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STI Policy in Germany at federal and regional level

A comparison of the federal High-Tech Strategy and the Bavarian High-Tech Agenda

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Executive summary

This report examines how Germany designs and implements major science, technology, and innovation (STI) policies at the federal and regional level, focusing on two flagship cases: the federal *High-Tech Strategy* (and its successors) and the Bavarian *High-Tech Agenda*. It analyzes strategy context, priority selection, implementation (including budgeting and instruments), and policy learning.

Germany's STI system operates within a cooperative, executive federalism that combines strong federal legislative roles with Länder implementation and substantial Länder competences in higher education, funding research organizations, and regional innovation policy. Regional and federal jointly exercise activities of particular relevance (e.g. support for excellent universities, support for research organizations) (Art. 91a and Art. 91b of the German basic law). At the federal level, responsibilities in the field of STI are primarily split between the Federal Ministry of Research, Technology and Space (*BMFTR*) and the Federal Ministry for Economic Affairs and Energy (*BMWE*). Ministerial coordination is constrained by a strong resort principle, granting ministries considerable autonomy.

At the federal level, the *High-Tech Strategy* and its successors have served as the federal government's umbrella STI strategy, coordinating activities across ministries since 2006. Strategy development is coordinated by the *BMFTR* and has relied on different approaches to prioritize activities including key technologies, missions and demand areas/future tasks. Despite these changing orientations and political priority setting, there is considerable continuity in overarching priorities, reflecting rather a gradual development than radical changes. Serving as umbrella strategy, it lacks an independent budget and depends on the willingness of ministries to contribute to the strategy, being partly locked in a "STI trap". It focuses mostly on thematically oriented research funding, providing inputs to selected priorities, while acknowledging the importance of framework conditions (that are partly beyond the scope of the federal level, as universities are financed mainly by the regional level). Stakeholder involvement has increased over time but does not include the formulation process. While monitoring has been recently established, echoing repeated calls from advisory bodies, so far, no evaluation has taken place at the strategy level. The recently adopted *High-Tech Agenda Germany* provides a paradigm shift, returning to key technologies and promising several innovations, including a stronger involvement of the regional level that so far has been widely absent from this strategy.

Introduced in 2019 and expanded via two additions (High-Tech Agenda+, *High-Tech Transfer*), the *High-Tech Agenda* is a top-level, government-led initiative to strengthen Bavaria's science, research, and economy. It is a rather unique type of strategy for regional governments, potentially serving also as a tool for communication and agenda-setting. It reflects the economically strong position of Bavaria, allowing it to mobilize additional resources for priority setting next to existing policies. Following a top-down approach and showing limited integration with existing policies and strategies, it provides an example of strong priority setting in recent key technology fields (artificial intelligence, super and quantum computing, aerospace, and CleanTech). Thereby, it provides a thematically more focused approach than the High-Tech Strategy of the federal level that can rather be characterized as path dependent. Besides research funding, it contains also considerable investments into research infrastructure/university position, as well as regulatory changes, reflecting the strong competencies of the regional level in this area.

1 Introduction

This report seeks to provide empirical evidence from the Federal Republic of Germany on how strategic choices in major technology and industrial policies are made and implemented in a multi-level setting. This includes questions about the embedding of relevant strategies in their specific policy context, selection and prioritization processes within strategies, implementation approaches (incl. budgeting, and use of instruments, internal coordination) as well as the role of policy learning such as the use of evaluations. For this purpose, this report combines two case studies of flagship policies at the national and regional level:

- The *High-Tech Agenda Germany* (*Hightech Agenda Deutschland*) was initiated in 2006 as *High-Tech Strategy* (*Hightech-Strategie; HTS*) and is the key STI strategy of the federal government, bringing together the activities of different ministries. It is regularly updated, serving as an umbrella strategy for the electoral term of the incumbent government aiming to provide policy direction and gained wide attention as a label for federal policy-making.
- The *High-Tech Agenda* in Bavaria (*Hightech-Agenda Bayern; HTA*) was announced 2019, aiming to set priorities on selected key technology fields und later extended by two additional initiatives (*High-Tech Agenda +, High-Tech Agenda Transfer*). Being a rather unique initiative at the regional level, it illustrates the ability of an economically strong federal state for priority setting.

The report is structured as follows. Section 2 provides an overview over the federal system in Germany and discusses the key features of science, technology and innovation policy in Germany. The following two sections discuss two selected initiatives at the federal and regional level. The concluding section 5 summarizes key insights from the case studies.

2 Institutional and contextual background

2.1 Federal system in Germany

Since 1949, Germany's Basic Law has established the country as a federal state with a differentiated allocation of competences both horizontally at the federal level and vertically, between the *Bund*, the federal level, and the 16 constituent states, the *Länder* (Arnold 2013; Behnke 2023; Niedobitek 2018). Typically, federalism has, among other things, been characterized as a tool for enhancing democratic legitimacy, enabling more efficient problem-solving and accommodating subnational diversity in 'unity'. Specifically in Germany, the normative premise of federalism is to level regional differences and ensure equivalent living conditions, e.g., through fiscal equalization (Behnke 2023; Broschek 2009).

Germany's federal system has been characterized as administrative or executive federalism (Behnke et al. 2021; Behnke 2023), cooperative federalism (Hesse 1987) or a compound model of federalism (Gamper 2005). All of these concepts refer to the functional distinction between legislative authority, concentrated at the federal level, and the *Länder*, which are responsible for implementing federal legislation (Niedobitek 2018). However, this division of responsibilities is not clear-cut due to a strong emphasis on shared rule and extensive joint decision-making (Gamper 2005).

Through the *Bundesrat*, the assembly of *Länder* governments, the *Länder* can influence and co-decide parts of federal legislation, granting *Länder* between three and six votes depending on its population size.

Besides co-legislating, the *Länder* also possess exclusive legislative power in some areas, such as education and culture (Behnke 2023). Horizontally, they coordinate policy-making in

intergovernmental councils and conferences of *Länder* ministers (Arnold 2013; Behnke et al. 2021; Behnke 2023; Schrapper 2021). Below the *Länder* level, local governments (municipalities and associations of municipalities in counties (*Landkreise*) are endowed with constitutionally guaranteed autonomy and are responsible for the further administration and implementation of federal-level policies. At the same time, their autonomy allows them to regulate local matters, such as schools, streets or public utilities, on their own responsibility (Behnke et al. 2021; Behnke 2023; Wollmann 2024).

In particular, the high rate of laws requiring explicit consent by the Bundesrat demands constant negotiation and coordination (Behnke et al. 2021; BMI n.d.; Niedobitek 2018), which has turned Germany's federal system into an interdependent network characterized as '*Politikverflechtung*' (interlocked politics) or a 'marble cake' model of federalism (Kropp et al. 2016; Scharpf). This cooperative but tightly interlocked federalism has also provoked criticism, sometimes referring to Germany not as a cooperative but as a unitary federalism that constrains regional autonomy and hampers flexibility, adaptability and democratic legitimacy (Behnke 2023; Kropp et al. 2016; Sturm 2018). Despite federalism reforms in 2006, 2009 and 2017, which aimed at disentangling levels, transferring competences to the *Länder* and stabilizing fiscal relations, criticism persists (Jäkel et al. 2025). In contrast, others argue that the narrative of uniformity in German federalism should be challenged and that it has even fostered policy consistency and legal stability (Behnke et al. 2021; Jeffery et al. 2016; Reutter 2017).

However, beyond the general characterizations and debates on federalism, its concrete expression and the degree and mode of cooperation between *Bund* and *Länder* are highly dependent on the policy domain. The following sub-section provides a brief overview of STI policy and key actors at different levels.

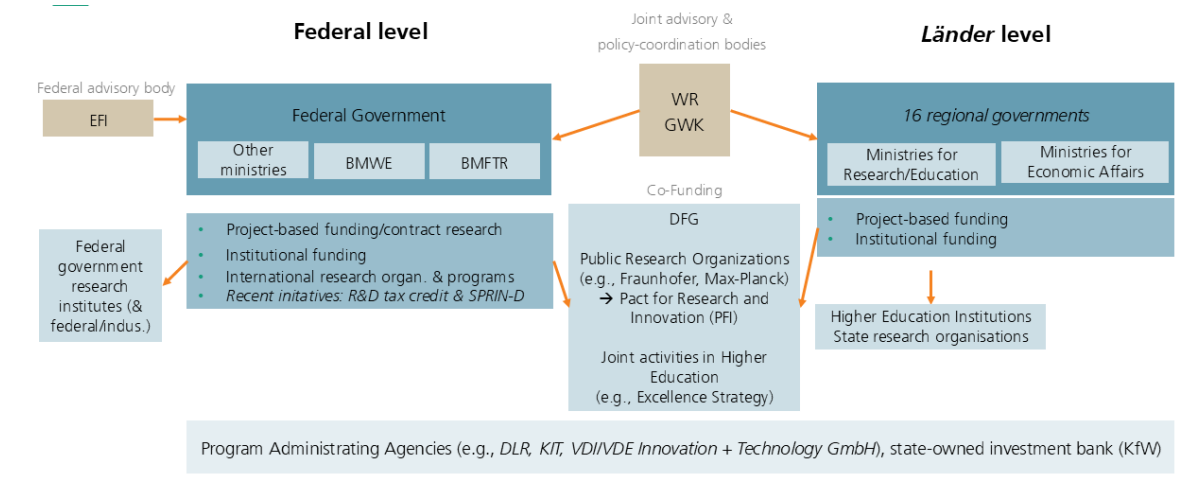
2.2 STI Policy in Germany

Overview

The German Science, Technology and Innovation (STI) system is extensive, with competencies distributed horizontally among various federal ministries as well as vertically between these ministries and state governments (cf. *Figure 1*). EUR 39.1bn of the EUR 120bn R&D spending in 2022 were made by territorial entities (BMFTR 2025b) of which EUR 23.4bn are spent by the federal level (BMFTR 2025c). This includes basic funding for federal and public research organizations as well as project-based funding schemes. Main basic financing for higher education institutions as well as co-payments for public research organizations is among the responsibility of Länder.

This distribution stems from Germany's Basic Law, which grants concurrent legislative powers for the regulation of educational and training grants and for the promotion of research (BMBF 2024; Edler et al. 2008). The German STI system is regarded as one of the most powerful globally, and decentralization has the advantage that it allows policies to address local socio-economic needs and remain agile. However, it faces significant challenges particularly in coordinating multi-level and multi-actor policymaking and therefore faces a lack of coherence in policy-making (Edler et al. 2008; OECD 2022). A major impediment, as in other domains, is limited cross-ministerial coordination (OECD 2022, p. 306) driven by a strongly pronounced resort principle, granting ministers considerable authority over their ministerial domain. STI policy is characterized by a strong sector-oriented approach and fragmented responsibilities, creating obstacles for overarching approaches such as mission-orientation (EFI 2008; OECD 2022, p. 308). Moreover, at the *Länder* level, unused synergy potential, avoidable duplication of structures, and a lack of capacity for more strategic cooperation are criticized (Gebert et al. 2024; OECD 2022).

Figure 1: STI actors and responsibilities in Germany



Source: Own elaboration, based on OECD 2022:301

Federal level

Horizontally, the competences in Germany's STI policy are primarily divided between several ministries. The *Federal Ministry of Research, Technology and Space* (*Bundesministerium für Forschung, Technologie und Raumfahrt*; *BMFTR*)[1] and the *Federal Ministry for Economic Affairs and Energy (Bundesministerium für Wirtschaft und Energie*; *BMWE*) [2] are key funders for R&D activities, accounting for approximately 70% of public R&D spending at the federal level (BMBF 2024, p. 72). Other ministries maintain small research divisions, but their activities are less central. Both ministries have experienced reconfigurations over time, with changing responsibilities and overlapping competences, however, as Edler et al. (2008, p. 272) note those changes are often primarily driven by political considerations instead of strategic considerations. This is also exemplified by the recent restructuring of ministerial responsibilities after the snap election 2025. While creating expectations for a more unified approach by creating a *Ministry for Research, Technology and Space* – large scale funding schemes of applied research and innovation (*ZIM, INNO-KOM, IGF, EXIST*) are not represented in the organizational structures of the *BMFTR* therefore responsibilities are likely to remain with the *Ministry of Economics* (Wiarda 2025d).

In general, the *BMFTR* focuses on research linked to universities and (publicly) research funded institutions potentially at lower TRL-levels and is the largest public funding source for science in Germany. Moreover, the BMFTR prioritizes project-based funding within thematic programs (e.g., including health, cybersecurity, quantum technologies etc.) (OECD 2022). Contrarily, the *BMWE* emphasizes innovation and its implementation in the business sector/industry addressing higher TRL-levels and market introductions. The *BMWE's* focus is on innovation- and transfer-oriented projects, public-private R&D collaborations and support for innovations, for instance, in SMEs (Edler et al. 2008; OECD 2022). The ministry follows a technology-open approach, promoting bottom-up selection of projects rather than prioritizing specific technologies (OECD 2022). The dualism between these two ministries has been assessed differently. Whereas the OECD points to the potential of (enforced) cooperation (OECD 2022, p. 303), Edler et al. (2008, p. 274) also point to efficiency losses and problems for policy implementation due to policy fragmentation.

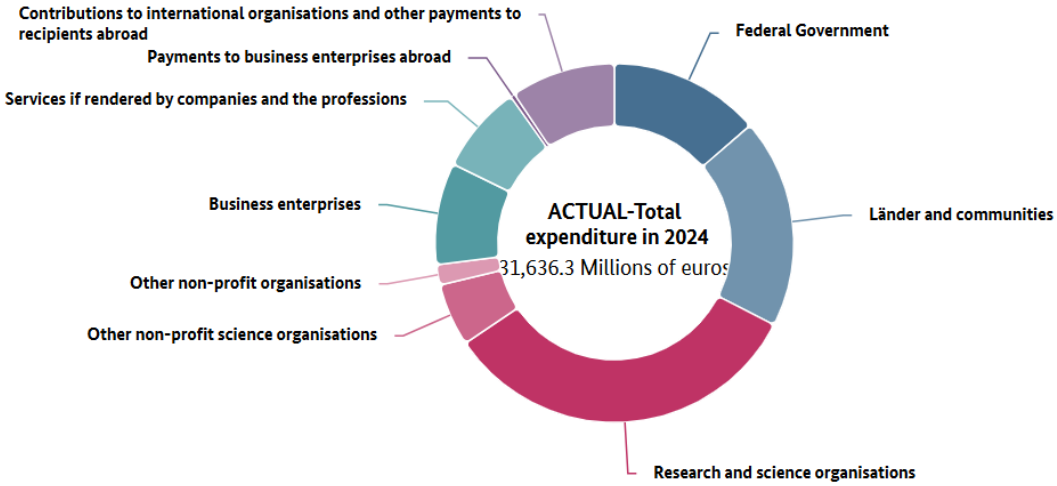
6 Between 1998 and 2025 the main responsibility for Technology was with the Ministry of Economics that was part of a restructuring of the ministrial structure. While obtaining responsibility, the former Ministry of Research of Education and Research (BMBF) lost its responsibility for Education that was assigned to the newly formed Federal Ministry for Education, Family Affairs, Senior Citizens, Women and Youth.

[2] In the following, we use – unless explicitly stated differently – for easier readability the same acronym for Ministries also for past periods where ministries were named differently.

Federal expenditure for research and development activities, and science (2024: EUR 31.6bln) is first allocated via project-based funding and support for departmental research activities accounting for 52.6% of expenditures (BMFTR 2025d), whereas 40.8% of expenditures relate to institutional support for public research organizations (including the German Research foundation, that itself grants funding for research activities that are usually thematically open, i.e. driven bottom-up). The remaining budget is provided to international programs and international organizations to facilitate R&D and university-related spendings (BMFTR 2025d). Over time, federal funding has shifted towards project-based, instead of institutional funding (OECD 2022).

Federal spending goes predominantly to private non-profit organizations (such as research organizations) (40.2%), territorial authorities (32.5%) that mainly comprise universities/university hospitals (Länder and communities in *Figure 2* and federal research organizations (Federal government in *Figure 2*), and the business enterprise sector (17.1%), with the remainder going to beneficiaries abroad (BMFTR 2025e). An overview of beneficiary types of federal spending can be found in *Figure 2*.

Figure 2: Federal Government expenditure on science, research and development, by recipient groups



Source: BMFTR (2025f). This work is licensed under a Data licence Germany attribution 2.0. (https://www.govdata.de/dl-de/by-2-0)

Lately, the R&D tax credit "Research Allowance" was introduced in 2020 to create incentives for firms to increase their R&D spending (Bundesministerium der Finanzen n.d.). Whereas this instrument is established in other countries, for Germany it has been a novel approach and despite good uptake among economic actors, it is yet less commonly used as in France or the Netherlands – a factor that might be driven by the large number of direct support instruments (Finger et al. 2023, 12f.).

A recent change has been the creation of a novel agency supporting disruptive innovation (SPRIND) in 2019 that was modeled after the US model of (D)ARPA. It provides funding for disruptive approaches both in a thematically open approach and thematically oriented challenges. Being an autonomous agency, its activities are not explicitly/directly linked to strategies of the federal government. Attempts to create a new agency focusing on transfer from universities (DATI - *Deutsche Agentur für Transfer und Innovation*) were stopped after the government change in 2025 (Forschung & Lehre 2025).

The creation of new agencies and research institutes is moreover partly driven by territorial considerations. This includes the creation of new research institutes in previous coal mining regions to tackle structural change (BMFTR 2024b). Recent new agencies were foreseen (for the later abandoned plans for DATI in Erfurt) or established in Eastern Germany (SPRIN-D in Leipzig), reflecting the Coalition agreement of 2021 to preferentially locate federal and research institutes in Eastern Germany and economically weak areas (SPD et al. 2021, p. 103).[3]

Regional level

At the *Länder* level, the main actors are the state ministries for science, research, education, or culture, and in some cases the ministries for economic affairs. The *Länder* retain substantial thematic competences, especially in higher education, research organization, and regional innovation policy (Gebert et al. 2024). This also includes basic financing of universities and universities of applied finances that is via agreements between universities and the relevant *Land* covering approximately 75% percent of revenues (HRK n.d., 2019) – total regional expenditures amount to approx. EUR 33.5bln in 2025 (Destatis 2025). For this purpose, regional authorities negotiate – depending on the Land with individual - Higher Education Institutions to agree upon goals and financing (for an overview of agreements see Stiftung zur Föerderung der HRK 2019). Remaining revenues of higher education institutions include – among others – third-party funding for project-based research from both federal and regional level. Coordination among the *Länder* occurs primarily through the *Standing Conference of the Ministers of Education and Cultural Affairs* (*Kultusministerkonferenz*, KMK), which facilitates joint positions and agreements on education and research matters that have interstate relevance (KMK 2015).

While the *Länder* technically possess authority over universities and education policy, "in cases of supra-regional importance" the federal level and the *Länder* can cooperate and jointly fund activities. The most prominent examples in the field of STI is the *Excellence Strategy* (*Exzellenz Strategie*; previously *Exzellenzinitiative*, 2007-2017/18), where universities can apply for additional funding for thematic clusters and obtain the status of an *excellence university* in order to receive additional funding, mobilizing approximately EUR 530 mio per year (DFG 2025c).

Besides higher education, regional authorities have also competencies with regard to economic development. The *Länder* have their own regional innovation strategies, which are aligned with the EU's cohesion/regional policy and the Smart Specialization Strategies (*RIS3*) framework (Gebert et al. 2024) and provide some guidance for funding activities. Although the thematic priorities often converge on e.g., mobility, digitalization, artificial intelligence (AI) and health, coordination between the *Länder* themselves as well as between the *Länder* and the federal level remains limited (Gebert et al. 2024). Moreover, regional governments have competencies for regional economic development, e.g. by supporting local innovation and start-up ecosystems or cluster initiatives (Edler et al. 2008; OECD 2022). Existing regional funding schemes are supposed to complement the national funding landscapes, however, may partially overlap.[4] Examples for regional level initiatives include e.g. cluster policy approaches that generally follow a triple helix logic or support for the creation of new enterprises that co-exist aside of the federal funding scheme *EXIST*. At the federal level there are cluster initiatives since the 1990s (funded by BMFTR or BMWE) that provide technical support and support both thematic and regional initiatives (cf. EFI 2017a for an overview)[5] aside of regional

[3] Similar commitments to decentralization of regional authorities to strengthen economically lagging regions can be also found in Bavarian coalition agreements (CSU et al. 2018, 2023).

[4] Cf. also the programme family innovation and structural change by BMFTR that aims to support regionalized approaches (https://www.innovation-strukturwandel.de/strukturwandel/de/programm/das-programm/das-programm_node.html)

[5] For example, the BMFTR supports the following, thematically open approaches: "*go-cluster*", which supports and connects the most efficient cluster management organizations; while the BMFTR is responsible Leading-Edge Clusters Competition (Spitzencluster-Wettbewerb), for the most

initiatives, amounting to a total of 475 clusters in Germany.[6] A similar pattern also applies to industrial policy approaches that may co-exist at the federal and regional level, but are not systematically used across different *Länder* (e.g. North Rhine-Westfalia formulated in 2024 guidelines for industrial policy (MWIKE 2024), whereas a similar document for Baden-Württemberg was not updated since 2015 (MFW BWL 2015) while some *Länder* like Bavaria do not have a dedicated industrial strategy).

In addition, the *Länder* co-finance major public, non-university research organizations (such as the *Fraunhofer Society* and the *Max Planck Society*) (cf. also Pact for Research and Innovation in Section 3.1 providing a long-term perspective on budget of public research organizations) and provide targeted fiscal support for local innovation and start-up ecosystems (Edler et al. 2008; OECD 2022). Co-financing rates of the regional level vary considerably (cf. GWK n.d.b for a detailed overview). Funding dynamics and quantity differ widely between the *Länder* due to differing economic performance and diverging strength of the science system (e.g., presence of excellence universities or public research organizations) (OECD 2022).

Table 1: Co-financing rates for selected initiatives/priorities

Initiative/Activity	Share *Bund*	EUR mio. (2024)	Share *Länder*	EUR mio. (2024)	Allocation of *Länder* share
Excellence Strategy	75%	399.8	25%	133.3	Host *Land* (of the universities)
German Research Foundation	58%	1594.9	42%	961.2.	All Länder according to the *Königstein key*[7]
Fraunhofer Society	90%	849.5	10%	195.6.	2/3 of the funding requirement of institutes in a specific *Land* 1/3 all Länder according to the *Königstein key*
Max-Planck Society	50%	1246.2	50%	964.9.	50% host *Land* 50% Länder according to the *Königstein key*
acatech	33.3%	1.3	66.6%	2.5	50% Bavaria 50% Länder according to *Königstein key*
Research buildings/Large scale infrastructure/HPC	50%	316.8	50%	316.8	Host Land (Large-scale infrastructure/Research buildings)

Source: GWK n.d.b

Advisory bodies and other stakeholders

Both ministries as well as the federal and state government delegate implementation and advisory functions to external organizations. The *German Science and Humanities Council* (*Wissenschaftsrat, WR*) and the *Joint Science Conference* (*Gemeinsame Wissenschaftskonferenz; GWK*) are the main joint advisory and policy-coordination bodies to both federal and state governments in STI

successful (in terms of bringing together the most important partners and establishing themselves internationally) clusters in their specific technology fields and regions and the *Clusters4Future* (Zukunftscluster-Initiative), for clusters with new and ambitious approaches in the STI field (Clusterplattform Deutschland 2025). Existing clusters may combine support from different schemes and acquire additional third-party funding (project funding), such as the MAI carbon cluster that is part of the Bavarian cluster strategy and received co-financing from the federal level Spitzencluster-Initiative. Overlaps in funding schemes have been criticized in the evaluation of the Excellence Cluster Initiative (Dehio et al. 2014, pp. 224).

[6] Cf. https://www.clusterplattform.de/SiteGlobals/CLUSTER/Forms/Suche/DE/Clustersuche_Formular.html?oneOfTheseWords=Suchbegriff%20eingeben (last accessed 16/12/2025)

[7] The *Königstein key* (*Königsteiner Schlüssel*) regulates the distribution/allocation of *Länder* share in the case of joint financing. It is based on the population and tax revenue of each *Land* and is calculated each year by the *GWK (GWK n.d.a)*.

policymaking. They evaluate institutions and programs and monitor the performance of the science and higher education system (BMBF 2018a; GWK n.d.c; Wissenschaftsrat 2025). The *Commission of Experts for Research and Innovation (Expertenkommission Forschung und Innovation; EFI)* is an advisory body of researchers to the federal government. Established in 2006 it advises the federal government and publishes annual – publicly available - reports on Research, Innovation and Technology in Germany drawing on own research and externally commissioned studies.

Besides basic funding and project-based research, research funding in Germany is allocated by the *German Research Foundation* (*Deutsche Forschungsgesellschaft; DFG*). It is co-funded by the federal and state governments, providing almost EUR 4 bln of annual funding (DFG 2025b). It supports research centers/infrastructures, individual and collaborative research and e.g., the clusters of excellence at universities (DFG 2025a) with a thematically open approach, relying on applications by researchers/organization for different funding schemes. It acts autonomously from federal/regional authorities.

A key specificity of the German system is the strong role of program administrating agencies (*Projekträger*). The administration of funding activities such as calls are usually outsourced from ministries and managed by one of 19 program administrating agencies (*Projektträger*). While ensuring comprehensive administrative experience and internal learning, the drawback is a stronger disconnect from policy-making processes as well as a higher risk aversion given the contractual relationship that is awarded in competitive tenders (OECD 2022, p. 321).

Another specific feature in the context of German STI policy is a rather weak link to strategic considerations of the EU level. In its review of German innovation policy the OECD has called for a better alignment of domestic policy with the EU level to increase leverage at both EU and national levels (EFI 2008, p. 45; OECD 2022, 25; 45).

3 Federal level: High-Tech Strategy

3.1 Overview of strategy and policy context

Research and innovation policy in Germany since 2006 has been coordinated by an overarching joint strategy of the federal government that brings together different ministries and is adopted for the duration of an electoral term, i.e. usually comprises of four years.[8] It was introduced in 2006 as an umbrella framework, aiming to increase the coherence of different activities of federal ministries and enhance strategic coordination (Edler et al. 2008, p. 271; OECD 2022, p. 119) and to move beyond the paradigm of a broad and thematically open funding approach (EFI 2008, p. 45). The *High-Tech Strategy* has quickly established itself as a shared label for coordinating STI activities in Germany and helped to mobilize activities/enhance policy coordination (EFI 2008, p. 6; OECD 2022, p. 119).

Initially labeled as *High-Tech Strategy* (*HTS*) (2006, 2010, 2014, 2018), the name was later changed to *Future Strategy for Research and Innovation* (*Zukunftsstrategie Forschung und Innovation*; 2023) and *High-Tech Agenda for Germany* (2025) (*Figure 3* and *4*). Alongside these changes, underlying conceptions also have evolved. While initially focusing on technology fields, the *HTS* [9] moved in 2010 towards a more challenge-oriented perspective (BMBF 2010) while the *High-Tech Strategy*

[8] After the collapse of the government coalition in the end of 2024, snap elections took place in February 2025, therefore leading to the formulation of a new strategy. As the most recent High-Tech Agenda for Germany was only presented recently and there is a lack of details on information, this Strategy will be discussed primarily in section 3.4.

[9] In the following we refer to *HTS* as a shared denominator for all editions including the most recent *Future Strategy* (2023) and *High-Tech Agenda Germany (2025)*.

2025, adopted in 2018, explicitly embraced a mission-oriented approach, making Germany a front-runner for this emerging policy paradigm (BMBF 2018b). With the relabeling as High-Tech Agenda in 2025 also came a shift back towards key technologies as the main structuring element.

Policy context – relationship with other strategies

Serving as an overarching umbrella strategy, the *HTS* and its successors prioritize topics of key national interest (cf. Section 3.2 for a more detailed review) bringing together ministries and policy initiatives. At the same time, it is complemented by more sector/technology-specific strategies that are coordinated by one or multiple ministries on behalf of the federal government. Priorities of these strategies may thematically overlap with priorities of the *HTS*. This includes, for example[10]

- *National Bioeconomy Strategy* (2010/2013//2020) – *BMBF/BMEL*
- *Artificial Intelligence Strategy* (2018/2020) – Federal Government (lead by *BMBF/BMWK/BMAS*)
- *Automated and Connected Driving Strategy* (2015) – Lead *BMV*
- *Quantum Technologies Conceptual Framework Programme* (2023) – Lead *BMFTR*
- *National Hydrogen Strategy* (2020/2023) – Lead *BMWE*

These strategies – depending on the lead ministerial responsibilities – reach beyond STI policy and include more sectoral policies such as regulation, taxation, standardization, and investment into infrastructure etc.

Being linked to the aim of coordinating strategy priorities, the relationship between the *HTS* and other strategies is, however, ambiguous. On the one hand, it is highlighted that there are comprehensive overlaps between different (sectoral) strategies and the *HTS*. For the *Future Strategy*, the *BMFTR* identifies approximately 150 strategies/action plans that share some links (BMBF 2023a). Moreover, there is a cross-referencing of strategies, with the *HTS* referring to key strategies for its implementation, while other strategies explicitly point out that they are part of the *HTS* (e.g. in case of the *National Bioeconomy Strategy*, BMEL 2014, p. 16).

On the other hand, strategic coordination with other strategies – even when linked to the *HTS* – is often limited or remains ambiguous. First, defining itself as an R&I strategy, the *HTS* and its successors – despite a claim to be a mission-oriented strategy (2018/2023) – remain mostly restricted to the STI domain (OECD 2022; Roth et al. 2021 cf. also section 3.3). In consequence, the *HTS* only subsumes selected STI initiatives, whereas the role of more implementation-oriented elements remains unclear (cf. also strategies above). Secondly, serving as an overarching framework, complementary strategies do not necessarily closely align with the overarching goals of the *HTS*. This is demonstrated, by the case of *Research for Sustainability – FONA*. While *FONA* was linked to several of the missions of the *HTS2025* (2018) (Circular economy, climate neutral industry, biodiversity, good living conditions across the countries), it pursues multiple other priorities alongside (BMBF 2021b).

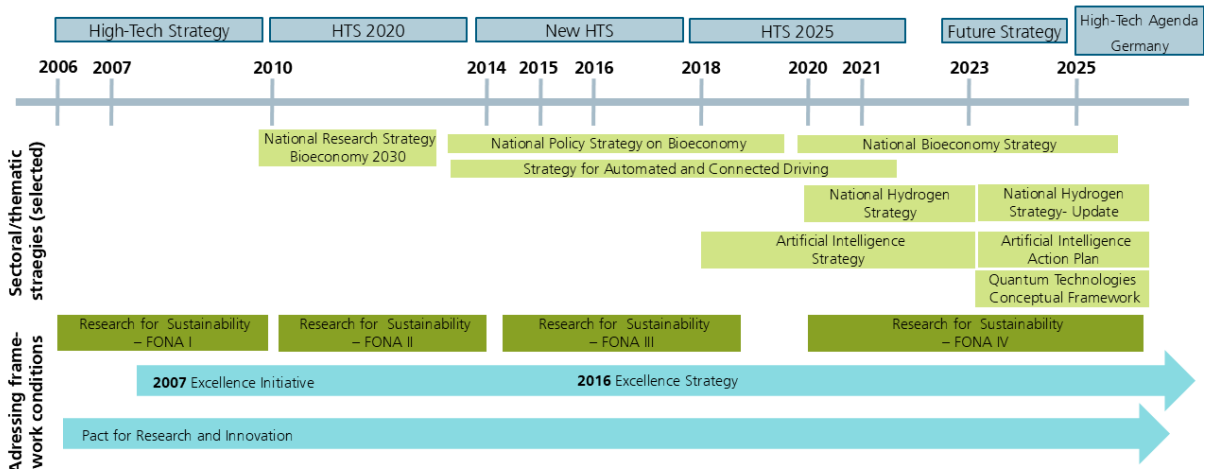
One initiative temporarily coinciding with the introduction of the *HTS* was the creation of the so-called *Pact for Innovation and Research (Pakt für Forschung und Innovation; PFI)*. It grants non-university research organizations (*Max-Planck Society , Fraunhofer Society, Leibniz Association, Helmholtz Association of German Research Centres, DFG*) a reliable financial budget (with a 3% increase every year) in exchange for increased coordination, cooperation and contributions to overarching policy objectives (OECD 2022, p. 119). Goals are negotiated individually for each research organization and cover the topics transfer, scientific excellence, cooperation with other actors in the field of science, attracting talents and provision of research infrastructures that are constantly monitored

[10] Explanation abbreviations: Federal Ministry of Education and Research (*Bundesministerium für Bildung und Forschung; BMBF*; predecessor *BMFTR*); Federal Ministry of Food and Agriculture (*Bundesministeriumg für Ernährung und Landwirtschaft; BMEL*); Federal Ministry of Labour and Social Affairs (*Bundesministerium für Arbeit und Soziales*; *BMAS*); Federal Ministry of Transport (*Bundesministerium für Verkehr; BMV*).

(BMFTR 2024a). In parallel, the Excellence Initiative/Strategy was created, providing additional funding for self-selected excellent research priorities of universities (cf. Section 2.2).

At the federal level there are discussions about industrial policy since 2019, focusing on identifying key challenges but not formulating explicit goals (BMWE 2019; BMWK 2023). Current discussions moved away from industrial policy (Grimm et al. 2025) and beyond a reduced electricity price there are little activities relying on instruments of industrial policy.

Figure 3: Key policy strategies and instruments at the federal level



Source: own elaboration

3.2 Thematic priorities and selection process

Formulation process

The formulation process of the *HTS* is primarily an internal process driven by priorities outlined in the coalition agreements of federal government, which set thematic priorities, naming, and partly also the approach (CDU et al. 2005, 23f; CDU et al. 2009, p. 63; CDU et al. 2013, 16; 25, 2017, 34; 40, 2025; SPD et al. 2021). Building on these negotiated results, the strategy is further developed and specified within relevant ministries. Despite being a strategy of the whole federal government, the process of setting up the *HTS* is coordinated by the *BMFTR* that acts as the lead ministry (cf. section 3.3). This implies that a first draft is provided by the lead ministry that subsequently seeks coordination with other ministries involved in relevant areas.

The *Expert Commission on Research and Innovation* (EFI 2008, p. 6, 2009, 2010) (cf. section 3.3) has highlighted the need for a systematic development of transparent selection criteria for relevant priorities, making use of foresight activities and stakeholder involvement. The former ministry for education and research (BMBF) has institutionalized foresight activities (Warnke et al. 2022, p. 53) that serve a cross-cutting function and contribute to different strategy processes within the ministry, including the *HTS* (BMBF 2021a; Warnke et al. 2016). However, it is important to note that foresight activities across different ministries are not well coordinated, leading to fragmented activities and a lack of a cross-ministerial perspective (EFI 2008; Warnke et al. 2022). Another issue remains a limited linkage to the EU level and activities in Horizon 2020/Horizon Europe. While other countries, like Austria have closely aligned domestic RTI policy with EU missions, the *German Future Agenda* (Deutscher Bundestag 2023) points to existing thematic overlaps without linking its activities specifically to dedicated EU missions. Besides the role of priority setting in coalition negotiations, the thematic continuity/path-dependency (see below) might act here as a barrier, to systematically align the strategy with the European level.

The formulation process does not entail systematic and strong involvement of external stakeholders. While the implementation of the *HTS* is accompanied by some expert panel/consultation forum (cf. section 3.4 for further details) these advisory boards are created after strategy formulation and therefore the selection/prioritization process is out of scope. In the *Future Strategy* (2023-2025), stakeholders from research organizations, professional associations etc. were for the first time invited to submit written comments on the draft of the *HTS* as part of a consultation process (BMBF 2021a, p. 14; Warnke et al. 2016). The consultation process, among other things, asked for suggestions regarding prioritization within the six mission areas. The final strategy was published two months after the end of the consultation process, without providing a statement on the nature of changes.

Development of thematic priorities

The way priorities are structured within the *HTS* has changed considerably over time (cf. *Figure 3*). While the first edition of the *HTS* in 2006 formulated 17 key technology fields (within three major categories) the subsequent editions have followed a more concerted approach. Moving from multiple challenge-oriented themes (which encompassed multiple technologies/areas of prioritization) the *HTS2025* (2018) formulated 12 dedicated missions at different levels of granularity. While the *Future Strategy* (2023-2025) relied on six rather broad mission areas, the new *High-Tech Agenda Germany* identifies six key technologies as the main strategic focus, plus six strategic research areas. This structure has usually been combined with a set of additional/cross-cutting elements that relate to structural conditions of the innovation system/general principles (like open innovation etc.) or cross-cutting (key enabling) technologies fields. Framework conditions comprise a wide range of different activities, including for example, support for start-ups, disruptive innovation (particularly with the creation of the agency for disruptive innovation in 2019) or thematically open initiatives such as the Clusters4Future initiative (2019) in case of the *HTS 2025* (2019) that are not systematically linked to thematic priorities.

The question of priority setting has accompanied the *HTS* since its inceptions, resulting in repeated discussions of these issues in the annual reports of the *Expert Commission for Research and Innovation* (EFI 2010, 2011, 2015, 2017b, 2018, 2025). Particularly in the beginning, the number of key technologies was considered too high and the *EFI* called for a stronger prioritization (EFI 2010, p. 44). While prioritization of topics has generally been welcomed by the *EFI* by acknowledging their relevance, a persistent weakness remains the poor translation of overarching priorities into distinct actions. In this context, the *EFI* has also repeatedly pointed to the need for clearer specification of goals and the formulation of milestones or roadmaps on how to achieve them (EFI 2008, 2015, 2017b, 2019, 2023).

Thematic priorities can be considered as a rather broad portfolio aiming to combine different (already existing) priorities and activities. Priority setting therefore – despite different approaches for structuring (missions, key technologies, priority fields) – reflects rather a logic of gradual evolution and continuous development instead of radical changes over time. The majority of topics were existent throughout all editions of the HTS between 2006 and 2025. As can be seen from *Figure 4*, there is considerable continuity among certain clusters of topics that are characterized by shifting internal priorities/adjustment to existing technological developments, instead of changing priorities altogether. While this does not exclude newly emerging priorities (such as the mission on new sources of knowledge in the *HTS2025 (2018)*), the overall picture is one of gradual change and adjustment reflecting recent developments, such as the growing importance of AI and quantum computing. At the same time, some topics like space and maritime technologies/research moved to the background after the initial *HTS* in 2006, only to re-emerge as a mission area in the *Future Strategy* (2023) or as a strategic research field in the *High-Tech Agenda Germany* (2025). Among

overarching priorities that remained constitutive (with varying internal priorities and framing) for the *HTS* over time are:

- IT/communication technology
- Mobility
- Health
- Sustainability
- Security

The priorities set in the *High-Tech Agenda Germany* (2025) confirm this picture, combining a renewed emphasis of existing topics (biotechnology), a response to growing importance of selected technologies (quantum technologies, AI), as well as an overall continuation of existing priorities (partly subsumed in the newly created strategic research fields). It is important to highlight that a number of technologies identified as key technologies in the *High-Tech Agenda Germany* (2025) were already identified in 2006 as key technologies (biotechnology, fusion research) but were less prioritized in the *HTS* editions until 2020.

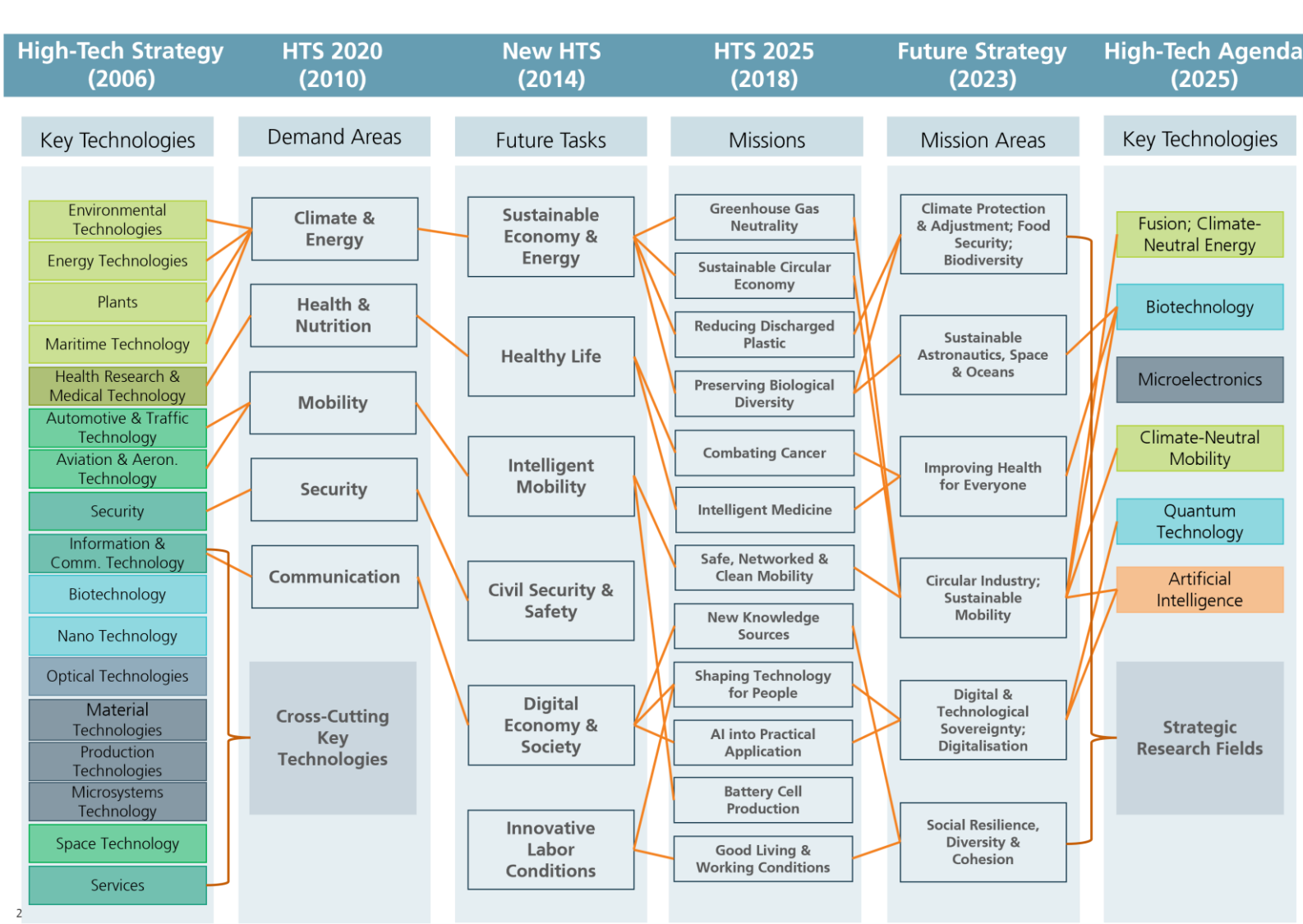
The topic of sustainable energy has been a continuous theme of the *HTS* (though there was no dedicated mission in the *HTS025*), showing strong thematic continuity over time. This may be linked to the on-going efforts and debates about the German *Energiewende (energy transition),* putting this topic high on the political agenda. Fusion energy as a specific technology, after being an explicit part of the *HTS* in 2006, largely disappeared until the *Future Strategy* in 2023, bringing back this technology as a promising avenue for tackling challenges in energy production. Similarly, the issue of mobility has been continuously emphasized in the different editions of the *HTS*. Over time electromobility aspects gained increasing importance, shifting the focus more towards sustainability.

A major shift is evident regarding biotechnology, which became highly visible again with the *High-Tech Agenda Germany (*2025*)*. While it was defined as one of the key technologies in the *HTS* (2006), subsequent editions of the *HTS* did not dedicate a prominent position to this field. The *Future Strategy* (2023) defined biotechnology as a key technology, linking it to different mission areas. A similar picture also emerges for microelectronics, which has been continuously present in strategies, however, without giving it a key position.

Two cases of prioritization are quantum technologies and AI, which are linked to technological progress in these fields. While they were not being explicitly referred to until 2014, topics gained importance with the *HTS2025 (*2018*)*. Formulating a dedicated AI mission in the *HTS2025* (2018), the *Future Strategy* (2023) strongly anchored these topics in the mission on technological sovereignty, with AI however, being a cross-cutting solution to almost all missions.

Besides the key technologies, the *High-Tech Agenda Germany (*2025) lists six strategic research fields: i) space and aviation, ii) health, iii) security and defense, iv) maritime/climate and sustainability, and v) humanities and social sciences. These strategic research fields show considerable continuity with regard to previous editions, addressing thematic clusters like health and sustainability that are not covered in the key technologies. The purpose of strategic research fields is not clearly defined in the strategy, instead the description mainly focuses on the importance of fields and lists selected (technological) initiatives/activities. According to some observers, these strategic research fields may have served as a counterbalance in coalition negotiations, to move beyond the strong tech-push approach advocated by the CSU and its Bavarian High-Tech Agenda (Wiarda 2025c).

Figure 4: Key priorities of the federal High-Tech Strategies



Source: Own elaboration based on *BMBF* 2006, 2010, 2014, 2018, 2023, 2025

The strategic research fields are rooted in previous editions of the *HTS*. Space, aviation, and maritime were particularly prominent in the first *HTS* in 2006 with space and maritime forming the foundation for one of the mission areas in the *Future Strategy* (2023). In a similar vein, the topics of health and sustainability have been longstanding priorities of the *HTS* and key elements throughout all editions. Both topics have, likewise, been paired with different additional priorities, health e.g., with nutrition care or digitalization and sustainability with energy, biodiversity or food security. Security research clearly illustrates changing priorities over time, linked to major geopolitical shifts. Initially centered on issues of crime/terrorism (2006), it shifted towards response to natural disasters, cyber security, and the protection of critical infrastructure (2010, 2014). After the Russian attack on Ukraine, it increasingly took up threats to democracy and issues of defense and civil protection (2023, 2025).

3.3 Implementation approach

Institutional responsibility and coordination activities

Formally the *HTS* and its successors are a strategy of the whole federal government bringing together ministries, aiming to bundle different activities in the field of STI policies. The development and implementation of the strategy since 2006 has been coordinated by the *BMFTR* while responsibility for priorities is shared among ministries. For example, the *Future Strategy* (2023) indicates that its six missions were co-lead by two or three ministries and involved up to nine additional ministries (BMBF 2023b).

Despite this broad formal involvement, in practice the *HTS* is closely tied to the *BMFTR* as its lead ministry. Consequently, it is often perceived as a *BMFTR*-strategy facing difficulties to mobilize other ministries to actively commit to the priorities of the strategy (Wiarda 2025a). The overall mode of coordination in the *HTS* " (Roth 2011: 31), therefore rather resembles the approach of "negative coordination, i.e. attempts to avoid overlaps between different ministries without aiming for coordinated action or a coherent policy framework (cf. Braun 2008; Scharpf 2000) – and been, despite some progress – a repeated issue in the annual reviews of the *EFI* (EFI 2009, 2010, 2011, 2012, 2015, 2018, 2019, 2025). The established mode of interministerial coordination in combination with the strong sectoral principle (cf. section 1.2) has proven difficult for enhanced policy coordination (cf. EFI 2017b, p. 90). The systematic involvement of state secretaries to facilitate cross-ministerial coordination activities has been recommended (EFI 2017, 2021, 2024). A first attempt to overcome the silo structure by the creation of mission teams in the *Future Agenda* (2023) has not yet yielded the expected results, leading to calls for more decisive approaches (EFI 2023; Wiarda 2025a).

Regarding the internal management of the HTS, it is moreover important to note that responsibilities are split across different units within the same ministry (BMFTR). Above all, there is a division between a strategic unit in charge of the overarching coordination of the strategy and the thematic units that are responsible for specific priorities/missions. This dualism has in the past proved a challenge in the implementation of novel concepts/approaches like mission-orientation, creating obstacles to ownership in the relevant units (Roth et al. 2021, 40ff). A key challenge in this regard is that there are no dedicated budgets for priorities/missions (EFI 2017b, 2024) or additional resources for coordination, resulting in coordination activities being an add-on to existing workload (Roth et al. 2021, p. 42).

Involvement of regional entities and other stakeholders

Overall, there have been demands for broader approaches to involve stakeholders across institutional, territorial and sectoral boundaries to shape the implementation of the *HTS* (OECD 2022, p. 24).

The subnational/regional level – despite early calls from expert bodies (EFI 2008:45) and expectations of the federal governments for states to align with this policy (Edler et al. 2008, p. 271) – has been widely excluded from the *HTS*. It is positioned as a federal level strategy. However, the new *High-Tech Agenda Germany* (2025) has brought back the issue of regional involvement (cf. section 3.4).

There have been multiple demands to ensure a stronger participation of new actors and civil society (EFI 2011, 2013, 2015, 2016). While the advisory board has been successfully extended to new stakeholder groups (cf. section 3.4) and the ambition to actively involve society and stakeholders (BMBF 2023b) a broader involvement of stakeholders beyond the advisory board (cf. section 3.4) to represent different groups of stakeholders is not systematically used.[11] This in particular applies to strategy formulation (see section 3.2). Consequently, mobilizing additional stakeholders to commitment to strategies, particularly with financial contributions has largely been absent (Roth et al. 2021).

Budget and financing

In line with its character as an umbrella strategy there is no dedicated budget for the *HTS* or its individual priorities/units (Bundesregierung 2024, 1f). Instead of allocating resources "top-down" to the strategy the budget results from the sum of relevant funding schemes and programs that are part of the strategy but remain under the responsibility of the ministries in charge. Consequently, there is no dedicated budget for the strategy or selected priorities, but the budget of the HTS depends on the willingness of ministries to contribute to the strategy, mobilizing their own budgets and link these activities to the HTS. This vagueness, particularly with regard to the endowment of selected priorities has been a major point of criticism of the *EFI* since the beginning of the strategy, limiting the transparency on available funding (EFI 2008, p. 45, 2011, p. 30).

Consequently, no consistent picture concerning the budget emerges, pointing to different underlying definitions and approaches for defining the budget. Whereas the first *HTS* reports a budget of EUR 14.6 bln, for later years estimates are mostly available via parliamentary requests. While for the *HTS2020* a budget of approximately EUR 27 bln (2010-2013) is provided (Bundesregierung 2012, p. 4), for 2017 alone (*New HTS*) the annual budget is estimated at EUR 17.4 bln (Bundesregierung 2017, p. 4). In contrast, for the *High-Tech Agenda Germany* (2025) for the whole electoral period (2025-2029) recent reports indicate a budget of EUR 18 bln (Wiarda 2025b). The HTS therefore covers only parts of federal spending on science, research and development, its delineation, however, remains a challenge.

Type of policy instruments

A key ambiguity is the link between individual policy instruments and the relevant strategies. Acting as an umbrella strategy, the HTS provides a framework for different priorities but has only limited agency to shape new initiatives. While in the first period the HTS – among others – lead to a streamlining of different funding lines in one thematically-open programme for SMEs by the BMWE (*ZIM – Zentrales Innovationspogramm Mittelstand*) (OECD 2022, p. 119) and went along with new initiatives like the Spitzencluster-Initiative in 2007 as part of the HTS (BMBF 2006), it is questionable whether the instrument mix is systematically developed based on the priorities of the strategy or rather evolves (partly) in parallel.[12] The development of the instrument mix is influenced by subsuming existing activities and often unclear delineation of instruments (Roth et al. 2021), pointing

[11] The *HTS2025* (2018) – among others – attempted for a series of workshop trying to bring implementation closer to different territorial areas such as regions, but suffered from a lack of clearly defined goals (Priebe et al. 2024; Wittmann et al. 2023).

[12] One example might be the Clusters4Future initiative that was announced in the *HTS2025* (2018) that might be linked to recommendations of the evaluation of the Spitzencluster initiative (Dehio et a. 2014, p. 225).

to an overall limited connection between strategy and individual policy instruments beyond selected key initiatives.

While strategy documents of the *HTS* define a list of key activities related to priorities/missions, there is no comprehensive overview of all instruments associated with a priority (cf. Wittmann et al. 2021b, p. 21). Moreover, complex strategies like *FONA – Research for sustainability*, may with some of their elements, contribute to certain priorities but not necessarily in their entirety (Wittmann et al. 2021b, p. 63). Consequently, the link between specific instruments and the overarching strategy can be considered rather limited, implying a dualism between overarching strategic priorities and the continuity/path-dependency of individual instruments and their specific development logic.

A review of policy instruments in the context of the *HTS2025* (2018) (BMBF 2021a) provides some insights into the instrument mix: First, there is a considerable continuity of various, partly long-standing, policy instruments that are supposed to contribute to existing priorities. While in some cases (Mission on Combating Cancer) there has been a deliberate shift towards the introduction of newly tailored instruments for specific priorities, other missions relied on a set of existing instruments/continuation of existing platform/strategies (EFI 2011, p. 30, 2017b, p. 90; Wittmann et al. 2021b, p. 68). While this continuity is a common practice in STI policy, there was little evidence of a systemic alignment of individual instruments with the relevant strategies (Wittmann et al. 2021b, 67f.). Second, funding is closely linked to established R&I funding and the creation of incentives with the majority of funding being instruments of direct distribution (project/Institutional support) (Roth et al. 2021, p. 27; Wittmann et al. 2021b, p. 65). Complementary elements are information-based instruments or approaches for systemic management.

Besides initiatives in the thematic priorities, instruments may also target overarching framework conditions e.g. with technologically open initiatives and activities related to transfer, etc such as ZIM or the Spitzencluster-Initiative. However, the relation between the thematic priorities of the HTS and thematically open, large-scale funding instruments such as *ZIM* (*Zentrales Innovationsprogramm Mittelstand*) are often rather unclear (Wittmann et al. 2021b, p. 51).

Resources provision in the *HTS* for thematic priorities pursues a thematically bound funding, inviting different stakeholders (universities, research institutes, private enterprises etc.) to engage in competitive funding application processes for resources that go beyond basic public funding of universities etc. In contrast, resource mobilization from non-public actors – beyond own contributions to project financing - has remained widely absent (Roth et al. 2021). Given its self-understanding as an STI strategy and its strong anchoring in the BMFTR, companies mainly appear as beneficiaries/partners in collaborative research projects or are addressed via cross-cutting priorities/thematically open instruments.

3.4 Learning and further development

Advisory structures

Since its creation in 2006, the *HTS* has been accompanied by a top-level advisory board. Initially composed of selected representatives from science and industry, since the *New HTS* (2014-2018) representatives of civil society were also included to the *High-Tech Forum (previously Research Union*). The main purpose of this advisory board was to accompany the implementation process and provide recommendations for further development. While the *High-Tech Forum* in the *HTS2025* (2018) opted for an approach providing impulses that cut across the structure of missions, the *Future Agenda* (2023) assigned the members of its advisory board (*Forum #Zukunftsstrategie*) to specific missions to better align recommendations with individual missions.

Monitoring and evaluation

Despite a self-understanding as a learning strategy (Bundesregierung 2012) and calls by the *EFI* for monitoring and evaluation (EFI 2015, 2019, 2023), efforts to monitor activities have only recently been undertaken. Progress and final assessment of the strategy has been provided by the *BMFTR* in the form of a progress and final report (BMBF 2024). For the *Future Strategy* (2023) an internal monitoring system was established that focuses on 17 cross-cutting indicators for the innovation system[13] (BMBF 2023b) but does not yield insights into the progress of dedicated missions. Moreover, an internal monitoring of mission goals was reported.[14]

While Germany generally has a strong system-oriented evaluation culture (Borrás et al. 2019), there is limited systematic evaluation of the *HTS* as such. Evaluation is mandatory for individual instruments according to paragraph 7 of the Budgetary Regulations (BMJV 2025). In contrast, policy mix evaluation is only moderately developed (Borrás et al. 2019). For the time being, no comprehensive evaluation of the *HTS* has taken place and is not foreseen (Bundesregierung 2024). However, there have been different activities accompanying the implementation such as commissioned studies looking at dedicated aspects such as the fit of thematic areas (Frietsch et al. 2013; Frietsch et al. 2017). Moreover, in 2017 a review of the first decade of *HTS* took place but has not been published (Daimer et al. 2017). For the *HTS2025* (2018) the *Fraunhofer ISI* was mandated to conduct accompanying research supporting the implementation process of selected missions and to develop a framework for impact assessment of the mission-oriented approach (Roth et al. 2021; Wittmann et al. 2021a). While relying on individual missions to test this approach, no comprehensive assessment of mission implementation took place.

The annual reports of *EFI* constantly reviewed the *HTS* and formulated needs for further adjustment and development covering both thematic priorities as well as organizational/structural hints. While these reports are non-binding, it appears that the *EFI* has considerable "soft power" (cf. also OECD 2022, p. 308). A number of recommendations/requests formulated by the *EFI* have experienced some uptake in the *HTS* over time (e.g. broadening of stakeholder involvement, monitoring & evaluation activities, involvement of state secretaries.), whereas other issues (like budget) were not addressed.

Recent discussions and developments

The current edition of the *HTS*, labelled *High-Tech Agenda Germany* (2025) was only adopted by the government in July 2025 and was publicly presented in November 2025, thus a number of issues related to implementation are not yet specified. This section provides a brief overview of relevant changes, developments, and on-going discussions related to the *High-Tech Agenda Germany* (2025).

Overall, there has been a positive reception regarding the ambitious priorities set by the *High-Tech Agenda Germany* (2025) as such, including its priority setting on selected key technologies (BMFTR 2025a). At the same time, concerns have been raised about a number of potential negative developments and barriers (Ronzheimer 2025; Wiarda 2025b). This includes the absence of the *Ministry of Economics* (*BMWE*) in the kick-off pointing to a continued dualism between *BMFTR/BMWE*, the lack of further operationalization of goals and overall limited financing. The latter is particularly relevant against the background of increased public spending in the coming years, aiming to spend around EUR 500 bln on additional resources for infrastructure and sustainable development within the next 12 years.

[13] This includes among others R&D spending, creation of new enterprises in high-tech sectors, the success of some flagship initiatives (such as SPRIND, DATI), employment and education in the field of R&D, gender equality and internationalization in research, number of spin.offs and framework conditions ((Deutscher Bundestag 2023, pp. 16).

[14] https://stip.oecd.org/moip/case-studies/28 (last accessed on November 27 2025).

While the *EFI* (2025, p. 24) has argued in favor of continuing the mission-oriented approach in German STI policy, the *High-Tech Agenda Germany* (2025) indicates a shift away from addressing grand societal challenges, placing again – like 2006 – key technologies at the heart of the strategy (BMFTR 2025a). The shift towards key technologies has been anchored in the coalition agreement of the current government (CDU et al. 2025) and might be potentially driven by different factors: i) difficulties with the implementation of the concept of mission-oriented policies, ii) a paradigm shift of the political discourse highlighting the importance of economic growth and competitiveness, iii) the influence of the Bavarian HTA that is closely linked to one of the parties of the coalition (cf also Wiarda 2025c).

Following long-standing calls for increased monitoring and roadmapping by the *EFI* (EFI 2015, 2019, 2023), the *High-Tech Agenda Germany (*2025*) (BMFTR 2025a)* formulates the ambition for a 360° monitoring approach and the provision of key indicators on overall systemic developments and the progress of technology roadmaps. Further details and information on stakeholders involved for the roadmapping processes are not yet available. This also includes participation by the *Länder,* which was already anchored in the coalition treaty (CDU et al. 2025, S. 77) but so far has not taken place. If implemented, this would be a major step towards a stronger vertical policy integration, which so far has been widely absent from the *HTS*.

4 Regional level: High-Tech Agenda

4.1 Overview of strategy and policy context

The *High-Tech Agenda Bavaria* (*Hightech Agenda Bayern*; *HTA*) is a top-level strategy at the regional level that was introduced in 2019 to strengthen science, research, academia and the regional economy of Bavaria (Bavarian State Government 2019). In 2020 and 2023, the *HTA* was expanded through the *High-Tech Agenda* +, which seeks to accelerate the implementation of the *HTA* (and serve as a booster to economic challenges caused by the Covid-19 pandemic) and the initiative *High-Tech Transfer Bavaria*, which focuses on enhancing knowledge transfer and leveraging research for the formation of start-ups and businesses (Bayerische Staatsregierung 2020; StMWK 2023). In contrast to the *HTS* at the federal level that is closely linked to electoral terms and regularly updated, the *HTA* is less embedded in continuous policy strategies. Among its predecessors are the *High-Tech Offensive Bavaria (Hightech-Offensive Bayern)*, adopted in 1999, which outlined five key technology fields aiming to link science, the economy, and which was financed by a cluster approach, as well as the *Future Offensive Bavaria* (*Zukunftsoffensive Bayern)* from 1994, which pursued a broader approach (Falck et al. 2010).

The *HTA* can be understood as an additional impulse to Bavarian STI policy by adding new priorities aside from other strategies and frameworks. As such it does not refer/link explicitly to other regional strategies or policy instruments[15] that characterize the Bavarian policy landscape in the field of STI policy (cf. *Figure 5*).

- One key element is the Bavarian cluster policies that were introduced in 2006 and currently in its fifth funding period support 17 different cluster networks that connect companies (including SMEs) among each other and/or with research institutions.[16] These cluster networks are

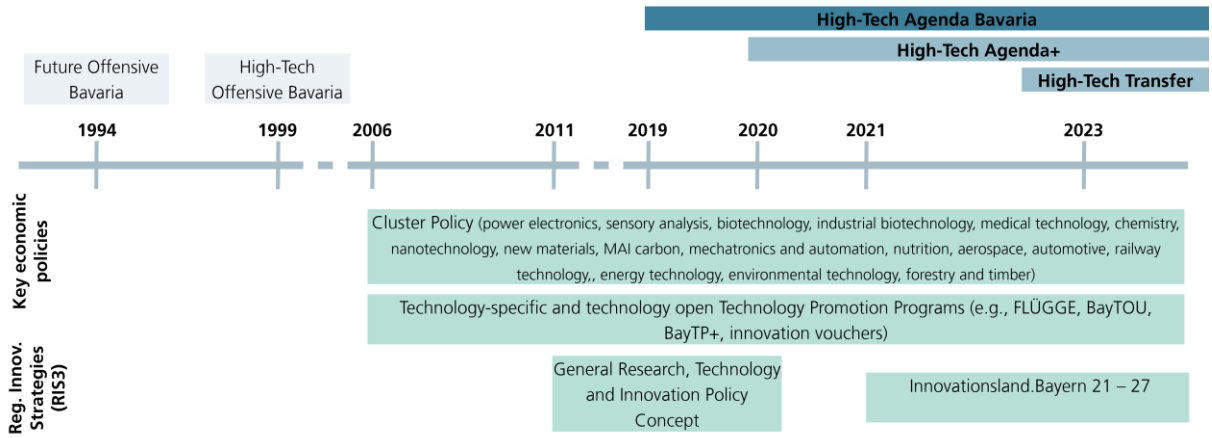
[15] The *HTA* is referred to as part of/one instrument of the transformation agenda (like e.g., *Bayern Digital*) in the current Research and Innovation Strategy

[16] The clusters are funded by the Bavarian government (StMWi) and acquisition of third-party funds by the clusters, e.g., by the Bund (EUR 282 mio. by 2021) or by the EU (EUR 53 mio. by 2021) (Invest in Bavaria 2021).. Some of the clusteres exist already since 2006 (e.g., Environmental technology, nutrition, forestry & wood, aerospace, railway technology, nanotechnology, mechatronics & automation, new materials, energy

mostly structured along the *RIS* priorities comprising clusters in the field of digitalization, life sciences and health, materialism energy (incl. sustainability), and mobility. While there is a dedicated cluster for aerospace and one for environmental technologies[17], there are no dedicated AI/quantum clusters. However, some of the partner networks (AI network, Munich Quantum Valley[18], Thinknet Quantum Technology[19]) are thematically/financially linked to the HTA.

- Besides cluster policies, there is a number of technology-specific funding schemes, including the collaborative research programs (*BayVFP*), the energy research program (*BayEFP*) and support for SMEs/start-ups in the field of digitalization that are also linked to thematic priorities of the RIS3.
- The most recent RIS3 *Regional Innovation Strategy* (*Innovationsland.Bayern 2021 – 2027*) as part of the EU framework for Cohesion Policy besides various fields of action (research infrastructure, innovation support, transfer, start-up funding) identifies a number of areas for specialization: mobility, life sciences, energy, materials and raw materials, digitalization.
- Moreover, the policy landscape is complemented by a number of technology-open funding schemes targeting different types of beneficiaries/activities such as transfer and validation of research findings and innovation, the foundation of technology-oriented companies (*FLÜGGE, BayTOU)*, support for the development of new, technology-oriented products or processes in SMEs *(BayTP, BayTP+, innovation vouchers*).[20]

Figure 5: Key policy strategies and instruments in the Bavarian policy landscape



Source: Own elaboration

In parallel to the *HTA*, the issue of digitalization is pursued by thematic strategies, most prominently the strategy *Bayern Digital* aimed at supporting the transformation process in economy and society

technology, automotive, sensor technology, power electronics; biotechnology), others were developed later (Cluster chemsitry 2007; medical technology 2007; MAI Carbon 2012; industrial biotechnology 2020). Some of the clusters at the Länder level, such as the *cluster energy technology* (*Energietechnik*) in Bavaria, are part of one of the three federal-level cluster funding lines. The cluster policy has been regularly evaluated, by reports are not publicly available (Institut für Innovation und Technik 2014; Pressedienst 2022).

[17] With a less pronounced focused on the automotive sector that is a distinct cluster.

[18] The Munich Quantum Valley was founded in January 2021 and "aims to create the world's foremost ecosystem for industrializing quantum technologies." (Bayerische Staatsregierung n.d.; Munich Quantum Valley n.d.) Its focus on research and transfer is mirrored by its structure as a registered association, consisting of three universities (FAU, LMU, TUM) and four research organizations (FhG, BAdW, DLR, MPG). It is funded by and was developed after initiation/within the framework of, the *HTA* as well as joint acquisition of third-party funds by the different members of the association and uses these funds to e.g., support research projects and develop a Center for Quantum Computing and Quantum Technology and a quantum technology park.

[19] ThinkNet Quantum technology aims at companies that want to use quantum technology or act as suppliers for the quantum ecosystem. The quantum technology program at Bayern Innovativ, including the ThinkNet, is on its official website intrinsically connected to the HTA (bayern innovativ n.d.b).

[20] These funding schemes are supposed to complement the national funding landscapes. However, there are often not explicit distinction criteria between national and regional policies, though one can assume that regional funding schemes may be more accessible and prepare for funding applications at the national level.

with EUR 6 bln (2012-2022). This also includes support for research (including AI, 5G), start-up activities and digital infrastructure and processes (e.g. in public administration). While showing thematic overlap, the *HTA* is considered distinct to *Bayern Digital* that temporally mostly preceded the *HTA* and covered different activities (Bayerischer Landtag 2021).

Another strong pillar of research and innovation activities in Bavaria is health/medicine. Being part of the *RIS* (life sciences) and having a dedicated funding scheme for medical technology, the launch of a *Highmed Agenda* has been announced in 2023 that was modeled after the *HTA*.

The instrument of the *HTA* is a rather unique feature for regional authorities in Germany. While the *Länder*, besides the Regional and Innovation Strategies (*RIS3*), regularly formulate technology-specific (e.g. for Hydrogen) or domain-specific (e.g. digitalization) strategies, dedicated strategies cross-cutting technologies that go beyond *RIS* priorities are rare. The closest equivalent to the *HTA* might be the *Innovation and Future Agenda Baden-Württemberg* (*Innovations- and Zukunftsagenda Baden-Württemberg*) (Staatsministerium Baden-Württemberg 2024) defining key areas of innovation (AI, quantum and super-computing, GreenTech, Digitalization, Data and Industry 4.0, Mobility, Health, Space and Aviation, start-ups). The Land Bavaria has some tradition with exploring novel approaches. The predecessor of the *HTA*, the *High-Tech Offensive Bavaria (*1999*)* with its cluster approach, was the first policy of this kind at the subnational level in Germany (Falck et al. 2010, p. 22).

While there are no systematic links between *HTS* (with its limited regional orientation, cf. section 3.3) and *HTA* in the form of cross-referencing or systematic alignment, there are multiple intersections with the federal level. First, a declared priority of the *HTA* (Bayerischer Landtag 2022; Forschung & Lehre 2023) is to strengthen self-selected research priorities of Bavarian universities, creating the basis for additional universities to qualify for the excellence status of the joint federal-regional funding initiative *Excellence Strategy*. Second, changing the label from *High-Tech Strategy* to *High-Tech Agenda Germany* (2025) at the national level indicates the adoption of the previously established Bavarian label, particularly as the responsible Minister for Research and Technology (*BMFTR*) is member of the *CSU* (*Christian Social Union*), the regionalist party governing Bavaria.

4.2 Thematic priorities and selection process

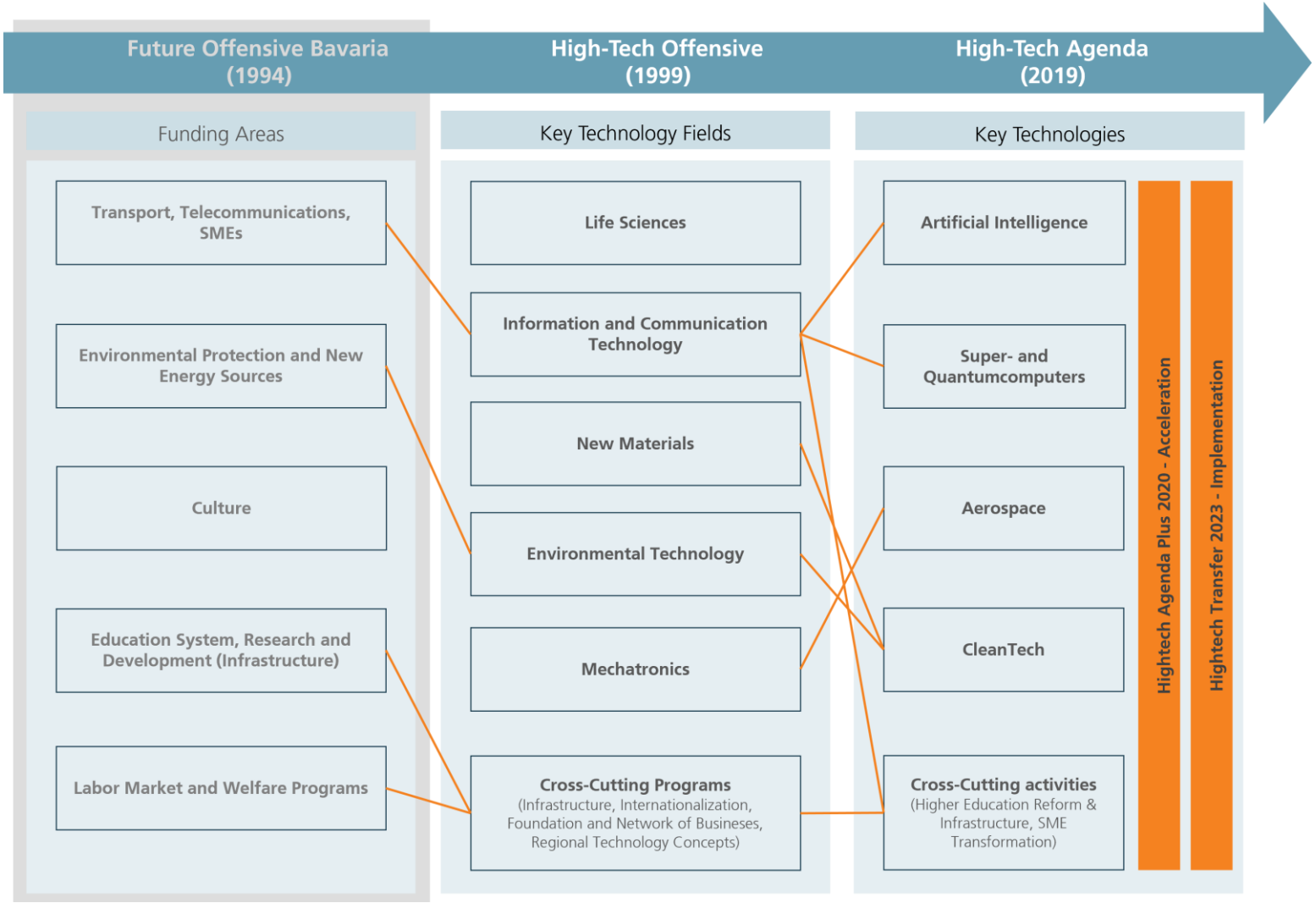
Formulation process:

The *HTA* was announced in October 2019 by Bavarian Prime Minister Markus Söder. While the coalition agreement from 2023 agrees to institutionalize and extend the *HTA* (CSU et al. 2023), the coalition agreement in 2018 does not explicitly mention the introduction of the *HTA* and refers only to AI as key technology, whereas other key technologies are not explicitly mentioned (CSU et al. 2018). Overall, desk research did not indicate evidence of a comprehensive strategy development process (including stakeholder involvement, foresight activities) but implies a top-down approach by the Bavarian government. The *HTA* lacks a codified structure in the form of a publicly available strategy document and was declared announced in a parliamentary speech (Söder 2019).

Development of thematic priorities

The *HTA* and its extensions (*HTA+*, *HTA Transfer*) concentrate on four key technologies: artificial intelligence, super and quantum computing, aerospace and CleanTech (which subsumes different technologies including batteries, hydrogen etc. and therefore is rather linked to the automotive sector instead of the broader understanding of environmental technologies). Besides these key technologies, the strategy focuses on framework conditions, by highlighting the need for improving the system of higher education institutions (including regulatory changes to the autonomy of

Figure 6: Key priorities of Bavarian High-Tech Strategies



Source: Own elaboration

HEIs), and the importance of mobile/data networks and support for businesses in the digital transformation.

Given the substantial temporal gap between the *High-Tech Offensive Bavaria* (1999) and the *HTA* (2019), there is also limited thematic continuity (cf. *Figure 4*), suggesting a reactive approach to newly emerging trends rather than continuing established priorities (which feature prominently within the RIS3 and the related instruments). With the notable exception of environmental technologies as one of the five key technology fields of the *High-Tech Offensive Bavaria* (1999), the remaining key technology fields only show limited continuity. The field of aerospace links to the Bavarian space program *Bavaria One* that was adopted in 2018 (Bayerische Staatsregierung 2018).

Emerging only shortly after the adoption of the HTS2025 (2018) at the federal level, the initial HTA entails several priorities that spilled over to the federal level, particularly with the High-Tech Agenda Germany (2025). This includes, most prominently, quantum computing as a key topic, also aerospace, which already occurred in the Future Strategy (2023).

4.3 Implementation approach

Institutional responsibility and coordination activities

The *HTA* is a top-level agenda of the regional government that was announced by the Bavarian Prime Minister. The main responsible ministries are the *Ministry for Science and Arts* (*Bayerisches Staatsministerium für Wissenschaft und Kunst; StMWK*) and the *Ministry for Economic Affairs, Regional Development and Energy* (*Staatsministerium für Wirtschaft, Landesentwicklung und Energie; StMWi*) complemented by *the Ministry for Digital Affairs* (*Bayerische Staatsministerium für Digitales; StMD*) which was created in 2018. Given its focus on flagship projects (cf. section on budget/instruments), responsibilities are primarily divided between the other two ministries, with the *StMWK* in charge of activities related to universities (law, new academic positions, academic infrastructure and research centers) and the *StMWi* focusing on economic actors and technology-based initiatives. The top-down character of the initiative is also reflected by the limited anchoring of the HTA in organizational ministerial structures i.e. assigning responsibility to a dedicated department or unit. Instead, implementation of the HTA is carried out by different thematically oriented units but lack an institutionalized overarching coordination structure.

Involvement of other stakeholders

There is no indication of systematic involvement of stakeholders in the development or implementation of the strategy in publicly available documents.

Budget and financing

The budget of the *HTA* comprises – according to official statements – investments totaling EUR 5.5 bln through 2027 (Forschung & Lehre 2023). For the years 2019-2023 the budget initially comprised EUR 2bln and was later extended by the *HTA+* with another EUR 900 mio and the *HTA Transfer* with more than EUR 100 mio. The initial financing of EUR 2bln was based on a reduction of foreseen repayments of public debt, channeling money towards investments (Söder 2019). For the period 2023-2027, total investments of EUR 2bln are foreseen (Forschung & Lehre 2023).

Overall, a considerable share of the budget is dedicated to investments in the sector of higher education (a key responsibility of the regional level). While no comprehensive official accounts are available, the *StMWK* has estimated its own contribution to the overall EUR 5.5 bln budget with EUR 1.5 bln (Bayerische Staatsregierung 2024).

Type of policy instruments

The *HTA* and its updates are built on multiple pillars, combining funding for research with structural investments and support for framework conditions. Besides a number of key flagship initiatives (e.g. 100 AI professorships) it includes also small-scaled initiatives/measures and continues existing measures, e.g. in the field of digitalization (Bayerische Staatskanzlei 2020). Among the flagship initiative, one may list (no exhaustive list)

- 1000 new professorships, including 100 AI professorships
- AI Hub in Munich
- Munich quantum valley, association to support development of quantum science and technology in Bavaria that builds on the cooperation of different key players from science
- Contribution to Leibniz Supercomputing Center
- Investments into construction works at higher education institutions
- Creation of technology transfer centers and start-up hubs
- Higher Education Reform (*Bayerisches Hochschulinnovationsgesetz, BayHIG*)

As can be seen from a parliamentary interpellation (Bayerischer Landtag 2022), a considerable share of investments goes to specified research institutes/thematic areas, supporting existing research organizations or infrastructures, i.e. is not distributed via open calls. For the AI professorships, 50 of the 100 professorships were allocated in a competitive tender, whereas the remaining were pre-allocated to different universities, granting universities in Munich among others 22 professorships (Forschung & Lehre 2019).

Funding for many of the large-scale initiatives is provided to selected projects/initiatives often without open calls. While there is criticism of a concentration of large projects particularly in Munich (Umlauft 2023) on the one hand, an analysis of the beneficiary map[21] reveals a strong territorial logic. Out of the 96 counties/cities with county-rights, there are only 15 that did not directly benefit from any project. Overall, this might hint towards a logic of representation of all key regions in Bavaria (Swabia, Upper Bavaria, Lower Bavaria, Upper Franconia, Middle Franconia, Lower Franconia, Upper Palatinate) that is deeply entrenched in the main political logic (Preis 2020).

While there is no comprehensive account of funded activities and reported budget volumes differ on the perspective (planned/spent), one can identify the following main pillars:

Investments in (research on) key technologies

Initially accounting for EUR 600 mio. (of a total of EUR 2 bln) this comprises investments in different key technologies by supporting the creation of new research centers (e.g. Munich Center for Machine Learning, thematic AI centers in Erlangen, Ingolstadt, Munich, and Würzburg) and computing infrastructure, research alliances/networks like the AI production network bringing together universities and research institutes or the network *Munich Quantum Valley*. Moreover, it includes investments in research by creating additional 100 professorships in the field of AI (approx. EUR 100 mio.). The priority field of CleanTech is closely linked to the automotive sector, emphasizing research (but also infrastructure investments) for synthetic fuel, battery and hydrogen (Söder 2019). More recently, also fusion energy became an issue related to the *HTA* (SZ 2023). For aviation/aerospace up to EUR 700 mio. are envisaged (Bayerische Staatsregierung n.d.).

Improving conditions in higher education

As a core responsibility of the regional level, higher education is a key focus of the *HTA*, announcing initial investments of EUR 600 mio., comprising infrastructure investments, capacity-enhancing measures, and regulatory changes. Among the announced activities are, among others, the creation

[21] Cf. https://www.hightechagenda.de/#in-meiner-region (last accessed 25/11/2025).

of additional 13.000 study places and 2.500 positions including 1.000 professorships (including 100 AI professorships and the creation of additional budget for outstanding professorships), investments into building/renovation of university buildings (approx. EUR 400 mio.) (Forschung & Lehre 2023). Moreover, activities include regulatory changes through the adoption of the *Higher Education Innovation Act* in 2022, which replaces the 2006 regulations, and revises autonomy and governance provisions and introduces a new form of state-university agreements.

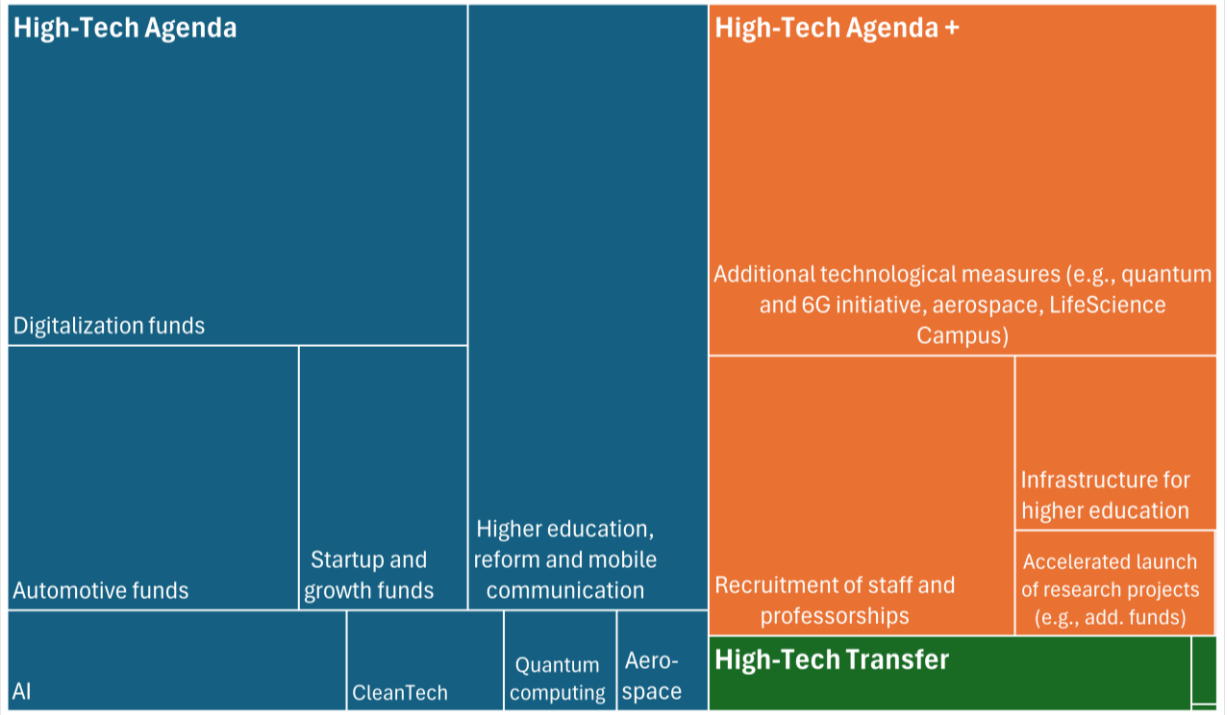
Improving framework conditions for technology transfer

This issue is particularly addressed by *HTA Transfer* investing into technology transfer centers at universities/universities of applied science and contributing to the diffusion in neighboring counties. Moreover, activities include start-up funding and support from venture experts across different regions in Bavaria (StMWK 2023).

Support of telecommunication

Given its link to AI, another priority is the support of telecommunication structures (5G/6G). Key activities include the support for joint research projects, pilot projects and networking among key actors to advance technology development and scale-up (Bayerische Staatskanzlei 2020).

Figure 7: Main activities/priorities of initiatives in the Bavarian *HTA*



Source. Own elaboration (Note: Uses reported/appropriated budgets of specific measures instead of overarching announcement). High-Tech Transfer includes: Technology transfer centers (EUR 103 mio.mm); Start-up hubs (EUR 5 mio.); Venture teams (EUR 0,5 mio.)

Support for small- and medium-sized businesses

Activities include a number of thematic funds aimed at supporting SMEs, particularly a fund for digital transformation in enterprises (approx. EUR 230 mio.), a start-up fund (EUR 50 mio.), and a fund to support Bavaria's strong automotive sector (approx. EUR 120 mio.). In addition, a parliamentary inquiry by the SPD (Bayerischer Landtag 2022) also lists a *transformation fund* (*Transformationsfonds*) with a volume of EUR 200 mio., which is funded by the Bavarian government (*StMWi*) and supports SMEs in transition phases, particularly regarding digitalization, climate and mobility (StMWi 2025). Start-ups and company founding is additionally supported through HTA funds that are dedicated to (technology-oriented) start-up centres (e.g., BioCubator Straubing). Moreover,

within the framework of the HTA+ and regional funding by the Bavarian government, programs such *as Transformation@Bavaria* (*Transformation@Bayern*) also support investments by SMEs in digitalization or transformation projects.

4.4 Learning and further development

The *HTA* is not systematically embedded in a broader environment for learning and evaluation. Given its focus on flagship initiatives, there are no official advisory bodies, or a subnational equivalent to the *Expert Commission for Research and Innovation* (*EFI*), providing continuous review of STI policy. Evaluation mostly takes place at the program/funding-line level (Bayerischer Landtag 2021), so no evaluation of the *HTA* as such is foreseen. Progress data are provided by the Bavarian government on a dedicated website (https://www.hightechagenda.de/) but lacking a coherent – publicly available - monitoring system. The predecessor of the *HTA*, the *High-Tech Offensive Bavaria* (1999) was analyzed with regard to its economic effects, finding a positive effect on innovation activities of involved companies (Falck et al. 2010).

The *High-Tech Agenda* + formally continues the priorities set by the *HTA* and was introduced as a reaction to the economic effects of the Covid19 pandemic, bringing forward various initiatives, but also implementing additional activities. An example for such new activities were investments in research on infectious diseases.

While the funding of the HTA is planned until 2027, recently there have been announcements of an update to the *HTA*, however, without details (Kveton 2023).

The label of the *HTA* has proved successful, leading to a number of spillovers. This includes the relabeling of the *HTS* at the federal level moving beyond the longstanding and established brand of the High-Tech Strategy, taking up also considerable thematic priorities such as quantum technologies, AI. At the regional level, the *Highmed Agenda (*2023*),* is considered to be modeled after the HTA and in 2025 the so-called High-Tech Awards were created.

5 Summary of results

The *High-Tech Strategy* and its successors became the key flagship policy for STI policy at the federal level that is linked to the electoral term of federal governments. It serves as an umbrella strategy, aiming to provide an overarching framework for different STI activities of ministries of the federal government.

- **While aiming for enhanced policy integration and portraying itself as a cross-departmental strategy of the federal government, the *HTS* is strongly anchored in the *BMFTR (formerly BMBF)* since its first edition in 2006** defining it as a STI strategy. In consequence, the *HTS* struggles with established practices of "negative coordination", resulting in limited mobilization and commitment of other ministries (particularly the *BMWE*), i.e. falling into the "STI trap". **Links with other sectoral and implementation-oriented policies therefore rather remain weak** (even with regard to *BMFTR* strategies). At the same time, it mainly serves as a **national STI strategy, having only limited connection with either the European or the regional level**.
- While addressing also crosscutting framework conditions, **main priorities of the *HTS* were either clustered around technology fields or societal challenges**. Priority setting for the HTS often takes place at the political level, anchoring priorities of the *HTS* in the Coalition treaty of governing coalitions. **Overall thematic development points to a gradual evolution allowing to embed recently (re)emerging topics** (e.g. quantum, AI) **and themes** (such technological

sovereignty) within the framework, **instead of radical thematic shifts**. This approach has the advantage to

i) **flexibly react to recent developments** with managing a portfolio of different topics that may have change importance over time and
ii) **being relatively resistant to abrupt policy changes** by allowing existing topics to continue under new label (cf. also OECD 2022, pp. 301 on German STI policy in general) and therefore providing reliable framework conditions.

The downside is a certain **path-dependency that often comes along with a continuity of established instruments and policies subsumed under changing labels instead of comprehensive policy change** – in consequence, while adding new initiatives in line with key priorities, it does not necessarily lead to the adjust or phase-out of existing priorities and approaches. Moreover, thematic prioritization in the strategy is counterbalanced by cross-cutting/thematically open priorities being linked to large-scale funding schemes.

- Having experimented with a mission-oriented approach (particularly in the *HTS2025* (2018)) there has been a **shift backwards to key enabling technologies** as main priorities of the strategy, linking the agenda again more to economic and competitiveness considerations instead of societal challenges.
- Acting as a main **umbrella strategy**, the HTS has contributed to a prioritization of STI policies, and contributed to policy change, both within the HTS (ZIM, Excellence Clusters) and the policy landscape with the Pact for Innovation and the Excellence Initiative (OECD 2022, p. 119). At the same time, it has **limited agency and guidance for introducing new policy instruments**. **Lacking an independent budget, it is dependent on the willingness of ministries to contribute to the agenda** by indicating relevant policy initiatives. In consequence, the instrument mix is not designed top-down to fit with the goals but emerges from a bottom-up negotiation/coordination process at the ministerial level, creating difficulties to partly delineate what is part of the strategy and creating a potential disconnect between strategy and policy. The continuity of priorities with long-term goals has been seen at odds with the electoral cycles (EFI 2024, p. 13). **Strategic priorities do not necessarily translate into policy change, as the instrument level is often not directly linked to the HTS.**
- Strategy implementation primarily takes place via **instruments of direct distribution**, generally delivered through thematic calls. Regulatory aspects etc. are beyond the scope of the strategy given its self-understanding as RTI strategy and the strong role of negative coordination.
- Formulating the **self-understanding as a "learning strategy" overall means for reflexivity are only weakly developed**. Internal monitoring was only introduced in 2023, a comprehensive evaluation at the strategy level has not taken place so far. The *Commission of Experts for Research and Innovation* (*EFI*) can be considered as a driver for change, as there is an uptake of its recommendations in its annual reviews of STI policy.

In contrast to the long-standing continuous *High-Tech Strategy* at the federal level, the Bavarian *High-Tech Agenda* has emerged as an ad hoc initiative (that was extended by the *High-Tech Agenda +* and the *High-Tech Agenda Transfer*), adding novel priorities aside from existing priorities in funding schemes and the regional innovation strategy (*RIS3*).

- **For the regional level, this type of agenda going beyond *RIS3* or sectoral (e.g. digitalization) strategies is rather unique** (closest equivalent: *Zukunftsagenda Baden-Württemberg*). Bavaria benefits from its rather **strong economic position**, allowing it to finance the *HTA* from reduction of additional debt repayments, providing it with room for maneuver for additional priority setting.
- There is no evidence for a comprehensive strategy development process or systematic stakeholder involvement, indicating rather an **ad-hoc and top-down character** with a prominent

role of the Prime Minister. Currently, there are attempts for prolonging the *HTA* that became a successful label and spilled-over to the federal level, a development that is likely to be linked to the role of the *CSU* - as the governing party in Bavaria – as part of the coalition at the federal level.

- Setting new priorities aside from existing strategies and policy instruments, the *HTA* is relatively **unconstrained by path-dependencies**, providing in many fields dedicated funding to new topics (most prominently AI and quantum computing).
- Given the strong competencies of *Länder* with regard to universities/higher education, **the approach of the *HTA* differs from the federal level**, by **emphasizing changes in Higher Education and a closer link between economic and research activities**. This is also facilitated by the different structures and responsibilities of ministries, as technology and economic affairs are located at the *Bavarian Ministry of Economic Affairs, Regional Development and Energy*, whereas at the federal level they are divided between the Ministry of Research, Technology and Space and Ministry of Economics and Energy at the federal level.
- **The implementation predominantly consists of investments into research and its related infrastructure (including transfer activities)**, e.g. by creating new professorships, study places, technology transfer centers etc. While on the one hand encompassing a number of key flagship initiatives with high spatial concentration (particularly Munich, but also other universities), several initiatives also aim for broad spatial distribution, ensuring that almost all counties benefit from some kind of funding. Besides putting an emphasis on research and technologies that also link to economically viable sectors (automotive), SMEs are supported via different (transformation) funds.

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