

# OECD *Multilingual Summaries*

## OECD Science, Technology and Innovation Outlook 2018

Summary in English



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Science, technology and innovation (STI) activities face several disruptive drivers of change. These include the productivity slowdown in the context of rapidly ageing populations; the impacts of climate change, and the need for mitigation and adaptation; and globalisation and the growing role of emerging economies. These drivers create opportunities and challenges for STI. They shape societal and policy expectations regarding the purposes of STI, and they affect the ways STI activities are carried out. Many drivers give rise to “grand societal challenges”, for example, around healthy ageing, clean energy and food security. Challenges like these are encapsulated in the Sustainable Development Goals (SDGs), which feature increasingly prominently in STI policy agendas.

If well-managed and used in conjunction with social innovation and policy reforms, scientific and technological advances can alleviate many of these challenges. Gene editing could revolutionise today’s medical therapies, nanomaterials and bio-batteries could provide new clean-energy solutions, and artificial intelligence (AI) could become the “primary drug-discovery tool” over the next decade.

But while new technologies like AI and gene editing present great opportunities, they could also lead to considerable harm. Preventing, correcting or mitigating their negative effects has become more important – yet more difficult – as technology itself has become more complex and widespread. The speed and uncertainty of technological change challenge policymakers to exert oversight of emerging technologies.

Governments need to become more agile, more responsive, more open to stakeholder participation and better informed. Some governments are already experimenting with new anticipatory and participatory approaches to policy design and delivery, but such practices have yet to be widely adopted in STI policy.

## Digitalisation is changing innovation and science practices

Digitalisation is transforming innovation processes, lowering production costs, promoting collaborative and open innovation, blurring the boundaries between manufacturing and service innovation, and generally speeding up innovation cycles. Data have become a main input to innovative activities, and many innovations are embodied in software or data. This has implications for policy support to business innovation, which (among other things) needs to ensure broad access to data.

Digitalisation is providing new opportunities to engage stakeholders at different stages of the innovation process. Several open, co-creative and socially responsive practices are emerging. Most countries now feature dedicated sites, such as maker spaces, living labs and fab-labs, that support the activities of potential “non-traditional” innovators. Established firms can also engage in inclusive innovation. Practices such as value-based design and standardisation are beginning to emerge; they could become powerful tools for translating and integrating core social values, safeguards and goals into technology development.

All areas of research are becoming increasingly data-intensive. Enhanced access to data promises many benefits, including new scientific breakthroughs, less duplication and better reproducibility of research results, improved trust in science and more innovation. Governments have a role to play here in helping science cope with the challenges of open science in several ways: by ensuring transparency and trust across the research community and wider society, enabling the sharing of data across national and

disciplinary boundaries, and ensuring that recognition and rewards are in place to encourage researchers to share data.

AI and machine learning have the potential to increase the productivity of science, enable novel forms of discovery and enhance reproducibility. AI systems have very different strengths and weaknesses compared to human scientists, and are expected to complement them. However, several challenges hinder the widespread use of AI in science, such as the need to transform and transpose AI methods to operate in challenging and varying conditions, concerns regarding limited transparency in machine learning-based decision-making, the limited provision of specific education and training courses in AI, and the cost of computational resources for leading-edge AI research.

## STI policy and governance are becoming more mission-oriented

In line with the SDGs, governments are seeking to redirect technological change from existing trajectories towards more economically, socially and environmentally beneficial technologies, and to spur private STI investments along these lines. This shift has given impetus to a new era of “mission-oriented” STI policy, with governments looking to work more closely with the business sector and civil society to steer the direction of science and technology towards ambitious, socially relevant goals.

However, current trends in public research and development (R&D) spending may not be commensurate with the corresponding ambition and challenges delineated in mission-oriented policies. Since 2010, government R&D expenditures in the OECD as a whole and in almost all Group of Seven countries have stagnated or decreased, not only in absolute amounts and relative to gross domestic product, but also as a share of total government expenditure. The share of government in total funding of R&D decreased by 4 percentage points (from 31% to 27%) in the OECD area between 2009 and 2016. Although this decrease has been compensated in many countries by an increase in R&D tax credits, governments may still find it difficult to steer research and innovation activities in the desired strategic direction.

Significant gender imbalances in science and innovation also remain, at a time when workforce diversity is urgently needed to address the SDGs. Deep-rooted structural factors, including gender stereotypes and research career paths that are inimical to family life, are largely to blame. Most countries have included gender diversity as a key objective in their national STI plans. However, policy initiatives remain fragmented, and a more strategic and systemic long-term approach is necessary.

Governments could benefit from embracing digital technologies in the design, implementation and monitoring of STI policies. Tools such as big data, interoperability standards and natural-language processing can provide governments with more granular and timely data to support policy formulation and design. By linking different datasets, these tools can transform the evidence base for STI policy, and help demonstrate the relationships between science and innovation expenditures and real-world outcomes. Monitoring the contribution of STI to the global and multidimensional SDGs remains challenging, however, and will require new developments in statistics and indicators.

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