



Transforming Science, Technology and Innovation Policy for Transitions

*Business at OECD Discussion Paper on
Science, Technology, and Innovation Priorities for the
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Established in 1962, *Business at OECD* (BIAC) is the officially recognized institutional business stakeholder at the OECD. We stand for policies that enable businesses of all sizes to contribute to economic growth, sustainable development, and societal prosperity.

Through *Business at OECD*, national business and employers' federations representing over 10 million companies provide perspectives to cutting-edge OECD policy debates that shape market-based economies and impact global governance. Our expertise is enriched by the contributions of a wide range of international sector organizations.

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Introduction

The stakes have never been higher for Science, Technology, and Innovation (STI) policies to address shared challenges and new opportunities. In response, the critical role of businesses collaborating with governments and other stakeholders to deliver transformative solutions in science, technology, and innovation has never been more important or timely.

New trends and emerging technologies such as Artificial Intelligence (AI), biotechnology and synthetic biology, next-generation data design and computing, and neuroscience, increasingly intersect with ongoing foundational cores for STI policy in research, education and workforce development, investment and capital, and agile anticipatory governance. But many long-standing STI policies have lagged in keeping up with the accelerating pace of disruptive “game changers”, ongoing digital and life science revolutions in multiple domains, compressed time cycles, multidisciplinary and convergence, and innovative new business models.

Enabling scientific research and technology development and fostering innovation ecosystems are crucial for businesses. Both government-led STI policies and government-business collaborations play a vital role in catalyzing these processes and building next-generation infrastructure. Forward-looking foundational pillars are needed to support agile and anticipatory governance, robust investment and finance strategies, broad-based workforce skills training, sound framework policies for business (including tax and intellectual property), and a range of new measures to strengthen innovation and entrepreneurial ecosystems. As the driving force behind innovation and a key contributor to value generation and societal solutions, businesses must be integral partners in creating and delivering public benefits, driving economic growth, ensuring productivity, providing quality jobs for the 21st century, and promoting societal well-being through STI.

Business at OECD (BIAC) believes the time has come to transform traditional STI policies, priorities, and government organizational structures to better and more proactively respond to the multiple disruptions, paradigm shifts, and transitions currently underway in STI. This includes developing more agile and anticipatory approaches to governance, breaking down outdated policy and bureaucratic silos, and recognizing how business increasingly engages as a critical and trustworthy partner in these transitions.

This paper highlights five key business priorities for forward-looking STI policy, benefitting from the OECD's unique convening power, thought leadership capabilities, and the ability to bring together market-based democracies with many shared values. These priorities for action include:



Addressing the New Disruptors through Agile Governance Policies



Building a Resilient Bioeconomy and Sustainable Next-generation Production Ecosystem for a Greener World



Educating and Training a Skilled Workforce to Fit the Evolving Needs of the 21st Century Job Market



Investing in Cutting-edge Research and Innovation Infrastructures



Incorporating Societal Trust into Science, Technology, and Innovation

Priorities for Action

1. Addressing the New Disruptors through Agile Governance Policies

STI is still in the early stages of facing multiple, massive disruptions, and transitions, fundamentally reshaping how companies conduct businesses and deliver value. In many cases, innovation is no longer primarily incremental but disruptive and nonlinear, and marked by new frontiers of research, accelerated technology development, and globalized impacts.

Disruptive new business models are simultaneously transforming STI, business, and government-business collaborations to deliver public benefits. A combination of various factors is fueling the advancements in science, technology, and innovation. These include:

- the emergence of new AI/ML tools, data, and other digital technologies
- the participation of non-traditional STI actors like venture philanthropists and citizen scientists
- the development of national and regional STI capabilities
- the adoption of diverse business competition and collaboration models
- the shifts in traditional research methods and innovation systems
- the global access to information and knowledge
- the availability of new platforms and methods
- the convergence of multiple foundational technologies.

In this rapidly changing STI landscape, we are witnessing a move towards mission-oriented and solutions-driven approaches across the board. Current research and innovation processes often are disconnected from traditional institutions and government policies. It is now possible, for example, to create, develop, and scale a disruptive technology with broad societal impacts outside the boundaries of traditional institutions or funding of research and innovation.

There is a growing gap between new business trends and societal drivers that focus on critical issues such as health crises, climate change, and food security. There is a disconnect between the traditional governmental structures, funding programs, tax policies, and top-down policies and the emerging challenges faced by today's society. These systems have difficulties adapting to a different era of science, technology, and innovation, remaining siloed and ill-equipped to handle the challenges of the present era.

Business recommendations to the OECD and governments

To achieve these objectives, *Business at OECD* recommends the OECD and its members to:

- Proactively identify key “game changers” or new “disruptors” in science, technology, and innovation, assess their implications on the full range of policy actions, and enable governments to get ahead of the curve for emerging and converging technologies and other STI paradigm shifts.
- Re-evaluate traditional STI policies, including regulatory bottlenecks and non-technological barriers that negatively impact innovation, limit the diffusion of new tools and technologies, and hamper economic growth and public benefit.
- Strengthen international and cross-cutting monitoring of developments in research and technology to assess the impact of disruptive emerging technologies, while fostering exchanges of best practices to significantly strengthen strategic foresight and horizon-scanning capabilities.
- Develop an effective model to assess social benefits and value, such as economic impacts, improvement of quality of life, increase in employment and human resource development by cutting-edge technologies and innovations in order to provide evidence to stakeholders.
- Develop a strategy to better harness the potential of automated science and disruptive innovation for research sharing, co-creation, and knowledge diffusion through the convergence of technologies, as well as rapid improvements in tools, methodologies, and laboratory operations such as AI and data design.
- Foster more agile, adaptive, and anticipatory approaches to the governance of science, technology, and innovation, which support and complement forward-looking private sector governance frameworks.
- Support innovative regulatory approaches, such as regulatory sandboxes, new types of innovation networks and public-private partnerships, and shared pre-competitive infrastructures, to create favorable conditions for technology-based solutions to flourish.
- Coordinate across the OECD to ensure that intellectual property (IP) rights are effectively implemented and keeping pace with new issues related to data governance, AI-enabled inventions, and Freedom to Operate (FTO) across traditional sectors.

2. Building a Resilient Bioeconomy and Sustainable Next-generation Production Ecosystem for a Greener World

A wave of emerging new technologies, such as synthetic biology, quantum computing, and novel nano-based materials, are not only expanding our knowledge but also revolutionizing how we produce sustainably in ways that allow us to flourish with our planet. For example, the McKinsey Global Institute estimates that over the coming decades, more than 60 percent of the physical inputs to the global economy could be produced biologically ([McKinsey Global Institute, 2020](#)).

Three examples of this next generation of sustainable production revolution include:

- The Wave of Networked Digital Innovation that will transform businesses and societies through rapid advances in connectivity, automation, and intelligence. The introduction of AI/ML, sensors, the Internet of Things, smarter and more customizable algorithms and production processes, and generative AI will combine to drive production systems, new types of value creation, and resilient supply chains.
- Synthetic Biology and Engineering Biology represent a transformational general-purpose technology platform for design and biomanufacturing at the intersection of biology, engineering, design, and computing. It has demonstrated promise in addressing a broad range of global challenges in health; climate change; environment; food security; sustainable agriculture; new materials; sustainable consumer goods; energy; and next-generation computing and semiconductors. It paves the way for new frontiers for research and the industrialization of biology, enabling us to grow alongside nature. This can be achieved by using biology as a technology and embracing distributed biomanufacturing to drive the bioeconomy in multiple ways. It also makes possible new business models and synthetic biology “stacks” or layers of smart specialization (like what occurred in ICTs over the last 50 years), and our ability to link biological systems with the cyber-physical world.
- Quantum Computing has the potential to revolutionize computing by introducing a fundamentally new approach that surpasses anything available with today’s computers. Unlike classical computing bits, qubits can exist in combinations of both 1 and 0 simultaneously due to quantum superposition, allowing them to solve certain large-scale problems much faster than even the most advanced current computers. Quantum computing could lead to significant breakthroughs in biomedicine, manufacturing, supply chains, and logistics, and enhanced cybersecurity.

Developments in science, technology, and innovation have a crucial role to play in realizing an effective green transition at scale through the development of new efficient systems (e.g., transportation, smart energy grids), techniques (e.g., precision agriculture, sustainable aquaculture), and mitigation strategies (e.g., impact predictions of climate change). The shift towards a more sustainable and low-carbon economy also presents significant opportunities for businesses to innovate, create new products and services, and capture new markets.

However, the green transition also offers its own challenges about investment requirements and adapting to changing regulations. In that context, businesses are strengthening efforts to achieve higher resource efficiency and gear their operations towards a more circular economy. Governments also have a key role in supporting the green transition by providing support measures directed towards sustainability goals that are targeted, transparent, and non-discriminatory, and by creating regulatory frameworks supportive of innovation and investment in clean technologies.

Business recommendations to the OECD and governments

To achieve these objectives, *Business at OECD* recommends the OECD and its members to:

- Build upon the OECD's Next Production Revolution (NPR) project to address the next wave of emerging technologies to enable a truly sustainable production revolution, drive the bioeconomy, and offer solutions to many of our most pressing economic and societal challenges.
- Support and maintain the work of the OECD Working Party on Bio, Nano, and Converging Technologies (BNCT) and the new Global Forum on Technology (GFTech), both of which present innovative platforms exploring new analysis and actionable options for democracies with shared values.
- Foster a general STI ecosystem that is more integrated and conducive to success for businesses, including:
 - Funding research, infrastructures, and systemic feedback loops with the aim of taking a more systemic approach to interconnected research, innovations, and market signals.
 - Moving beyond traditional lab-to-market policies to address new needs, like scaling up emerging technologies, improving complex processes, deploying predictive tools, and ensuring common metrology and standards across different STI areas.
- Expanding governmental procurement such as Small Business Innovation Research (SBIR) to accelerate market growth.
- Ensure rapid uptake and diffusion of emerging technologies, including through developing best practices for more innovative funding models, better recognition of the value of innovation, early-access schemes, and ensuring that regulatory science stays abreast of the state-of-the-art in science and technology.
- Provide support measures directed towards sustainability goals that are targeted, transparent, and non-discriminatory.
- Reinforce best practices and policies for international collaboration, co-creation, and knowledge sharing to achieve the green transition among governments, businesses, and other key stakeholders.

3. Educating and Training a Skilled Workforce to Fit the Evolving Needs of the 21st Century Job Market

The STI sector needs a workforce with the skills and competencies to develop and deploy new technologies. Significant investments are necessary to strengthen the innovation pipeline and support workforce development and training throughout their careers. The technology frontiers and jobs of tomorrow require developing skills and workforce training today to support their development.

At the same time, innovations can bring significant changes to markets, including labor markets. Employers and workers are both challenged to respond to rapid changes with technologies that disrupt traditional labor markets and policies. It is important to enable individuals to adapt to more productive sectors and jobs in the longer term while mitigating short-term costs of change driven by technology.

Companies around the world are investing in training and upskilling their employees to keep pace with the rapid technological change. This includes providing training on new technologies, as well as developing soft skills that are essential for success in the 21st Century workplace. Governments also have a role to play in training a skilled workforce for the STI sector. This includes investing in STEM education and lifelong learning programs, developing new curricula for automated labs and production systems, and developing and evaluating effective strategies for accreditation, credentials, assessment, and career pathways for the STI workforce we need.

Business recommendations to the OECD and governments

To achieve these objectives, *Business at OECD* recommends the OECD and its members to:

- Invest in STEM education and lifelong learning initiatives, training professionals at all levels.
- Develop and evaluate effective strategies and modern programs such as career pathways for professionals, revised education curricula at all levels, and high-quality lifelong learning opportunities.
- Focus on flexibility-enhancing reforms and accompanying measures, such as active labor market policies (ALMPs) for STI. ALMPs, for example, should support employers looking to re-train workers or find new talent.
- Prioritise improving gender equality, diversity, and inclusiveness in STI labor force participation and skills training.
- Collaborate with businesses and other stakeholders to develop and implement effective initiatives for education, skills training, and lifelong learning that focus on being versatile and adaptable to change.

4. Investing in Cutting-Edge Research Infrastructures

STEM futures, innovation, and economic value-creation increasingly depend on new types of core advanced infrastructure, platforms, and complex systems. The OECD and governments around the world need to move beyond a focus on traditional brick-and-mortar infrastructure to a new set of systemic, data-driven, and automated infrastructures.

Public funding for STI research and innovation infrastructures has stayed flat or declined in many OECD countries ([OECD, 2023](#)). However, government support for STI infrastructures provides high returns in driving scientific progress, creating economic value, developing new types of public goods, and the ability to solve thorny global and local societal challenges. Numerous studies have shown how public investment in infrastructures also catalyzes private-sector investment and creates positive multiplier effects ([World Bank, 2021](#)).

It is crucial for infrastructure to support the advancement of knowledge, technology development, and economic value creation. However, a significant portion of our STI infrastructure is outdated and not sustainable. We recommend that governments provide support for the development, adoption, and diffusion of next-generation digital infrastructures for STI and emphasize the importance of public private partnerships. Improvements include broadband availability, cutting-edge AI and ML, access to cloud resources, and data exchanges and shared repositories. Since STI infrastructures are no longer just about physical facilities and equipment, we encourage government policies and funding to support new types of infrastructure such as infra technologies, prototyping and scaling, metrology, biofoundries, design tools, metrology and standards, and access to shared, pre-competitive infrastructure commons.

To this end, Governments should explore new financial mechanisms to support research and innovation beyond the traditional methods. The OECD members and governments should also reconsider the existing public funding, incentives, and R&D tax schemes. This includes aligning them with broader societal challenges and mission-oriented STI policies, adopting a technology portfolio management approach, exploring innovative ways to access capital markets and private investments, and reducing wasteful duplication across ministries and unnecessary research administrative costs. Governments should also move away from one-size-fits-all policies for STI and leverage scarce resources by reducing bureaucratic silos.

While fundamental research and early-stage de-risking remain essential in government STI policies and funding, it's crucial to complement these efforts with later-stage policies supporting manufacturing readiness levels and the diffusion of emerging technologies at a commercially competitive scale. Many businesses and especially small and medium-sized enterprises (SMEs) often encounter obstacles in terms of short product cycles, high financial market pressures, and fierce competition. These factors limit their abilities to invest in fundamental research and expand their operations to reach commercially competitive levels.

Business recommendations to the OECD and governments

To achieve these objectives, *Business at OECD* recommends the OECD and its members to:

- Foster government investments in STI infrastructures and public private partnerships to achieve economic growth and sustainable development, which, in turn, enables private sector efforts to deliver positive multiplier effects.
- Support fundamental research and early-stage de-risking policies for lab-to-market that go beyond funding primarily STI applications or mission-oriented programs.
- Take measures to address the investment gaps in next-generation STI infrastructures. Important steps in this regard should include:
 - Developing “de-risking toolkits” for funding and investments that are shared among governments, businesses, venture philanthropists, and other key stakeholders.
 - Increasing the role of multistakeholder collaborations such as public-private partnerships, and fostering collaborative policies for knowledge transfers, STI co-creation, and shared data; and
 - Experimenting with new approaches to accelerate and expand lab-to-market translations and commercialization.
- Redesign public funding systems, tax schemes, and incentives for innovative and inclusive next-generation STI infrastructures, including tools and data.

5. Incorporating Societal Trust into Science, Technology, and Innovation

Considerations about trust, ethics, privacy, cultural values, and responsible innovation no longer are afterthoughts in science, technology, and innovation. They increasingly drive companies' actions, shareholder value, and business models.

Recent OECD work on AI, neurotechnologies, and synthetic biology, along with the recent establishment of the OECD Global Forum on Technology, represent high-value initial efforts to integrate these non-technological considerations into all aspects of STI. However, broader efforts are needed to integrate societal trust considerations into all STI programs and funding schemes from the outset.

Privacy concerns, new types of cybersecurity and biosecurity threats, adherence to fundamental ethical principles, the conduct of responsible research and innovation, and building cultures of responsibility in science, technology, and innovation are all timely and critical issues that require greater collaboration and coherence among government, business, and other key stakeholders

In today's world, new models and approaches to public engagement are changing the way governments, businesses, and citizens think about science, technology, and innovation. The policy priorities are now being defined by these new approaches, which all center around the crucial need to build trust and trustworthiness. Without trust, the numerous advances in STI will fall short of their potential.

Business recommendations to the OECD and governments

To achieve these objectives, *Business at OECD* recommends the OECD and its members to:

- Emphasize how considerations about building trust, trustworthiness, and transparency increasingly drive shareholder welfare, business models, and business engagement with all aspects of STI.
- Integrate societal and ethical issues across the full range of programs in the CSTP and its working parties, as well as in the OECD Global Forum on Technology.
- Develop new approaches for public engagement with STI that are inclusive, evidence-based, and accessible.
- Support increased international collaboration and shared values for market-oriented democracies in OECD programs and STI policies while recognizing that markets remain essential tools for achieving democratic values.

Conclusion

In an era marked by rapid technological advancements and global challenges, harnessing the power of Science, Technology, and Innovation (STI) has become more critical than ever. By strategically addressing the investment gap, developing agile governance frameworks, training a skilled workforce, supporting the green transition, and accelerating innovation adoption, we can pave the way for a more prosperous, sustainable, and equitable future for all.

The investment gap remains a formidable barrier to realizing the full potential of STI. Allocating resources to fundamental research, workforce development, and infrastructure is essential. Governments, private sectors, and international organizations must collaborate to ensure adequate funding for groundbreaking projects while fostering an innovation-friendly environment. As technology evolves, governance frameworks must adapt swiftly. Agile policies must aim to strike a balance between innovation and ethical considerations. Governments should engage with industry experts, academia, and civil society to create flexible regulations that foster innovation while safeguarding public interests. Further, fostering a skilled workforce is the backbone of STI. Education systems must evolve to equip individuals with relevant skills. Lifelong learning, vocational training, and upskilling programs are essential. By nurturing talent across diverse fields, we can bridge the digital divide and ensure that no one is left behind. With this strong base, STI can play a pivotal role in the current transitions and in combating climate change. Collaboration between governments, research institutions, and industry leaders is essential, and the OECD has an important role to play in addressing STI issues holistically. Together, we can accelerate the transition toward a greener, more resilient planet and make sure to unlock STI's transformative potential, shaping a future where prosperity, sustainability, and trust coexist.



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