

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

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

Contribution by Portugal

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

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

Priority themes for the 28th CSTD annual session

Contribution by Portugal

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?

Yes, Portugal has conducted both Science, Technology, and Innovation foresight (ForSTI) and Technology Assessment (TA). These activities have been essential for various strategic and policy-making purposes. Therefore, it is possible to roughly identify 5 periods:

1. **Planning Dominant in the R&D Policy Cycle (Until 1974):** initial planning phases involved collective strategies and stakeholder involvement, but no foresight techniques were used.
2. **Priority Setting and Programming (1979-1990):** Introduction of foresight techniques with the Science Law (1986), which included a 10-year plan developed with international support.
3. **Programming after European Cohesion Funds (1991-2000):** Emphasis on regional development and R&I programming with priority setting exercises.
4. **Strategy Development Focus (2000-2020):** Coordinated development of Smart Specialisation Strategy and FCT's R&I Thematic Agendas.
5. **Return to Policymaking Cycle with Foresight (2021 onwards):** New policy rationales and foresight strengthening at the EU level.

ForSTI and TA activities were undertaken in Portugal for the following reasons:

Strategic Planning and Policy Making:

ForSTI and TA provide critical insights into future technological trends and their potential socio-economic and environmental impacts. This information is used to develop long-term, evidence-based policies that support national development goals.

Anticipating Future Challenges and Opportunities:

These exercises help anticipate future technological advancements and their implications, enabling Portugal to prepare for potential challenges and leverage opportunities. This proactive approach ensures the country remains competitive in the global market.

Enhancing Competitiveness and Innovation:

By identifying emerging technologies and trends, ForSTI and TA contribute to enhancing the competitiveness of the Portuguese economy. These insights guide investments in key areas likely to drive future economic growth.

Sustainable Development:

Aligning technological progress with sustainable development goals is a key reason for conducting ForSTI and TA. These exercises ensure that technological innovations support

economic, social, and environmental sustainability, helping Portugal meet its international commitments.

Public Engagement and Inclusivity:

ForSTI and TA processes engage various stakeholders, including the public, in discussions about technological developments. This inclusivity helps create policies that are broadly accepted and beneficial to different segments of society, fostering a more inclusive approach to technological innovation.

Mitigating Risks:

By assessing the potential risks associated with new technologies, ForSTI and TA help develop strategies to mitigate negative impacts. This proactive approach is essential for ensuring that technological advancements do not lead to undesirable socio-economic or environmental consequences.

Additionally, the Portuguese Regulatory Authority (ANACOM) for the electronic communications, postal, e-commerce, space sectors undertakes foresight activities related to technologies in those sectors, and more generally in the digital economy, ensuring that technological advancements in telecommunications contribute positively to sustainable development goals in Portugal.

For more detailed insights and ongoing projects related to ForSTI in Portugal, you can refer to the [Eye of Europe – The Research and Innovation foresight community](#) and the [MLE on R&I Foresight \(2022-2023\)](#).

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?

As mentioned in question 1., Portugal has undergone an intermittent long-term process regarding R&D/R&I Foresight practices, in which these emerged and submerged along the way. This is mainly rooted in the fact that Foresight was never deeply institutionalised - it was not either explicitly and formerly part of Public Administration bodies' mission and organic laws and bylaws, and systematically used in the policy making cycle in R&I policy, such as planning, priority setting, programming, budgeting, monitoring or evaluation.

Another reason lies in the resulting lack of Foresight literacy and capacity, resources (human and financial resources).

Importantly, some of the relevant bodies that pioneered Foresight in Portugal underwent substantial changes, resulting in a backlash in Foresight practices.

Nonetheless, in line with most European national regulatory authorities in the electronic communications industry, our regulatory body (ANACOM) lacks specific legal competencies to address environmental and sustainability issues in general.

The interest in pursuing either ForSTI or TA and the correspondent adjustment in resource allocation must be perceived in the light of the evolution of national and European public policies in this field.

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

In Portugal, several agencies are responsible for Science, Technology, and Innovation foresight (ForSTI) and Technology Assessment (TA), which have been highly positively impacted by several initiatives at the European Union level, such as Annual Strategic Foresight Report, the Network of Ministers for the Future (integrating Foresight Communities), the dynamics under the TRIOs of presidencies of the European Council (namely the German, Portuguese and Slovenian trio) or the organisation of a MLW “Strategic Foresight in R&I” under the Portuguese Presidency. The Agencies are:

ANACOM:

ANACOM, as regulatory authority for the electronic communications, postal, e-commerce and space sectors undertakes foresight activities, related to technologies in those sectors, and more generally in the digital economy.

ANACOM’s role includes regulation, promoting research and innovation, efficient spectrum management, monitoring compliance, ensuring digital inclusion and fostering sustainable infrastructure development. By focusing on those areas, ANACOM helps to ensure that technological advancements in the telecommunications sector contribute positively to SDGs in Portugal.

Fundação para a Ciência e a Tecnologia (FCT):

The FCT is the primary public agency responsible for the continuous development and implementation of science, technology, and innovation policies in Portugal. It plays a significant role in coordinating foresight activities and strategic planning.

It is actively involved in various European initiatives related to foresight, such as the Annual Strategic Foresight Report and the Network of Ministers for the Future.

FCT led the R&I Thematic Agendas process (2017-2019) and launched a national informal R&I Futures network, focusing on the acceleration of technological development and other thematic areas. It is and objective to aim developing its foresight capacities further, institutionalizing it within its strategic framework.

PlanAPP:

PlanAPP was created in 2021 under the Council Ministers Presidency, tasked with consolidating the systematic integration of foresight in the policymaking cycle and priority setting across all sectors of public administration.

It coordinates the network of Public Administration Planning and Foresight Services (RePLAN), promoting cooperation, knowledge sharing, and multi-sectoral projects in strategic planning, public policies, and foresight.

Agência Nacional de Inovação (ANI):

ANI is responsible for promoting innovation and fostering collaboration between research institutions and industry. It conducts foresight studies and technology assessments to guide innovation policy and support strategic decision-making.

ANI has organized the Entrepreneurial Discovery Processes Workshops, aiming to enhance knowledge valorisation in strategic sectors prioritized for smart specialization. These events targeted various stakeholders, including higher education institutions, interface centres,

collaborative laboratories, technology transfer offices, clusters, companies, and regional policymakers.

These agencies collectively ensure that Portugal's foresight and technology assessment activities are well-coordinated, contributing to strategic planning, innovation, and sustainable development.

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?

In Portugal, the implementation of Science, Technology, and Innovation foresight (ForSTI) and Technology Assessment (TA) is a collaborative effort involving multiple levels of government and a multistakeholder approach:

National Government: The national government oversees and funds ForSTI and TA activities primarily through the Ministry responsible for Science, Technology, and Higher Education. It sets strategic priorities and provides necessary resources for these initiatives.

Foundation for Science and Technology (FCT): the FCT is a key player in coordinating and implementing ForSTI and TA under the national government. It funds research projects, supports strategic planning, and facilitates collaborations among different stakeholders. FCT's efforts include national foresight activities and participation in European foresight initiatives.

Agência Nacional de Inovação (ANI): ANI promotes innovation and fosters public-private partnerships. It collaborates with industry, research institutes, and universities to conduct foresight studies and technology assessments. ANI also plays a role in building regional capacities for foresight exercises and promoting transregional collaboration, as seen in its partnership with the Azores Region.

Sub-national Levels of Government: Regional Coordination Bodies for Regional Development (CCDRs) are emerging as significant actors in foresight, particularly within the smart specialization approach and open discovery processes. They engage all regional actors in a quadruple helix approach, involving government, academia, industry, and civil society.

Universities / Academia: universities contribute by developing and offering courses on foresight, such as the “Futures, Strategic, Design & Innovation” course at ISEG – Instituto Superior de Economia e Gestão – Universidade de Lisboa. They also participate in foresight studies and collaborate with other institutions.

Research Institutes: the Institute for Prospective Studies (IP) has been organizing annual Prospective Meetings since 1992, focusing on fundamental issues for the future of Portuguese society and Europe. These meetings involve academic, political, business leaders, and social partners, fostering dialogue and reflection on long-term development.

Consultancy Companies: companies like Insight & Foresight and Alva Research & Consulting are also active in developing and implementing ForSTI practices, offering expertise and support for foresight activities.

Civil Society: Civil society organizations and various stakeholders are engaged in the foresight processes through inclusive approaches that ensure broad participation and reflect diverse perspectives.

This multi-level and multi-stakeholder approach ensures that foresight and technology assessment activities in Portugal are comprehensive, inclusive, and aligned with national and regional development goals.

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?

ForSTI (Foresight for Science, Technology, and Innovation) and TA (Technology Assessment) in Portugal have been undertaken in various sectors and linked to multiple policy processes.

These efforts are aligned with several Sustainable Development Goals (SDGs), as such:

Telecommunications and Digital Economy (ANACOM)

Policy Processes: Regulation, policy development, spectrum management, digital inclusion, and infrastructure development.

Some related SDGs: **SDG 7** (Affordable and Clean Energy): Encouraging the use of energy-efficient technologies and renewable energy sources; **SDG 9** (Industry, Innovation, and Infrastructure): Promoting resilient and sustainable telecommunications infrastructure; **SDG 10** (Reduced Inequality): Ensuring digital inclusion and accessibility for all population segments; **SDG 11** (Sustainable Cities and Communities): Supporting smart communities through next-generation networks and IoT.

General Science, Technology, and Innovation Policy (FCT and ANI)

Policy Processes: Strategic planning, priority setting, fostering innovation, and public-private partnerships.

Some related SDGs: **SDG 9** (Industry, Innovation, and Infrastructure): Enhancing competitiveness and fostering innovation; **SDG 8** (Decent Work and Economic Growth): Supporting economic growth through innovation and technology advancement; **SDG 13** (Climate Action): Addressing climate change through technological innovation and sustainable practices.

Regional Development and Smart Specialization (CCDRs (Regional Coordination Bodies for Regional Development) and ANI))

Policy Processes: Implementing smart specialization strategies, fostering regional innovation, and promoting transregional collaboration.

Some related SDGs: **SDG 8** (Decent Work and Economic Growth): Promoting regional economic development; **SDG 9** (Industry, Innovation, and Infrastructure): Developing regional infrastructure and innovation capacities; **SDG 11** (Sustainable Cities and Communities): Supporting sustainable regional development and urban planning.

Education and Research (Universities, Research Institutes, and FCT).

Policy Processes: Developing foresight courses, organizing prospective studies and meetings, and engaging in national and international foresight networks.

Some related SDGs: **SDG 4** (Quality Education): Enhancing education on foresight and strategic planning; **SDG 9** (Industry, Innovation, and Infrastructure): Supporting research and development activities.

Social and Environmental Sustainability (ANACOM and FCT)

Policy Processes: Ensuring equitable access to digital services, promoting green technologies, and fostering sustainable infrastructure.

Some related SDGs: **SDG 10** (Reduced Inequality): Promoting social equity and digital inclusion; **SDG 13** (Climate Action): Encouraging sustainable practices and resilience to climate change.

By addressing these sectors and policy processes, Portugal's ForSTI and TA activities contribute significantly to achieving a broad range of SDGs, ensuring that technological advancements support sustainable economic, social, and environmental development.

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

A recent return to foresight practices and tools, namely along the different steps of mission-oriented innovation policies (MOIP) or smart specialisation strategies (S3), makes it worth mentioning:

1. Diagnosis - analysing the societal objectives / visions, trends, innovation potential, and stakeholders: expert interviews, Horizon Scanning; trend Analysis; Cros-impact analysis; backcasting.
2. Exploration - exploring plausible future developments and innovation options: expert interviews; Expert panels; Horizon Scanning; Trend analysis; Cross impact analysis; backcasting; Technology mapping; SWOT analysis; Wild cards analysis.
3. Strategic orientation - prioritising options based on shared vision: System thinking; Technology Mapping; Ecosystem Mapping.
4. Implementation - identifying concrete steps /actions for implementing strategic plans, and for monitoring and evaluating them on an ongoing basis. Delphi, PESTLE (MOIP), Wisdom of Crowds (MOIP), System thinking, Data analytics, Technology Mapping; Ecosystem Mapping.

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?

STI Foresight practices have recently re-emerged in Portugal. Connecting the STI Foresight system, and ensuring that all elements are available and mature is certainly still a challenge – concretely in terms of:

- Demand: such as legislative commitment, parliamentary oversight, political commitment, championing and institutionalised demand to inform policy making cycle.
- Capacity and skills to apply foresight techniques: available foresight specialists, policy researchers and programme managers, policy analysts, auditors and evaluators, public engagement specialists.
- Institutions: institutional set-up across government departments and policy cycle head units, agencies and departments, formal and informal networks.
- Embeddedness: being effectively part of the policymaking cycle for an effective uptake.
- Feedback: review of Foresight systems, with evaluation and impact assessment.

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 Portuguese Regulatory Authority, ANACOM, has developed over time several prospective studies, which, in a way, might be considered to combine ForSTI and TA approaches.

For example, the 2008 study on the impact of next generation networks (NGN) on the electronic communications market in Portugal, which was carried out by Ovum Consulting at the request of ANACOM, addresses several issues that emerge with a view to establish favourable conditions to the launch and development of NGN networks and services in Portugal.

The document is divided into 13 chapters, covering issues such as the characterisation of existing networks in Portugal, NGN in the international context, the characterisation of demand for NGN based services, costs and investments, co-installation of operators, impact on info-inclusion, interconnection models, impact on the assessment of costs from a regulatory point of view, impact of the conditions of access to buildings, analysis of NGN profitability and recommendations.

Study available at: [ANACOM - Impact of next generation networks \(NGN\) on the market - study](#)

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

Through FCT, Portugal was involved in the organisation of the EU Workshop on Strategic R&I Foresight (June 2021), during the Portuguese Presidency of the Council and in the [MLE on R&I Foresight- Policy and Practice \(September 2022 - October 2023\)](#), under the Policy Support Facility (PSF, Horizon Europe), with 2 national representatives. FCT is also a partner in the European Consortium responsible for the project [“Eye of Europe”](#) (CSA funded by the HE- November 2023).

As a result, it is worth to mention the creation of awareness on the relevance of Foresight and strategic intelligence along the policy making cycle, capacity building, acquaintance with other countries Foresight experiences / sharing experiences and challenges, as well as the creation of a CoP-Community of Practice.

With regards to ANACOM, Portugal has been involved in extensive international cooperation and partnerships, playing a crucial role in its technology foresight activities. Through collaboration with international bodies, participation in global standards organizations (like ITU, IEC), and engagement in research and innovation projects, ANACOM ensures that it stays at the forefront of technological advancements and contributes to sustainable development in the telecommunications sector.

Other international organizations where ANACOM's participation is active include EU bodies - like BEREC (Body of European Regulators for Electronic Communications), CEPT (European Conference of Postal and Telecommunications Administrations), OECD and ARCTEL (Association of Communications and Telecommunications Regulators of the Community of Portuguese Speaking Countries). ANACOM has also developed bilateral agreements with telecommunications regulators in other countries to share knowledge and best practices.

Those international cooperation efforts not only enhance the regulatory framework in Portugal but also align it with global best practices and international standards.

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

International cooperation plays a crucial role in promoting Science, Technology, and Innovation foresight (ForSTI) and Technology Assessment (TA). By **facilitating the exchange of knowledge**

and best practices, international cooperation allows Portuguese researchers and policymakers to learn from global experiences and apply these insights locally. This knowledge sharing and capacity building are essential for enhancing the effectiveness of ForSTI and TA activities.

Moreover, international organizations can provide much-needed **funding and resources**. Access to international grants and financial support helps overcome budget constraints, enabling more comprehensive foresight and assessment activities. **Collaborative research and innovation** projects also benefit from international cooperation, as they incorporate diverse perspectives and expertise from various countries, enhancing the scope and impact of these projects.

Policy alignment and standardization are another significant benefit of international cooperation. Harmonizing ForSTI and TA methodologies and policies across countries ensures comparability, interoperability, and a common understanding of technological impacts, supporting more effective national and international policymaking.

Additionally, international cooperation enables countries to **collectively address global challenges** such as climate change, health pandemics, and digital transformation. ForSTI and TA are used to develop joint strategies and solutions that benefit all participating nations, including Portugal.

International cooperation also plays a role in enhancing **analytical capabilities**. By leveraging international expertise and advanced tools, including AI and data analytics, countries can strengthen their analytical capabilities. Promoting **ethical innovation** is another important aspect, as global standards and guidelines ensure that technological advancements align with ethical standards and contribute positively to societal goals.

Furthermore, international cooperation helps build **resilient and inclusive innovation** systems by fostering global networks and cooperation among stakeholders. This strengthens the overall ecosystem for innovation and ensures that technological advancements benefit a broad range of sectors and communities.

The CSTD can significantly enhance the promotion of ForSTI and TA by:

1. Showcasing the advantages of Foresight:
 - Demonstrates the benefits of using foresight in designing R&I policies.
 - Highlights successful case studies and best practices from around the world.
2. Promoting exchanges between countries:
 - Facilitates interactions between more advanced and less advanced countries and foresight communities.
 - Strengthens Communities of Practice (CoPs) in foresight.
3. Creating opportunities for capacity building:
 - Provides training programs, expert advice, and sharing of methodologies.
 - Leverages analytics and AI to aid in decision-making processes.
4. Policy influence and alignment:
 - Helps harmonize ForSTI and TA methodologies and policies globally.

- Ensures that Portugal's interests and priorities are represented in international STI policy frameworks.

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

[Please refer to Question 8]

Additionally, it is worth mentioning the [R&I Thematic Agendas](#) (12 Agendas) - [Council of Ministers Resolution 32/2016, June 3](#) - have been a very important initiative in recent times, although not fully a Foresight exercise. Involving experts from the academy (around 500 hundred personalities from 2017-2019), the business sector, policy makers and public administration, they aimed at identifying the priorities for research and for innovation in 2030. This exercise was mainly based on structured brainstorming.

One background idea of these agendas was to indirectly influence the Strategic Research Agendas of the Research Units involved, through their appropriation of the resulting Thematic agenda priorities. Besides, these priorities have supported several policy making decisions, mainly as regards collaboration and participation in international partnerships.

They have also inspired sectorial policy making, across sectors, such as:

[PNEC – Plano Nacional de Energia e Clima](#) - explicitly mentioned the relevance of many of the R&I Thematic Agendas, namely for the expected contribution of these agendas for the development of the R&I in crucial areas to help addressing challenges and problems of sectors of society, with direct impact in energy transition and in climate action, namely the agri-food area, forest and biodiversity, climate change, circular economy, industry and manufacture, sea and sustainable energy systems.

[Exam to the National Energy Policy by the IEA- International Energy Agency](#) – Chapter on "Energy, Technology Research, Development and demonstration (page 133 and 134). Reference on "A strategy for research, development and innovation (RD&I) is under preparation and the final step (decision making) should follow soon. This last review took place in 2020. Portugal contributed to the discussions on the basis of the Thematic Agenda on Sustainable Energy Systems.

[ENEI – SMART SPECIALIZATION STRATEGY](#) – alignment with national priorities and policies in the several priority domains, include: the Strategy Portugal 2030, the Regional SMART Specialization Strategies and the National Strategic Plans, **the R&I Thematic Agendas 2030**, the competitiveness Clusters, the UN SDGs (Sustainable development Goals), and European Policies, Programs and Strategies, such as Cohesion Policy 2021-2027 and the RRP (Resilience and Recovery Plan).

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

As previously mentioned, during the period 1979-1990, Foresight techniques effectively supported priority setting and programming. However, in more recent times, R&I Foresight suffered a backlash, lacking institutionalisation, but have recently re-emerged in Portugal (see 4.) as ForSTI and TA can contribute to visible surplus gains with regard not only to the electronic

communications sector, but also downstream in other sectors, such as energy, climate, and health.

To achieve these gains, it is of the utmost importance to analyse also potential risks to data privacy, network integrity and security.

This balanced analysis will then serve to define forms of “anticipatory technology governance”, thus helping to define appropriate regulatory and public policy principles, gather megadata and intelligence to contribute towards implementation, enhance the engagement of different stakeholders, promote agile regulation and guide national and international cooperation.