15 Agile, responsive and experimental policy for innovation

This chapter discusses the importance of policy and governance agility for STI in transition. The innovation challenges involved in the sustainable and digital transitions require new approaches from policymakers and governing institutions, with an onus on greater flexibility and experimentation. The chapter introduces role of the public sector as an agent of change, and discusses how policymakers can use policy and regulatory experimentation to spur innovation, with a particular focus on disruptive innovation. The chapter presents a recommendation on developing a public-private policy laboratory for experimentation.

Introduction

German STI policy has both supported and been shaped by the successes of its innovators. Its varied set of comprehensive and well-resourced policies (see Chapter 5 focuses specifically on including *Mittelstand* firms, as illustrated by the Federal Ministry for Economic Affairs and Climate Action's (BMWK) Central Innovation Programme for SMEs (ZIM). There are also diverse approaches to support start-ups, and efforts to support key enabling technologies for the future, such as industry 4.0, AI and hydrogen (s).

The pace of technological change, and the complexity and societal implications of transformative challenges, require more agility, flexibility and experimentation in policy making than before. Increasing the contribution of the science, technology and innovation (STI) system to achieving transitional goals is rife with issues, to which policy makers must respond.

- First, many of the solutions necessary for success, particularly in the sustainability transition, are rapidly developing at the frontier of technology. This raises questions on the ability of regulatory frameworks to both accommodate and encourage important innovations. Experimentation will be essential: the many uncertainties concerning future technological developments makes it difficult to set fixed roadmaps. Managing this experimentation and adopting the most promising approaches also introduces a range of governance challenges (see Chapter 14).

- A second, related issue is that many of these potentially important technological solutions remain at a low level of technological readiness and are therefore not yet commercially viable. In other cases, the technology might be viable, but market failures – such as the under-pricing of carbon and other environmental externalities – may lower the innovation's commercial potential. In both these cases, policy makers may have to do more to bring high-potential technologies to the market more quickly, including by supporting the development of new markets where necessary.

- Finally, the government may find it necessary to take a more directional approach to STI policy making by targeting its interventions at specific missions or goals, requiring even more agility, flexibility and experimentation to reach the intended direction. The rationale for leaving this success to the market may be weaker – particularly given the time-sensitive nature of several objectives, such as carbon-reduction commitments.

This section assesses the agility, flexibility and experimentation of Germany's STI policies. It provides a set of recommendations on next steps that can enhance the government's agility to support STI policies and future success. The recommendations and assessment presented in this section should be seen as complementary to the existing policy mix for STI. Germany remains at the cutting edge of STI policy in many respects, particularly when it comes to supporting the innovative capacities of the country's small and medium-sized enterprises (SMEs). The importance of these challenges will not diminish in the years to come; on the contrary, they will be more complex. A key question is therefore whether current STI policy making in Germany is prepared to step into a context where there exists in many areas of technology and science a need to move to more agile, responsive and experimental policy making, where new ideas and approaches are tested in practice.

The first key recommendation presented in this section is to build a policy laboratory that could function as an incubator and accelerator for the most promising STI policy interventions in the context of Germany's transition. The section then assesses agile and experimental policy for German innovation.

Recommendation 2: Create a public-private laboratory for innovation policy experimentation

Overview and detailed recommendations

The pace of technological change and the nature of the transformative challenges facing Germany's socio-economic future require more agility and experimentation in policy making. STI policy approaches require foresight strategies, co-creation of policies with civil-society actors and digital tools to inform innovation-policy approaches, such as semantic and big-data analyses to gather and interpret data relevant to the STI system. More agile STI policy could enhance the effectiveness of mission-oriented interventions, help scale the most effective policy approaches and allow recalibrating the chosen course of action more quickly. This is essential if Germany wants to take the lead in introducing new disruptive innovation sand associated business models. The proposed public-private policy laboratory would introduce policy agility in key areas linked to the proposed forum's vision of keeping up with the global pace of change needed to lead in the transitions (see R1 above).

R2.1 **The laboratory should act as the forum's institutional arm (see R1) to support policy agility, increased and accelerated responsiveness, experimentation and learning, and the major changes needed to achieve its future vision**. To this end, the laboratory would have a mandate to support champions – those who engage in experiments – and promising innovations across the STI system, including public bodies undertaking regulatory experimentation (R3) and innovative public procurement (R7), as well as city initiatives and other bottom-up efforts supporting transitions. This would include promoting lead-actor mechanisms across Germany's *Länder* to experiment with core missions – such as the digitalisation of the public sector – and new approaches to innovative procurement across all levels (including municipalities). The laboratory would also have a mandate to mitigate co-ordination failures across line ministries and public institutions, industry and civil society. It would exploit regional competencies and priorities to hasten the development and scaling of the most promising regulatory and policy approaches to innovation challenges. Importantly, the laboratory would look for ways to promote responsiveness and learning from policy experiments, as well as (where needed) facilitate fundamental policy changes.

R2.2 **The laboratory would promote implementation and monitoring, and the vision for Germany in 2030 and 2050 (see R1).** Concretely, it could implement a strategic foresight exercise that will produce the "Germany 2030" vision, as well as monitor developments and co-ordination challenges that may impede the transitions. This means considering the full innovation chain, from idea generation to market introduction, driving transfers across different actors. The laboratory would also support agents of change – notably through prizes, competitions, etc. – that help markets and different actors of the STI system to achieve the vision. For example, it would support the development and implementation of regulatory sandboxes and other forms of regulatory simplification (as detailed under R3), and could similarly support innovative public procurement (R6). It would also promote demand-side mechanisms for stimulating innovation, such as innovative procurement, and promote framework conditions conducive to innovation. Finally and importantly, the laboratory would support breakthrough innovation by promoting the activities of SPRIND and, more broadly, risk-taking entrepreneurship.

R2.3 **The laboratory would have the autonomy and means to recruit staff with different profiles through more flexible employment options, as well as to engage flexibly with innovation actors.** This would promote a greater level of industrial engagement through secondments or temporary positions, ensuring that policy making in frontier and complex areas of science and technology is underpinned by technical and entrepreneurial experience, and practical knowledge. To avoid adding further complexity to an already extensive set of STI policy actors,

the laboratory would fulfil a temporary role, designed to set in motion a new agenda of change for future transitions.

Relevant global experience

In recent years, as policy making has become more complicated (partly because of wider scope and objectives) and urgent (owing to the speed of technological progress and climate change), policy laboratories have gained increasing attention as a way of testing new regulations or policy interventions. Policy laboratories allow policy makers to design initiatives in close interaction with users and stakeholders, as well as to implement policies in a real – but contained – thematic or geographic setting. By enabling policy makers to co-design, test and fine-tune approaches over time, policy labs can enhance and accelerate learning and reflexivity, thereby improving the quality and effectiveness of policies. Overall, they can strengthen and accelerate change and innovation in the public sector, improving not only the services it provides, but also its ability to support innovation in general.

Policy labs and related experimental platforms target certain policy areas – such as taxation, financial services, health care and mobility solutions (Austria), organised crime (Sweden), immigration (Finland) and employment systems (Denmark) – or promote innovative, experimental and inclusive policy making in the public sector (EUPAN, 2018[1]). They can be used not only for policy design, but also for purposes of implementation and evaluation – which involves testing the effects or consequences of new regulations or policy approaches on people, organisations and systems. According to the UK Government, policy labs bring people-centred design thinking to policy making: "Policy Lab is bringing new policy techniques to the departments across the civil service, helping design services around people's experience, using data analytics and new digital tools" (GOV.UK, 2022[2]). Other examples of policy laboratories can be found in Denmark, Austria, Finland and Sweden (The GovLab, 2016[3]; Social Innovation Community, 2018[4]; Arge ITA-AIT Parlament, 2021[5]; Verket för innovationssystem, 2017[6]).

15.1. The public sector as an agent of change

Germany has long striven to improve its public administration. Co-creation programmes ("Work4Germany" and "Tech4Germany") introducing bringing innovative ways of working into the public sector by temporarily employing private-sector professionals have been launched, and new strategies for implementing (*Umsetzungsstrategie "Digitalisierung gestalten"*) and data-sharing (*Datenstrategie*) have been designed and implemented (Federal Government, 2018[7]). Germany has also implemented the "Federal Cloud" for intra-governmental online services. A new law on the harmonisation of registers in Germany (*Registermodernisierungsgesetz*) to facilitate the structured and secure digital exchange of citizens' data between different government departments was passed in July 2021. This law is in line with the government's legal commitment to offer a broad range of digital public services by 2022 (*Onlinezugangsgesetz*), for which efforts have recently been accelerated. As of May 2021, 315 of the 575 public services encompassed in the law were at least partially available online (European Commission, 2021[8]).

However, a number of significant public-sector administration challenges limit policy makers' ability to implement new approaches to STI. Central to these challenges is the question of public-sector modernisation (including its digitalisation) and the ability of the public sector not just to keep pace with the private sector, but to lead by example. If, for example, the pace of public-sector digitalisation remains slow, and data integration and interoperability remain poor, then how can the public sector and STI policy makers be expected to make the most of new and complex sources of information as evidence for public intervention?

The National Regulatory Control Council (Normenkontrollrat), created in 2006, has consistently pointed out the urgent and critical need of modernising and future-proofing the German public administration (Nationaler Normenkontrollrat, 2021[9]; Süddeutsche Zeitung, 2021[10]). Areas of particular concern include the slow pace with which Germany's public sector is responding to digitalisation (both in terms of changing its own way of working, and of hampering digitalisation in society and industry); overly lengthy legislative and regulatory processes that are out of touch with their practical contexts (Nationaler Normenkontrollrat, 2021[9]); excessive regulatory and bureaucratic burdens for citizens and businesses; and, more generally, a public sector that is not adapted to current needs and realities of society and the economy (Nationaler Normenkontrollrat, 2020[11]). Since 2011, the council has been monitoring the compliance costs accruing to the private sector, the public sector and citizens as a result of rules and regulations (*Erfüllungsaufwand*). In its 2021 annual report, the council concluded that while compliance costs have increased significantly for enterprises and the public sector, they have declined slightly for citizens (Nationaler Normenkontrollrat, 2021[9]).

In October 2021, 23 experts and stakeholders, including the head of SPRIND, published a position paper identifying a modern public administration as a critical prerequisite for Germany's future prosperity and democracy, and listing eight concrete areas where they see an urgent need for action (Zenodo, 2021[12]). They called for a fundamental change in the functioning, culture and mindset of the public administration, which they argue will be essential in ensuring Germany's ability to handle the coming decades of transformation. Their concrete recommendations include creating organisational-development competence; fundamentally reforming human-resource management in the public sector; working with foresight and participatory policy processes; designing a public administration for a digital world; strengthening horizontal and vertical policy co-ordination and governance; and increasing transparency, interaction and societal participation in public administration.

15.2. Agencies

The institutional arrangement in Germany, where the management of R&I programmes is handled by 19 programme management organisations (*Projektträger*), also shapes policies' agility, experimentation and responsiveness (Förderberatung des Bundes, 2022[13]). One advantage is that the long-standing nature of this practice has led to the creation of organisations that have acquired substantial experience, allowing them to provide feedback and use their institutional memory when implementing new projects. In addition, the competitive process for winning five-year contracts introduces a competitive element in project management costs and incentivises these organisations to seek high-quality research and programme management. *Projektträger* are usually active in different thematic fields, so that they bundle different perspectives and experiences.

However, this arrangement also presents potential downsides, particularly in terms of agility, responsiveness and experimentation. Programme management organisations' arm's-length and contractual relationship with the ministries means that policy implementation distances programmes from the policymaking process. The organisations' strict contractual relationship with the ministry, and their lack of independence, also make it more difficult for Projektträger to support riskier innovations that might underpin the most innovative projects (Edler and Fagerberg, 2017[14]). The German system contrasts with the broad and deep experience available in organisations like Vinnova in Sweden or Research Council of Norway, which as a result can play more active roles in programme design and policy development, in partnership with their ministry principals.

The arrangement may change in coming years as the coalition agreement of the government that came into office in December 2021 foresees creating an agency for transfer and innovation ("Deutsche Agentur für Transfer und Innovation" [DATI]) to support social and technological innovation at applied science

institutes and universities, in co-operation with SMEs, start-ups, and social and public organisations (SPD, Bündnis 90/Die Grünen und FDP, 2021[15]).

15.3. Leveraging policy and regulatory experimentation for innovation

German innovation policy has increasingly focused on spaces and laboratories for policy experimentation (BMWi, 2021[16]). Several initiatives at the federal and state levels have sought to promote policy labs, particularly in digitalisation and energy, but also in areas such as urban development. A key feature of experimentation has been improving the agility of regulators to support potentially high-impact new technology.

As discussed in Chapter 6, anticipatory and experimental regulatory approaches, such as those used in regulatory sandboxes, are likely to be an increasingly important lever for supporting the development of the most innovative and high-potential technologies.

The BMWK defines sandboxes (*Reallabore*) as follows:

> *Regulatory sandboxes enable in a real-life environment the testing of innovative technologies, products, services or approaches, which are not fully compliant with the existing legal and regulatory framework. They are operated for a limited time and in a limited part of a sector or area. The purpose of regulatory sandboxes is to learn about the opportunities and risks that a particular innovation carries and to develop the right regulatory environment to accommodate it. Experimentation clauses are often the legal basis for regulatory sandboxes* (BMWi, 2021[16]).

One element of support for sandboxes has been an innovation prize for policy labs (BMWi, 2021[17]), in which the winners are awarded a quality seal. At the Länder level, governments have also supported policy laboratories in various ways (see, for example, (Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg, 2020[18]).

15.4. Policy to support breakthrough and disruptive innovation

Momentum has been gathering in German policy, industry and the broader STI community for pushing the German government to strengthen the country's ability to produce disruptive, breakthrough and radical innovation. In a 2018 report, the presidents of the Max Planck Society and the Fraunhofer Institute, as well as the chair of the board of trustees of the National Academy of Science and a number of industrial leaders, called for reforming the innovation system to support more radical innovation (Harhoff, Kagermann and Stratmann, 2018[19]). The authors' (and many commentators') opinion is that tackling the transformative societal and economic challenges facing Germany and other countries requires more transformative – and at times disruptive – innovation. Given Germany's sophisticated innovation system and the globally leading strengths of many of its key industries, there is no "off-the-shelf" policy approach that is immediately available and applicable to promote this type of innovation in the German context.

To this end, following examples of institutions such as the U.S. Defense Advanced Research Projects Agency (DARPA), in 2019 the German government founded SPRIND, perhaps the most concrete manifestation of German policy makers' acknowledgement of the need to provide greater support to radical and breakthrough innovation activities. The principal tasks of SPRIND are to identify and develop research ideas that have the potential to lead to radical or breakthrough innovation, and to accelerate the commercialisation and diffusion of highly innovative ideas. In this regard, the agency is an extension of the already well-established tradition of publicly backed knowledge transfer between science and industry, but its outlook responds to the concerns voiced by STI actors.

SPRIND has a continuously growing budget, which is planned to amount to EUR 1 billion over the first ten years. Organisationally, the agency falls under the aegis of both the Ministry of Education and Research (BMBF) and BMWK. The supervisory board comprises high-ranking members from industry, academia and politics, as well as one representative each from three ministries: finance, education and research, and economic affairs and climate action. Like DARPA, SPRIND will issue innovation challenges or competitions around specific themes, continuing a form of innovation incentives and initiatives that grew in popularity during the COVID-19 pandemic but are already well-established in information technology sectors (e.g. "a quantum shift for new antiviral agents").

While it is too early to judge its successes, the establishment of SPRIND illustrates the kind of institutional development that is likely to support the types of innovation activities favoured by political and industrial leaders. However, the agency's ability to live up to its mission and mandate is currently hampered by bureaucratic, legislative and institutional factors. SPRIND faces a number of operational barriers that could mitigate its effectiveness. For example, the agency is bound by several institutional and legal constraints – such as state aid rules and rules around regulatory compliance – that may prevent it from fulfilling its intended purpose. At this time, the agency can only possess wholly owned subsidiaries, to which the agency or the ministries can then extend loans, with the obligation to sell the subsidiary after a maximum of five years. At the same time, the agency's governance, with responsibilities split between the BMBF and BMWK raises the problem of co-ordination and inter-ministerial co-operation. Securing consensus among these ministries (and the Federal Ministry of Finance) delayed the establishment of the agency, while the COVID-19 pandemic also was a preoccupation at the time, and the risk of ongoing struggles in inter-ministerial co-ordination could seriously limit its operational and strategic capacity. These factors should be identified and addressed. Furthermore, even if SPRIND is given the space and resources to function optimally, its impact is limited to the projects it funds and their potential impact. SPRIND therefore needs to be complemented with other measures, both to allow it to function effectively and achieve long-term impact, and to support breakthrough and disruptive innovation more systemically and effectively, ensuring they are not limited to certain pockets. In recognition of those constraints, SPRIND was granted more legal freedom, and further legal simplifications are in the planning stage to allow the agency to work with more agility, flexibility and independence (BMBF, 2022[20]).

First, the government should place an emphasis on initiatives and programmes that fund more high-risk and breakthrough research. These should be viewed not as a substitute, but rather as a complement to Germany's strong research system. Second, existing research funding could be complemented with initiatives that seek to link or connect existing basic research in different academic disciplines around a common societal challenge, as with the National Science Foundation's "Convergence Research" initiative in the United States (National Science Foundation, 2020[21]). Third, the government should seek to fund disruptive innovation more systematically, aside from the SPRIND. This involves changing mindsets, rules and evaluation criteria for existing innovation and other funding programmes. It might also require designing new programmes that are more specifically tailored to breakthrough innovation. Fourth, the government should explore ways promote a more systematic upscaling of successful disruptive solutions. In addition to channelling funding to this effort (e.g. through an earmarked programme), this will most likely require a stronger focus on anticipatory regulation, conducive standard-setting processes, and a mechanism for identifying and investing resources into scaling successful solutions in the public sector. Finally, the government should revisit and significantly ramp up its earlier efforts to use public procurement to promote disruptive innovation (e.g. in digitalisation, environmental technologies and sundry sustainability solutions).

Overall, it is important to recognise, communicate and anchor the belief – among policy makers, relevant stakeholders and society at large – that supporting breakthrough and disruptive innovation is necessary to break path dependencies and advance desirable transitions, and that it requires a shift in mindset, mandate and management.

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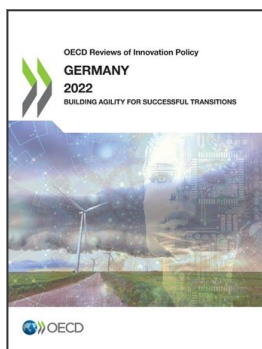
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