contribute to this research, such as science, technology and society studies (STS), technology assessment, science policy studies, applied ethics, political sciences and governance research. For the table below, examples for projects funded at the national level have been selected to give an overview on how intensively these areas are covered.

[100] http://www.bmbf.de/pub/bufi_2010.pdf

Name of project (incl. web-link or contact information)	Local, national, or cross-country	Institutions participating	Budget and funding source	Field of study
Ansätze zu einer dialogisch-reflexiven Schnittstellenkommunikation zwischen Wissenschaft und Politik	Transnational	Münchner Projektgruppe für Sozialforschung e.V. Universität Hamburg Universität für Bodenkultur Wien Interface Institut für Politikstudien Luzern	German Federal Ministry of Education and Research	Knowledge for decision-making processes
Aufbau und Prüfung von Orientierungs- und Bindungsmodulen zur Motivation insbesondere junger Frauen zu MINT-Karrieren im Rahmen des BMBF-Programms Nationaler Pakt für Frauen in MINT-Berufen	National	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG)	821.379 € German Federal Ministry of Education and Research	Gender equality, Science education
Ausgründungen als Grenzüberschreitung und neuer Typ der Wissensgenerierung: Chancen für die Innovation, Risiken für die wissenschaftliche Qualität?	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Ausmaß und Folgen von Öffentlichkeits- und Medienorientierung in der Governance von Hochschulen http://egora.uni-uenster.de/ifk/forschen/governance.shtml	National	Westfälische Wilhelms-Universität Münster	384.535 € German Federal Ministry of Education and Research	Governance of science
Auswirkungen der evaluationsbasierten Forschungsfinanzierung an Universitäten auf die Inhalte der Forschung http://www.sciencepolicystudies.de/en/projects/evaluation/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Balancierung von Wissenschaft und Elternschaft an Universitäten http://www.bawie.de/	National	Gesellschaft Sozialwissenschaftlicher Infrastruktureinrichtungen (GESIS)	207.048 € German Federal Ministry of Education and Research	Equality
Begleitforschung AAL – damit die Technik richtig ankommt. http://www.aal-deutschland.de/deutschland/begleitforschung-aal	National	Several projects	German Federal Ministry of Education and Research	Technology acceptance
Berufsorientierung im Unterhaltungsformat – Aufbau eines Innovation-Lab	National	Technische Universität	830.027 € German Federal	Gender equality

zur Popularisierung naturwissenschaftlich-technischer Berufe und weiblicher Berufsrollenbilder durch Spielfilme und Serien		Berlin	Ministry of Education and Research	
Biotechnologische Herausforderungen und rechtliche Reaktionsmöglichkeiten. Vorstudien zu einer Gesetzgebungslehre der Humanbiotechnologie	National	Julius-Maximilians-Universität Würzburg	151.270 € German Federal Ministry of Education and Research	Ethics
Brain exchange – Brain drain? Intersektorale Mobilität von Wissenschaftlern http://www.sciencepolicystudies.de/en/projects/braindrain/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
careers@communication. Digitalisierte Kommunikation in Unternehmen – Karrierehindernis oder Karrierechance für Frauen in Deutschland? http://www.mgs.tu-berlin.de/v-menue/forschung/careerscommunication_de/	National	Technische Universität Berlin	188.053 € German Federal Ministry of Education and Research	Gender equality
Chancengleichheit in der strukturierten Promotionsförderung an deutschen Hochschulen - Gender und Diversity http://www.uni-hildesheim.de/de/39394.htm	National	Stiftung Universität Hildesheim	76.101 € 431.237 € German Federal Ministry of Education and Research	Gender equality
Computersimulationen – Neue Instrumente der Wissensproduktion. Validierungspraktiken, Unsicherheitsfaktoren und öffentliche Vermittlung http://www.sciencepolicystudies.de/en/projects/computer_simulation/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Die Herstellung und Darstellung von Wissen unter Medialisierungsbedingungen	National	Universität Bielefeld	386.978 € German Federal Ministry of Education and Research	Science communication, Governance of science
Disziplinäre Forschung in der Transdisziplinarität. Dissertationen in der Technikfolgenabschätzung (TRANSDISS) http://www.itas.fzk.de/deu/projekt/2008/deck08a.htm	National	Karlsruhe Institute of Technology	German Federal Ministry of Education and Research	Transdisciplinary studies on science and technology
Effizienz und Innovativität von homogenen und heterogenen ErfinderInnenteams in Forschung und Entwicklung http://www.effinet-hfu.de/	National	Hochschule Furtwangen	49.850 € 199.400 € German Federal Ministry of Education and Research	Equality
Entwicklung eines Instruments zur Erfassung von Führungsmotivation insbe-	National	Universität	59.499 € German Federal	Gender equality

sondere bei Frauen http://www.fuehrungsmotivation.de/ http://www.motivation-to-lead.com/		Siegen	Ministry of Education and Research	
Entwicklung von Messinstrumenten mit reduzierten geschlechtsstereotypen Interessen- und Selbstwirksamkeitseinschätzungen als Grundlage einer geschlechtergerechter Studien- und Berufsberatung http://projekt-eigelb.de/wp/	National	Universität Erfurt	209.914 € German Federal Ministry of Education and Research	Gender equality
Ethical Governance? Wissen, Werte und politische Entscheidungsprozesse in Deutschland, Frankreich und Großbritannien http://www.sciencepolicystudies.de/en/projects/ethical_governance/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Expertenwissen, Öffentlichkeit und politische Entscheidung. Ethikkommissionen und Bürgerbeteiligung als Instrumente der Politikberatung in Deutschland und Österreich http://www.sciencepolicystudies.de/en/projects/political_consultation/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Exzellenz und Geschlecht in Führungspositionen der Wissenschaft und Wirtschaft http://www.eliten-projekt.de/	National	Wissenschaftszentrum Berlin für Sozialforschung gGmBH	153.793 € 312.245 € German Federal Ministry of Education and Research	Equality
Forschungskooperation ELSA: Biomedizinische Lebensplanung für das Altern - Werte zwischen individueller ethischer Reflexion und gesellschaftlicher Normierung	National	Georg-August-Universität Göttingen Friedrich-Alexander-Universität Erlangen-Nürnberg	237.739 € 245.326 € German Federal Ministry of Education and Research	Ethics
Forschungskooperation ELSA: DIALOC: Analyse des Potenzials und des zukünftigen Bedarfs portabler, diagnostischer “Lab-on-a-Chip!”-Systeme in der Gesundheitsversorgung	National	Ernst-Moritz-Arndt-Universität Greifswald Georg-August-Universität Göttingen Universitätsmedizin Greifswald	274.782 € 194.523 € 212.772 € German Federal Ministry of Education and Research	Ethics
Forschungskooperation ELSA: Entwick-	National	Rheinische	268.969 €	Ethics

lungsbiologische Totipotenz; Bestimmung als normatives Kriterium in Ethik und Recht unter Berücksichtigung neuer entwicklungsbiologischer Erkenntnisse.		Friedrich-Wilhelms-Universität Bonn Universität Passau Medizinische Hochschule Hannover	268.307 € 237.291 € German Federal Ministry of Education and Research	
Forschungskooperation ELSA: Individualisierte Gesundheitsversorgung: Ethische, ökonomische und rechtliche Implikationen für das deutsche Gesundheitswesen.	National	Ludwig-Maximilians-Universität München Helmholtz Zentrum München Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH) Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (MPG)	282.673 € 255.345 € 115.366 € German Federal Ministry of Education and Research	Ethics
Forschungskooperation ELSA: Personalisierte Medizin in der Krebsforschung; eine interdisziplinäre Untersuchung ethischer, rechtlicher, medizinischer und ökonomischer Aspekte	National	Ruhr-Universität Bochum Medizinische Hochschule Hannover Universität Duisburg-Essen	473.367 € 137.145 € 275.880 € German Federal Ministry of Education and Research	Ethics
Forschungskooperation ELSA: Person und Demenz	National	Rheinische Friedrich-Wilhelms-Universität Bonn Heinrich-Heine-Universität Düsseldorf Forschungszentrum Jülich GmbH Rheinische Friedrich-	136.138 € 103.138 € 180.288 € 124.588 € German Federal Ministry of Education and Research	Ethics

		Wilhelms-Universität Bonn		
Forschungskooperation ELSA: Synthetische Biologie	National	Albert-Ludwigs-Universität Freiburg Friedrich-Alexander-Universität Erlangen-Nürnberg Karlsruher Institut für Technologie (KIT) Medizinische Hochschule Hannover	289.269 € 131.425 € 112.411 € 119.770 € German Federal Ministry of Education and Research	Ethics
Forschungskooperation ELSA: Untersuchungen zur genetischen Diskriminierung in Deutschland	National	Johann Wolfgang Goethe-Universität Frankfurt am Main Helmut-Schmidt-Universität, Universität der Bundeswehr Hamburg	271.099 € 268.094 € German Federal Ministry of Education and Research	Ethics
Forschungsvorhaben zur Wirksamkeit von Nachwuchsfördermaßnahmen zur Karriereförderung von Frauen in der Wissenschaft am Beispiel von Mentoring-Projekten. Entwicklung von Qualitätsstandards und Handlungsempfehlungen	National	Universität Stuttgart	145.952 € 583.809 € German Federal Ministry of Education and Research	Gender equality
Frauen in der Spitzenforschung – Eine Untersuchung zur Umsetzung der Chancengleichheit von Frauen und Männern in den drei Förderlinien der Exzellenzinitiative des Bundes und der Länder http://www.wiso.uni-hamburg.de/projekte/spitzenforschung	National	Universität Hamburg	986.811 € German Federal Ministry of Education and Research	Gender equality
Frauen und ihre Karriereentwicklung in naturwissenschaftlichen Forschungsteams	National	Universität Potsdam - Brandenburgisches Institut für Existenzgründung und Mittelstands-	198.707 € German Federal Ministry of Education and Research	Gender equality

		förderung - Centrum für Entrepreneurs hip und Inno-vation der Universität Potsdam (BIEM-CEIP)		
Führungskräfteentwicklung von Frauen in Großbetrieben: Bestandsaufnahme, Problemwahrnehmungen und Lösungs-ansätze	National	FIA For-schungsteam Internationaler Arbeitsmarkt GmbH	454.743 € German Federal Ministry of Education and Research	Gender equality
"Gemeinsam Karriere machen" - Reali-sierungsbedingungen für Doppelkarrie-ren in Akademikerpartnerschaften http://www.wzb.eu/bal/aam/karriereprojekt.de.htm	National	Wissen-schafts-zentrum Ber-lin für Sozial-forschung gGmbH	62.952 € German Federal Ministry of Education and Research	Gender equality
Genderfairness berufs- und studieneig-nungsdiagnostischer Tests	National	Universität Konstanz	531.928 € German Federal Ministry of Education and Research	Gender equality
Intendierte und nicht intendierte Effekte dezentraler Anreizsysteme am Beispiel der fakultätsinternen leistungsorientier-ten Mittelvergabe (LOM) in der Medizin	National	Institut für Forschungsin-formation und Qualitätssiche-rung	342.266 € German Federal Ministry of Education and Research	Governance of sci-ence
Integration wissenschaftlicher Expertise in medienvermittelte öffentliche Diskur-se (INWEDIS) http://www.sciencepolicystudies.de/en/projects/inwedis/index.htm	National		German Federal Ministry of Education and Research	Knowledge for deci-sion-making proc-esses
ITA-Monitoring – Identifizierung neuer Themen für die Innovations- und Tech-nikanalyse des BMBF http://www.itas.fzk.de/deu/projekt/2008/deck0832.htm	National	Foresight of future themes at the interface of technology and society	Ca. 1.4 mio. € German Federal Ministry of Education and Research	Foresight
Karriereverläufe von Frauen: Paardyna-miken und institutionelle Rahmungen in der "Rush-Hour of Life" http://www.dji.de/cgi-bin/projekte/output.php?projekt=664	National	Deutsches Jugendinstitut e. V.	442.807 € German Federal Ministry of Education and Research	Gender equality
Kinder und Kinderlosigkeit im wissen-schaftlichen Karriereverlauf. Auswertung der Personaldaten des akademischen Personals an Universitäten und Fach-hochschulen http://www.hdz.uni-dortmund.de/	National	Technische Universität Dortmund	115.289 € German Federal Ministry of Education and Research	Equality

index.php?id=wissen-elternschaft				
Mechanismen der Erneuerungsfähigkeit der universitären und außeruniversitären Forschung: Deutschland und die Vereinigten Staaten im Vergleich	Cross-national	Otto-Friedrich-Universität Bamberg	431.762 € German Federal Ministry of Education and Research	Governance of science
Mediale (De-)Legitimation von Forschung als informelle Governance der Wissenschaft, MediGov	National	Forschungszentrum Jülich GmbH	475.974 € German Federal Ministry of Education and Research	Governance of science
MINToring "Studierende begleiten Schülerinnen u. Schüler"	National	Stiftung der Deutschen Wirtschaft e.V.	1.616.645 € German Federal Ministry of Education and Research	Science education
Nested Networks: Neue Formen der Governance der globalen Umweltforschung (NESNET) http://www.ufz.de/index.php?de=19865	Transnational	Helmholtz-Zentrum für Umweltforschung GmbH - UFZ	372.989 € German Federal Ministry of Education and Research	Governance of science
Neue Steuerung von Universitäten (New governance for universities)	National	Ruhr-Universität Bochum	415.312 € German Federal Ministry of Education and Research	Governance of science
Nichtwissenskulturen. Analysen zum Umgang mit Nichtwissen im Spannungsfeld von epistemischen Kulturen und gesellschaftlichen Gestaltungsöffentlichkeiten http://www.sciencepolicystudies.de/en/projects/non-knowledge/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Partizipative Governance der Wissenschaft: Möglichkeiten, Wirkungen und Grenzen der Beteiligung zivilgesellschaftlicher Akteure am Beispiel von Biomedizin und Nanotechnologie	National	Universität Augsburg	392.122 € German Federal Ministry of Education and Research	Governance of science
Pilotprojekt Geschlechterforschung in der Medizin	National	Deutsches Herzzentrum Berlin	263.954 € German Federal Ministry of Education and Research	Gender equality
Problemorientierte Forschung und wissenschaftliche Dynamik. Das Beispiel der Klimaforschung http://www.sciencepolicystudies.de/en/projects/climate_research/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Raum-zeitliche Mobilitätsanforderungen als Hemmnis beruflicher Karrieren von	National	Technische Universität	96.478 € German Federal	Gender equality

Frauen in Wirtschaft und Wissenschaft http://www.karriere-und-mobilitaet.eu/		Dortmund	Ministry of Education and Research	
Relevanz von Geschlecht in der sportmedizinischen Forschung - Entwicklung von Grundsätzen zur systematischen Berücksichtigung geschlechtsbezogener Aspekte in der Sportmedizin		Deutsche Sporthochschule Köln	45.650 € 182.599 € German Federal Ministry of Education and Research	Gender equality
Ressortforschung unter Anpassungsdruck: Governance im Spannungsfeld von Staat, Wissenschaft und Gesellschaft	National	Leibniz Universität Hannover	401.810 € German Federal Ministry of Education and Research	Governance of science
Sicherung des Kreativitätspools, Verbesserung der Chancengleichheit: EPSCoR ein Vorbild für die DFG?	National	Universität Flensburg	35.000 € German Federal Ministry of Education and Research	Governance of science, Equality and social inclusion in science
Spurensuche! Genderspezifische Entscheidungswege in Natur- und Ingenieurwissenschaften hinein und mögliche Ursachen für das Verlassen dieser Fächer an den TU9-Universitäten http://www.lte.ei.tum.de/gender/spurensuche.html	National	Technische Universität München	135.852 € German Federal Ministry of Education and Research	Gender equality
Transnationalisierung der Wissenskommunikation und ihre Folgen für den politischen Meinungsbildungsprozess. Beispielfall Stammzellforschung http://www.sciencepolicystudies.de/en/projects/transnationalization/index.htm	National		German Federal Ministry of Education and Research	Knowledge for decision-making processes
Verbund: PRIVATE Gen: Vergleichende und interdisziplinäre Erforschung von Regimen zum Schutz von Privatsphäre in Biobanken, sowie deren Variationen, Anpassungen und Transformationen im (Post-) Genomischen Zeitalter	International	Philipps-Universität Marburg Universität Mannheim	461.937 € 90.549 € German Federal Ministry of Education and Research	Ethics
Verbund: THCL: Holistische Konzepte des Lebens: Erkenntnistheoretische und soziokulturelle Implikationen der Systembiologie	International	Universität Hamburg	600.205 € German Federal Ministry of Education and Research	Ethics
Verbund: Translationale Forschung in der Genom-basierten Medizin (TRi-Gen)		Fraunhofer-Institut für System- und Innovationsforschung (ISI) Medizinische Hochschule Hannover	295.977 € 28.183 € German Federal Ministry of Education and Research	Ethics

Verbund: Soziale, politische und ethische Implikationen der Nutzung von DNA-Tests in Einwanderungsverfahren	International	Johann Wolfgang Goethe-Universität Frankfurt am Main	405.085 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Cognitive Enhancement - Normalität, Normalisierung und Enhancement in den Neurowissenschaften: Ethische, soziokulturelle und neuropsychiatrische Aspekte von Cognitive Enhancement	International	Johannes Gutenberg-Universität Mainz	514.950 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Ethische, rechtliche und soziale Aspekte der Tiefen Hirnstimulation - Gesundheit, Lebensqualität und personale Identität	International	Universität zu Köln	766.535 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Ethische und rechtliche Aspekte von Normen im Bereich "Neuroimaging"	International	Institut für Wissenschaft und Ethik e.V. Rheinische Friedrich-Wilhelms-Universität Bonn	123.552 € 218.252 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Externe Evaluationen als Innovationsanreiz für intra-universitäre Governance Teilprojekt: Vergleichende Fallstudien	National	Deutsche Hochschule für Verwaltungswissenschaften Speyer Technische Universität Berlin	25.376 € 405.347 € German Federal Ministry of Education and Research	Governance of science
Verbundprojekt: Frauen in modernen Unternehmen http://www.frauen-in-karriere.de/	National	Institut für Sozialwissenschaftliche Forschung e.V.(ISF) Friedrich-Alexander-Universität Erlangen-Nürnberg	647.295 € 188.866 € German Federal Ministry of Education and Research	Gender equality
Verbundprojekt: Governance Geistigen Eigentums. Homogenisierung oder Heterogenisierung der Aneignungsformen in wissensbasierten Ökonomien?	National	Universität Augsburg Ludwig-Maximilians-Universität München	179.300 € 171.862 € German Federal Ministry of Education and Research	Governance of science
Verbundprojekt: Messung der Diversität der Forschung Teilprojekt: Methoden-	National	Humboldt-Universität zu	175.311 € 49.169 € German Federal	Governance of science

entwicklung		Berlin Technische Universität Berlin	Ministry of Education and Research	
Verbundprojekt: Mustererkennung und Video Tracking: sozialpsychologische, soziologische, ethische und rechtswissenschaftliche Analysen (MuViT) – Teilvorhaben: Ethik (MuViT-E)	National	Eberhard-Karls-Universität Tübingen	391.149 €	Ethics
Verbundprojekt: Neuroethik chronischer Bewusstseinsstörungen	International	Klinikum der Universität München	261.403 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Other Minds	International	Ruhr-Universität Bochum Universität zu Köln	395.121 € 227.225 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Sicherheiten, Wahrnehmungen, Lagebilder, Bedingungen und Erwartungen - Ein Monitoring zum Thema Sicherheit in Deutschland (BaSiD) - Teilvorhaben: Ethik und Theorie	National	Eberhard-Karls-Universität Tübingen	224.672 € German Federal Ministry of Education and Research	Ethics
Verbundprojekt: Universitätsmanagement als intra-organisationale Forschungsgovernance. Fallstudien zur Praxis und Praktiken der managerialen Forschungsteuerung an drei Universitäten in Deutschland	National	HIS Hochschul-Informations-Systeme GmbH	255.311 € 93.303 € 100.077 € German Federal Ministry of Education and Research	Governance of science
Verbundvorhaben: Aufstiegskompetenz von Frauen: Entwicklungspotentiale und Hindernisse auf dem Weg zur Spitze http://www.aufstiegskompetenz.de/	National	Universität Hamburg Universität Leipzig	282.170 € 572.891 € 58.619 € 119.014 € German Federal Ministry of Education and Research	Gender equality
Verbundvorhaben: CyberMentor - E-Mentoring für Mädchen im MINT-Bereich vor dem Hintergrund des Aktiotopansatzes.	National	Universität Regensburg Universität Ulm	153.850 € 615.401 € 41.438 € 165.751 € German Federal Ministry of Education and Research	Equality, Science Education
Verbundvorhaben: Fachlaufbahnen - Alternative Laufbahnentwicklung für Frauen	National	Helmut-Schmidt-Universität Fachhoch-	German Federal Ministry of Education and Research	Gender equality

		schule Lübeck		
Verbundvorhaben: Frauen in Spitzenpositionen des Polizeidienstes	National	Deutsche Hochschule der Polizei Universität Dortmund	429.941 € 518.001 € German Federal Ministry of Education and Research	Gender equality
Verbundvorhaben: Innovative Arbeitsstrukturen, Unternehmenskultur und Frauenkarrieren http://www.enter-spitzenfrauen.net/startseite.html	National	Unique Gesellschaft für Arbeitsgestaltung, Personal- und Organisationsentwicklung mbH Soziale Innovation GmbH SI research and consult	202.785 € 70.735 € German Federal Ministry of Education and Research	Equality
Verbundvorhaben: Integration hochqualifizierter Migrantinnen auf dem deutschen Arbeitsmarkt http://www.hochqualifizierte-migrantinnen.de/	National	Humboldt-Universität zu Berlin TU Hamburg Harburg Rheinisch-Westfälische Technische Hochschule Aachen	154.824 € 86.093 € 82.114 € German Federal Ministry of Education and Research	Gender equality
Verbundvorhaben: Karriereverläufe und Karrierebrüche bei Ärztinnen während der Facharztweiterbildung.	National	Universität Leipzig Universitätsklinikum Hamburg-Eppendorf	91.228 € 223.352 € 105.342 € 257.907 € German Federal Ministry of Education and Research	Gender equality
Verbundvorhaben: MINT Role Models - Ein integratives Konzept zur nachhaltigen Steigerung des Anteils von Frauen in MINT Berufen - Teilvorhaben	National	Verein Deutscher Ingenieure (VDI) e.V.	1.071.311 € German Federal Ministry of Education and Research	Gender equality; women in science
Verbundvorhaben: Spitzenfrauen im Fokus der Medien. http://www.spitzenfrauenindenmedien.de	National	Freie Universität Berlin Universitätsklinikum Hamburg-Eppendorf	144.809 € 149.711 € German Federal Ministry of Education and Research	Gender equality
Verbundvorhaben: taste MINT; Entwicklung und Erprobung eines Potenzialassessments für Mathematik, Informatik, Naturwissenschaften und	National	LIFE - Bildung, Umwelt, Chancengleichheit e.	101.222 € 404.889 € 22.733 € German Federal Ministry of	Equality, Science education

Technik für Abiturientinnen http://www.tastemint.de/		V. Kompetenz-zentrum Technik-Diversity-Chancen-gleichheit e.V.	Education and Research	
Verbundvorhaben: Veränderungspoten-ziale von Führungsfrauen in Umwelt und Technik	National	Wuppertal Institut für Klima, Um-welt, Energie GmbH Bergische Universität Wuppertal	142.227 € 37.141 € 148.563 € German Federal Ministry of Education and Research	Gender equality
Visualisierungen in der Wissenskommu-nikation. Analysen zur Frage einer »digi-talen Zäsur« und ihrer Konsequenzen in der Forschungspraxis und der Kommu-nikation in der Öffentlichkeit http://www.sciencepolicystudies.de/en/projects/visualization/index.htm	National		German Federal Ministry of Education and Research	Knowledge for deci-sion-making proc-esses
Von der Beobachtung zur Beeinflussung. Medialisierte Konstellationen von Wis-senschaft, Medien und Politik in Bezug auf wissenschaftliche Fachkulturen	National	Westfälische Wilhelms-Universität Münster	443.310 € German Federal Ministry of Education and Research	Science communica-tion, Governance of science
Vorausdenken und Bewerten von Technikzukünften http://www.itas.fzk.de/deu/projekt/2010/grun10b.htm	National	Acatech (Na-tional Acad-emy of Sci-ence and En-gineering)	110.000 €	Foresight & Assess-ment
Wissenschaft debattieren http://www.wissenschaft-debattieren.de/	National	Wissenschaft im Dialog Universität Stuttgart	German Federal Ministry of Education and Research	Science communica-tion, public under-standing of science
Wissenschaftskarrieren: Orientierung, Planung und Beratung am Beispiel der Fächer Politikwissenschaft und Chemie http://www.wiwi.uni-rostock.de/index.php?id=1768	National	Universität Rostock	51.687 € 252.354 € German Federal Ministry of Education and Research	Equality
Women@Technology – Ein Projekt zur Förderung von Gender-Diversity in In-novationsprozessen deutscher Unter-nehmen http://www.innovation-needs-diversity.de/	National	Europäische Akademie für Frauen in Poli-tik und Wirt-schaft	453.856 € German Federal Ministry of Education and Research	Gender equality
Zukunftsperspektiven der Technikfol-	National	Karlsruhe In-stitute of	Helmholtz-Gemeinschaft,	Governance of sci-ence, technology

genabschätzung http://www.itas.fzk.de/deu/projekt/grun0432z.htm		Technology	Programm "Technik, Innovation, Gesellschaft"	assessment
Zur Abwägung von Nutzen- und Schadenpotenzialen von Forschungsvorhaben an und mit Menschen - Aktualisierung und Vertiefung der Empfehlungen zur Antragstellung und Begutachtung klinischer Studien bei bzw. durch Ethik-Kommissionen (AVEEK)	National	Universität zu Lübeck	120.614 € German Federal Ministry of Education and Research	Ethics

Sources:
http://www.dlr.de/pt/desktopdefault.aspx/tabid-5787/9401_read-18114/
http://www.gesundheitsforschung-bmbf.de/de/186.php
http://www.sciencepolicystudies.de/en/projects/index.htm

3.1.2 Trends in research

Not only during the last five years, research related to Science in Society issues has been subject to dedicated funding initiatives in Germany. It can generally be observed (see table above, which by no means is complete) that all major areas of SiS issues, like equality, ethics, science education, science communication, and governance of science, are broadly covered. At least, three large thematic trends can be observed:

- Careers of women in (natural) science and technology related areas: This includes the challenge of leveraging women's potential in technology-related areas of Germany's industry as well as attracting girls to natural sciences and technology during school and motivating them to pursue a scientific career. Closely related to these education-oriented aspects is research on how to create an environment which improves access for women to management positions in science and industry as, by international comparison, the number of women in these positions in Germany is relatively low. The need for research in these areas is also motivated by respective political initiatives and debates targeting at industry and by the strategic goals of the Pact for Research and Innovation and the Excellence Initiative (see Sec. 1.2).

- New technologies and sciences and their consequences to society: To ensure competitiveness of Germany's industry, political initiatives, like the High Tech Strategy 2020 (see Sec. 1.2), identify areas for innovation which require leading-edge research and the translation of its results into marketable products and services. This raises not only scientific questions in the respective, often interdisciplinary research areas but also concerning the acceptance of such new technologies by society and related ethical or legal issues. Also the national academies have taken up this issue. For example, the Deutsche Akademie der Technikwissenschaften (acatech, National Academy of Science and Engineering) recently published a position paper on acceptance of technology

and infrastructures.[101] A large number of SiS-related research projects can currently be found in the areas of health technology, biotechnology and nanotechnology.

Shaping science and technology: The idea of "shaping technology" according to social values and by involving citizens, stakeholders and people affected has received more attention, in particular in relation to research on "new governance of science and technology", which was also an important issue in the Report of the MASIS expert group. The programme Innovations- und Technikanalysen (ITA, Innovation and Technology Analyses)[102] of the BMBF directly foresees the involvement of possible users and citizens in order to arrive at more "robust" ideas for developing and shaping technology. Also the programme Technologie, Innovation und Gesellschaft (TIG, Technology, Innovation and Society) of the Helmholtz Association includes elements of shaping technology by reflecting its possible social implications (see below).[103]

3.2 Main stream research embedding Science in Society issues

It is one thing to conduct targeted research on Science in Society issues (see above) and another to go for embedding Science in Society issues directly in more traditional, that means disciplinary and main stream research.

3.2.1 Trends and good examples

For several years, a strong concern of funding in Germany has been to embed SiS perspectives in mainstream research. This has been realised e.g. by setting priorities on SiS perspectives in funding programmes or by sub-projects of larger network projects. Examples include:

- Nano-Initiative - Aktionsplan 2010 (Nano Initiative - Action Plan 2010): This initiative creates a framework for translating research results in nanotechnologies into innovative products, reduces barriers to innovation by coordinating the policies of all ministries involved, and intensifies the dialogue with the public on chances of nanotechnologies for innovation as well as potential risks. This includes publicly accessible databases on nanotechnology information and citizen/consumer conferences.
  http://www.bmbf.de/en/nanotechnologie.php

- The Health Research Programme of the BMBF includes a funding priority "Ethical, Legal and Social Aspects of Modern Life Sciences and Biotechnology" since 1997 and currently allocates 3.8 million euros

[101] http://www.acatech.de/de/publikationen/publikationssuche/detail/artikel/akzeptanz-von-technik-und-infrastrukturen.html
[102] http://www.innovationsundtechnikanalysen.de/ and http://www.bmbf.de/en/1324.php
[103] http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/

per year to such projects.
http://www.gesundheitsforschung-bmbf.de/en/186.php

- The activities of the Wissenschaft im Dialog (Science in Dialogue) initiative (see Sec. 4.4.4) promote science communication, public involvement in political debates around science and technology, and stimulate the interest especially of children in natural sciences and technology. The activities funded under this umbrella initiative also include a research project on SiS issues.
http://www.wissenschaft-im-dialog.de/en/about-wissenschaft-im-dialog/projects.html

- The network project "Mustererkennung und Video Tracking" (MuViT, Pattern Recognition and Video Tracking) on socio-psychological, sociological and legal aspects of security technologies includes a subproject on ethical aspects.
http://www.uni-tuebingen.de/einrichtungen/internationales-zentrum-fuer-ethik-in-den-wissenschaften/forschung/ethik-und-kultur-sicherheitsethik/forschungsschwerpunkt-sicherheitsethik/muvit.html

- The Helmholtz alliance "Future infrastructures for meeting energy demands. Requirements of sustainability and social compatibility", which will be established from September 2011, changes the previously dominant perspective of energy research. It complements the existing research on the energy supply side (mainly new technologies) by strongly taking into account the demand side (users, consumers, households as well as industry) and the regulatory level and by explicitly considering the necessity of conflict resolution and participation for implementing new elements of the future energy infrastructure. In doing this, the main stream energy research will be embedded into a broader view on energy infrastructures as socio-technical elements of society (URL not yet available).

- In the field of public science (Öffentliche Wissenschaft), more and more research projects but also practical activities take place, aiming at a better public understanding of science but also at improved legitimisation. Activities of the Zentrum für Angewandte Kulturwissenschaften (ZAK, Centre for Cultural and General Studies) illustrate this development as an example.
http://www.zak.kit.edu/english/751.php

- The Helmholtz programme "Technology, Innovation and Society" is building many bridges between mainstream scientific and engineering research on the one hand, and Science in Society issues such as participation, acceptance, science communication and governance on the other. This holds, for instance, in the fields of nuclear waste storage, risk assessment of nanoparticles, synthetic biology, and sustainable development.

http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/

- Geo- and climate engineering have attracted a great deal of attention in light of expected major global problems that are generally thought to be caused by climate change. "Tipping points" may exist in the climate system with potentially catastrophic consequences. Examples of suggested technical measures to counter global warming that have come under scrutiny recently include iron fertilisation of the oceans, air capture to reduce the CO_2 concentration in the atmosphere, or the injection of sulphate aerosols into the stratosphere to induce a cooling effect. In Germany, the Deutsche Forschungsgemeinschaft (DFG, German Science Foundation) and Nationales Komitee für Global Change Forschung (NKGCF, National Committee on Global Change Research) have proactively dealt with this issue from 2009 on. In round-table discussions (Rundgespräche) it was clear from the very beginning that Science in Society issues must necessarily be involved. Experts from ethics, technology assessment, international law and social sciences joined the meetings. Today, there is broad consensus that in the case of engineering and natural science research on climate engineering these disciplines must be involved. Research on climate engineering in Germany, if it is established in the years to come, will integrate Science in Society issues from the very beginning.
  http://www.nkgcf.org/geo_start.php
  http://www.itas.fzk.de/tatup/102/sagr10a.htm

- The field of synthetic biology is currently being discussed intensively and on an interdisciplinary basis. As an example, the ELSA project of the BMBF "Engineering Life" (see table in Sec. 3.1.1) involves researchers from ethics, theology, technology assessment, as well as from biology itself and is thus directly relating Science in Society research with natural science.
  http://www.igm.uni-freiburg.de/forschung/projektdetails/SynBio

These examples show that there is a more and more intensive cooperation between Science in Society research and mainstream research in Germany at the level of projects and overarching initiatives.

3.3 Funding for research on Science in Society

Research on Science in Society issues at the federal level is mainly funded by the BMBF and national research organisations, but also by some foundations. Major examples are given in the following table.

Name of program and link to "call"	Primary funding agency	Total budget in € per year	Total amount in € applied for per year	Average no. of applicants per year	Average no. of successful applicants per year

Nationaler Pakt für Frauen in MINT-Berufen (National Pact for Women in MINT Careers) http://www.komm-mach-mint.de/MINT-Projekte	Other governmental funding agency (incl. Ministries)				Currently 7 projects funded
Ethische, rechtliche und soziale Aspekte der modernen Lebenswissenschaften und der Biotechnologie (Ethical, legal and social aspects of modern life sciences and biotechnology) http://www.gesundheitsforschung-bmbf.de/de/186.php	Other governmental funding agency (incl. Ministries)	3.8 mio. € per year			Currently ~ 40 projects running between 2008 and 2013
Frauen an die Spitze (Women to the top) http://www.dlr.de/pt/desktopdefault.aspx/tabid-5787/9401_read-18114/	Other governmental funding agency (incl. Ministries)				~ 30 projects in total, starting in 2007
Research on the relationship between science, politics and society I) Knowledge for decision processes (2003-2008) II) New Governance in Science (2008-2012) http://pt-uf.pt-dlr.de/de/194.php	Other governmental funding agency (incl. Ministries)				12 projects in phase I, 16 projects in phase II
Wissenschaft -- Öffentlichkeit -- Gesellschaft (Science -- Public -- Society) http://www.volkswagenstiftung.de/foerderung/wissenschaft-oeffentlichkeit-gesellschaft.html	Non-profit private sector foundations	~ 1.5 mio. € per year, ~ 5.6 mio. € since 2007	~ 3.5 mio. €	~ 10 proposals per year	~ 7 proposals per year
Helmholtz programme "Technology, innovation and society" (TIG) http://www.helmholtz.de/en/research/energy/technology_innovation_and_society/	Helmholtz Association This is not a programme open to applicants but a programme of Helmholtz	~ 12 mio. € per year	Does not apply	Does not apply	
Schwerpunktprogramme der Deutschen Forschungsgemeinschaft (German Research Foundation) http://www.dfg.de/foerderung/programme/koordinierte_programme/schwerpunktprogramme/index.html	German Research Foundation (several of the many DFG programmes include issues of science in society)				

3.4 Importance of Science in Society issues as evaluative elements for national research programmes and academic institutions

Issues of gender balance, especially with regard to access for women to scientific management positions, are important evaluative aspects of the national Pakt für Forschung und Innovation[104] (Pact for Research and Innovation, see Sec. 1.3). The Pact for Research and Innovation includes the four major German research organisations jointly funded by federal and state ministries (Helmholtz Association, Max-Planck Society, Leibniz Association, Fraunhofer Association) as well the German Research Foundation (DFG) which in turn fund projects mainly with universities. Additionally, these four research organisations plus the DFG have regular internal evaluation procedures in place, which evaluate not only scientific excellence but also issues like gender balance.

The Exzellenzinitiative (Excellence Initiative, see Sec. 1.2), a competitive national programme targeted at universities, includes gender balance as evaluative criteria for all of the sub-programmes[105] (graduate schools, clusters of excellence, future concepts). As for research organisations, gender balance and access for women to scientific (management) positions at all levels are important issues of governance at universities. The Instrumentenkasten zu den Forschungsorientierten Gleichstellungsstandards[106] (toolbox of science-oriented gender balance standards) lists nearly 200 examples of promoting gender balance at German universities and research institutes.

Requirements for proposals or reporting of general funding programmes differ between German funding agencies, making sections on ethical or gender issues, dialogue strategies, stimulation of young people's interest in science etc. optional parts (if they are not directly related to the research being carried out)[107]. Ethical and gender balance issues are subject to evaluation of all project proposals submitted to the DFG, and specific evaluative elements are in place for projects dealing with e.g. biodiversity or clinical research[108]; the outreach of research (publications, presentations etc.) is reported as part of intermediary and final project reports and evaluated by reviewers.

While gender and ethical issues are well taken into account, other issues of Science in Society are not that present in evaluation procedures. In particular, it remains difficult to include more practical outcomes such as policy advice, public involvement and outreach activities like contributions to public debate and to science communication as criteria into the indicator systems of scientific evaluations.

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[104] http://www.pakt-fuer-forschung.de/fileadmin/papers/GWK-Heft-13-PFI-Monitoring-Bericht-2010.pdf

[105] http://www.gwk-bonn.de/fileadmin/Papers/GWK-Bericht-Exzellenzinitiative.pdf

[106] http://www.instrumentenkasten.dfg.de/startseite/

[107] See proposal guidelines of the German Federal Ministry of Education and Research as an example: http://www.kp.dlr.de/profi/easy/formular.html#AZA

[108] http://www.dfg.de/foerderung/formulare_merkblaetter/index.jsp

4 Activities related to Science in Society

This section relates to SIS as a field encompassing a variety of different activities particularly concerned with public communication of science and technology in Germany. The issues addressed are formats for science communication and the actors involved in science communication as well as trends at the national level.

4.1 National science communication trends

The science communication scene in Germany is very complex and active when judged by frequency, coverage and actors involved. It has a long tradition with the first professional organisation for science journalists, Technisch-Literarische Gesellschaft (TELI, German Association of Science Writers), established in 1929 (see Sec. 4.2) and many national newspapers covering science and technology on a daily basis (see Sec. 4.4.3). A large number of TV and radio programmes (see Sec. 4.4.1 and 4.4.2) are dedicated to communicate science and technology issues in adequate formats to different target audiences, ranging from pre-school children to scientifically educated adults. Bachelor and Master courses and a large number of training activities targeted at science journalists and scientists aim at enhancing the communication skills of both researchers and scientific writers (see Sec. 4.2).

Over 1,000 science centres and museums on science and technology, natural history and natural science provide access to their collections and attracted over 24 million visitors in 2009, an increase of approx. 5% compared with the previous year (see Sec. 4.4.6). Large-scale science festivals organised jointly by a large number of partners at the national level, like the Wissenschaftsjahr (Science Year, see Sec. 4.4.4), focus science communication activities around a topic relevant to society as a whole, and stimulate a large number of activities throughout the year (in 2010, around 2,000 events on "The Future of Energy"[109] have been organised by 700 partners and attracted over 2 million visitors). Another major issue of science communication in Germany is that of bringing (natural) science education to schools, aiming at stimulating interest and attracting young people to education and career in natural science and technology. Dedicated activities focus on natural science education in pre-schools (Haus der Kleinen Forscher / Little Researcher's House, see 4.3.1), primary (SINUS in Grundschulen / SINUS for Primary Schools) and secondary schools

[109] http://www.zukunft-der-energie.de/en.html

(MINIT activities) or seek to attract girls and young women to careers in natural science and technology (see Sec. 4.3).

Major scientific research organisations, universities and institutes carrying out departmental research at federal and state level have intensified public communication of their findings over the years, e.g. by hiring trained science communicators for public relations and press work. This includes regular magazines which continuously inform about ongoing research and research outcomes in a way suitable for the general public, and the publication of research reports on the institutes' web sites. In addition, several scientific organisations in Germany aim at improving the general accessibility of research results by supporting open access to scientific publications by establishing Open Access repositories (freely accessible document servers) and Open Access journals (freely accessible scientific journals published on the Internet). In a similar way, this holds true for civil society and consumer organisations which have established networks to support each other and use the Internet to inform the public in a timely manner, and to influence public awareness. As a result, more and more scientific information becomes freely accessible (mostly on the Internet) and is presented in a way suitable for a non-scientific audience.

4.1.1 Good practises

The Bürgerdialog Zukunftstechnologien[110] (Citizens' Dialogue on Future Technologies), starting in March 2011, is the latest initiative by the Bundesministerium für Bildung und Forschung (BMBF, Federal Ministry of Education and Research) to actively involve citizens in the political processes related to technologies with an anticipated impact on society. The citizens' dialog will follow a three-step process, were in a first step scientists will compile the state of the art on a selected topic (the first topic is related to future energy supply) and citizens will reflect on these reports on the basis of their personal expectations. In a second step, citizens will discuss their concerns with experts either during citizens conferences or on the internet in the form of online consultations. In a third step, citizens will produce a citizens report which will be presented at a final conference held in Berlin and handed over as recommendations for further action to the German Minister of Education and Research and representatives from politics, science, industry, and society.

The Wissenschaftsjahr[111] (Science Year, see section 4.4.4), started in 2000 with the Year of Physics, offers a platform for the exchange between science and society to present recent research results and scientific challenges around a central theme to the public. Science communication activities of universities, research institutes, museums, science centres, civil society organizations and industry are invited to take part. The Wissenschaftsjahr is initiated and supported by the Bundesministerium für Bildung und Forschung (Federal Ministry for Education and Research) and by the Wissenschaft im Dialog (Science in Dialogue) initiative. Wissenschaft im Dialog was founded in 1999 by major Ger-

[110] http://www.buergerdialog-bmbf.de

[111] http://www.wissenschaft-im-dialog.de/projekte/wissenschaftsjahre.html

man research organisations and the Stifterverband für die Deutsche Wissenschaft (Donors' Association for the Promotion of Science and Humanities in Germany) and with the support of the Bundesministerium für Bildung und Forschung with the goal of strengthening dialogue between science and society.

Each year, the Wissenschaftsjahr focuses on a specific theme which is translated by the participating organisations and other partners into activities (e.g. exhibitions, events, competitions, etc.) highlighting the impact of science and research on society. Focussing on one topic per year allows for better coordination of events, which take place throughout the year, and gives a more complete picture of the many aspects the theme might have in regard to different disciplines of science or areas of daily life. For 2011, the theme "Research for our Health"[112] has been selected; the themes of previous years were "Future Energies" (2010), "Research Expedition Germany" (2009), "Mathematics" (2008), "Humanities", (2007), "Computer Science" (2006), "Einstein Year" (2005), "Technology" (2004), "Chemistry" (2003), "Geo Sciences" (2002), "Life Sciences" (2001), and "Physics" (2000).

Closely related to the Wissenschaftsjahr are MS Wissenschaft (MS Science), a science centre based on a ship which visits around 30 cities throughout summer, and Wissenschaftssommer, a science festival taking place in one city (the winner of a contest) each year. Both share their theme with the Wissenschaftsjahr. In 2010, around 2,000 events on "Future Energies" were organised by 700 partners throughout the Wissenschaftjahr and have attracted over 2 million visitors. MS Wissenschaft dropped anchor in 34 cities and attracted around 105,000 visitors; more than 50,000 visitors attended the 100 events of the Wissenschaftssommer (Science Summer) in Magdeburg.

Started in 2002 in Tübingen with a lecture attended by 400 children on "Why do volcanoes erupt?", Kinderuniversitäten[113] (Children's Universities) have gained increasing popularity since then - in Germany and abroad. Nearly all German universities now offer these lectures specifically adapted to children's needs with the goal to attract them to science and motivate them for a scientific career. For the current winter term 2010/11, around 60 universities are offering lectures of which some in the past attracted as much as 1,000 children. Many universities organise these children's universities much like regular courses, i.e. children are handed out student ID cards and certificates to motivate them to follow the complete term. Very soon in their relatively short history, children's universities attracted internationally renowned lecturers, like Nobel Prize winner Christiane Nüsslein-Volhard with her talk on "Why is one not allowed to clone human beings?" in 2003. In 2005, the Tübingen Kinderuniversität received the Descartes Prize for Science Communication.

The project InsideScience[114] is going for better public understanding of the research being done in Sonderforschungsbereiche (Targeted Research Fields

[112] http://www.forschung-fuer-unsere-gesundheit.de/english.html
[113] http://www.die-kinder-uni.de
[114] http://www.zak.kit.edu/english/751.php

funded by the Deutsche Forschungsgemeinschaft [DFG, German Science Foundation]). It is working with films and animations for making advanced research more tangible and understandable and addresses in particular schoolchildren. Another aim of the project is to enable young scientists to better communicate with the public.

The mobile information campaign on nanotechnology "nanoTruck - Treffpunkt Nanowelten" (nanoTruck - Meeting Place Nanoworlds) is a major initiative of the BMBF. It aims at bringing nanotechnology directly to the people by using a truck as a mobile exhibition, information and dialogue instrument. NanoTruck[115] wants to provide the public with more information about the benefits and potential risks of nanotechnology at an early stage. It shall also show new perspectives for a successful career in an exciting and promising area of technology.

Science communication is alos decisive in the field of biotechnology which is a central field of innovation in the High-Tech Strategy for Germany. With the supporting programme "Biotechnology – seize and design chances" the BMBF wants to support the development of biotechnology. An open dialogue involving citizens is regarded crucial for the competitive ability of Germany in biotechnology as well as the promotion of interest, talent and dedication of junior scientists. The initiative "BIOTechnikum. Investigate life - design the future" by BMBF (Federal Ministry for Education and Research) makes biotechnology an experience.

http://www.biotechnikum.eu/

To encourage scientists to actively engage in the public communication of science and technology, a number of competitions, awards and prizes have been established where individuals, groups or even cities can apply for. The Communicator-Preis[116] (Communicator Award) is given jointly by the DFG and the Stifterverband für die Deutsche Wissenschaft to individuals with outstanding achievements in communicating scientific results to the public since 2000. The prize is valued at 50,000 euros. The Wissenschaft interaktiv[117] (Science Interactive) competition, valued at 10,000 euros, motivates groups of researchers together with public relation experts of their institute to submit a concept which innovatively communicates science to a wider audience. The winning team of the award, which was established in 2009 by the Wissenschaft im Dialog (Science in Dialogue) initiative and the Stifterverband für die Deutsche Wissenschaft, is selected by the audience of the Wissenschaftssommer science festival.

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[115] http://www.nanotruck.de

[116] http://www.dfg.de/gefoerderte_projekte/wissenschaftliche_preise/communicator-preis/index.html

[117] http://www.wissenschaft-im-dialog.de/de/wissenschaftskommunikation/wissenschaft-interaktiv.html

4.2 Science journalism and training activities

German science journalist associations (examples):

Technisch-Literarische Gesellschaft (TELI, German Association of Science Writers): The Technisch-Literarische Gesellschaft, founded in 1929, is - by its own account - the world's oldest association for technical and scientific journalists. It has around 120 members.
http://www.teli.de

Wissenschafts-Pressekonferenz (WPK, Science Press Conference): The Wissenschafts-Pressekonferenz, founded in 1986, is the professional association for science journalists in Germany with around 200 members.
http://www.wpk.org

Bachelor / Master courses in science journalism and communication:

Bachelor of Arts in Science Journalism at the Hochschule Darmstadt (Darmstadt University of Applied Sciences).
http://journalismus.h-da.de/wj

Bachelor of Arts in Science Journalism at the Technische Universität Dortmund (TU Dortmund University).
http://www.wissenschaftsjournalismus.org/content/view/347/375/

Bachelor of Arts in Specialised Journalism at the Hochschule Bremen (Bremen University of Applied Sciences).
http://www.hs-bremen.de/internet/en/studium/stg/isf/index.html

Bachelor of Science in Technical Journalism / Public Relations at the Hochschule Bonn-Rhein-Sieg (Bonn-Rhine-Sieg University of Applied Sciences).
http://fb03.fh-bonn-rhein-sieg.de/technikjournalismus.html

Master in Media and Communication Studies, Specialisation: Science Journalism at the Freie Universität Berlin (Free University of Berlin). Is planned to replace the post-graduate course in science journalism (suspended in 2006) from winter term 2011/12.
http://www.polsoz.fu-berlin.de/kommwiss/institut/wissenskommunikation/zusatzstudiengangmaster/index.html

Master of Arts in Science Communication at the Hochschule Bremen (Bremen University of Applied Sciences).
http://www.hs-bremen.de/internet/en/studium/stg/scma/index.html
http://www.master-sciencecommunication.de

Master of Arts in Science Journalism at the Technische Universität Dortmund TU Dortmund University).
http://www.wissenschaftsjournalismus.org/content/view/348/376/

Master of Science in Technology and Innovation Communication at the Hochschule Bonn-Rhein-Sieg (Bonn-Rhine-Sieg University of Applied Sciences).
http://fb03.fh-bonn-rhein-sieg.de/technik_Innovationskommunikation.html

The Faculty of Humanities and Social Sciences of the Karlsruhe Institute of Technology will install a new MA course on science communication from 2012 on (in the framework of the Ausbauprogramm 2012). It will be closely related to the existing EUKLID courses.

Other science journalism education (examples):

Akademie der Bayerischen Presse (ABP, Academy of the Bavarian Press): Provides seminars on science journalism in general and also on science journalism for university magazines.
http://www.a-b-p.de/kurse-seminare/kurse/detail/2339_Wissenschaftsjournalismus.html
http://www.a-b-p.de/kurse-seminare/kurse/detail/2291_Wissenschaftsjournalismus_im_Hochschulmagazin.html

Forschungszentrum Jülich (Jülich Research Centre): Offers training seminars specifically directed to scientists since 1994.
http://www.fz-juelich.de/inm/inm-8/DE/Leistungen/Dienstleistungen/Medientraining/medientraining_node.html

Initiative Wissenschaftsjournalismus (Initiative Science Journalism): From 2008 - 2011, the initiative, funded by Robert Bosch Stiftung (Robert Bosch Foundation), Stifterverband für die Deutsche Wissenschaft and BASF SE, provides training modules, mentoring, a scientific conference, research grants and study trips for science journalists in German-speaking countries.
http://www.initiative-wissenschaftsjournalismus.de

Klaus Tschira Stiftung (Klaus Tschira Foundation): Offers workshops for scientific writing and media seminars since 2001.
http://www.sags-klar.info/index.html

Robert Bosch Stiftung (Robert Bosch Foundation): Offers a travel grant programme for young science journalists from local German newspapers to visit the conference of the American Association for the Advancement of Sciences (AAAS) and Euroscience Open Forum (ESOF), and for science journalists from China, India, Japan and the United States of America to Euroscience Open Forum (ESOF) to give them insight into current research in Europe.
http://www.bosch-stiftung.de/content/language2/html/1485.asp

Other activities related to science communication (examples):

Awards and competitions for science communication in Germany, like the "Communicator-Preis" or "Wissenschaft interaktiv" can be found at the web site of the Wissenschaft im Dialog initiative (12 examples as of January 2010).

http://www.wissenschaft-im-dialog.de/
wissenschaftskommunikation/wettbewerbe-und-preise.html

WISSENSWERTE: Yearly conference on science journalism.
http://www2.wissenswerte-bremen.de

4.3 Young people and science education in schools

4.3.1 Skills and interest

Due to Germany's federal system, responsibility for the educational system is split between the federal and the state level. Therefore, initiatives and activities with regard to science education in schools can be found at the level of individual states and coordinated in nation-wide initiatives. The examples selected for this overview have a national scope and cover the range from pre-schools to secondary schools. This includes large-scale initiatives of the German industry and civil society organisations, like MINT Zukunft schaffen (MINT Create the Future), with nearly 1,000 individual activities. In addition to the examples provided below, around 650 innovative projects and programmes to support the development of quality in the education system (funded at the federal and state level) can be found in the Innovationsportal[118] (Education Innovation Portal).

Haus der kleinen Forscher (Little researcher's house): This initiative, initiated by the Helmholtz-Gemeinschaft (Helmholtz Association), McKinsey & Company, Siemens Stiftung (Siemens Foundation) and Dietmar Hopp Stiftung (Dietmar Hopp Foundation) and supported by the BMBF seeks to bring science education to pre-schools by organising training workshops, establishing a network between schools and educators and by supplying teaching materials for conducting scientific experiments at school. It tries to raise children's curiosity and enthusiasm for natural sciences and technology and sees learning as a shared process between children and educators. Local networks of participating schools facilitate the individual activities, and a magazine, launched in 2011, provides latest information to educators. Schools which participate for a longer time can enter the competition for the "Haus der kleinen Forscher"-Award. In 2011, an additional 5,000 pre-schools and 3,000 all-day schools are expected to join the initiative, summing up to a total of 20,000 pre-schools with more than 500,000 children and more than 25,000 educators trained by the programme. From 2011, the Federal Ministry for Education and Research provides an additional 2 million euros per year to include children between 6 and 10 years of age. http://www.haus-der-kleinen-forscher.de

SINUS in Grundschulen (SINUS for Primary Schools): Eleven federal states in Germany (and four states with an associate status) are jointly carrying out the programme between 2009 and 2013 which supports primary school teachers in developing their teaching skills in mathematics and science. SINUS follows a modular approach in which module descriptions explain important aspects of

[118] http://www.bildungsserver.de/innovationsportal

preparing lessons specifically for mathematics and science. The 10 modules defined in SINUS pick up typical "problem" areas in teaching (e.g. recognising learning difficulties, discovering student's talents and supporting them) and provide guidelines and supporting materials for teachers accordingly. SINUS in Grundschulen is based on its predecessor SINUS-Tranfer, which was carried out between 2004 and 2009 in 400 schools and with around 1,500 teachers. The second phase from 2009 to 2013 allows additional schools to participate. http://www.sinus-an-grundschulen.de

Komm-mach-MINT (Come on, join MINT) and Girl's Day are two initiatives with the goal to attract girls and young women to study MINT subjects or to consider a professional position in this area. Around 700 individual projects have been launched until 2010 and have attracted around 90,000 girls and young women. The National Pact for Women in MINT professional areas aims at changing the image of MINT professions, at fascinating girls and young women for natural sciences and engineering and at empowering women educated in MINT disciplines to go for careers in science and economy. Targeted measures are offered to reach these goals, in particular at the interfaces between school and university as well as between university and occupation.

http://www.komm-mach-mint.de; www.komm-mach-**mint**.de/content/download/1324/

The MINT Zukunft schaffen (MINT Create the Future) initiative[119] seeks to stimulate school children's (secondary schools) and students' interest in MINT subjects (Mathematics, Informatics, Natural sciences, Technology) and to develop quality and quantity of teaching in these areas at schools and universities. Initiated by German companies and industry associations in 2007 for a six-year period, the MINT activities aim at satisfying the recognised demand in skilled personnel in technology-oriented industry sectors, to increase the number of women working in these areas, and to increase the number of successful students in MINT subjects at universities. Activities include internships, pre-university classes, workshops, awards, and competitions. Examples of MINT activities (996 activities listed in February 2010[120]):

MINToring (scholars accompany students): In this programme, scholars from university accompany students at schools during the last three years of school. The idea is to give students insight into studying the MINT subjects Mathematics, Informatics, Natural sciences or Technology (engineering). 655 school children and students have been supported by the MINToring programme in 2010. In the related school children's academy programme which provides orientation to school children in identifying appropriate vocational training opportunities, 18 project schools with 328 school children were participating. http://www.sdw.org/schuelerakademie/mintoring

LernortLabor (teaching room research lab) is the national association of children's research laboratories. With its 280 registered "teaching rooms" in natural

[119] http://www.mintzukunftschaffen.de/

[120] http://www.mintzukunftschaffen.de/navigator/suche/list?query=&sort=null&_order=

sciences and technology outside of schools, LernortLabor attracts students from primary and secondary schools, with a higher number of activities targeted at secondary schools. The major part of approx. 130 laboratories is located at universities and research institutes. http://www.lernort-labor.de

NaT-Working (Natural Sciences and Technology - Networking students, teachers and scientists): The idea of the programme is to build up and maintain a personal relationship between students from school, teachers, and scientists. This is done by internships of students and teachers in research labs, summer schools, and student's conferences of which 135 have been organised since 2000. http://natworking.bosch-stiftung.de

Jugend forscht (German contest for young scientists): A very well recognised national competition, initiated in 1965, where school children (up to 14 years of age) and young people (15 to 21 years of age) present projects (e.g. experiments, innovative solutions or products) in seven scientific disciplines. The competition takes place every year and started out as a national competition, but nowadays is organised in three levels (regional, state and national level). For 2011, 10,677 participants have registered 5,707 projects for the competition. Winners of the competition are invited to present their projects at events at conferences, trade shows and the media. Winners are also nominated to participate in the European Union Contest for Young Scientists.[121]
http://www.jugend-forscht.de

4.3.2 Societal issues and critical reflection

The Bundeszentrale für politische Bildung[122] (Federal Agency for Civic Education) is an agency of the Bundesministerium des Inneren (Federal Ministry of the Interior) and promotes awareness for democracy and participation in politics. It closely cooperates with the respective agencies at the state level[123] (schools in Germany are organised at the state level) in organising events and preparing printed, audio-visual and online materials on culture, economics, media, politics, and society. Its activities are, to a large extent, targeting at education at schools, but it also provides information to the general public. Current materials related to a critical reflection on the role of science in society include: chances and risks of bio-information (DNA databases and genome sequencing), biotechnology (e.g. biotechnology applied in industrial production, crop production, and medical industry), stem cell research, agriculture and food (including mass production and biotechnology) and climate change (including new and sustainable energies). The materials not only provide an introduction and overview of the topic in question, but also present different viewpoints and arguments. http://www.bpb.de/themen/775R7M,0,0,Gesellschaft.html

[121] http://ec.europa.eu/research/youngscientists/index_en.cfm
[122] http://www.bpb.de
[123] http://www.bpb.de/partner/7KK0V7,0,0,Landeszentralen_f%FCr_politische_Bildung.html

Additional examples for different types of projects and activities targeted at education in schools include:

gen.ethix: an online game on ethical questions raised by the application of bio- and medical technologies. The game, targeted at secondary schools, presents different scenarios and asks the participant to develop solutions and to express his opinion on the problems raised. The scenarios (genetic testing, genetic information and privacy, use of human embryonic stem cells (hESCs) for drug production) are accompanied with short videos, interviews and statements to document both the current state of science and the public debate. The game was realised by the working group on Bioethik und Wissenschaftskommunikation[124] (Bioethics and Science Communication), the German section of the Human Genome Project and Fachhochschule Potsdam (Potsdam University of Applied Sciences). http://www.bioethik-diskurs.de/genethix_d (Macromedia Flash player required)

Kommunikationsmanagement in der Biologischen Sicherheitsforschung (communication management for risk assessment in biology): The project network provides extensive teaching materials for discussing ethics in biology (e.g. genetically modified plants) at school. The materials, targeted at secondary schools, provide detailed suggestions for planning lessons, for excursions to public and private research labs and links to scientific organisations. The activity is part of an initiative of the BMBF named bioSicherheit[125] (bio-security). http://www.biosicherheit.de/schule/371.ethische-urteilsbildung-beispiel-gentechnischer-pflanzenzuechtung.html

4.4 Communication activities

Means	Much less	Less	Same	More	Much more
Science TV programmes				x	
Radio			x		
Newspapers			x		
Magazines			x		
Large scale festivals					x
Web-based communication				x	
Museums, exhibitions				x	
Citizen- or CSO initiatives				x	

Due to the absence of a representative and comparative study on the role of different means of science communication in Germany, the judgement has been made on the following facts:

[124] http://www.bioethik-diskurs.de/documents/English_version/Home/view
[125] http://www.biosicherheit.de

As tables 4.4.1 and 4.4.2 show, there is a large number of TV and radio shows in Germany of which some are being broadcasted for more than 20 years. There was some fluctuation during the last five to ten years, but it seems that the variety and number of programmes still is on a high level. Especially TV, in contrast to radio and print media, supports the audio-visual communication of the complex concepts found with science and technology topics.

Nevertheless, recent statistics on media usage in Germany[126] indicate a trend for the years from 2006 to 2012 where the daily time spent with "classical" media, like newspapers, TV and radio is constantly decreasing (but TV still has the greatest share), as is the number of printed runs of German newspapers[127]. Internet and mobile media usage, in contrast, is continuously increasing. This is supported by the Trendstudie Wissenschaftskommunikation[128] (trend study on science communication) which indicates a sometimes dramatic drop in sold circulation of scientific print magazines and a substitution of print media with online media.

In spite of the fact of a probably decreasing audience of the print media, the presence of science in these media increased over the last years. In addition, new online media entered the game. One example of such new online media are science blogs (see Sec. 4.4.5). Also the number of science festivals (see Sec. 4.4.4), science centres and activities in museums (see Sec. 4.4.6) and citizen- or CSO initiatives (see Sec. 4.4.7) in Germany has continuously grown.

4.4.1 TV programmes

Programme title (and web-link if possible)	Frequency Pick from list:	Duration (in minutes)	Target audience	Themes covered
Abenteuer Forschung http://abenteuerforschung.zdf.de/	Monthly	30 min.	General public, students, researchers	Covers many science topics; one topic covered per feature
Abenteuer Wissen http://abenteuerwissen.zdf.de	Weekly	30 min.	General public	Popular science
BR-alpha http://www.br-online.de/br-alpha/index.xml	Daily	Full TV channel with features of 30 - 60 min.	General public, students, teachers, researches	Broad coverage of all sciences; educational programmes (self studying), special programme for students (alpha-campus), and e.g. astrophysics (alpha-centauri)
C't Magazin	Weekly	30 min.	General pub-	Information technology and

[126] http://de.statista.com/statistik/daten/studie/77176/umfrage/dauer-der-mediennutzung-in-deutschland-von-2006-bis-2012/ (registration required)
[127] http://de.statista.com/statistik/daten/studie/72084/umfrage/verkaufte-auflage-von-tageszeitungen-in-deutschland/
[128] http://wk-trends.de

http://www.heise.de/ct-tv/			lic	related topics
Clever - Die Show, die Wissen schafft http://www.sat1.de/comedy_show/clever/	Weekly	60 min.	General public	Scientific phenomena and triva in the form of a (comedy) show
Deutsche Welle - Projekt Zukunft http://www.dw-world.de/dw/0,,3210,00.html	Daily	30 min.	General public, students, researchers	Web-TV (video podcast) with features covering research results, popular science and technology
Die große Show der Naturwunder http://www.swr.de/naturwunder/	Several times per year	90 min.	General public	Entertainment show around natural science
Die Sendung mit der Maus http://www.wdrmaus.de	Weekly	30 min.	Children (also preschool)	Scientific programme for children, started in 1971; presents scientific phenomena, popular science, and technology
Faszination Wissen http://www.br-online.de/bayerisches-fernsehen/faszination-wissen/index.xml	Weekly	30 min.	General public	Popular science and technology
Galileo http://www.prosieben.de/tv/galileo/	Daily	60 min.	General public	Wide range of topics, covering popular science to trivia
hitec http://www.3sat.de/hitec/	Weekly	30 min.	General public	Broadcasted since 1991, focusing on technology
Kopfball http://www.wdr.de/tv/kopfball/	Several times per month	30 min.	General public	Popular science
Löwenzahn; Fragen, Forschen, Wissen http://tivi.zdf.de/fernsehen/loewenzahn/start/index.html	Weekly	25 min.	Children	Natural sciences (biology)
Myth Busters: Die Wissensjäger http://www.dmax.de/web/die-mythbusters/ and http://www.rtl2.de/16690.html	Several times per week	~45 min.	General public	Popular science in the form of experiments
n-tv wissen http://www.n-tv.de	Several times per week	55 min.	General public	Popular science and technology
nano http://www.3sat.de/nano/	Daily	30 min.	General public, students, teachers, researches	Natural sciences, humanities, technology, medicine, technological change etc
Planet Wissen http://www.planet-wissen.de	Daily	60 min.	General public	Popular science from all fields.
Planetopia http://www.planetopia.de/	Weekly	45 min.	General public	Popular science and technology
Quarks & Co http://www.wdr.de/tv/quarks/	Weekly	45 min.	General public	Popular science

Scobel http://www.3sat.de/scobel/	Weekly	Varying	General public	Broad range of science topics
Total Science http://www.rtl2.de/33419.html	Daily	45 min.	General public	Popular science from all fields
[W] wie Wissen http://www.daserste.de/wwiewissen/default.asp	Weekly	25 min.	General public	Popular science; covering many field, also medical and health issues as related to science
Wissen macht Ah! http://www.wissenmachtah.de	Daily	25 min.	Children	Broad coverage of disciplines; communicates basic principles from physics, chemistry, biology etc. in form of experiments; answers questions about scientific phenomena
ZDF Umwelt http://www.umwelt.zdf.de/	Weekly	30 min.	General public	Topics related to environmental issues

The list of TV programmes was collected from the web sites of major German TV stations. A list of radio and TV programmes as of 2008 is available at http://www.polsoz.fu-berlin.de/en/kommwiss/v/avsa/Downloads/Selected_Science_Programmes.pdf but also includes programmes not specifically scientific.

4.4.2 Radio programmes

Programme title (and web-link if possible)	Frequency	Duration (in minutes)	Target audience	Themes covered
Aus Wissenschaft und Technik http://www.br-online.de/b5aktuell/aus-wissenschaft-und-technik/index.xm	Weekly	25 min.	General public	Popular science and technology
Deutsche Welle - Wissenschaft http://www.dw-world.de/dw/0,,12296,00.html	Weekly	15 min.	General public, students, researchers	Radio program, web radio, and podcast covering research results from all disciplines
Forschung aktuell http://www.dradio.de/dlf/sendungen/forschak/	3x per Week	25 min.	General public, students, researchers	Presents latest research results, covering all disciplines
IQ - Wissenschaft und Forschung http://www.br-online.de/bayern2/iq-wissenschaft-und-forschung/index.xml	Daily	25 min.	General public	Covers popular science, technology and health
Logo - Das Wissenschaftsmagazin http://www.ndrinfo.de/programm/sendungen/logo114.html	Weekly	55 min.	General public	Covers popular science from many disciplines and technology
Radiomikroskop http://www.lilipuz.de/wissen/radiomikroskop/	Weekly	55 min.	Children	Many different fields of science and technology
SWR2 Campus - Neues aus Wissenschaft und Forschung	Weekly	25 min.	General public, students,	Latest research results from many fields, news about the

http://swr2campus.radio.de/			researchers	education and research sector
WDR 5 - Leonardo http://www.wdr5.de/sendungen/leonardo.html	Daily	55 min.	General public	Popular science from many disciplines and special features (e.g. a monthly experiment presented live)
Wissenschaft im Brennpunkt http://www.dradio.de/dlf/sendungen/wib/	Weekly	30 min.	General public	Covers from popular science to health issues
Wissenswert http://www.hr-online.de/website/specials/ wissen/index.jsp?rubrik=6584	Daily	15 - 25 min.	General public	Popular science and technology
Wissenswerte: Forschung im Gespräch http://www.inforadio.de/radio_zum_lesen/wissenschaft/wissenschaft.html	Daily	5 or 40 min.	General public, students, researchers	Short features describing research activities, researchers and research institutes; from time to time long features, e.g. public discussions

The list of radio programmes was collected from the web sites of major German TV stations. A list of radio and TV programmes as of 2008 is available at http://www.polsoz.fu-berlin.de/en/kommwiss/v/avsa/Downloads/Selected_Science_Programmes.pdf but also includes programmes not essentially scientific.

4.4.3 Popular science articles in newspapers and magazines

Newspaper science sections:

Title of newspaper (and web-link if possible)	Frequency of science section	No. of print runs	Target audience	Themes covered
Die Welt http://www.welt.de	Daily (Mo. - Sa.)	~250,000	General public	Broad range of science issues
Die Welt am Sonntag http://www.welt.de	Sunday	~400,000	General public	Broad range of science issues
Die Zeit http://www.zeit.de	Weekly (weekly newspaper)	~500,000	General public	Broad range of science issues
Financial Times Deutschland http://www.ftd.de	Double page, once per week	~100,000	Financial	Focus on technology issues
Frankfurter Allgemeine Zeitung http://www.faz.net	Science supplement, once per week	~380,000	General public	Broad range of science issues
Frankfurter Rundschau http://www.fr-online.de	Daily	~150,000	General public	Broad range of science issues
Handelsblatt http://www.handelsblatt.com	Two times per week	~140,000	Financial	Natural sciences and humanities
Süddeutsche Zeitung http://www.sueddeutsche.de	Daily	~440,000	General public	Broad range of science issues

National newspapers with more than 100,000 printed runs have been selected for the table above. Data is based on the newspapers' web sites and the report "Science News? Overview of Science Reporting in the EU" (http://ec.europa.eu/research/conferences/2007/bcn2007/overview_of_science_reporting_eu_en.pdf)

Popular science magazines:

Title (and web-link if possible)	Frequency Pick from list:	No. of print runs	Target audi-ence	Themes covered
Bild der Wissenschaft http://www.wissenschaft.de/wissenschaft/home.html	Monthly	~100,000	General	Broad range of science issues
GEO Magazin http://www.geo.de	Monthly	~310,000	General	Broad range of science issues
National Geographic Deutschland http://www.nationalgeographic.de	Monthly	~220,000	General	Broad range of science issues
P.M. - Welt des Wissens http://www.pm-magazin.de	Monthly	~280,000	General	Natural sciences, tech-nology, biology, history
Spektrum der Wissenschaft http://www.spektrum.de/	Monthly and sev-eral special issues per year	~110,000	Educated	Broad range of science issues
VDI Nachrichten http://www.vdi-nachrichten.com	Weekly	~160,000	Engineering	Focus on engineering and machinery
Welt der Wunder http://www.bauermedia.de/weltderwunder.html	Monthly	~260,000	General	Broad range of science issues
Wunderwelt Wissen http://www.wunderwelt-wissen-magazin.de	Quarterly	~220,000	General	Broad range of science issues

Science magazines with more than 100,000 printed runs have been selected for the table above. Data is based on the magazines' web sites and the report "Science News? Overview of Science Reporting in the EU" (http://ec.europa.eu/research/conferences/2007/bcn2007/overview_of_science_reporting_eu_en.pdf)

4.4.4 Festivals, science weeks, etc.

Activity title (and web-link if possible)	Activity type	Organiser	Frequency	Number of participants (approx.)	Venue (city / region- / national)	Short description
National initiative Wissenschaft im Dialog (Science in Dialogue) and its projects						
1. Wissenschaft im Dialog (Science in Dialogue) http://www.wissenschaft-im-dialog.de/en/about-wissenschaft-im-dialog/projects.html	National umbrella activity concerning science in society	Wissenschaft im Dialog (Science in Dialogue) Initiative (WiD)	ongoing	n/a	Different venues	The Wissenschaft im Dialog (Science in Dialogue) initiative was founded in 1999 by the major German research organisations, the Federal Ministry for Education and Research, and the Donors' Association for the Promotion of Science and Humanities in Germany.
FameLab http://www.famelab-germany.de	Festival	British Council Germany, research institutes, companies	Several times per year	n/a	Different venues	For the first time, the FameLab competition takes place in Germany in 2011. It is a competition of young scientists originally organised by the British Council in the United Kingdom. Scientists are given three minutes time to present their ideas, using anything to support their presentation - except slides
Kinderuniversität (Children's University) Interactive map with lectures in 2010/11 at http://www.die-kinder-uni.de/html/vorlesungsverzeichnis.html; directory of 69 children universities collected by the European Children's University Network: http://eucu.net/cu/pro	Open university	Universities	Many times per year	Several hundred children per lecture	Different cities	Lectures at universities specifically adapted to school children. Often, the organisation of the lectures simulates a real university, i.e. with student identity cards and certificates

jects#country_DE						
Lange Nacht der Wissenschaft (Science Nights) URLs for participating cities in 2011: Rostock http://www.lange-nacht-des-wissens.de/_cache Berlin and Potsdam http://www.langenachtderwissenschaften.de Magdeburg http://www.magdeburg.de/wissenschaft/lndw.php Cologne http://www.nacht-der-technik.de Dresden http://www.dresden-wissenschaft.de/index.php?id=langenacht Halle http://www.wissenschaftsnacht-halle.de Aachen http://www.rwth-aachen.de/go/id/lgh	Interactive presentations, scientific talks, open laboratories	Universities, research institutes, companies	Once a year per city / institution	5,000 - 30,000 according to reports in the media	Different cities	Participating institutions present their results to the general public. Activities include scientific lectures, open laboratories, guided tours, interactive experiments and exhibitions
2. MS Wissenschaft http://www.wissenschaft-im-dialog.de/projekte/ms-wissenschaft.html	Interactive Exhibition	Wissenschaft im Dialog (Science in Dialogue) Initiative	yearly	100,000	Stops in 30 cities	A ship, MS Wissenschaft, is equipped with an interactive exhibition and visits around 30 cities per year. The exhibition's theme is identical with the theme of the current Wissenschaftsjahr (Science Year, see below).
Science Slam http://www.sciencesslam.org/Deutschlandweite%20-%20Slam-Staedte%20-	Festival	Local organisers	Several times per year	n/a	Several cities	Young scientists present their research in short lectures (up to 10 min) during a competition. The

%20teilnehmende%20Science%20Slam%20St%C3%A4dte						audience rates each lecture by the complexity of the matter, the comprehensiveness of the talk and the presentation skills of the speaker. Science Slam winners from all over Germany then compete for the "Bundeshirn" ("federal brain") trophy
ScienceStation http://www.wissenschaft-im-dialog.de/projekte/sciencestation.html	Interactive Exhibition	Wissenschaft im Dialog (Science in Dialogue) initiative, Deutsche Bahn	yearly	n/a	Different cities	Interactive exhibition at train stations across Germany. The train's journey lasts for several weeks, and the exhibition and experiments have a specific motto, e.g. "Knowledge is the best medicine" in 2011, which is related to the current Wissenschaftsjahr (Science Year, see below).
Wissenschaftsfilmfest (Science Film Festival) http://www.wissenschaft-im-dialog.de/projekte/wissenschaftsfilm-fest.html	Film festival	Wissenschaft im Dialog (Science in Dialogue) Initiative	yearly	n/a	Different city every year	A four days film festival where researchers introduce the audience to each film's topic and answer questions afterwards.
Wissenschaftsjahr (Science Year) http://www.wissenschaft-im-dialog.de/projekte/wissenschafts-jahre.html and individual URLs per year, e.g. http://www.zukunft-der-energie.de (2010 on future energies) and	Interactive Exhibitions	Wissenschaft im Dialog (Science in Dialogue) Initiative	Every year	2010: around 2,000 events with a total of 2 mio. visitors	Across the country	A scientific discipline or research field (e.g. mathematics, social sciences, future energies, health) is presented by partner organisations from research, education, industry, culture and politics throughout the year and at different places. The many different events of the

http://www.forschung-fuer-unsere-gesundheit.de (2011 on health) Themes: 2011: Health 2010: Future Energies 2009: Research Expedition Germany 2008: Mathematics 2007: Humanities 2006: Computer Science 2005: Einstein Year 2004: Technology 2003: Chemistry 2002: Geo Sciences 2001: Life Sciences 2000: Physics						Science Year give insight into the research carried in the discipline(s) related to the yearly motto and the impact of science and research on daily life and society. Activities directly related to the Science Year's theme are the projects MS Wissenschaft (see above), Wissenschaftssommer (The Science Summer, see below), and Expedition Zukunft (Expedition Future),
3. Wissenschaftssommer (The Science Summer) 4. http://www.wissenschaft-im-dialog.de/projekte/wissenschafts-sommer.html	Exhibition	Wissenschaft im Dialog (Science in Dialogue) Initiative (WiD)	One week every year	70,000 - 100,000	Different city every year	Wissenschaftssommer (The Science Summer) is the major science fair in German research. Every year, WiD presents Science for All in a different city: exhibitions, workshops, open laboratories, public discussions etc.
Festivals, science weeks etc. taking place at different locations across Germany						
Explore Science http://www.explore-science.info	Science Festival	Klaus Tschira Foundation	yearly	50,000	Mannheim	Five days science festival targeting at all ages
Geniale Bielefeld http://www.geniale-bielefeld.de	Science Festival	Bielefeld Marketing GmbH and several universities	2008, 2011	40,000	Bielefeld	Science festival with over 400 events at 50 locations
Highlights der Physik (Highlights of Physics) http://www.weltderphysik.de/de/8824.php	Science Festival	Deutsche Physikalische Gesellschaft (German Physical	Yearly since 2001	23,000 in 2010	Different city every year	Interactive exhibitions, live experiments, and lectures by scientists giving insight into physics. During recent years,

		Society), Federal Ministry for Education and Research (BMBF)				the festival's motto was related to the current Wissenschaftsjahr (Science Year, see above)
IdeenExpo http://www.ideenexpo.de	Science Festival	IdeenExpo GmbH	2009, 2011	283,000	Hannover	Nine days science festival supported by a road show
Land der Ideen (Germany - Land of Ideas) http://www.land-der-ideen.de	Competition and local events	Public-private-partnership of federal ministries and companies	365 times a year	n/a	365 different places in Germany	Institutions of all kinds (scientific and non scientific) present their winning "ideas" in the most adequate way (lectures, exhibitions, open labs etc.). All events are published in a guide
Münchner Wissenschaftstage (Munich Science Days) http://www.muenchner-wissenschaftstage.de	Science Festival	Ludwig-Maximilians-Universität München	Yearly since 2001	n/a	Munich	Science festival targeting at students and adults with special activities for children
Science Days http://www.science-days.de/sdays	Science Festival	Science und Technologie e.V.	yearly	n/a	Europa-park Rust	Three days science festival (for all ages) located in an amusement park
Science Days for Kids http://www.science-days.de/kinder	Science Festival	Science und Technologie e.V.	yearly	n/a	Europa-park Rust	Two days science festival (children from 4 to 8 years) located in an amusement park
Stadt der Wissenschaft (City of Science) http://www.stadt-der-wissenschaft.de	Yearly competition between German cities	Stifterverband für die deutsche Wissenschaft (Stifterverband is the business community's innovation agency for the German science system)	yearly	n/a	Different city every year	A competition which motivates communities to find out about their scientific assets (e.g. lesser known research institutes) and make "science" the principal thing in the city throughout the year. Over 50 cities participated in the competition (prize: 250,000 euros) since 2005. Win-

						ning cities: Bremen / Bremerhaven (2005), Dresden (2006), Braunschweig (2007), Jena (2008), Oldenburg (2009), and Mainz (2011)

To present an overview of festivals, science weeks etc. in Germany and to give insight into the diversity and richness of the events, the German umbrella initiative Wissenschaft im Dialog (Science in Dialogue) has been used. The table above shall serve as an entry point to related activities and lists (in alphabetical order) projects of a national scope (e.g. the Science Years), mostly focusing on a common theme, a specific type of event or a competition which is carried out throughout Germany. The second part of the table lists examples of local events or types of events which aim at linking specific places with science and technology (i.e. to promote universities or local research institutes). Events dedicated to e.g. children are listed for completeness only as they are covered in other sections of this report.

4.4.5 National portals, blogs

Activity title (and web-link)	Activity type	Number of users (if known)	Themes covered	Short description
Bundesministeriums für Bildung und Forschung (BMBF, Federal Ministry of Education and Research) http://www.bmbf.de	Portal	n/a	Current research policy and funding programmes, selected research projects	The ministry presents its own activities, but also acts as a platform to communicate the current research agenda and important projects
Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) http://www.dfg.de and DFG Science-TV http://www.science-tv.de	Portal	n/a	Current research policy and funding programmes, selected research projects	Portal presenting the largest German funding organisation, its policies and programmes. DFG Science-TV presents video footage aimed at communicating current research to the general public
Informationsdienst Wissenschaft (Idw, Scientific Information Service) http://idw-online.de	Portal	n/a	Aggregates news about research results, projects, conferences, research policies, knowledge transfer etc.	Portal targeted primarily at media and experts, but also at researchers, students, parents etc.
ScienceBlogs.de http://www.scienceblogs.de	Portal	n/a	Research results from all disciplines	Portal to 35 blogs covering scientific results, history of science, and ethics of science
Sciencegarden	Blog	n/a	Natural sciences	Blogs covering scientific

http://www.sciencegarden.de/blog			and technology, education, culture and society	results, but also history of science and ethics of science
scilogs http://www.scilogs.de	Blog	n/a	Focuses on neuroscience, psychology, astronomy, history, natural sciences	Blogs covering scientific results, but also history of science and ethics of science
Wissenschaft im Dialog (Science in Dialogue) http://www.wissenschaft-im-dialog.de Wissenschaft debattieren (Debating Science) http://www.wissenschaft-debattieren.de	Portal	n/a	Activities around communicating science	Presents activities around communicating science, from "Children's University" to "Long Night of the Museums"; sub-portal with local events on the dialogue about science, e.g. with students or citizens
Wissenschafts-Café (Science Café) http://www.wissenschafts-cafe.net	Blog	n/a	Directory of science blogs	Presents a list of the top 20 German science blogs

The table (in alphabetical order) gives examples of portals and blogs in Germany. The portals selected cover a national scope and a broad range of scientific topics. The blogs selected publish articles by a group of authors (i.e. they are not personal blogs) on a variety of topics or aggregate individual scientific blogs and may serve as a starting point to the German "blogosphere" as related to science and technology.

4.4.6 Science museums and centres

Activity title (and web-link if possible)	Activity type	Number of visitors/year	Themes covered	Venue (city)	Short description
Deutsches Bergbaumuseum http://www.bergbaumuseum.de/	Museum	n/a	Coal mining	Bochum	
Deutsches Museum (German Museum) http://www.deutsches-museum.de	Museum	1.3 mio.	Natural sciences, technology, energy, transport, materials, communication	Munich and Bonn	Largest science and technology museum in Germany
Deutsches Schiffahrtsmuseum http://www.dsm.national.museum/	Museum	n/a	National museum on shipping	Bremerhaven	
Deutsches Tech-	Museum	600,000	Technology,	Berlin	Science and technology museum with five

nikmuseum (German Museum on Technology) http://www.sdtb.de			astronomy		campuses, including a science centre
Germanisches Nationalmuseum http://www.gnm.de/index_en.html	Museum	n/a	panoramic overview of the cultural history of German-speaking central Europe	Nürnberg	
Museum für Naturkunde (Berlin Museum of Natural History) http://www.naturkundemuseum-berlin.de	Museum	n/a	Natural history	Berlin	Natural history museum
Museum Koenig (Zoological Research Museum Alexander Koenig, ZFMK) http://www.zfmk.de	Museum	100.000	Zoology	Bonn	Zoological museum
Naturmuseum Senckenberg (Senckenberg Research Institute and Natural History Museum) http://www.senckenberg.de	Museum	n/a	Natural history, biodiversity	Frankfurt am Main, Görlitz, Dresden	Natural history museum
Römisch-Germanisches Zentralmuseum http://web.rgzm.de/1.html?&L=1	Museum	n/a	History and culture of the Rhine valley	Mainz	
Science Centres in Germany Examples: Dynamikum http://www.dynamikum.de experimenta Heil-	Science Centres	n/a	Natural sciences and technology	Different cities	Three lists with a large number of science centres in Germany

bronn http://www.experimenta-heilbronn.de Exploratorium Potsdam http://www.exploratorium-potsdam.de Kinderreich (Children's Realm at German Museum) http://www.deutsches-museum.de/ausstellungen/kindermuseum/kinderreich Mathematikum http://www.mathematikum.de Odysseum http://www.odysseum.de Phaeno http://www.phaeno.de Science House http://www.science-house.de Spectrum http://www.sdtb.de/Spectrum.4.0.html Universum Bremen http://www.universum-bremen.de					

The list of museums (in alphabetical order) presents examples of scientific museums and science centres in Germany. According to the statistical report of the Institut für Museumsforschung[129] (IfM, Institute for Museum Research) for the year 2009[130] (in which 6,256 museums have been included) there were 767 mu-

[129] http://www.smb.spk-berlin.de/ifm/

[130] Statistische Gesamterhebung an den Museen der Bundesrepublik Deutschland für das Jahr 2009. Materialien aus dem Institut für Museumsforschung , Heft 64. Staatliche Museen zu Berlin – Preußischer Kulturbesitz, Institut für Museumsforschung. http://www.smb.spk-berlin.de/ifm/dokumente/materialien/mat64.pdf

seums on science and technology and 313 natural history and natural science museums in Germany with a total number of 24 million visits in 2009. The examples selected for this report are museums from these areas which are jointly funded by the federal and state governments as members of the Leibniz Gemeinschaft[131] (Leibniz Association) or have a national character. The web site of Deutscher Museumsbund (German Museum Association) provides links to directories[132] of museums in all German states. A number of German museums also have science centres included, while other science centres are funded or operated by civil society organisations, universities, research institutes or private companies. escite[133], the European Network of Science Centres and Museums, lists 46 science centres and museums in Germany (as of February 2011). The examples selected for this table are recognised[134] by the Wissenschaft im Dialog initiative (see above).

4.4.7 Citizen- or Civil society organisations initiatives

Activity title (and web-link if possible)	Activity type	Frequency	Number of participants	Short description
Berlin Science Talks http://www.bosch-stiftung.de/content/language2/html/22944.asp (with minutes of the recent science talks)	Discussion	Irregular	n/a	Since 2001, the Robert Bosch Stiftung (Robert Bosch Foundation) invites high-level experts from science, politics and business to discuss a scientific topic of relevance to society. In the first part of the event, a closed forum provides an environment for open exchange and discussion. The second part consists of a public round-table discussion
5. Bürgerausstellung (Citizen science exhibition) 6. http://www.wissenschaft-debattieren.de/buergerausstellung.html	Citizen science project	Irregular	n/a	Citizen science exhibition where photographs, quotes and exhibits document citizens' opinion on scientific topics. Up to now, two exhibitions have taken place on personalised healthcare (2009 in Bremen) and future energies (2010 in Magdeburg). Supported by the Wissenschaft im Dialog initiative (Science in Dialogue, see 4.4.4)
7. Bürgerkonferenz (Citizens conference)	Citizens conference	Irregular	50 - 200	Public conference where citizens and experts discus topics relevant to society as a whole.

[131] http://www.leibniz-gemeinschaft.de
[132] http://www.museumsbund.de/de/links/national/museumsverzeichnisse/
[133] http://www.ecsite.eu
[134] http://www.wissenschaft-im-dialog.de/projekte/science-center.html

8. http://www.wissenschaft-debatti-eren.de/buergerkonferenz.html				In 2010, four conferences have been held on future energies (in Berlin, Essen, Karlsruhe). Supported by the Wissenschaft im Dialog initiative (Science in Dialogue, see 4.4.4)
9. Junior Science Cafe http://www.wissenschaft-debatti-eren.de/junior-science-cafe.html	Science cafe	Three to four times per school term (since 2009)	30 - 100	Science Cafes organised by students. Students select and prepare topics, invite scientists to their schools and moderate discussions. Currently, two schools (in Berlin and Bergheim) are participating. Supported by the Wissenschaft im Dialog initiative (Science in Dialogue, see 4.4.4)
10. Konsensuskonferenz (Consensus conference) http://www.wissenschaft-debatti-eren.de/konsensuskonferenz.html	Citizen conference	One up to now	25	Conference where citizens, supported by experts and scientists, discuss on a topic and try to reach consensus. The consensus reached is documented in a report, giving advice to scientific and political stakeholders. For the first conference in Essen (2010), a representative group of 25 citizens has been selected to discuss on Germany's future energy supply. Supported by the Wissenschaft im Dialog initiative (Science in Dialogue, see 4.4.4)
11. Phänomenta http://www.phaenomenta.com/	Initiative	Regular	n/a	Network of civil society initiatives (with partners form industry and ministries) dedicated to supporting science and education by making natural sciences and technology more accessible and "popular"
12. Wissenschaftscafé (Science cafe) In addition to science cafes organised in the context of e.g. science weeks and festivals, examples for science cafes (with a different level of current activities)	Science cafe		n/a	

include:				
Phänomenta Wissen-schaftscafé http://www.phaenomenta-lueden-scheid.de/verein/wiscaf.html		Around four times a year		Science cafe launched in 2005, active until 2008
Science Café Bielefeld http://www.bielefeld-marke-ting.de/de/wb/projekte/sciencecafe/		Around four times a year		Science cafe launched in 2009, organised by Bielefeld city marketing
Science Café DESY http://sciencecafe.desy.de		Bi-weekly		Science cafe organised by Deutsches Elektronen-Synchrotron DESY (research facility running particle accel-erators)
Urania Science Café http://www.schalley-lab.de/public/sciencecafe.html		Irregular		Series of science café events between 2005 and 2008, organ-ised by Urania (civil society organisation) in Berlin
Wissenschaftsladen Bonn (Science Shop Bonn) http://www.wilabonn.de/646_3625.htm?h335 http://www.comscience.eu		5 times in 2010/11		Series of five science cafés or-ganised in the context of the EU-funded project ComScience
Wissenschaftscafé Freiberg (Science Cafe Freiberg) http://www.cafe.pegleg.de		Weekly		Weekly science cafe, started in 2006 and is organised by scien-tists of TU Bergakademie Freiberg (University). Several times per year, invited speakers focus on a dedicated topic (e.g. genetics, new energies, envi-ronmental pollution) and discuss with the audience

13. Wissenschaft-sladen (Science shops) Examples: kubus - Kontakt und Beratungsstelle Umweltschutz http://www.zewk.tu-berlin.de/v-menue/kooperation_wissenschaftgesellschaft/kubus Wissenschaftsladen Bonn http://www.wilabonn.de Wissenschaftsladen Dortmund http://www.wissenschaftsladen-dortmund.de Wissenschaftsladen Hannover http://www.wissenschaftsladen-hannover.de Wissenschaftsladen Tübingen http://www.wila-tuebingen.de	Science shop	-	-	Science shops seeks to bridge the gap between universities and citizens by presenting scientific knowledge and research results in a way understandable by the general public. Activities include science cafes, job portals and job fairs, workshops and trainings on new occupational images (e.g. around new energies and sustainable technologies), educational trainings, teaching materials (e.g. for biological diversity or healthy diet), and excursions
14. Wissenschaftstheater (Science theatres, science shows) In addition to science theatres and shows organised in the context of e.g. science weeks and festivals, other examples include:				
Phaeno Wissenschafts-theater http://www.phaeno.de/shows.html	Science shows	Changing schedule	n/a	Science shows (changing topics) at Phaeno Science Centre

Und sie bewegt sich doch! (And yet it moves) http://www.deutsches-museum.de/ information/vortraege/fuer-jedermann/fuer-jedermann-0910/16-17122009-wissenschaftstheater	Science theatre	Only once	n/a	Science theatre about Galileo Galilei and Johannes Kepler, taking place at Deutsches Museum in December 2009
Universum Bremen http://www.universum-bremen.de/de/start-seite/veranstaltungen/terminkalender.html	Science theatre, science shows, science dinner	Changing schedule	n/a	Science shows and theatres (changing topics), and a science dinner with experiments and insights into molecular cuisine

5 The Fukushima accident

5.1 Media coverage and public debate

In Germany there has been for decades a dominant skeptical attitude towards nuclear power. A strong public movement was successful already in the 1980ies in preventing the establishment of some nuclear power plants and the nuclear materials recycling technology at Wackersdorf. The Tschernobyl disaster in 1986 fuelled this movement considerably. Since that time a majority of the population does prefer a phase-out (Ausstieg) of nuclear powering Germany. In 2000 there was a decision to exit nuclear power in about 20 years from that time. During the last years, however, the percentage of opponents decreased slowly. In late 2010 the German Government decided to revise the earlier decision from 2002 and to considerably extend the runtime of most of the 17 German nuclear power plants.

The Fukushima event changed this situation dramatically. Mass media and political debate strongly reported about the event. For weeks it was the dominant issue in all mass media. Environmental risks and health risks related with a possible release of radioactive materials were the main issues. Major concern was spent to a possible radioactive cloud approaching the metropolitan area of Tokyo over the first days. Many experts were cited in the media about direction of wind and the possible risk for urban areas. After these first days the situation of the population directly affected became the most important issue. Many reports informed the German population about the evacuation of inhabitants in a radius of first 20, then 30 kilometers around the Fukushima nuclear power site. Interviews with people directly affected transported their desperateness and fears to the German population. Furthermore, the information policy of Tebco, the company running the Fukushima plant, and of the Japanese Government was subject of information and criticism. In the later stage of reporting the control and supervision measures on nuclear power plants in Japan in general came into the interest of reporters.

The accident was framed as a mainly political issue. Also the decisions decades ago which foresaw protection against strong earthquakes and tsunamis but not sufficient with respect to the events of March 11 were framed as human decisions which could have been made in a different way if other criteria would have been applied. Many newspapers and TV magazines reported about too much trust into technology in Japan but also about economic reasons for not

implementing stronger safety measures. Climate concerns did not play any role. Science and technology were mainly used in their expert roles. Many interviews were made with experts trying to get insights into what was really happening at Fukushima. Science and technology were accused of being responsible only seldom. Criticism was raised more against economic power, against the governance of supervision and control, and against the Tebco Company.

An essential point in media coverage was from the very beginning what would follow from the Fukushima disaster for nuclear power in Germany. In spite of the fact that comparable earthquakes and tsunamis would probably never occur in Germany, there was a vast majority in mass media reporting and commenting postulating a faster phase-out of nuclear power in Germany. Criticism was in particular raised concerning the seven oldest nuclear power plants. A frequently used argument was that these plants would even not resist a minor airplane crash or a terrorist attack.

5.2 Levels and modes of public involvement

The major part of public involvement was triggered by mass media reporting. Many readers of newspapers and observers of TV and broadcast magazines gave their opinions in form of letters to the editor of as interviewees. Regularly, representative polls were conducted in order to get knowledge about the problem perception of the population and also about what ordinary people would conclude for the German nuclear power policy. There was, however, no formal involvement in the sense of participatory assessments or citizens panels.

The major political institutional invention was the establishment of the so called ethics committee on a safe energy supply (Ethik-Kommission für eine sichere Energieversorgung). This committee was chaired by Professor Klaus Töpfer, the former executive director of the United Nations Environmental Program UNEP. He receives strong reputation across all political parties and in the population. During the deliberations in this committee a hearing was conducted which was transported by TV to all people interested. This model had been successfully implemented during a mediation procedure at the occasion of severe conflicts around the Stuttgart21 plan of building a new main railway station underground replacing the old station. However, this was a good opportunity to the population to inform itself and to reflect on the own opinion but it was a one-channel communication not allowing for interaction.

At the local and regional level, there were a lot of information, deliberation and dialogue events. In most cases, either research institutions or local initiatives or civil society organizations were the organizers. Many people took the occasion and joined these events.

5.3 Political responses and scientific advice

In Germany there were strong political reactions which led to a complete revision of the political program of the governing coalition of Christian Democrats (CDU/CSU) and Liberal Democrats (FDP) concerning nuclear power. While

these parties had fought against the phase-out decision of the red-green coalition in year 2000 and were successful in revising that decision in late 2010, they changed their position after the Fukushima event within few days. A first political response was to switch off the seven old nuclear power plants directly after the disaster for the time of a moratorium of three months. The second response was to install the so called ethics committee on a safe energy supply (Ethik-Kommission für eine sichere Energieversorgung) chaired by Professor Klaus Töpfer, the former executive director of the United Nations Environmental Program UNEP. This committee was requested to provide recommendations about future German policy in the field of nuclear power within two months.

Several members of the ethics committee came from natural and engineering sciences but also from social sciences and the humanities, amongst representatives of major societal groups. The involvement of scientists from different disciplines was one of the entry points for bringing in scientific expertise. The second entry point was an extended expert hearing where about 30 experts from different fields were consulted concerning their opinion on nuclear power but also on alternative strategies for future energy supply. Furthermore, the committee took notice of many studies which were published shortly after the Fukushima disaster.

As a result, the Committee came up with a recommendation to phase out nuclear power in Germany within the next 10 years, in combination with many measures supporting a quick implementation of other forms and technologies of energy supply. The German Government followed this recommendation more or less and decided at the beginning of June to phase out nuclear power until 2022. The Parliament (Bundestag and Bundesrat) approved this decision recently.

In summary, the Fukushima accident led to the situation that a broad consensus about phasing out nuclear power in Germany emerged. Only few voices warned against phasing out, mostly related with arguments that accidents similar to Fukushima would never happen at German nuclear power stations and that a quick phase-out would bear considerable risk for a safe energy supply and for the competitiveness of the German economy. The broad consensus concerning quick phase-out, however, can only be understood against the background of a long-lasting and stable uneasiness or even rejection of nuclear power in large parts of the population.