



Stimulate science, technology and innovation

Science, technology and innovation (STI) are considered the key drivers of innovative and inclusive jobs, as they propel availability and adoption of novel technologies, greater productivity, industrialisation, economic growth, quality of education and decent job creation¹. In addition, they are contributing to addressing societal challenges, such as access to healthcare and to essential medicine, food security and transition to sustainable development. There is evidence that automation technology adoption fosters process and product innovation, with the latter having a greater job creation effect². Overall, STI reinforce each other, leading to the development of a knowledge economy and of innovative organisations/enterprises. The knowledge economy is conditioned by investments in science and innovation ecosystems, processes that foster technological progress and technology diffusion, availability of highly skilled labour³. Thus, policymakers should ensure sufficient support to stimulate STI.

Ensure integration of STI policies into a broader policy agenda

Innovation and technology policies need to be integrated in a broader policy agenda to ensure that policymakers maximise the benefits of STI for each policy area (e.g., entrepreneurship, education), address challenges associated with the STI policy design and implementation (e.g., intellectual property rights, international collaboration on STI), and to build synergies with other policies/instruments and stakeholders. The latter is critical for ensuring sufficient availability of funding for STI, coherence of policies that stimulate economic and human development. To ensure successful integration of STI policies into a broader policy agenda, policymakers should be aware of the benefits and challenges associated with STI and present a long-term vision on the development of STI. In addition, policymakers should involve relevant stakeholders to discuss how STI could address their needs and how to ensure sufficient allocation of resources for them.

¹ United Nations. (2013). Science, Technology and Innovation (STI) and Culture for Sustainable Development and the mdgs | economic and social council. United Nations. Retrieved December 21, 2022, from <https://www.un.org/ecosoc/en/content/science-technology-and-innovation-sti-and-culture-sustainable-development-and-mdgs>

² Vivarelli, M. (2015, May 1). Innovation and employment. IZA World of Labor. Retrieved December 21, 2022, from <https://wol.iza.org/articles/innovation-and-employment/long>

³ Australian Council of Learned Academies. (2020, August). Stimulating the science and research ecosystem creates jobs and investment. Retrieved December 21, 2022, from https://acola.org/wp-content/uploads/2020/09/ACOLA_stimulating-science-and-research-ecosystem-creates-jobs-and-investment.pdf



Stimulate investment in research and development

Investment in research and development (R&D) stimulates STI and results in greater competitiveness and better positioning of organisations on a global scale. Beyond this, investments in R&D can help organisations to be ahead of market trends or to follow most recent trends, and to identify the resources needed for R&D. Due to a high cost of investment R&D, stimulating public and private investment and reducing costs for doing R&D are imperative. This can be achieved by designing an STI strategy that sets a target for expenditure on R&D, by institutional and regulatory frameworks that encourage R&D through initiatives that partially cover costs especially for small enterprises, increase accessibility of resources (e.g., human capital, infrastructure). In addition, a sharing/reduction of costs can be supported by (international) collaborative frameworks (e.g., projects, ecosystems, networks) and alignment with the EU STI policies.

Foster effective collaboration between research and industry organisations

Collaboration between research and industry organisations is a cornerstone of STI and of economic growth. Such collaboration will stimulate valorisation of research findings and discovery of market-relevant solutions. While research organisations can provide expert knowledge, ensure compliance with rigorous scientific methodologies, the industry organisations can support development and commercialisation of products/services that respond to consumer/market needs. Thus, industry-research collaboration will not only help STI-driven products/services be faster integrated into the market, but also supporting the STI ecosystem development that will benefit from new knowledge, shared resources and engagement of new members. Additionally, industry-research collaboration can increase the quality of education at universities through joint projects and by better understanding industry needs. To stimulate effective collaboration between research and industry organisations, policymakers should encourage joint initiatives through public procurement, financial incentives or ecosystems, and there is a need to support the stakeholders in addressing potential challenges, such as joint intellectual property rights, differences in working styles and timelines of involved organisations etc.

Ensure availability of human capital

Besides infrastructure and financial resources, the development of STI is reliant on availability of human capital. This calls for a continuous adaptability of the education/training system, supported by sufficient allocation of resources. Specifically, policymakers should ensure that the education/training is characterised by a high level of collaboration between educators and employers/industry actors to reduce a labour market mismatch, by a high quality of education materials, tools and methods of education. The latter implies availability of high-quality infrastructure and technologies, as well as, innovative methods of learning that foster development of technology, social and meta skills, stimulate curiosity and lifelong learning. This is conditional on availability of support for teachers/trainers that provide



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education/training. Lastly, inclusion to the education process should be seriously considered to maximise availability of highly skilled labour and inclusion on the labour market. Apart from developing local human resources, policymakers should consider attracting best talent from other locations (either in the same country or abroad). To do this successfully, information on employment opportunities should be widely shared and various incentives for migration should be provided.

Strengthen STI networks and (inter)national partnerships

To facilitate sharing of most recent scientific discoveries, to support technology transfer and to stimulate innovation it is key to strengthen STI networks and (inter)national partnerships. Such networks involve stakeholders from academia, industry, government and civil society, thereby helping in building up STI capabilities, boosting (inter)national knowledge and technology flows, and enhancing advocacy for the STI stakeholders. Although the governance of the STI networks and partnerships might be complex and involve several levels of decision-making, it is worth joining the forces, especially when societies are faced with large challenges that require significant investment. To encourage and strengthen the development of (inter)national STI networks and partnerships, policymakers should identify key obstacles that prevent their development, develop capabilities to mediate complex discussions on innovation priorities and provide resources for the stakeholders to realise their STI ambitions⁴.

Consider the following PILLARS and external resources to stimulate science, technology and innovation:

Title and weblink	Authors and year	Description
<u>Science, Technology and Innovation Policies Can Make The EU The Global Frontrunner of Sustainable Development</u>	European Commission, 2015	The report by the Group offers a foundational framework aiming to position EU research and innovation policy as a driving force behind transformative change aligned with universal sustainability objectives. It provides recommendations encompassing general policy directions and specific domains for EU STI policy, fostering the implementation of the 2030 Agenda in Europe and globally. Additionally, the report advises the EU to leverage its Horizon 2020 program, earmarking over 60% of its funds for sustainable development and encouraging international collaboration.
<u>S&T Policy 2025</u>	OECD, 2023	STI policies play a crucial role in addressing global challenges by transforming socio-technical systems,

⁴ Miedzinski, M., Kanehira, N., Cervantes, M., & Mealy, S. (2020). International STI collaboration and investment for Sustainable Development Goals. Science, Technology and Innovation (STI) for SDGs Roadmaps. ResearchGate. Retrieved 2020, from https://www.researchgate.net/publication/345978505_International_STI_collaboration_and_investment_for_Sustainable_Development_Goals_Science_Technology_and_Innovation_STI_for_SDGs_Roadmaps.



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		necessitating a holistic governmental approach. Although governments are implementing relevant policies, they require more ambitious and urgent action in STI policies, urging systemic changes. The OECD's array of projects offers guidance for systemic policy reforms, aiming to direct STI policies towards transition challenges, culminating in the crosscutting project, S&T Policy 2025, aimed at enabling transitions through Science, Technology, and Innovation.
<u>Public Support to Business R&D: A Survey And Some New Quantitative Evidence</u>	Henri Capron and Bruno van Pottelsberghe de la Potterie	This paper aims, referencing Capron and van Pottelsberghe's integrated assessment scheme, to derive policy implications from quantitatively assessing R&D subsidies' effectiveness in seven major industrialized countries. Its goal is to challenge the notion of innovation policies as reliant on faith rather than comprehension, as suggested by Rothwell and Zegveld. The empirical framework assesses two study categories: the direct influence of R&D subsidies on productivity growth and their stimulation effect on private R&D investment across 22 manufacturing industries. The paper's structure includes a survey of existing quantitative literature, an evaluation of R&D subsidies' impact on productivity and private R&D investment, and concludes with suggestions for designing public investment policies.
<u>Investing In Research: An Action Plan for Europe</u>	European Commission, 2003	The action plan, prompted by the March 2003 European Council, was formulated following extensive consultation with European institutions, Member States, candidate countries, and industry stakeholders, expressing broad support for the 3% objective. Most countries have initiated measures to enhance research investment and set national targets aligned with this European objective. It aims to sustain and align European and national initiatives, addressing various challenges hindering research and technological innovation, such as issues in research careers, visibility of European research, financing for technology-driven SMEs, and intellectual property management, complementing other European initiatives for enhancing competitiveness and innovation in line with the Lisbon European Council objective of 2010.
<u>Public Private Partnerships (PPP) - Cooperative Models</u>	ENISA, 2018	ENISA seeks to examine the present state of Public-Private Partnerships (PPPs) within the EU through this report. It explores primary collaboration models, identifies challenges encountered by both public and private sectors in initiating and advancing PPPs, and offers recommendations to foster PPP growth across Europe.
<u>Luxinnovation</u>	Luxinnovation, 2023	Luxinnovation functions as the designated national innovation agency, focusing on enhancing partnerships between companies in Luxembourg and the research ecosystem as a key part of its mission. Their activities serve as an example of a good practice.



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<p><u>OECD Productivity Working Papers</u></p>	<p>OECD, 2023</p>	<p>The OECD Productivity Papers are linked to the Global Forum on Productivity, facilitating international collaboration among public bodies to analyse and promote policies that enhance productivity. It acts as a platform for sharing insights, experiences, and information on government structures and policies, aiming to develop more effective strategies. The Forum expands the OECD's ongoing analytical work by focusing on productivity growth drivers, addressing the policy research needs of participants.</p>
<p><u>Guidelines Concerning Measurement Of Qualifications And Skills Mismatches Of Persons In Employment</u></p>	<p>ILO, 2018</p>	<p>These guidelines aim to establish norms for defining and measuring qualification and skills mismatches among employed individuals, complementing existing labour market measures like unemployment. Each nation should strive to gauge the levels and trends of different mismatch types to provide an essential data foundation for diverse statistical users, considering unique national needs. The measurements are intended to monitor labour markets, evaluate the impact of mismatches on economic and social outcomes by education levels and skills, and assess how specific demographic groups are affected by these mismatches.</p>
<p><u>European Cooperation in Science & Technology</u></p>	<p>COST, 2023</p>	<p>COST, a funding organization, supports the formation of research networks known as COST Actions, facilitating collaboration among scientists across Europe and beyond to drive research progress and innovation. Researchers can initiate networks by submitting proposals aligned with their research interests through the COST Open Call, spanning various scientific fields. These Actions are inclusive, interdisciplinary, and remain open for expansion over a four-year funding period, involving multiple stakeholders like the private sector, policymakers, and civil society.</p>