

**INTERSESSIONAL PANEL OF THE UNITED NATIONS COMMISSION
ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)**

**Geneva, Switzerland
21-22 October 2024**

Contribution by Brazil

**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

United Nations Commission on Science and Technology for Development (CSTD)

Dear CSTD Member,

The [27th CSTD annual session](#) selected “Technology foresight and technology assessment for sustainable development”, as one of the priority themes for its 28th session (2024-2025) period).

Along with unprecedented opportunities, rapid technological developments present multifaceted challenges and risks, socio-economic disruptions and environmental impacts, among others. STI foresight (ForSTI)¹ and technology assessment (TA)² are useful tools for identifying and understanding key emerging trends and the risks and opportunities from the creation and adoption of new technologies, improving the quality of decision-making by making it better informed, more evidence-based and inclusive, promoting inclusive discussion, and identifying strategic priorities for future STI policy at the national level, and thereby enable more effective adaptation to technological and other systemically important future changes. STI foresight is a systematic process aimed at envisaging the future and strategically making decisions on STI policy and the use policy actions in the present to arrive at a preferred future.

Technology assessment is an interdisciplinary process for assessing opportunities and risks of new technologies, informing policymakers, inducing public dialogues and debates, and helping frame supportive policies and instruments. Therefore, they are policy tools that are particularly relevant to ensuring that policymakers can identify STI policy actions and implement more inclusive policy processes that move towards leaving no one behind, which is closely aligned with the theme under consideration for ECOSOC 2025 (“Advancing sustainable and inclusive solutions for leaving no one behind”).

The annual resolutions negotiated at the CSTD have consistently underscored the importance of technology foresight and TA exercises and have encouraged all stakeholders to conduct inclusive national, regional and international and foresight exercises on existing, new and emerging technologies to help to evaluate their development potential and mitigate possible negative effects and risks. By integrating these processes into strategic planning and innovation policymaking, countries could navigate better the complexities of technological changes while maximizing its benefits for national development.

Under this theme, the Commission will consider issues such as the methodology for conducting ForSTI and TA, good practices and challenges in conducting these exercises, and the effective integration of the results from these exercises into the design and implementation of STI policies that will drive progress towards achieving the SDGs. The Commission will also consider how international cooperation and the CSTD could play a role in this regard.

The CSTD secretariat is in the process of drafting an issues paper on the theme to be presented at the CSTD inter-sessional panel meeting to be held on 21 and 22 October 2024 in Geneva. In this context, we would like to solicit inputs from CSTD member States on this theme. We would be grateful if you could kindly answer the following questions based on your experience in your country or region. To facilitate your answering, we have made the questions be as specific as possible.

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

¹ Technology foresight is a term that can be usefully broadened to STI foresight to recognize that STI is broader than technology alone, and foresight for national policy related to technology can include STI more broadly defined. This remains narrower than “strategic foresight”, which can be applied to many areas of policy and diverse uses, and “futures”, which can include many future-oriented studies of a diverse nature.

² TA is not the same as technology needs assessment (TNA), which aims to identify technology needs for addressing climate change rather than the impacts of adopting a technology new to the country.

Yes.

The Center Strategic Studies and Management (CGEE), linked to the Ministry of Science, Technology and Innovation of Brazil (STI), has been conducting several studies using ForSTI and TA over the past 20 years, with the aim of supporting the construction of mid and long-term planning for STI federal policies. Moreover, the use of foresight enhances the engagement of actors and stakeholders as they develop a common future vision and objectives for the policies that are in the creation process.

In addition, SERPRO, a government-owned company, at the federal level, tasked with providing digital solutions for the Brazilian federal government, states and municipalities, has carried out analyses focused on the adoption of emerging technologies for the implementation of public policies, based on innovation perspectives for the solutions that enable government entities (costumers). SERPRO also operates in the private market, helping promote economic development through the integration of government and society. SERPRO does not carry out ForSTI and TA with a focus on the adoption of emerging technologies by the entire Brazilian society, although it has internal AI and data governance initiatives that can be used by the whole society to reduce impacts on the use of new technologies.

SERPRO has implemented ForSTI and TA actions through partnerships, its innovation policy and in accordance with its strategic planning, directing the use of technologies (software and hardware) in line with the company's business strategies. Examples of technologies adopted based on previous evaluations of technology trends and the positive impact they can bring to their customer follow:

- Technology Trends
 - ✓ Cloud adoption, with the need to establish solutions that provide data sovereignty
- Technology Assessments
 - ✓ Generative AI
 - ✓ Block chain
 - ✓ IoT

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?

Not applicable.

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

Referring to the first answer, the Center for Strategic Studies and Management (CGEE) is a prominent organisation that frequently conducts ForSTI to support STI policies. The organisation has been created to support the decision-making of the Brazilian Ministry of STI through strategic studies and foresight and by the identification and broadly articulation of specialists and actors.

Apart from the Ministry of STI, the Ministry of Management and Innovation in Public Services (MGI) has also carried out analyses of technological trends and defined public policies focused on the use of technologies and national development. The Ministry of Health also conducts TA and ForSTI.

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 Center for Strategic Studies and Management (CGEE) is responsible for conducting ForSTI to support STI public policies at Federal Level. TA has been implemented by different organisations, directly or indirectly linked to STI public policies but also to Industrial policy. In this context, for example, the Brazilian Agency for Industrial Development has also conducted TA in cooperation with CGEE.

Also, sectorial Ministries have conducted their own ForSTI and TA aiming specific needs and concerns. Among them, Oswaldo Cruz Foundation (Fiocruz), responsible to produce, disseminate and share knowledge and technologies aimed at the strengthening and consolidation of the Unified Health System (SUS) and contribute to the promotion of health and quality of life of the population, and the Brazilian Agricultural Research Corporation (Embrapa) have to be highlighted. Moreover, different institutions have worked in different future studies for national development where STI was an important axis of analysis.

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?

The Brazilian Government has undertaken ForSTI and TA to support several sectorial policies. Among these that have been conducted by CGEE are:

- a) Sustainable cities (SDG 11): different types of STI foresight and other types of future studies were conducted in the last 10 years to better design and implement innovations for sustainable cities.
- b) Economic Development, Industry and Innovation (SDG 8&9): CGEE has developed technological roadmaps and ForSTI to enhance industrial policy and foster technological innovation, helping detect trends and opportunities.
- c) In a more transversal approach, different types of foresight and long term studies have been developed to support research policy. In particular three studies can be highlighted concerning the future of National Research Council (CNPq); the new agenda for research and graduate studies; and new agenda for Social Sciences and Humanities.

In the field of health, as an example of technological assessment (TA), the Ministry of Health of Brazil carries out the National Digital Health Maturity Index (INMSD), an integral part of the SUS Digital Programme (mentioned in #4). INMSD aims to assess and promote the digital maturity of health systems at the municipal, state and federal levels in Brazil with the objective of: (i) offering a comprehensive and equitable assessment of the digital health landscape, considering the geographic diversity and inequalities present in Brazil; (ii) promoting the effective integration of technology in health, promoting equity and improving the quality of services throughout the national territory; and (iii) generating evidence that supports states and municipalities in the preparation of their Transformation Action Plans for Digital Health.

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

CGEE usually adapts methods and methodologies for each project. In terms of technological assessment, CGEE usually applies technological roadmaps, surveys with specialists, and patent analysis. Moreover, the TRL (technological readiness level) is also very useful to determine technological trends and to define priorities of public investments in different sectors, such as defence, energy, space, among others. For STI foresight, CGEE mixes different types of future studies or scenarios, with scientific productions analysis and survey or meetings with specialists.

SERPRO, on its turn, adopts a technological radar that is constantly updated based on an analysis of technological trends and corporate strategic planning. This radar guides decisions for acquisitions and the development of knowledge and skills necessary for the best performance of its systems, solutions and employees.

As for the the field of health, in the methodological context of the INMSD (#5), this Programme is fed by the federative entities that joined the SUS Digital Program. These answers will help the Ministry of Health to understand the panorama of digital health maturity in Brazil, identifying challenges and opportunities for the development of STI in the SUS.

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?

The high costs of main databases of scientific production and patents make evaluations and STI studies difficult at national level for many countries. These data are also important considering the relevance of broader scientific measures and evaluations all around the world.

According to SERPRO, one of the biggest challenges is to align budget constraints of its customers with the market values of emerging technologies and provide new solutions in the face of legal frameworks that still need to be defined or revisited.

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 main agencies have not provided any recent examples.

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

On behalf of Ministry of STI, CGEE is the focus point of the BRICS for STI group.

SERPRO is supporting SETIC-FP, an Angolan Government-owned company responsible for the development of government technological solutions, in the adoption of new solutions, which may involve the use of emerging technologies. However, this supporting initiative focuses on the analysis of the positive implications of the use of technology for the Angolan government, without involving a comprehensive analysis of the impacts of the use of new technologies for the entire Angolan society.

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

The CSTD serves as an important platform to foster discussion about technological trends and their implications for the entire society of a country, as well as to foster international cooperation in the matter, which could favour the reduction of inequalities that are amplified by the adoption of specific technologies, such as AI. International cooperation could also promote discussions towards the adoption of a common framework that would facilitate ForSTI and TA discussions, accelerating the analysis and adoption of assertive public policies that enhance the benefits of IT and reduce negative social impacts in the adoption of technologies.

New initiatives on ForSTI international cooperation led by CSTD could play a crucial role in the promotion of a shared understanding of the opportunities and risks of technological development for the achievement of the SDGs. CSTD leadership can help promote ForSTI as a pivotal space for scientific diplomacy.

CSTD has proven to be a platform to discuss pressing issues, such as solutions for equitable and consensual use, creating for New Space, or non-geostationary orbits (NGSO), rules of access to the scarce resource, in line with what is already done for geostationary orbits (GSO). Discussions about technological forecasting and assessment for sustainable development should necessarily pay attention to aspects of equitable use of scarce resources essential for the provision of services and the construction of more advanced transversal infrastructures.

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

As mentioned above, in #5, STI policies have been using subsidies of ForSTI in different moments. Among the contributions made by CGEE for STI and research policies using forSTI, one could mention

the elaboration of the 2016 National Plan of Research and Graduated Studies (PNPG) and the definition of strategic topics for funding at humanities and social sciences research.

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

The use of ForSTI has been improved but there is still room to be broadly used and to have more influence in the practice of designing and implementing STI public policies.

According to SERPRO, the analysis of technological trends and the evaluation of new technologies have allowed them to better serve the government in the implementation of public policies that benefit from the digitalization of services.

Please indicate contact person(s) and agencies responsible for projects/policies and international collaboration on ForSTI and TA in case we need clarification on the inputs.

Please send your responses and any further inputs on the theme to the CSTD secretariat (stdev@unctad.org) by 24 **July 2024**. We look forward to receiving your valuable inputs.

Sincere regards,
CSTD secretariat