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ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)**

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Contribution by Germany

**to the CSTD 2024-2025 priority theme on “Technology foresight and technology
assessment for sustainable development”**

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PRIORITY THEME 2: Technology foresight and technology assessment for sustainable development

1. Has your country conducted ForSTI, TA or both? If yes, what were the reasons for undertaking ForSTI and TA?

The German Government has been – and still is – engaging in both, ForSTI and TA via numerous line ministries and other public institutions [see 3]. The overall goal is forward-looking governance and policy-making by exploring the societal, economical, ecological and political risks and opportunities associated with social and technological innovations / STI trends and developments in the medium- to long-term.

2. If you have not conducted ForSTI or TA in the past, what were the reasons for this (lack of need or requests for it, lack of familiarity, lack of capacity, lack of funding etc.)? Would you be interested in pursuing either ForSTI or TA as a policy tool in the near future?

N/A

3. What agency (or agencies), if any, is responsible for ForSTI and/or TA?

The (political) responsibility for ForSTI and TA is shared amongst various federal line ministries – in their respective policy fields – and other public institutions e.g. (partly supported by specialised external service providers): Federal Ministry of Education and Research (conducting foresight processes with a focus on STI since the 1990s and with a long history of funding projects conducting research and technology/innovation assessment.), Federal Ministry for Economic Affairs and Climate Action, Federal Ministry of Labour and Social Affairs, Federal Ministry for Digital and Transport, Federal Ministry of Defence, Federal Ministry for Economic Cooperation and Development, Office of Technology Assessment at the German Bundestag.

4. Who was responsible for implementing the ForSTI and/or TA undertaken - national government, sub-national levels of government (state/province or other levels), industry, universities, research institutes or civil society?

The German Government conducts ForSTI and TA on the national level via various federal line ministries and public institutions (see 3). They cooperate with numerous stakeholders in the diverse field of ForSTI and TA, e.g. other public institutions, independent research institutes, universities, companies, foundations and think tanks, as well as civil society actors.

5. In which sectors and/or for what policy processes have ForSTI and TA been undertaken, or linked to? What SDGs have they related to?

Recently (2019-2023), the foresight process of the German Federal Ministry of Education and Research has conducted a large scale horizon scanning of relevant technological and societal trends within the next 15 years. In-depth foresight studies have focussed on the topics of the future of societal values in Germany, the growing convergence between biology and technology, the future of trust in a digitalised world and the concept of a purpose economy. The current focus of the foresight process is on the monitoring and identification of critical and emerging technologies.

Current focus areas of TA projects funded by the German Federal Ministry of Education and Research are among others hydrogen economy, digital transformation in education and social innovations. A new funding period with new focus areas is due to start in 2025.

The SDGs addressed in the current funding period for TA projects are mainly SDGs 4, 7, 9 and 12, and to a lesser extent 3, 8, 10 and 11.

6. What specific methods (tools) and methodologies have been used for ForSTI and/or TA?

The foresight process of the German Federal Ministry of Education and Research has used a wide spectrum of both qualitative and quantitative foresight methods ranging from desk research and expert-based horizon scanning, Delphi studies, focus groups, expert interviews, surveys, design thinking workshops over forecasting and bibliometric and patent-based analyses to scenario development, futures wheels, and futures narratives (list non-exhaustive). A current focus is on the development of data-based and AI-assisted foresight tools for

monitoring and identification of critical and emerging technologies. The innovation/technology assessment projects funded by the

The technology/innovation assessment projects funded by the German Federal Ministry of Education and Research are free in their choice of methods and the employed methods vary greatly between specific projects. Projects are interdisciplinary by nature and can include (non-exhaustive) impact assessment, expert interviews, life cycle assessment, comparative policy analyses, forecasting, scenario development etc. Many projects feature strong participatory elements in their research designs, e. g. futures workshops or stakeholder working groups.

7. What challenges have you experienced in undertaking ForSTI and TA exercises? Does your country have any specific capacity needs to strengthen the conduct and use of ForSTI and TA? As is common and well-documented in government foresight and TA exercises in general, also for the ForSTI and TA activities of the German Federal Ministry of Education and Research there is still room for improvement for better connecting these activities to actual decision making. This includes better tailoring processes and products to the specific needs of decision-makers and stakeholders, as well as improving understanding for capabilities, but also imitations these approaches offer. A particular challenge is at what stages and to what extent to include the relevant stakeholders while ensuring that processes are lean and relevant.
8. Have you conducted combined ForSTI and TA in a single exercise at any time? What were the benefits and challenges of combining ForSTI and TA? Do you see this as a useful and feasible approach?

The German Federal Ministry of Education and Research views Foresight and Innovation/Technology Assessment as operating on slightly different time-scales (ForSTI more long-term, TA more short-term). There have been no concerted efforts to combine the two so far. Nonetheless, both fields benefit from making use of the toolkit of the respective other area. Many of the TA projects funded by the ministry employ foresight methodology (e. g. scenarios, participatory futures workshops), while the foresight activities of the ministry also include "traditional" TA aspects such as analysis of the potential impacts of social or technological innovations. Furthermore, issues first identified in horizon scanning and foresight exercises can be picked up as focal areas for subsequent analysis by technology/innovation assessment projects.

9. Are you involved in any international cooperation or partnerships for ForSTI and TA? Which ones and what are their benefits?

The German Federal Ministry of Education and Research is involved in the European Foresight for STI community organised by DG Research and Innovation of the European Commission, as well as the OECD Government Foresight Community (the latter not specific for ForSTI). Benefits are mainly knowledge and experience sharing, especially regarding methods and integration of foresight and innovation/technology assessment into government processes. To a lesser extent also sharing of concrete results from ForSTI and TA initiatives.

10. What role(s) can international cooperation, and the CSTD, play in promoting ForSTI and TA?

The sharing of experiences and best-practices is a key benefit of international cooperation. Sharing the results of ForSTI or TA activities of mutual interest can be a further benefit. International cooperation can also help prevent potential biases in national ForSTI/TA activities through the inclusion of more diverse perspectives. Given the global scale and dimension of the challenges addressed with STI policies joint international ForSTI or TA activities could provide valuable insights.

11. What have been some important ForSTI and TA examples undertaken in your country, especially related to national policy (prioritization, design etc.)?

The results from ForSTI and TA activities of the German Federal Ministry of Education and Research frequently affect strategic discussions and decision-making indirectly, as they are just one of many elements that factor into decisions. Some of the impacts include the creation of a new unit within the ministry working at cross-sectional topic that had been underrepresented until then, the improvement of cross-departmental cooperation as well as highlighting of specific aspects in the development of research funding programmes. Another important aspect is that public dissemination of the results helps elevate the level and knowledge base of public discourse on STI topics (results from TA projects are often reported by the media e. g. on the topics of cultured meat, autonomous vehicle in public air space, robots in care facilities, digital participation for people with disabilities).

12. Based on your experiences, how have ForSTI and TA improved STI decision making and the prioritization, design and implementation of STI policies?

ForSTI and TA can be one element in forward-looking and evidence-based STI policy making. They can be especially beneficial in early stages of strategy/decision-making processes to broaden the horizon, help discover blind spots, and shed light on potential interdependencies, second order effects, etc that might have been unnoticed otherwise. However, to realise their full potential the obstacles mentioned in question 7 need to be addressed.