# OECD STI Outlook 2025

## Driving Change in a Shifting Landscape

## Highlights

24 de fevereiro de 2026 | Técnico Innovation Center | Lisboa

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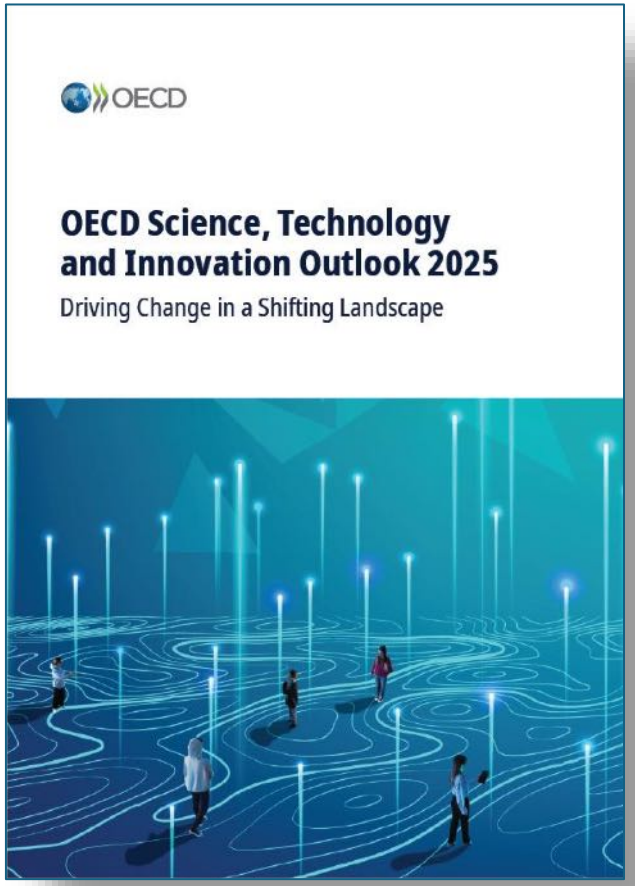
# STI Outlook 2025 – Driving Change in a Shifting Landscape




- OECD **flagship** publication, published every two years since the mid-1990s
- Asks: "**What's new** in the field of science, technology and innovation policy?"
- Provides an **international review** based on latest policy information and indicators

# Key drivers of change that raise challenges – and opportunities – for STI and STI policy

## Global challenges amid fiscal constraints

Ageing societies, climate change, antimicrobial resistance . . . Challenges like these shape the STI agenda and imply a need for transformative change, but at a time of high government indebtedness and fiscal constraints

## Rising geoeconomic tensions and economic security concerns

Growing global competition and geopolitical rivalry are reshaping global innovation networks and international research co-operation, as governments put greater emphasis on their economic and national security

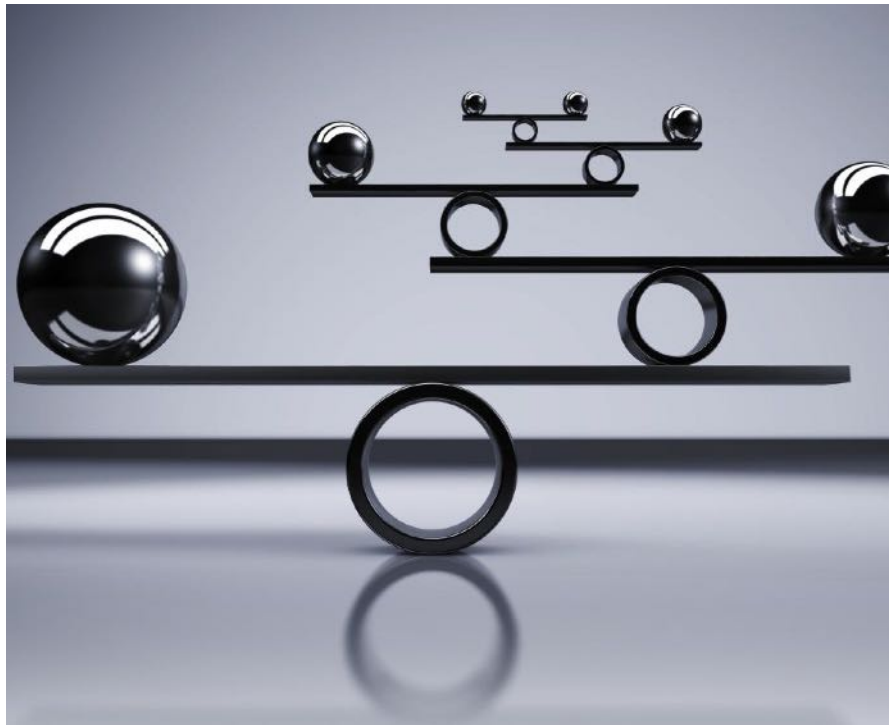
## Inequality in opportunities and rising societal fragmentation

Uneven opportunities to benefit from and contribute to STI in different places and socioeconomic groups reduces trust in science, reinforces inequalities, and hinders consensus on much needed transformative change

## Disruptive emerging and converging technologies

Rapid and ubiquitous technological change, particularly artificial intelligence, are driven by STI developments but also affect science and innovation directions and practices

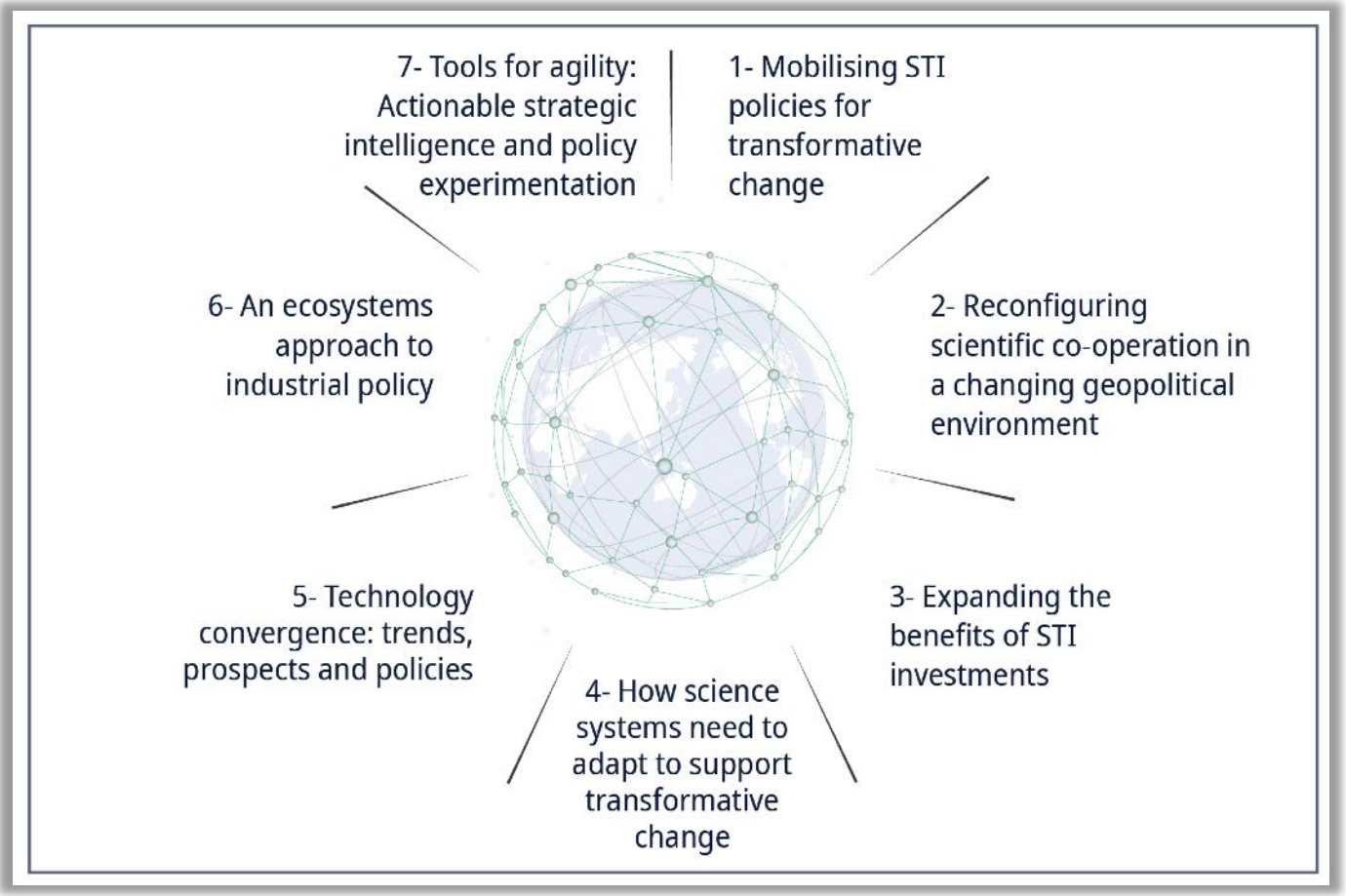
# STI policy is at a turning point



To remain **fit-for-purpose** in this **new** and r**apidly changing environment, STI systems** require structural reforms to improve the **effectiveness** and **efficiency** of **policy interventions**.

These policy reforms will **strengthen national innovation systems**, helping them **drive change** that responds to the **shifting policy landscape** and tackles **future challenges**.

# STI Outlook 2025: Key Themes and Topics




## Headline Themes

Enhance **efficiencies** in STI policy to reach ambitious, transformative goals in times of **resource constraints**

Retain the benefits of **international STI linkages** while **securing** STI systems

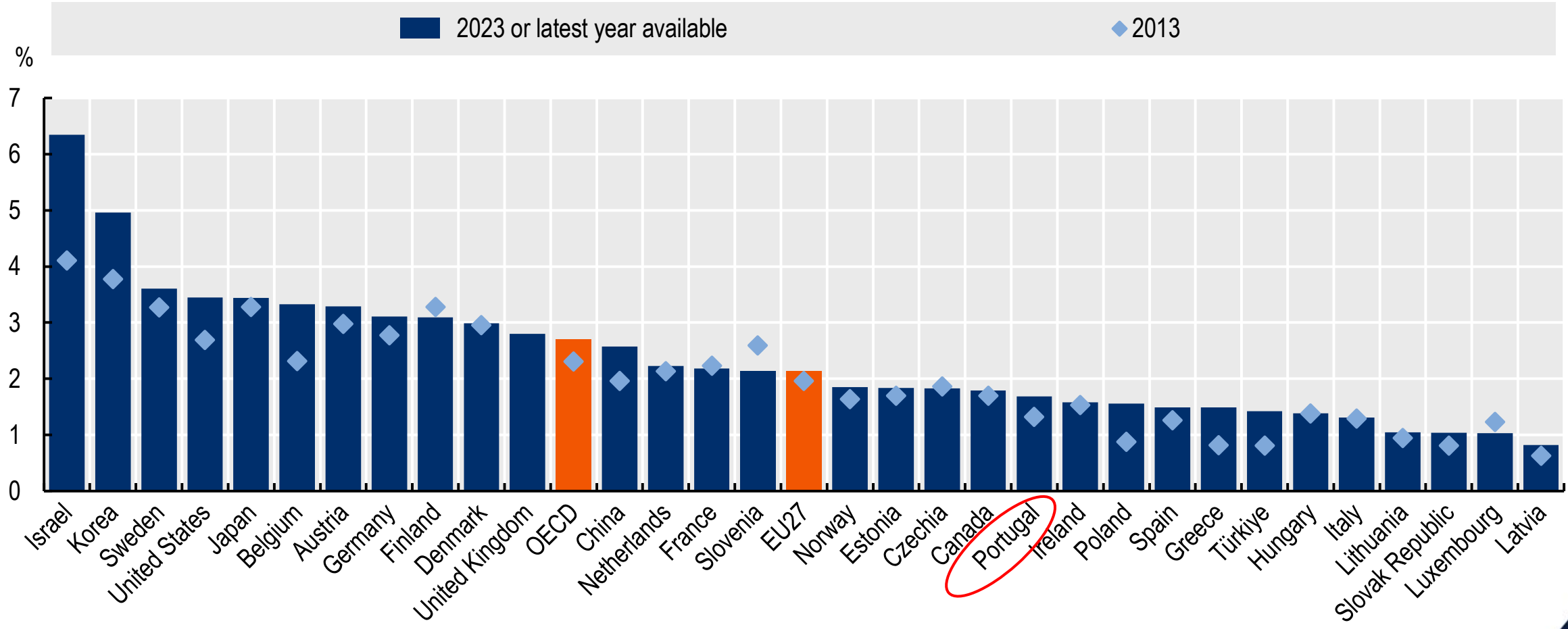
Enact **structural reforms** that promote **high-risk/reward STI**, **interdisciplinarity** and **technology convergence**

Update **policy frameworks** and the **supporting evidence base** for more effective STI policies


# Enhancing policy efficiencies

# R&D intensity has grown over the last decade, but the rate of growth has recently slowed

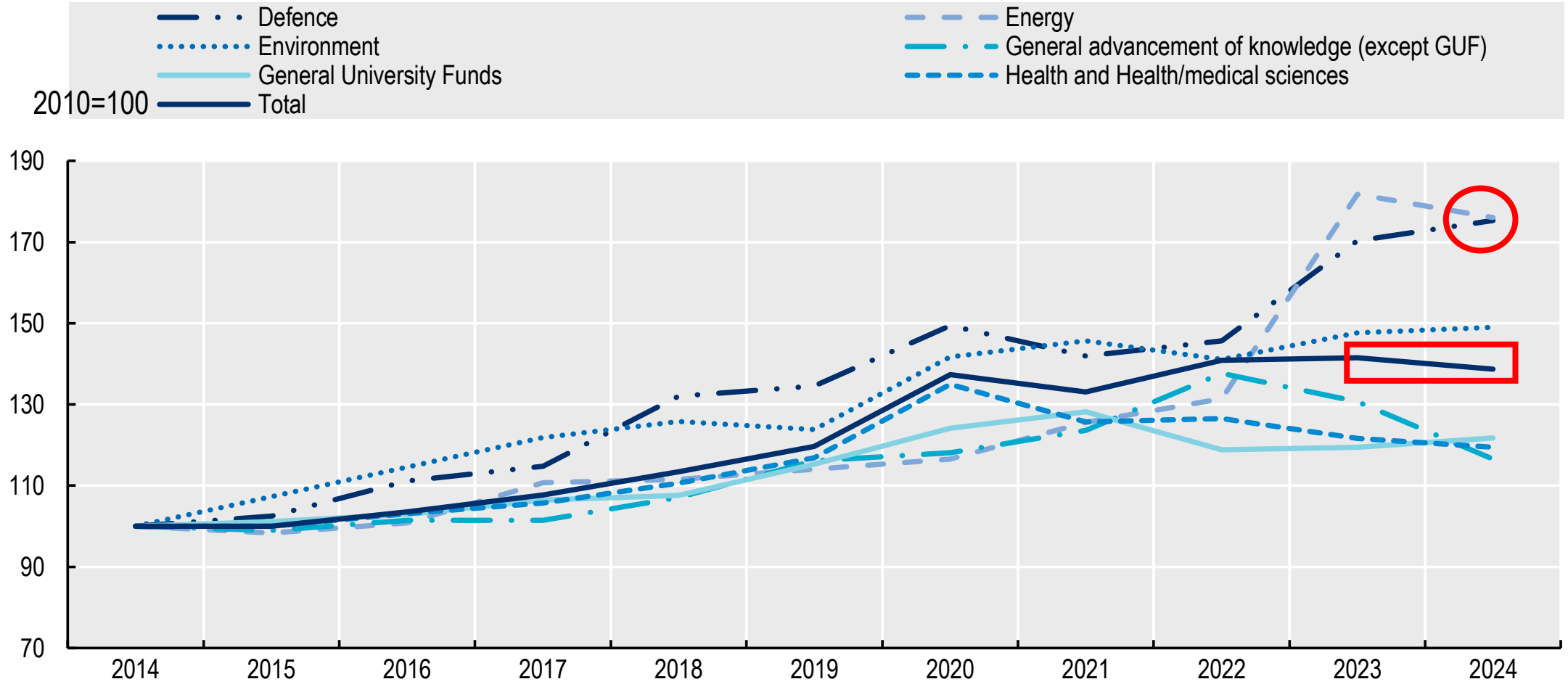
## R&D intensities, selected economies, 2013-2023




Note: 2023 data corresponds to 2022 for United Kingdom 2024 data for Canada
Source: OECD, Main Science and Technology Indicators Database, March 2025. http://oe.cd/msti.

# Govt budget allocations for R&D stagnated in 2024 . . . but allocations to energy and defence R&D have grown strongly

## Government R&D budgets trends, broad spending categories, OECD area, 2014-24




Source: OECD calculations based on OECD Main Science and Technology Indicators (MSTI) Database, March 2025, https://oe.cd/mstihttps://oe.cd/msti.

# Ambitious goals and limited resources call for actions that promote greater efficiencies in STI policy

## Five policy actions to tackle ambitious goals more efficiently

1

### Leverage Policy Priority Synergies

STI agendas should leverage synergies and minimise trade-offs between priorities. Well-designed support for competitiveness can also strengthen resilience, security and sustainability transitions.

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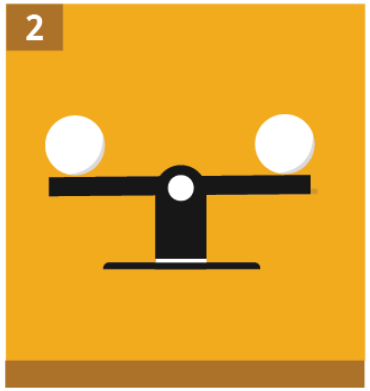

### Rebalance Direct and Indirect R&D Support

Policymakers must rebalance direct R&D funding for breakthroughs with non-directed measures that spur near-market innovation to accelerate transformative change.

3

### Strengthen Co-ordination

Governments should improve co-ordination between STI and non-STI policies using tools such as challenge-based funding or mission-oriented innovation policies.

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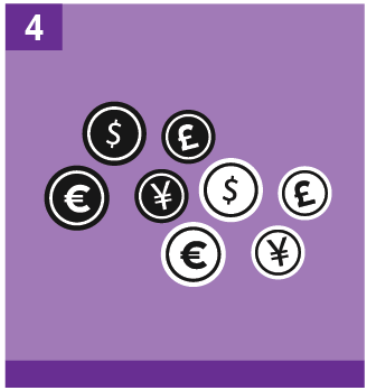

### Mobilise Public and Private Finance

Public funding should crowd in private investment. Instruments such as blended finance can overcome market failures and channel capital into transformative technologies.

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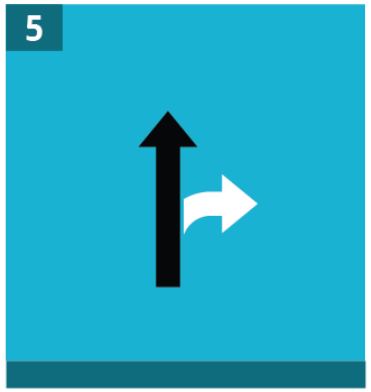


### Foster Fundamental, Transformative Change

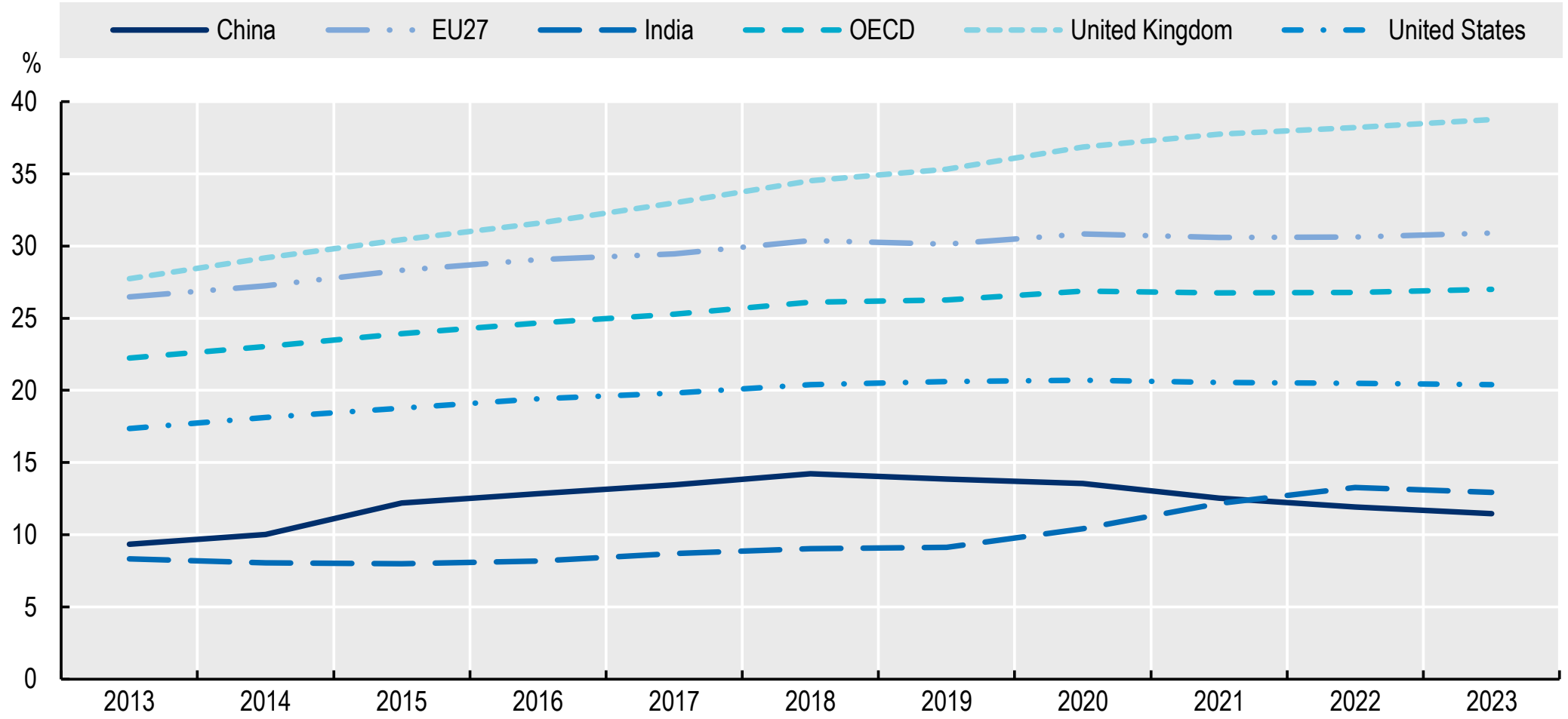
Policymakers must embrace radical shifts rather than incremental steps, identifying leverage points that can trigger system-wide transformations.

# Retain the benefits of international STI linkages while securing STI systems

# International collaboration has lost momentum in recent years

## Trends in international scientific collaboration, selected countries, 2013-2023

Percentage of scientific publications involving international collaboration, based on fractional counts

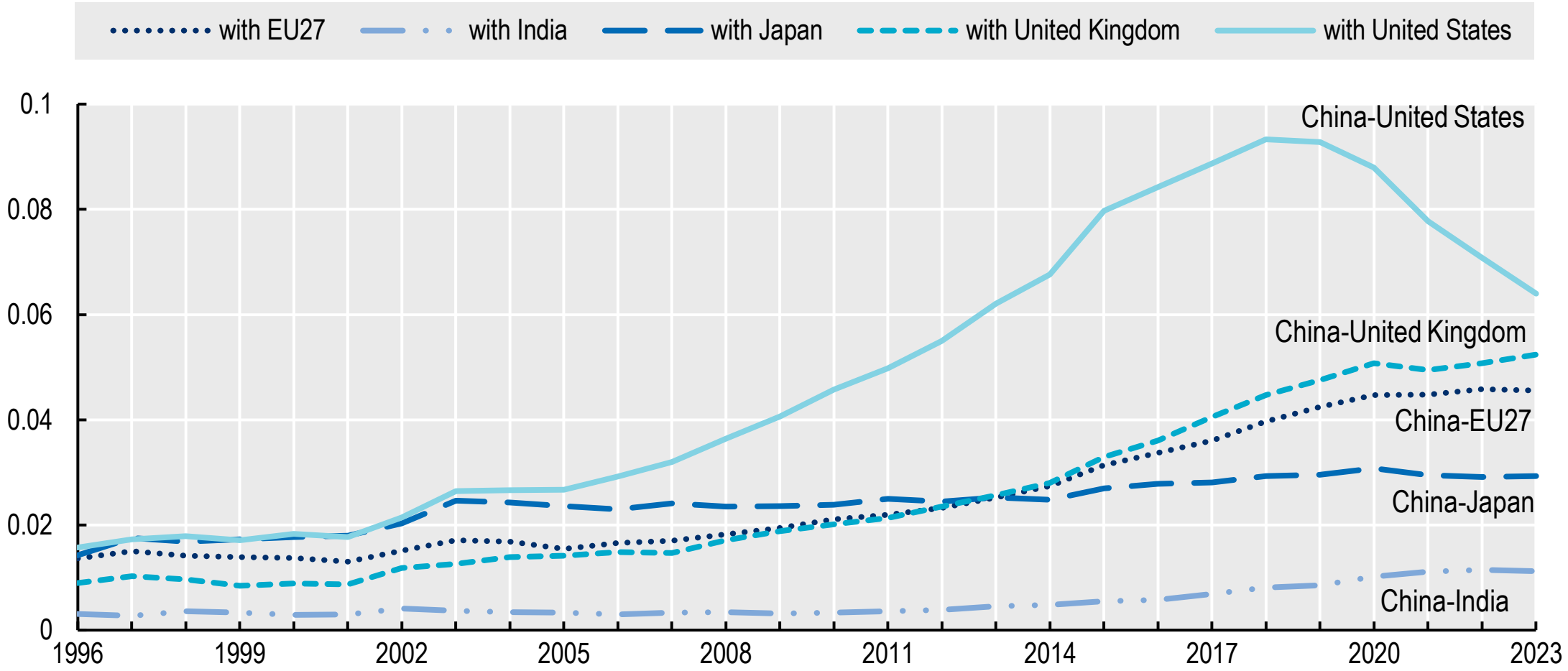



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 1.2025, April 2025

# International collaboration patterns are changing dramatically

## Bilateral collaboration intensity trends in scientific publications, 1996-2023

Normalised collaboration based on whole counts

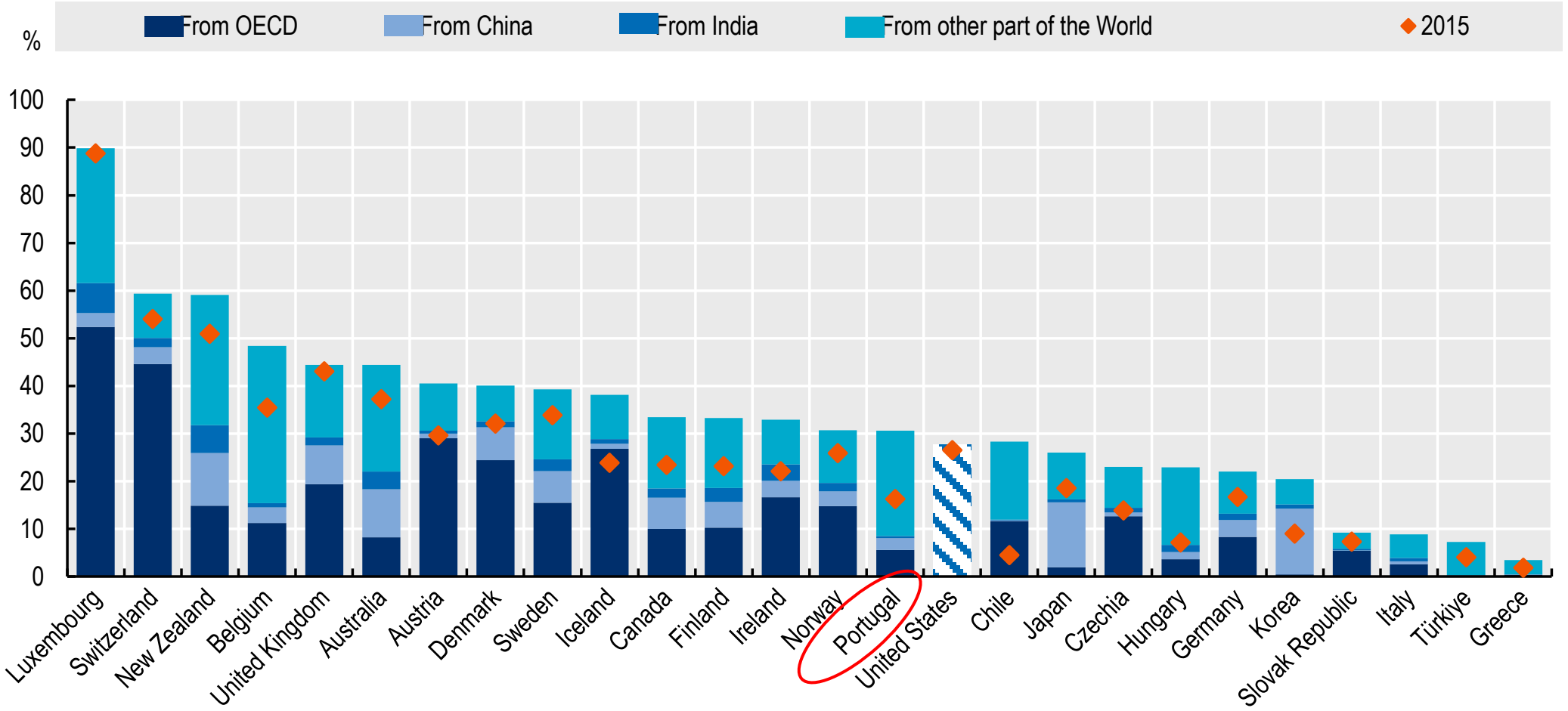



Source: Calculations based on Scopus Custom Data, Elsevier, Version 1.2025, April 2025.

# Yet, many OECD science systems are looking to attract a broader base of talent

## Share of mobile PhD graduates, selected countries 2015 and 2022

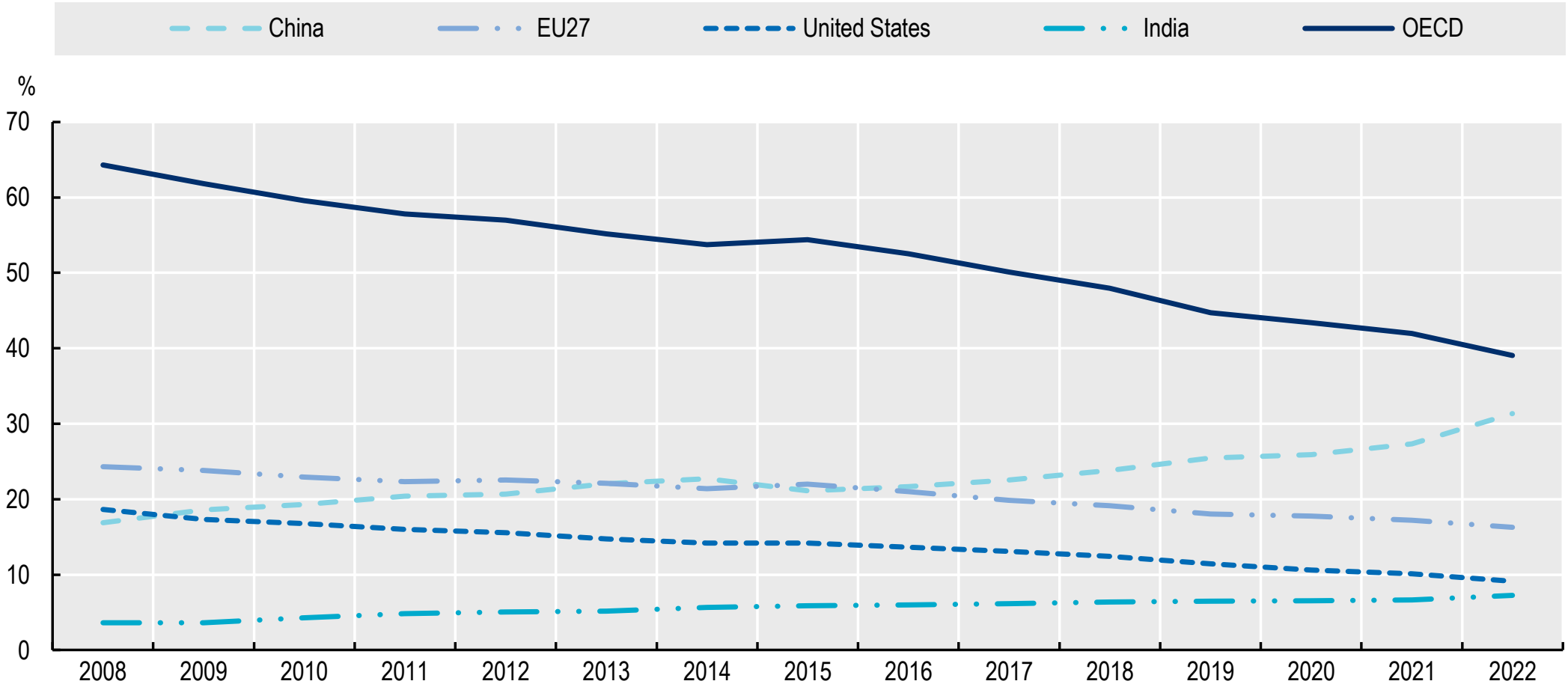
As a percentage of total PhD graduates




Source: OECD Education statistics databases, accessed on 18 July 2025

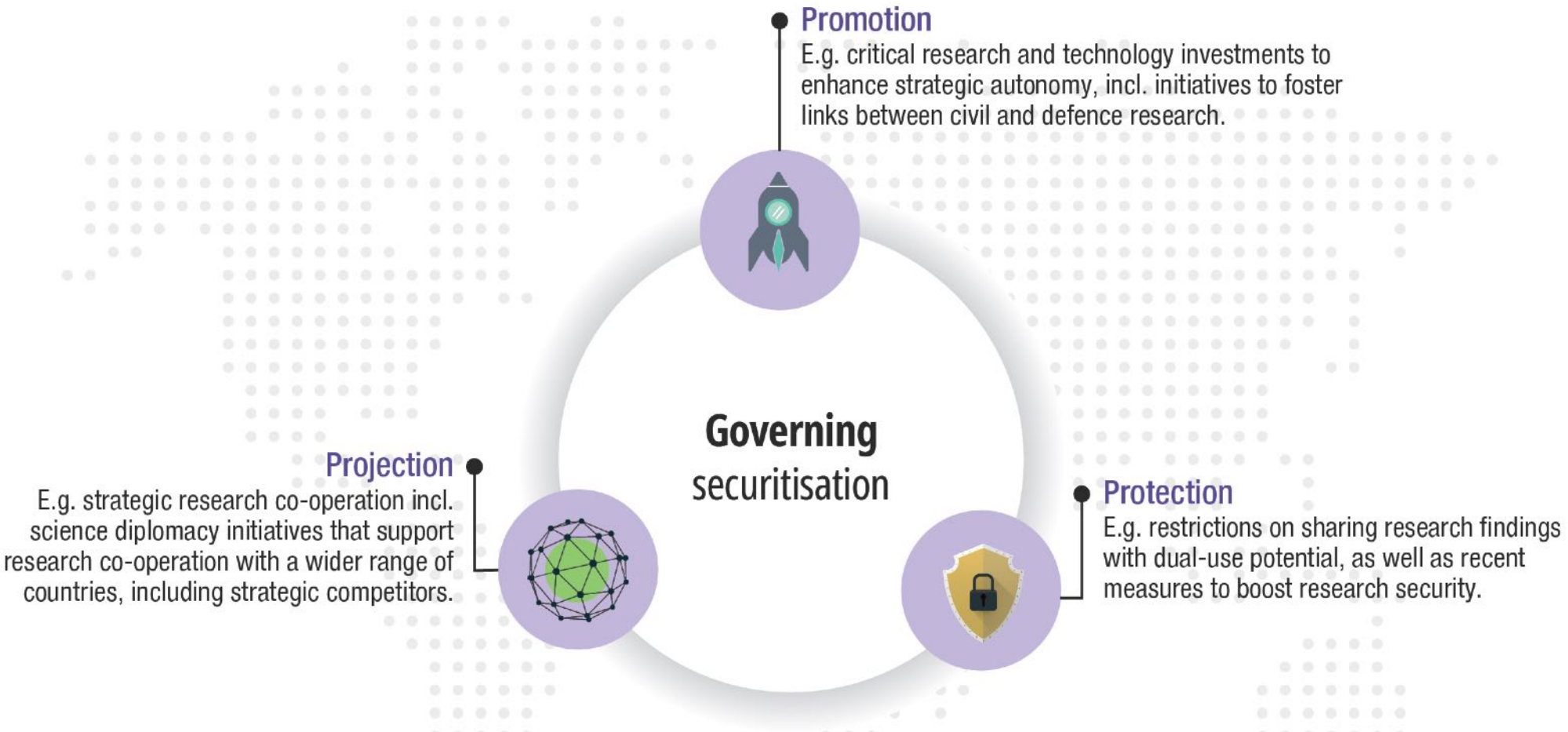
# International openness and exchanges remain essential for OECD countries

## Trends for main contributors to energy and “green” SDG scientific publications, 2008-22




Source: OECD calculations based on OECD SDG classifier (Aristodemou et al., 2025) and Scopus Custom Data, Elsevier, Version 1.2024.

# Growing securitisation of research – the 3Ps



# Protection: Research security policies have grown almost ten-fold over the last seven years

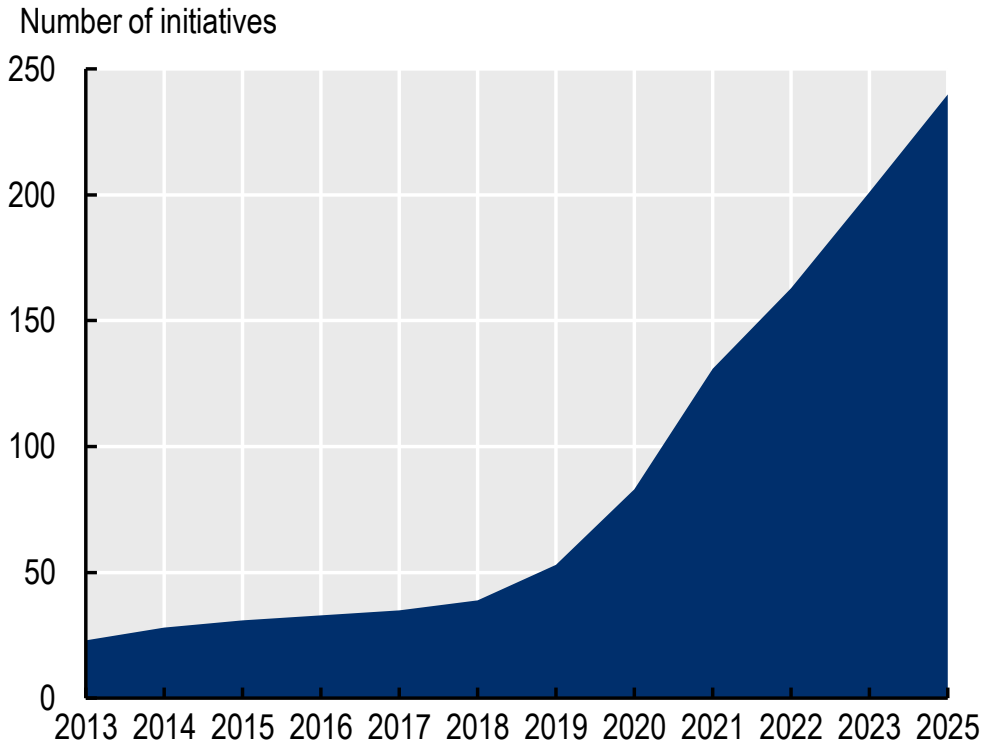
**Research security policies**

A portal that shares policy initiatives to safeguard national and economic security whilst protecting freedom of enquiry, promoting international research cooperation, and ensuring openness and non-discrimination.

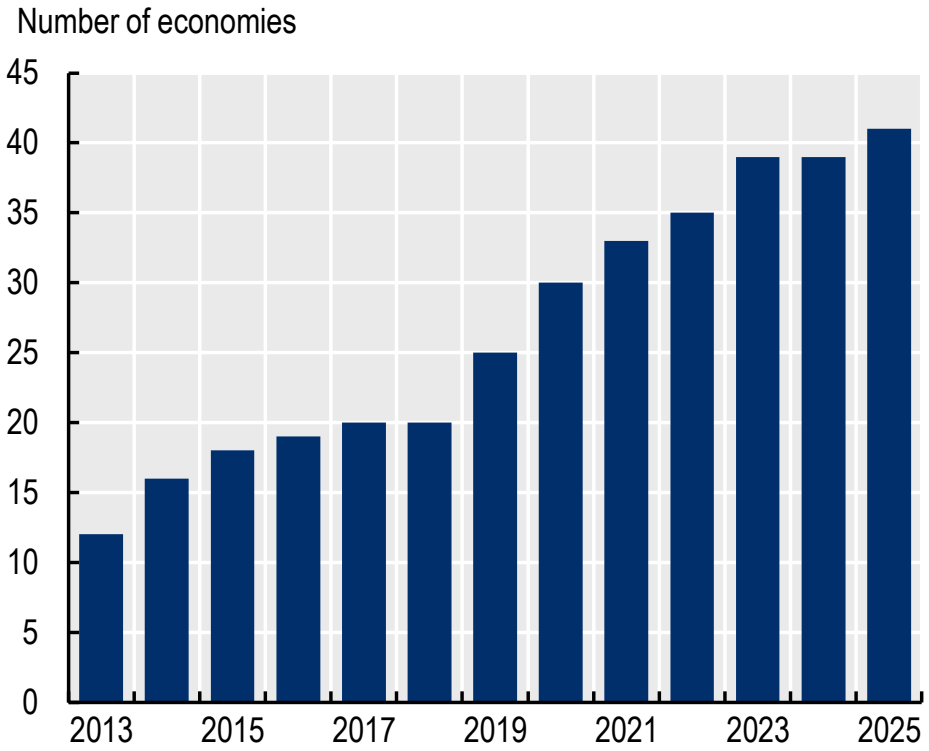
View more

The STIP Compass portal on research security policies shows a sharp rise in research security measures – policies designed to protect sensitive research and prevent foreign interference. In 2025, countries reported 250 such policies — almost ten times more than in 2018. Over the same period, the number of countries with research security policies has increased from 12 to 41.

**A. Number of on-going research security initiatives**

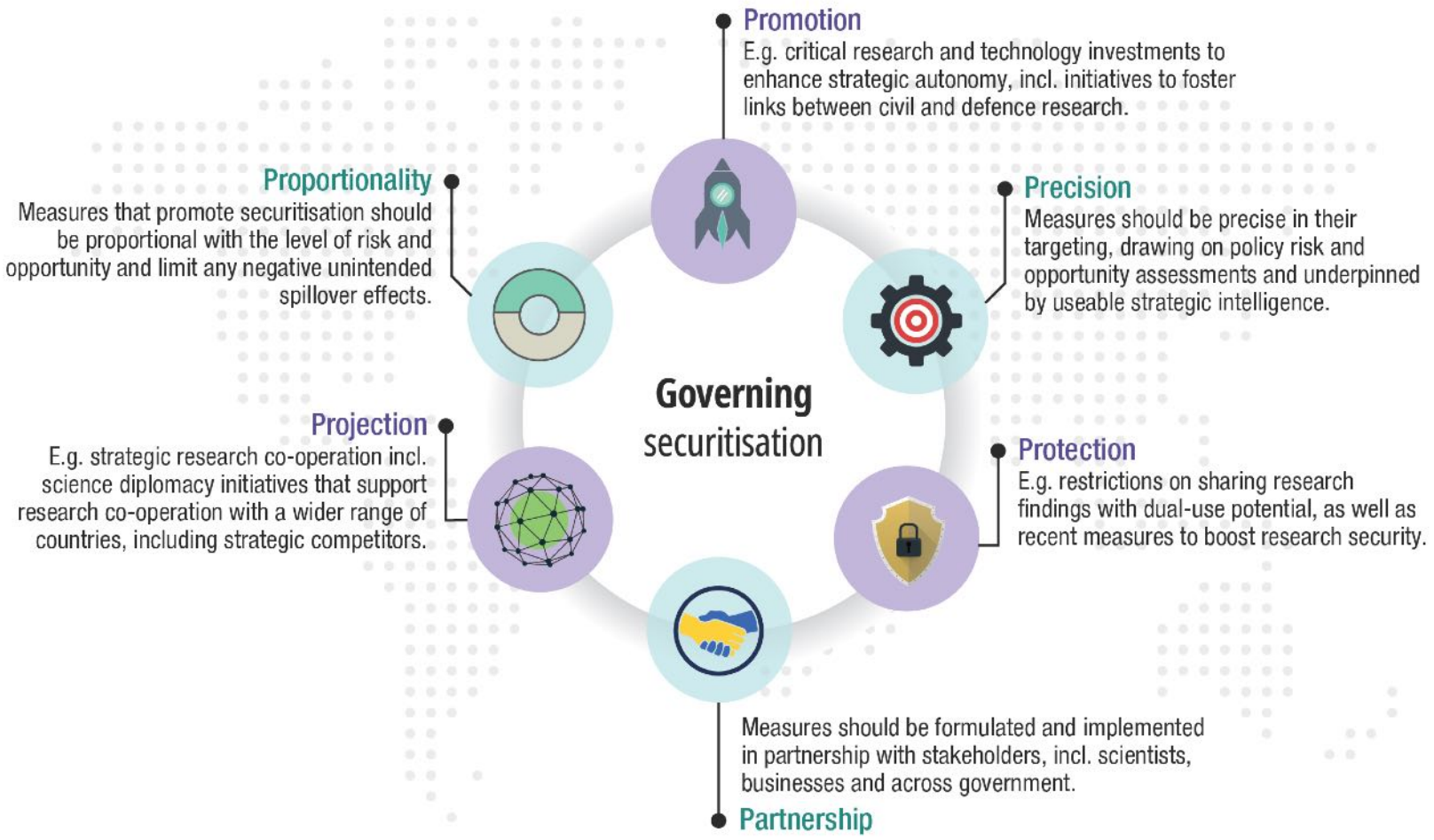



**B. Number of economies with at least one on-going initiative**




Source: EC-OECD (2025), STIP Compass: International Database on Science, Technology and Innovation Policy (STIP), edition 8 August 2025, https://stip.oecd.org

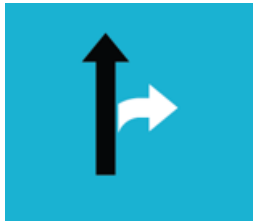
# The risk of over-securitisation could compromise research quality, undermine innovation and fragment co-operation on shared global challenges




- To remain effective, such policies must be **proportionate**, co-ordinated and **precise**.
- They should be developed in close **partnership** with scientists, businesses and other parts of government, and remain agile as risks evolve.


# Enact structural reforms of science and technology systems

# Science systems need to adapt to support transformative change - CHALLENGES



## Research workforce

### Need to attract and maintain the brightest talent

**Systemic challenges**:

- ❑ Precarity in research careers
- ❑ Academic research career paths and options
- ❑ Careers for professional research support staff
- ❑ Responding to the digital transformation, including data skills/capacity
- ❑ Lack of diversity in people, perspectives and research choices

## Research Infrastructures

### Need to support RIs to play a catalytic role in transformative research

**Systemic challenges**

- ❑ Funding mechanisms for RIs leave little room for flexibility in operations
- ❑ International RI networks/ecosystems difficult to support – governance and funding challenges
- ❑ Human resource issues, training and career paths for critical technical experts
- ❑ Data management challenge, e.g. limited support for interoperability and new users

## Science and society

### Need to embed science in society an ensure trust in science (and science-based policies)

**Systemic challenges:**

- ❑ Effective science communication often neglected and undervalued
- ❑ Mis-information often focuses on or emerges from science
- ❑ Trans-disciplinary research and citizen science under-valued
- ❑ Science for policy activities under-valued
- ❑ Maintaining scientific autonomy/academic freedom

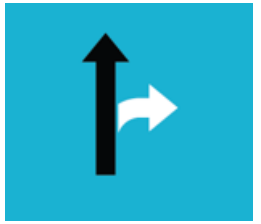
## Research assessment and incentives

### Need to value and reward multiple scientific outputs and impacts

**Systemic challenges**:

- ❑ Disciplinary silos and academic culture that focuses on narrow definition of research excellence
- ❑ Current incentive structures (precarity + publish or perish) lead to undesirable behaviours
- ❑ Little incentive to take risks or address the 'big questions'
- ❑ Use of indicators and peer review processes not adapted to capture all important outputs

# Science systems need to adapt to support transformative change – POLICY ACTIONS



## Research workforce

- ❑ Address the underlying structural issues that underpin **research precarity** and discourage **high-risk/high-return research**.
- ❑ Promote "**inclusive excellence**" across science systems.
- ❑ Promote a variety of **alternative career pathways** within and beyond academia that can enable the generation and use of scientific knowledge to support transformations.
- ❑ Stimulate **two-way mobility** between academic science and other sectors, including industry.
- ❑ Continue to support and facilitate **international mobility** and exchange of researchers and professional research support staff

## Research Infrastructures

- ❑ Recognise the essential role that RIs can play in supporting crisis response and socio-economic transformation and **adopt strategic funding approaches** that enhance their sustainability and enable flexibility.
- ❑ Support the co-ordinated and collaborative development, operation and use of RIs – including the promotion of **global RI ecosystems** - to tackle complex and interconnected global challenges
- ❑ Mandate and support RIs as sites for the generation and secure stewardship **of high-quality data** for responding to societal challenges.
- ❑ Leverage RIs for **training and education** to help address skills scarcities associated with transformations.

## Science and society

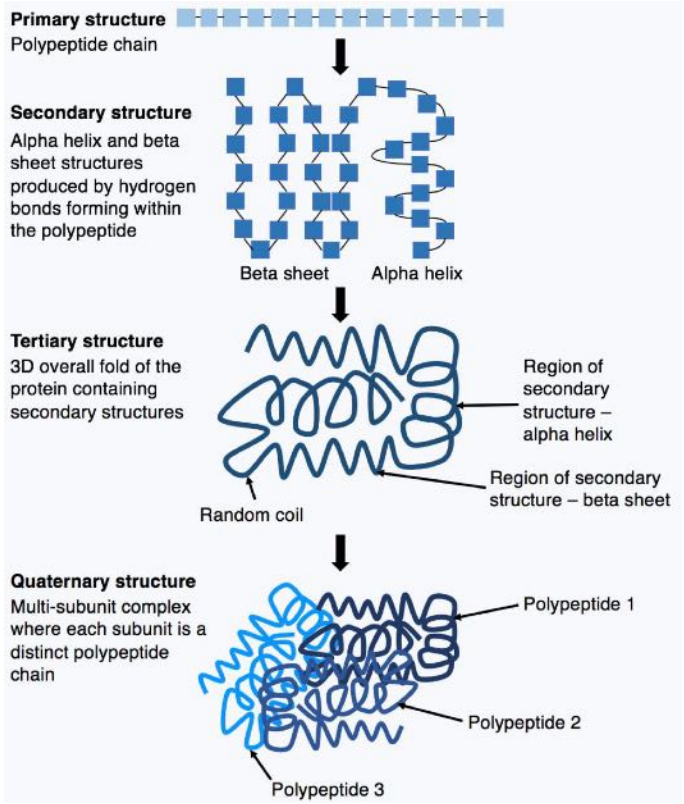
- ❑ Strengthen **scientific integrity** and good research conduct by shifting the focus from quantity to quality, transparency and rigour
- ❑ Prioritise and reward **responsible science communication** and societal engagement, including **transdisciplinary and citizen science** activities
- ❑ Promote **open science** and public access to scientific data and information, whilst ensuring the **safety and security** of sensitive information.
- ❑ Develop effective **science advisory systems** that can integrate insights from different disciplines and respond in a timely manner to the needs of policymakers and citizens.
- ❑ Promote **scientific and digital literacy** across society and reward scientists for contributing to related education and training activities.
- ❑ [Protect the **freedom of Research** and autonomy]

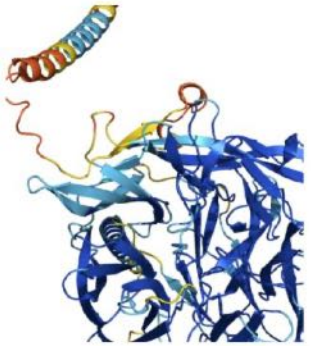
## Research assessment and incentives

- ❑ Review research assessment processes at all levels to **promote inclusive excellence**
- ❑ Recognise the value of **citizen engagement, policy advice and FAIR data** provision (even in the absence of rigorous quantitative measures) in individual recruitment and career progression.
- ❑ Recognise the value of **teamwork, inter-and-trans-disciplinary research and citizen science approaches**, which are all required to address sustainability transformations, and embed this into research assessments
- ❑ Provide the **necessary funding support**, via suitably adapted mechanisms, to scale-up the type of research and activities, including **public and policy engagement**, that can support the transformations agenda

# Technology convergence is driving much innovation today

- Promise of **powerful synergies** to enhance the speed and functionality of technologies, tools and products.
- Industrial actors are moving beyond traditional single-technology development models towards more **cross-disciplinary technology convergence**
- AI is likely to drive the **large-scale integration** of digital technologies
- Key areas of emerging technology like robotics, biotechnology, quantum science and technology or satellite systems **integrate tools, approaches and disciplines**



Alphafold uses AI to drive a new approach to computational biology that mines in new ways genetic data

# Take home policy points

In the interest of promoting technology convergence to drive transformative change in the economy, governments could:

- ❑ Promote deeper forms of **interdisciplinary research**, engineering and business development.
- ❑ Use the power of **challenge-based thinking** to promote convergence
- ❑ Emphasise **interdisciplinary talent** (who can integrate and engineer digital and material systems)
- ❑ Leverage different funding models, access rules, and technology transfer structures to shape the technological and **collaborative platforms** necessary for convergence.
- ❑ Include **ethical, legal social analysis into the interdisciplinary mix** of institutions innovating through convergence due to the often-complex regulatory implications of convergence
- ❑ Find **agile regulatory approaches** and **promote strategic intelligence** to better anticipate and engage the drivers and impacts of convergence (OECD work on emerging tech governance can help)

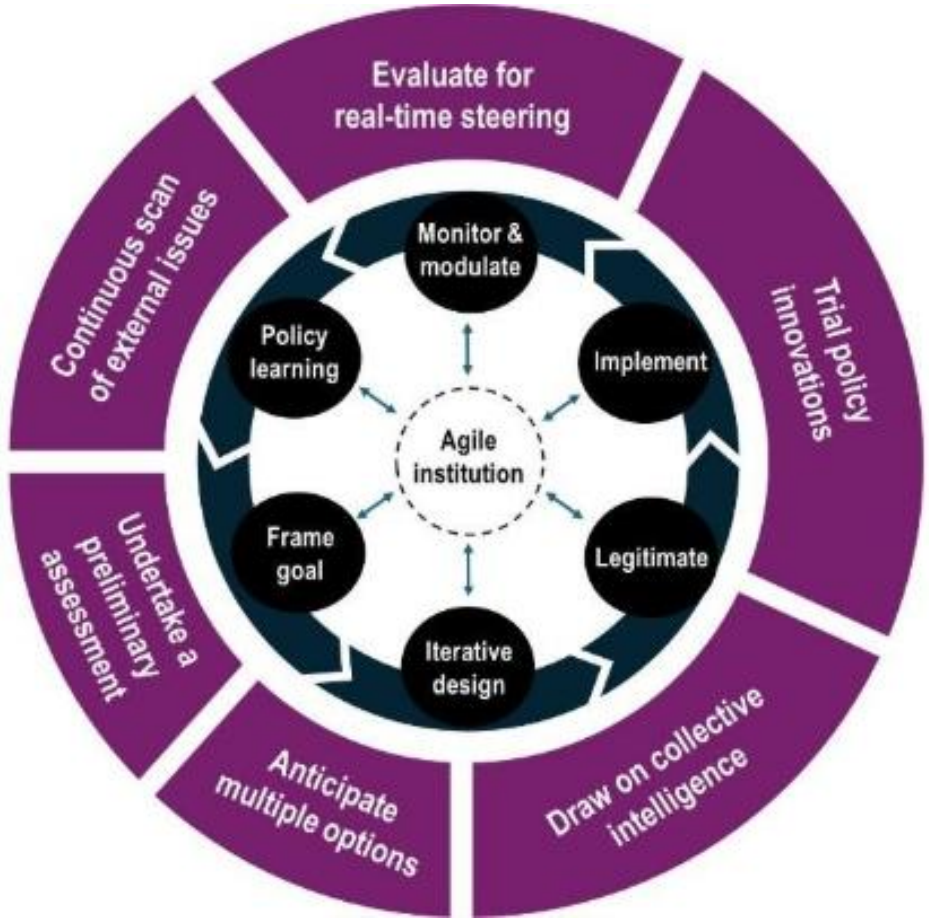

# Update policy frameworks and the supporting evidence base

# Toward anticipatory and agile STI policymaking

Strategic intelligence can provide **timely insights** through **anticipatory and real-time evidence production.**

Policy **experimentation** can **enable testing** of **new ideas** and **critical evaluation** of **policy impacts**.

Together, these approaches support **evidence-based policymaking** and boost **policy agility**.



# OECD expanding work in strategic intelligence for emerging technologies

- ❑ Strategic intelligence tools : A policy primer
- ❑ Chapter 7 of the STI Outlook: Tools for agility: Actionable strategic intelligence and policy experimentation
- ❑ Forthcoming **Horizon scanning paper**
- ❑ **Tech Assessment**: Synbio/AI and automation; Quantum applications to health, space, finance, transport and energy
- ❑ **Capacity building in countries** (e.g., Finland, Sweden)

## Strategic Intelligence

"timely and useable knowledge that supports policy makers in understanding the relevant aspects and scope of the impacts of science, technology and innovation, and their potential future developments"

- ❑ Map the ecosystem of strategic intelligence **tools and practices**
- ❑ Facilitate (**do**) strategic intelligence work
- ❑ Support capacity building and dig deep into strat. Intel and policy interface **(use of intelligence)**
- ❑ Support mutual learning on new institutions and units for strategic intelligence
- ❑ Explore standards and best practices


Technology Assessment

Forecasting & Horizon Scanning

Participatory Foresight

Emerging Risk Assessment


Ex Ante & real-time evaluation

New indicators and modelling

# Intelligence from administrative data (work @OECD)

**Mutual learning:**

- Using **AI tools to manage and analyse data in RD&I funding bodies**
- Enhancing **interoperability** of admin. RD&I funding data
- Practices for **access and use** of admin. RD&I data
- Using **AI for classification and labelling**
- **Large language models** for admin. R&D data
- Methods for **directionality**

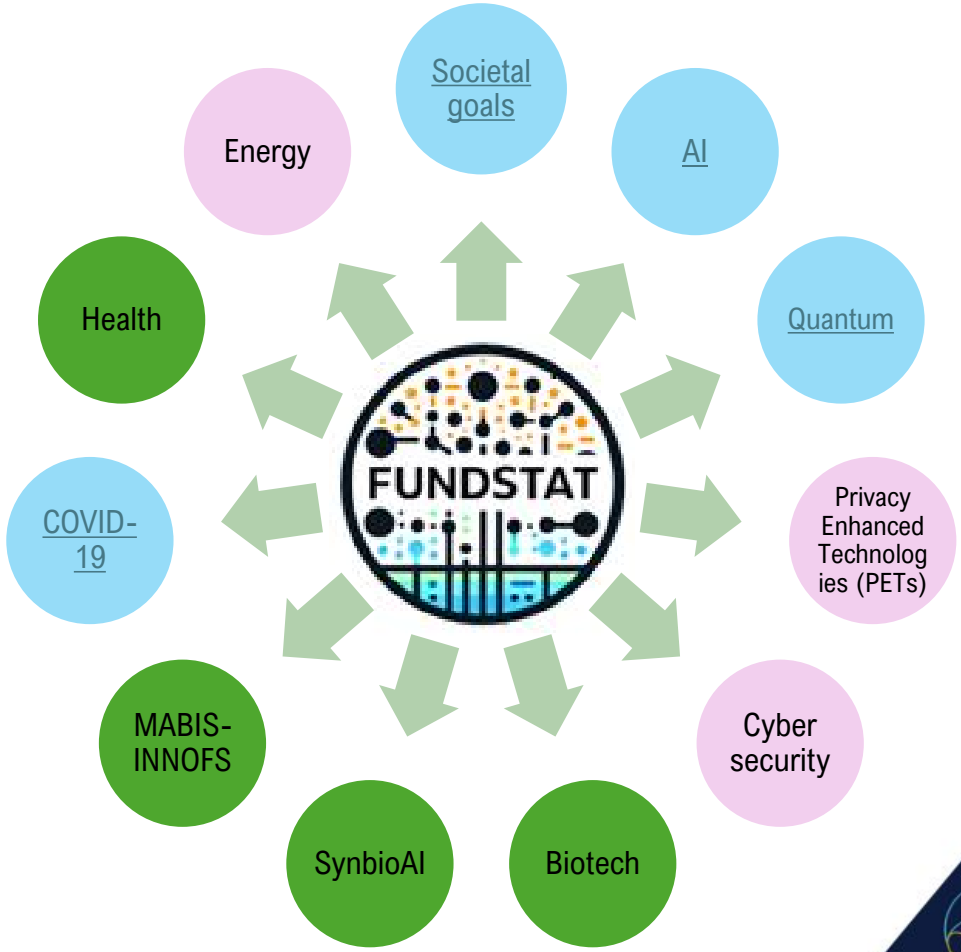
**v.2024:**

- **19 OECD member countries** (AUS, AUT, BEL, CAN, CHE, CZE, EST, FIN, FRA, GBR, DEU, IRL, JPN, LTV, LIT, NOR, POR, SWE, USA), and the **European Union – EC programmes.**
- **2.1 million R&D project awards**, accounting for **1.5 trillion USD PPP (2015-2023).**

**v.2026:**

- **Upcoming additions:** COL, DNK, ESP, ITA, ISR, KOR, NLD, NZL, POL, SVN, BRA, HRV, CHN

**AI-assisted methods and tool development: Classification** (deep learning, multi-class, multi-label); Multilingual hierarchical **topic modelling**



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**THANK YOU!**

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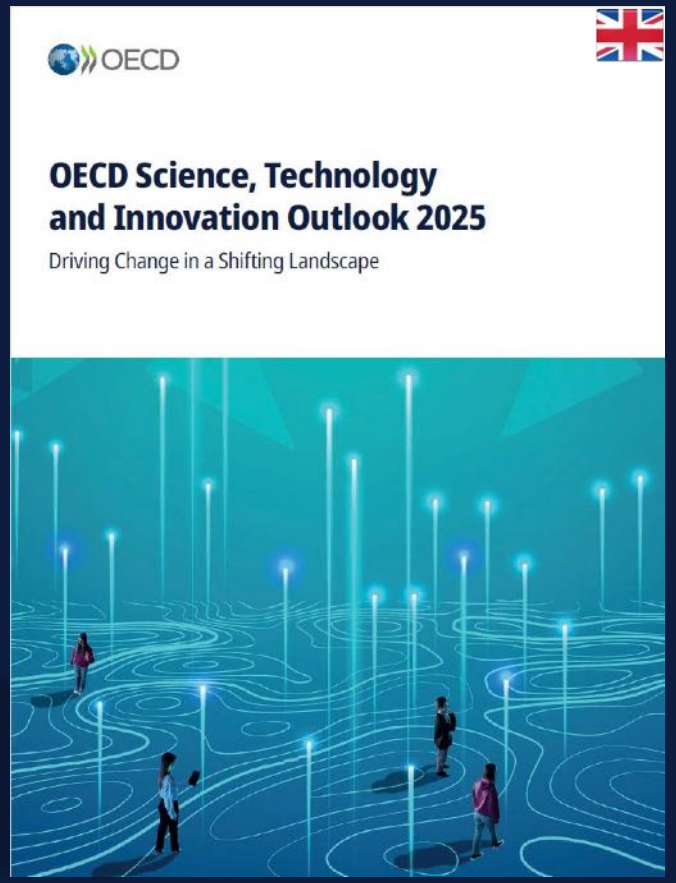


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