

# OECD *Multilingual Summaries*

## OECD Science, Technology and Innovation Outlook 2016

Summary in English



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Tomorrow's world is set to be of another kind. Powerful forces, rising from deep socio-economic, environmental, technological and political trends – so-called “megatrends” – are influencing developments in economies and societies, shaping our future, often in unexpected ways. These multidimensional, mutually reinforcing and sometimes opposing megatrends will affect the direction and pace of technological change and scientific discovery and influence future STI activities and policies.

## Megatrends are shaping future STI capacity and activities

Ageing societies, climate change, health challenges and growing digitisation are, among other factors, expected to shape future R&D agendas and the scope and scale of future innovation demand. Novel markets are likely to emerge, creating new skills needs and new growth and job opportunities. New approaches to sustainable growth, e.g. through the circular economy, are making their way.

The fast pace of economic development in emerging economies, coupled with the cross-border activities of multinationals and a further fragmentation of global value chains, will also favour a broader distribution of STI activities across the planet. Global competition for talent and resources will most likely intensify, as will the production and diffusion of new knowledge. Existing centres of excellence may benefit from this competition, further concentrating the best talent and resources at the expense of less competitive places.

STI activities could however be confronted with strong resource constraints. Possibly insufficient growth in developed and emerging economies, as well as competing policy priorities and agendas, may limit the financial resources available. This could compromise the role of STI to address future challenges. Similarly, an ageing population, together with changing patterns in migration, will have uncertain consequences for the availability of STI skills.

The megatrends raise urgent issues that demand policy responses, but the capacities of governments to intervene will likely face major constraints, including high public debt, increasing international security threats, a possible erosion of social cohesion, and the rise of influential non-state actors that challenge their authority and ability to act.

## Technology is set to disrupt societies, with uncertain outcomes

Future developments in STI could accelerate, intensify or reverse megatrend dynamics. But these developments also have the potential to offer solutions to the challenges we face. For example, globalisation will be further enabled by advances in communications and transport technologies; income growth will be increasingly driven by STI developments; reductions in CO<sub>2</sub> emissions will depend on the development of new, cleaner energy technology; and improved health outcomes and increasing life expectancy will heavily depend on health technology innovation.

On the other hand, emerging technologies carry several risks and uncertainties, and many raise important ethical issues, too. STI developments could exacerbate inequalities without wider innovation diffusion and skills acquisition. Developments in artificial intelligence and robotics raise concerns around

future jobs; the Internet of Things and big data analytics around privacy; 3D printing around piracy of intellectual property; synthetic biology around biosecurity; and neurosciences around human dignity.

Still, emerging technologies are expected to have wide impacts across several fields of application and will often depend on other “enabling” technologies for their development and exploitation. Technology convergence and combination could be further helped by cross-disciplinary working arrangements and skills training.

## **Public science has a central role to play, provided it can manage its own transition**

Public sector science will continue to play pivotal roles in developing knowledge and skills for exploitation in the wider economy. But it will also undergo its own transformation. Emerging technologies are opening up a new age for research. Big data and algorithms are generating huge amounts of data, changing scientific methods, instruments and skills requirements and creating new fields of research.

Open science is the next frontier. Open data access practices are increasingly widespread. Encouraging the sharing and re-use of research data could generate more value for public money. Science is also becoming a less institutionalised endeavour, with citizens conducting their own research alongside the scientific community. However, deep changes in academic culture will be necessary to realise the full potential of a more open science.

Funding issues will evolve. The proportion of public spending that goes to R&D is unlikely to increase, and a decline in the public funding of universities is already noticeable in many countries. Public science will need to find new sources of funding, including from philanthropists and private foundations, and this will have impacts on future public R&D agendas. Research careers will also remain precarious, especially for women, with consequences for attracting future generations of researchers.

## **Today, policy attention remains focused on immediate economic imperatives and efficiency gains**

The recent financial crisis hit STI activities hard, and the subsequent rebound has remained weak. Financial conditions for innovation and entrepreneurship remain difficult, especially for SMEs.

OECD countries and non-OECD economies have placed considerable emphasis on supporting firms’ capacity to innovate. Many countries have sought to consolidate their business support programmes to make them more accessible and more cost-efficient. Several governments have also adopted a “no-spending” approach in supporting innovation, e.g. through extensive use of fiscal incentives and public procurement. Many countries have also adjusted their policy portfolios to assist SMEs and start-ups, especially for accessing global markets. There is emerging evidence of a trade-off in the allocation of public support between firms on the one hand and public research on the other, with a growing share of the total budget going to the business sector.

The picture nevertheless differs across countries, and the gap between countries on a low-growth path and those on a high-growth path is widening. Even within Europe, noticeable cross-country differences in investment profiles signal a growing threat to the cohesion of the European Union. Governments are seeking to improve the efficiency and impact of their STI policy mix, giving increasing attention to policy evaluation and new data infrastructures to improve the policy evidence base.

## **Governments will increasingly work with the wider society to shape and exploit STI**

Governments are increasingly managing the risks and uncertainties around emerging STI developments by adopting more “responsible research and innovation” (RRI) policies. RRI principles have diffused into policy agendas, funding programmes and governance arrangements, integrating ethical and social considerations “upstream” in the innovation process.

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