

Priorities for R&I Policy in the Coming Legislative Period

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The COVID-19 crisis hits the German R&I system at a time when it is addressing grand societal challenges and questions about the future. The crisis exposes and makes visible the strengths of the system as well as its weaknesses, for example, regarding digitalization of the economy and society.

In the past two decades, Germany has through smart financial and economic policies mastered challenges such as the reform of the labour market⁶⁰ and the management of the financial market crisis in 2008/09. It was also possible to create scope of action both for future investments and for coping with crises. On the one hand, Germany has in recent years been able to advance and further develop the R&I system and, on the other hand, it has recently been able to mitigate the most serious distortions caused by the COVID-19 crisis through extensive borrowing.

The Excellence Initiative and the Excellence Strategy⁶¹ as well as the various pacts⁶² have been able to give the science system a boost. The High-Tech Strategy⁶³ (HTS) was further developed as a cross-departmental, innovation-oriented policy approach with the aim of laying the foundations for future key technologies and supplying innovative solutions to key societal challenges. The innovation activity of East German companies has in recent years largely converged with the innovation activity of West German companies.⁶⁴ After reaching the three-percent target in 2017, Germany's R&D intensity has now reached the international top group with a value of 3.17 in 2019 (cf. chapter C 2) – a joint success of private-sector R&D activities and wide-ranging public sector funding policy. Germany has thus definitely achieved its goal of playing a leading international role as a location for innovation, or at least has come remarkably close to it.

Yet such a strengthened R&I system is no reason to relax. Although overcoming the COVID-19 crisis will be one of the key tasks of the new Federal Government in the coming legislative period, R&I policy must continue to be prioritized. The Commission of Experts expects the next Federal Government to make no, or at most only minor, cuts in R&I policy despite the greatly reduced budgetary leeway resulting from the COVID-19 crisis.

The new Federal Government still needs a coherent policy approach that focuses on the entire innovation process from basic research to application and to which all ministries are committed. For the next legislative period, existing R&I policy priorities must be further developed, and new priorities set, as the short- and long-term challenges to the German R&I system have also increased, parallel to the positive developments mentioned above and beyond the symptoms of the COVID-19 crisis. This is accompanied by the need for continuous adaptation of the R&I system itself, R&I policy, and its objectives.

In view of the tasks and problems awaiting solution, R&I policy in the coming legislative period should align its strategies and measures with five key priorities. The grand societal challenges and in particular the sustainability goals must be given a high priority. It is equally important for the development of prosperity that Germany catches up with existing technological gaps and avoids these in potential key technologies from the outset. To achieve these objectives, Germany, as a country poor in natural resources, must have a strong skilled labour base. With regards to R&I investments in private enterprises, it is moreover important to increase innovation participation. Finally, the agility of R&I policy is an important prerequisite for successfully

implementing the transformative change desired by society (cf. chapter B 1). The impact of the COVID-19 crisis on the R&I system must of course be considered.

Priority 'Addressing Grand Societal Challenges'

The grand societal challenges and the Sustainable Development Goals (SDGs) have played an increasingly important role in shaping R&I objectives and programmes over the past decade. The Federal Government has taken these into account in the HTS 2025 and has formulated corresponding missions such as: 'Large-scale greenhouse gas neutrality of industry', 'Preserving biodiversity' and 'Safe, connected and clean mobility'. Although moderate progress has been made in some of these fields in recent years, such as the reduction of greenhouse gas emissions,⁶⁵ the initiated transformation processes are essentially still in their infancy. Necessary directional changes in technology are often slowed down, if not prevented, by lock-in in old technologies. Escaping this lock-in situation requires a combination of technological innovations, incentives to adapt behaviour, and sometimes also impulses to change attitudes.

Meet Societal Challenges with Technological and Social Innovations

The grand societal challenges can only be met if ongoing transformative change processes are continued, and new ones are initiated (cf. chapter B 1). Such change processes cannot be achieved without technological and social innovations, for example, for a socially acceptable and universally accepted transition to sustainable mobility. Conflicting goals between SDGs, such as poverty reduction on the one hand, and combating climate change on the other, cannot be resolved without significant and often radical technological innovations and complementary behavioural changes.

To initiate and support the necessary transformative change processes, the Commission of Experts recommends to further pursue and consistently develop the approach of a mission-oriented R&I policy as already laid out in the HTS 2025. The extent to which the HTS 2025 missions currently in implementation phase should be continued, adapted, or terminated

must be examined based on an evaluation. For the implementation of missions, incentives should be provided for technological and social innovations. Here, the Federal Government should rely even more consistently on price instruments. At the same time, sufficient funds must be made available for basic research and transfer.

Further Expedite Energy Transition Through Innovation

Further efforts are needed to successfully continue the energy transition. The Commission of Experts sees high potential both in the expansion of CO₂-free electricity generation capacities and in the implementation of innovations for the intertemporal balancing of supply and demand. The latter refers especially to smart metering, smart grids, and new electricity storage technologies. In addition, innovative solutions are needed in the market design for electricity transmission.

The Hydrogen Strategy is an important pillar in the energy transition. The Commission of Experts welcomes this initiative and recommends the setting of further impulses for its development and diffusion and the development of corresponding competences. It emphasizes, however, that long-term subsidization of hydrogen production should be avoided. The production of hydrogen must not result in a displacement of green electricity in the regular electricity supply and thus to an increase in the use of fossil energy sources.

Accompany Mobility Transition with Open Approach to Technology

The mobility transition puts pressure on the automotive industry, one of Germany's core industries. The Commission of Experts sees the need for R&I policy support to achieve a sustainable and socially acceptable mobility transition. Yet it also calls for openness towards alternative sustainable propulsion concepts instead of one-sided prioritization of a specific technology. Even though battery-powered electric vehicles currently have a technological and infrastructural lead over fuel cell vehicles, synergy potentials can be expected between hydrogen-powered long-distance, freight and passenger car transport. Since Asian countries, primarily Japan and South Korea, are investing

considerable resources in the further development of fuel cell technology for passenger cars and in their market penetration, Germany should not disconnect itself from this know-how.

Priority 'Catching Up and Avoiding Technological Gaps'

In its previous reports, the Commission of Experts identified Germany's technological gap in an international comparison, especially regarding radically new technologies and their application. This applies, for example, to technologies and applications such as service robotics, artificial intelligence (AI), autonomous systems, cybersecurity applications, e-government, digital business models and the digitalization of universities.⁶⁶ Due to these developments, Germany is not in the top bracket of countries regarding the process of digital transformation. In the life sciences, too, such as red biotechnology with the development of CRISPR/Cas, Germany needs to catch up (cf. chapter B 3).

These gaps indicate problems in the development, adoption, and application of radically new technologies, which adversely affects the performance of the German R&I system. A first step towards avoiding backlogs was the establishment of the Federal Agency for Disruptive Innovations (Bundesagentur für Sprunginnovationen, SPRIN-D). Yet additional efforts are needed beyond that.

Early Identification of New Technological Developments

The Commission of Experts recommends identifying technologies with high future potential at an early stage through foresight processes. The necessary promotion of these technologies must be underpinned by an adequate strategy and budget and implemented by means of suitable measures.

Define and Promote Key Technologies

Key technologies are characterized by a wide range of applications and a high innovative potential. The Commission of Experts advocates promoting

their development and diffusion based on the systemic relevance, innovative potential, and the high knowledge spillover (cf. box B 1-2) of these technologies. To this end, the Federal Government should define transparent and comprehensible criteria for the identification of key technologies. However, the Commission of Experts warns against the declaration and promotion of technologies as key enabling technologies for the sole purpose of giving domestic companies unfair advantages in international competition.

Consider Technological Sovereignty in R&I Funding

More recently, a politico-economic debate has developed around the issue of technological and digital sovereignty, including cybersecurity issues and ethical and legal standards in the field of AI or cloud services. The Commission of Experts welcomes this debate but warns against tendencies to favour autarkic structures as a solution to the problem. The concept of technological sovereignty must not be misused to impede structural change and protect industries that are no longer competitive internationally.

Increase Digitalization Momentum and Explore New Governance Options

The successful implementation of the digital transformation is an essential factor for maintaining Germany's international competitiveness. On the one hand, digital technologies themselves are the object of further developments, innovations, and business models. On the other hand, they fulfil direct and indirect support functions in many R&I processes. The Commission of Experts strongly urges increased support for digitalization activities on a broad scale and the setting of appropriate incentives for this. It once again recommends that the expansion of an efficient, digital infrastructure finally be vigorously pursued.

In view of these complex tasks and their great importance for the German economy and the German R&I system, the Commission of Experts considers it urgently necessary to think about new governance structures in the Federal Government, for example, in the form of a Ministry of Digitalization.

Advance E-government and Consolidate Open Government Data

Compared with other European countries, Germany is lagging considerably and increasingly behind in e-government.⁶⁷ The Commission of Experts advises vigorous pursuit of the goals set in the Online Access Act (Onlinezugangsgesetz) of making all public administrative services digitally available by 2022 and also developing new, user-friendly offerings. Open administrative data available in real time also holds considerable innovation potential for the public sector, the economy and science.

Priority 'Securing the Skilled Labour Base'

As a country poor in raw materials, Germany is dependent on highly educated people to ensure competitiveness and prosperity through the development and use of technological potential. That is why an efficient, socially permeable education system, technological and scientific competence through exceptionally good STEM education at all levels, and the recruitment of foreign skilled workers are of key importance for the economy and society. The performance of the German R&I system is also largely based on these elements. The Commission of Experts regularly points this out.⁶⁸

In the coming years, the pressure to secure the skilled labour base in Germany will increase. The native working-age population will decline significantly in the years ahead, which means that skilled labour bottlenecks that hinder growth and innovation may intensify and become more entrenched. At the same time, new knowledge and skills need to be developed across the population to successfully advance R&I and technological change and to strengthen social participation.

Strengthen Occupational Adaptability

Innovation-driven transformative developments entail increasing demands on occupational adaptability (cf. chapter B 2). To ensure that job-related continuing education and training (CET) for adaptability in face of these developments starts early, before employment is lost, the Commission of Experts recommends supplementing the existing funding instruments with measures to support preventive adaptation qualifications. Comprehensive monitoring of occupational skills should be set up

to support needs-based vocational and continuing education and training (VET/CET). To ensure employability in times of digital transformation, VET and CET must be even more strongly geared towards teaching both digital and non-digital core skills.

Improve Exploitation of Domestic Skilled Labour Base

The Federal Government should improve the framework conditions for the improved exploitation of the existing potential for securing the skilled labour base in Germany.⁶⁹ To this end, the Commission of Experts recommends the consolidation of measures for the in-service higher qualification and catch-up vocational qualification of groups that are poorly integrated into the labour market – specifically semi-skilled and unskilled workers and people with a migration background. It also recommends creating even stronger incentives for full-time employment of women and introducing measures to further increase the labour force participation of older people, such as creating more attractive conditions for employment beyond the standard retirement age.

Attract More Foreign Skilled Workers

With the Skilled Workers Immigration Act, the Federal Government has made it easier for skilled workers from third countries to immigrate and work in areas of shortage. To position Germany even better in the international competition for skilled workers, the strategy developed by the Federal Government under the leadership of the BMWi for the targeted recruitment of skilled workers from third countries should be swiftly expedited.⁷⁰ The Commission of Experts emphasizes that, above all, job-related qualification measures and language support at home and abroad should be further consolidated. In addition, SMEs should be supported even more through help with recruitment abroad.

Priority 'Increasing Innovation Participation'

In recent decades, a decline in productivity growth rates can be observed in Germany.⁷¹ At the same time, the share of innovative firms in both industry and services is declining, and so is innovation participation.⁷² In addition, a decline in start-up activities can be observed, especially in research-intensive industries and knowledge-intensive services.⁷³ The

conditions for profitable innovation activities on a broad scale, especially for SMEs, and for participation in R&I activities therefore appear to be deteriorating. These developments can be seen as early warning indicators of weaknesses in the R&I system. R&I policy must appropriately respond to this.⁷⁴

Reinforce Knowledge and Technology Transfer

The transfer of insights and knowledge from science to business and society can initiate and inspire innovation activities. Yet new ideas and findings from tertiary education institutions and non-university research institutions often remain unused. Researchers lack incentives and the necessary skills to communicate their findings beyond the academic context.⁷⁵ The framework conditions for transfer, for example, regarding the financing, investment, and licensing conditions for academic spin-offs, are also frequently rather inhibiting and not internationally competitive. The Commission of Experts urgently suggests that suitable funding formats be expanded⁷⁶ and further developed, and that appropriate framework conditions for transfer activities from the science sector be promoted.

Evaluate Research Allowance and Adjust Where Necessary

Wide-ranging R&I participation and high R&I intensity are essential for the performance capability of an R&I system. One instrument for achieving this objective is tax incentives for R&D. The Commission of Experts has long called for it and therefore strongly welcomes the introduction of the Research Allowance on 1 January 2020.⁷⁷ It should be evaluated as soon as possible and then adjusted accordingly where necessary.

Align Public Procurement and Investment to Focus on Innovation

Public procurement can provide important impulses for innovation activities and participation. In view of the considerable public procurement volume, the Commission of Experts advocates using part of these funds more intensively and in a more coordinated way than before to promote innovation.⁷⁸ For this part of the funds, public procurement law and practice would need to be adapted to allow 'priority for the innovative offer'.⁷⁹ Such an innovation criterion

should, however, include a careful weighing of the positive effects of an expected market breakthrough against the potential additional costs of procurement.

The Commission of Experts sees potential in the proposal for a future quota, which supports a fixed share in the budget for investments in the areas of education, research, new technologies, environmental and climate protection as well as modern infrastructure for digitalization, among other things, and calls on the Federal Government to examine this proposal accordingly.

Priority 'Increasing the Agility of R&I Policy'

Given the great importance of the R&I system for Germany's competitiveness and the background of the upcoming transformative change with major structural changes in the economy and society, the public sector has a special role in going with and initiating these processes.

The complexity and breadth of transformation processes, the associated uncertainty of funding outcomes and the need to coordinate policy measures require proactive, flexible, and reflexive, and often rapid, political action on the part of R&I policy. In addition, participatory formats and a high degree of structural adaptability constitute important elements of an agile R&I policy.

With this in mind, the German R&I policymakers do not yet act with sufficient agility. Instead, bureaucratic structures with long decision-making processes, inadequate superordinate coordination structures, a lack of space for reflection, a poorly developed error culture and a certain reluctance to evaluate and make the necessary adjustments prevail. Although participatory elements are practised, they do not yet influence political action in all respects.

Market-oriented Alignment of New Mission Orientation

Against the background of the grand societal challenges, the Commission of Experts recommends pursuing R&I policy missions (cf. chapter B 1) that are aimed at enabling or accelerating transformative change. It advocates a market-oriented version of New Mission Orientation. The key feature of this R&I policy approach is not to prescribe specific technological or organizational solutions for the

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missions, but to indicate a corridor in which the market can be used as a discovery process. R&I policy intervention in the market should be catalytic, if at all, to resolve lock-in situations or to promote infant industries.

Further Improve Policy Coordination

In pursuing the policy approach of New Mission Orientation, R&I policy is particularly challenged to steer support measures and regulatory adjustments on a broad scale (cf. chapter B 1). To prevent contradictory policy impulses and to realize synergies, horizontal coordination in R&I policy in particular should be further improved. Measures and initiatives from different policy fields must be coordinated in terms of content and timing.

Greater Integration of Policy Learning into Processes

The Commission of Experts recommends the development, testing and implementation of appropriate new formats to support and improve policy learning at the strategic, structural, and operational levels of government R&I policy. Policy learning must be integrated more intensively into the processes from the outset. A policy of experimentation, for example, by way of experimental spaces, as well as evaluations are important cornerstones here. In this context, the evaluation practice, too, must be critically questioned and scientifically assessed.