Nov 12th, 9:00 AM - 9:30 AM

Opening Address: Open Science and Singapore

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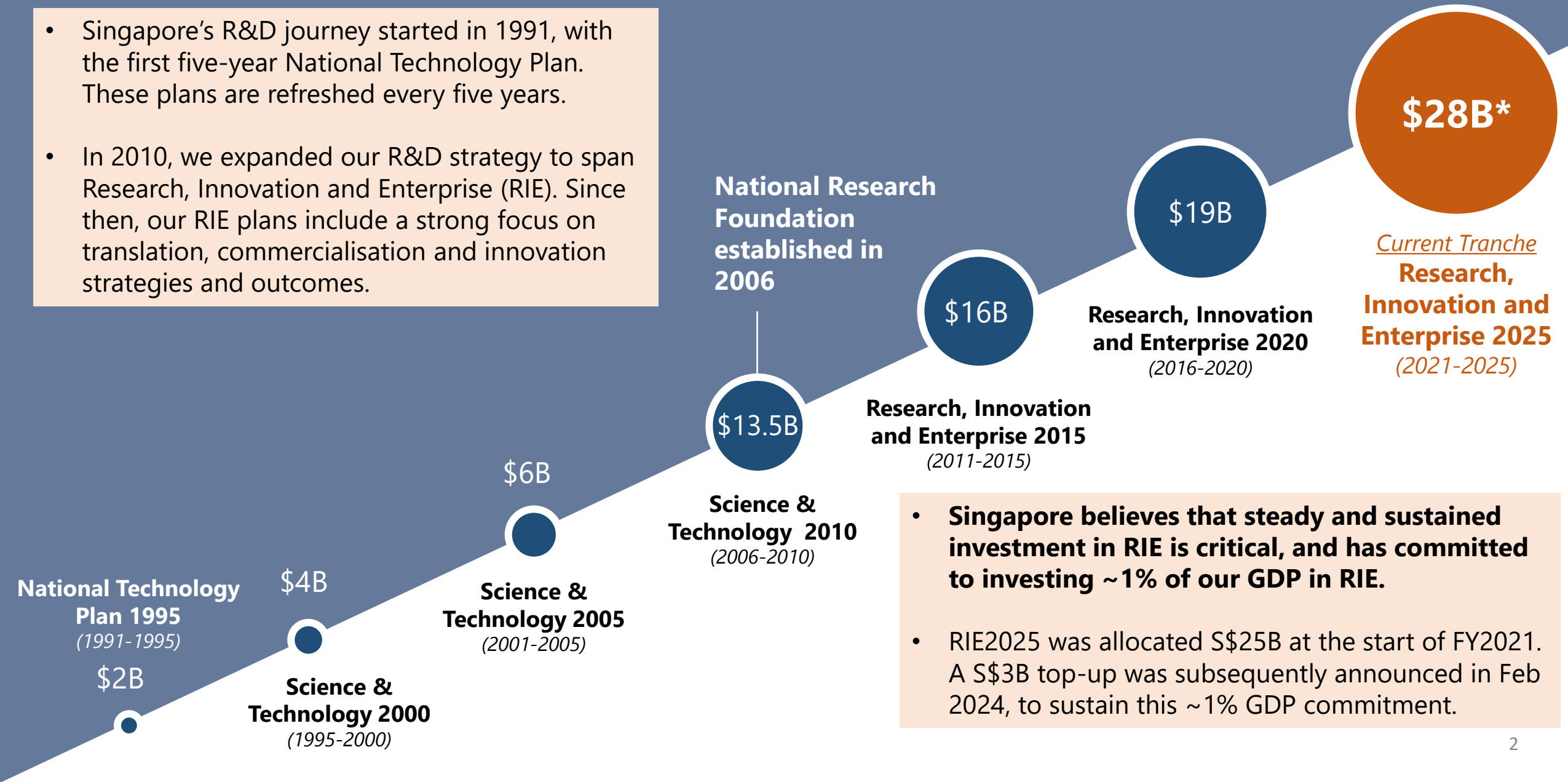
SINGAPORE OPEN RESEARCH CONFERENCE 2024
Accelerating the Impact of Open Research

Singapore's RIE Journey: 7 Masterplans over 3 Decades

- Singapore's R&D journey started in 1991, with the first five-year National Technology Plan. These plans are refreshed every five years.
- In 2010, we expanded our R&D strategy to span Research, Innovation and Enterprise (RIE). Since then, our RIE plans include a strong focus on translation, commercialisation and innovation strategies and outcomes.

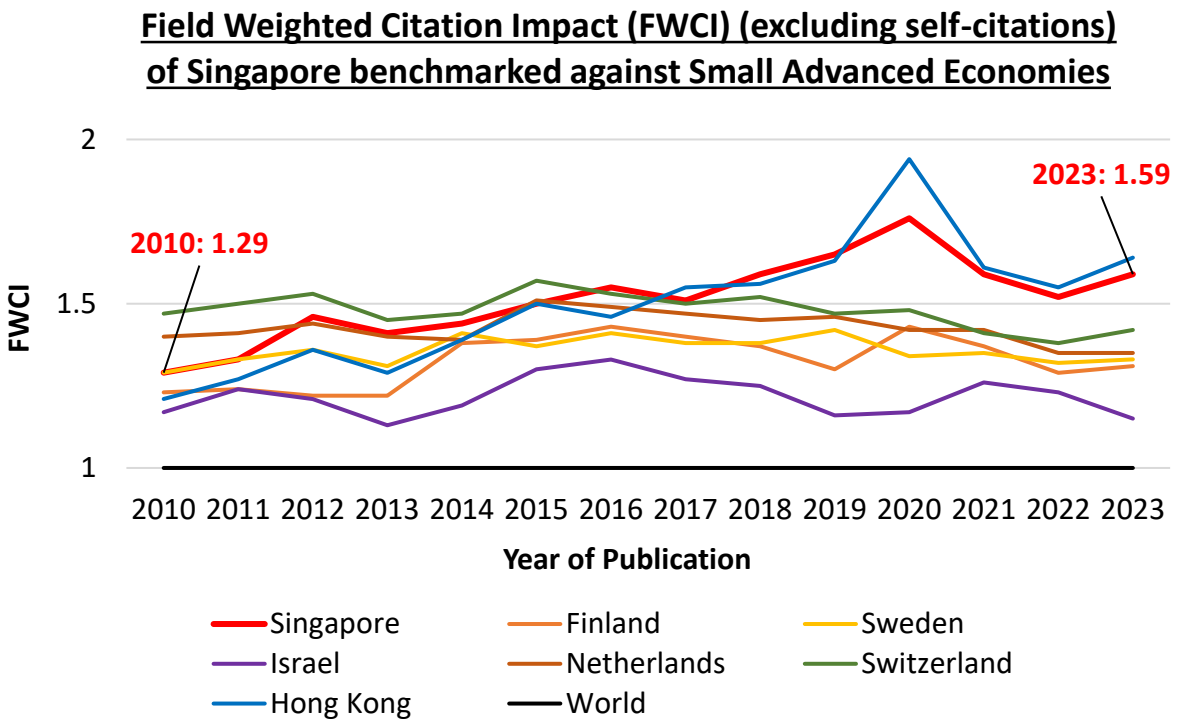


- **Singapore believes that steady and sustained investment in RIE is critical, and has committed to investing ~1% of our GDP in RIE.**
- RIE2025 was allocated S$25B at the start of FY2021. A S$3B top-up was subsequently announced in Feb 2024, to sustain this ~1% GDP commitment.

Singapore has continued to strengthen and grow our R&D capabilities …

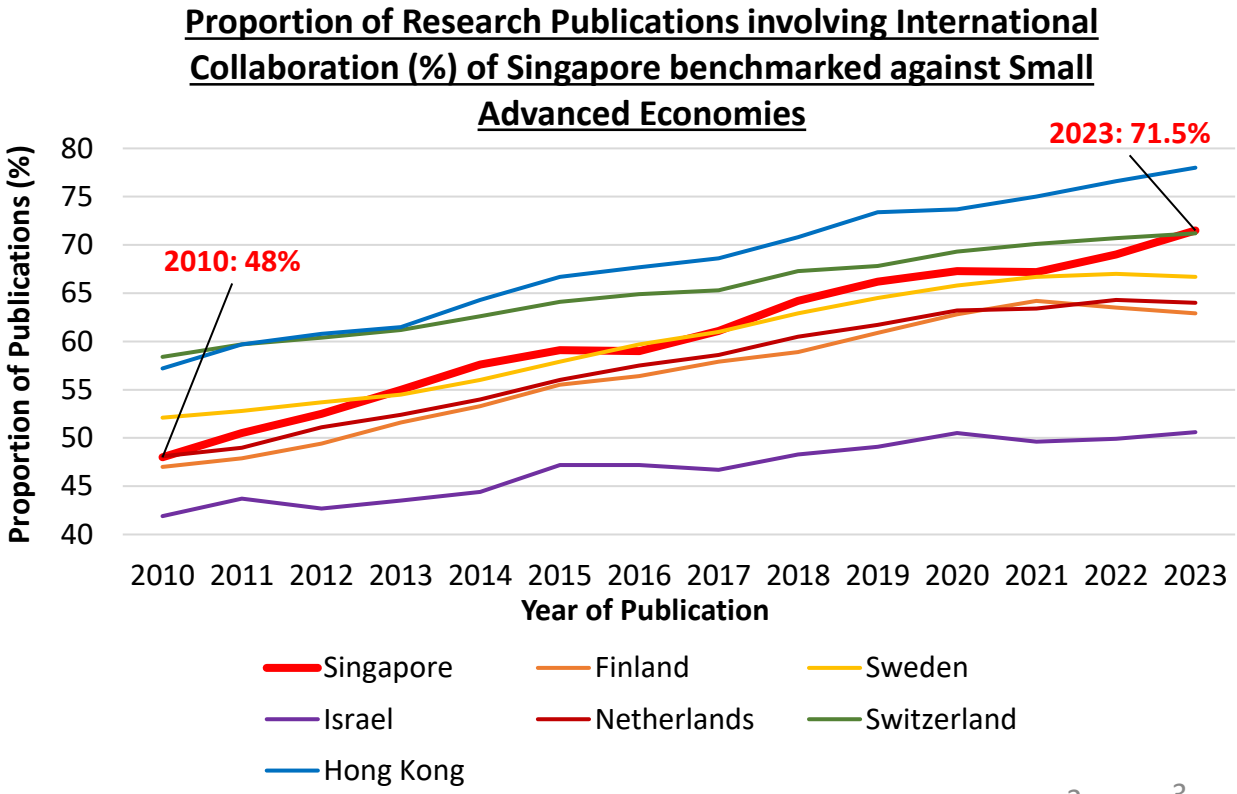
Overall research quality continues to rise

- Singapore's Field-Weighted Citation Impact (FWCI), a measure of research impact, grew from 1.29 in 2010 (29% above world average) to **1.59 in 2023 (59% above world average)**.



International collaborations continue to grow

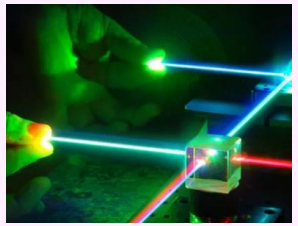
- Singapore's proportion of research publications involving international collaborations grew from 48.1% in 2010 to **71.5% in 2023 (50.7% above world average).**



Growing Peaks of Excellence

- NRF catalyses build-up of expertise and develops specific areas of strengths, that contribute to building new peaks of excellence, such as Quantum Technologies, Microelectronics, Cancer Research, Climate Science.

Quantum Technologies

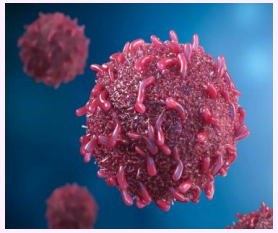


- Gained international recognition and rising talents in the field, established quantum technology research communities and the Centre for Quantum Technologies (CQT).
- Competitive research outputs, well-placed among small advanced economies.

Microelectronics

- Advanced research and development capabilities for new technologies and solutions across the microelectronics supply chain.
- Anchored by Singapore Hybrid-Integrated Next-generation Microelectronics (SHINE) Centre.

Cancer Research



- Significant breakthroughs and advances in fundamental understanding of cancer cells from Cancer Science Institute (CSI)
- Positive and vibrant research outputs, seen by growth in the volume of publications since 2016, with a corresponding increase in Singapore's FWCI (88% higher than world's average in 2022).

Climate Science

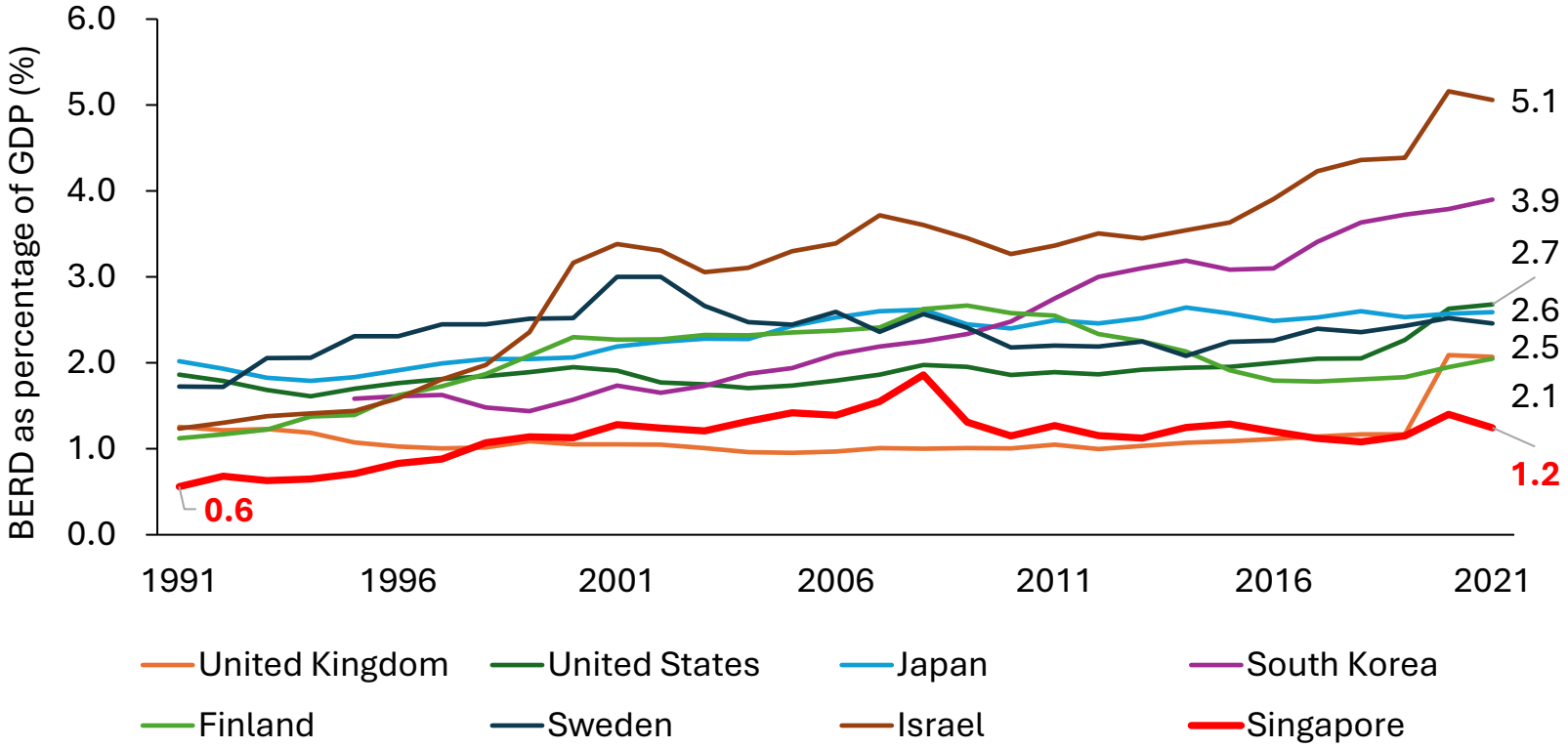
- Developed underpinning climate sciences useful for policy-relevant climate advice and climate adaptation efforts.
- Critical scientific talent and research capabilities in the Earth Observatory Singapore (EOS), in addition to programmes administered through the Climate Science Research Programme Office.

Singapore's BERD growth supports our transformation into an innovation-led economy

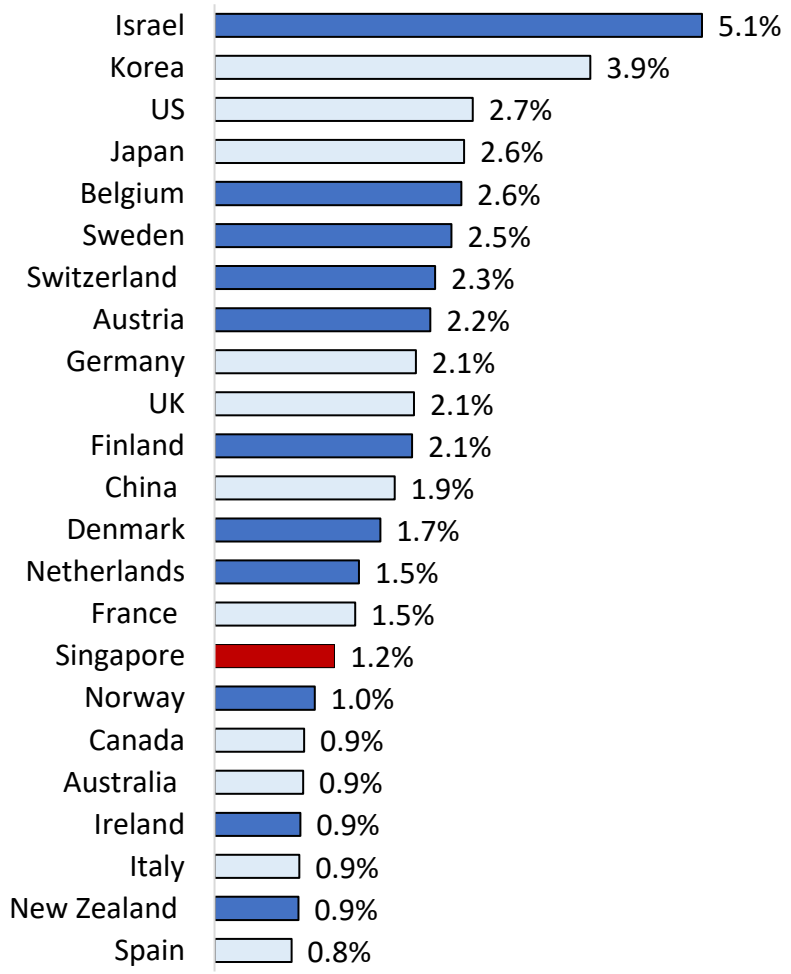
Singapore's economy is growing in R&D intensity, and we are developing a vibrant Innovation & Enterprise (I&E) ecosystem.

- Business Expenditure on R&D (BERD) increased from S$3.8B in 2010 to S$7.1B in 2021.

BERD as percentage of GDP (%)



BERD as % of GDP in 2021[1]



[1] International data on BERD as a percentage of GDP are based on latest available data from OECD (2021) except: Australia (2019).

Accelerating the Impact of Open Research

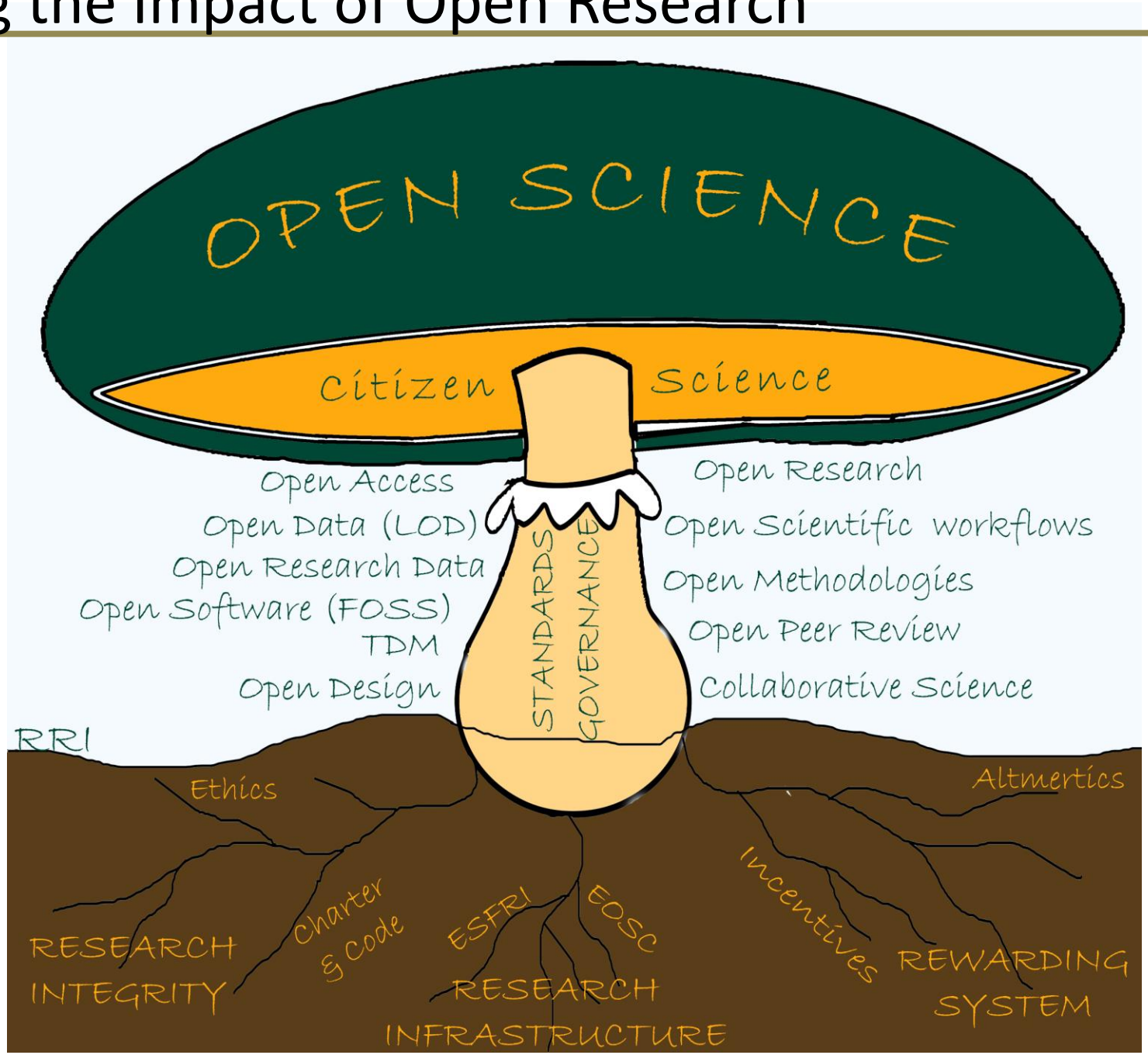


Figure drawn by Judit Eva's Fazekas-Paragh based on Eva Méndez (2021, p. 5). https://www.openaire.eu/blogs/hungary-on-the-move-1

The Global Landscape

White House Office of Science and Technology Policy (OSTP) launched a Year of Open Science in 2023

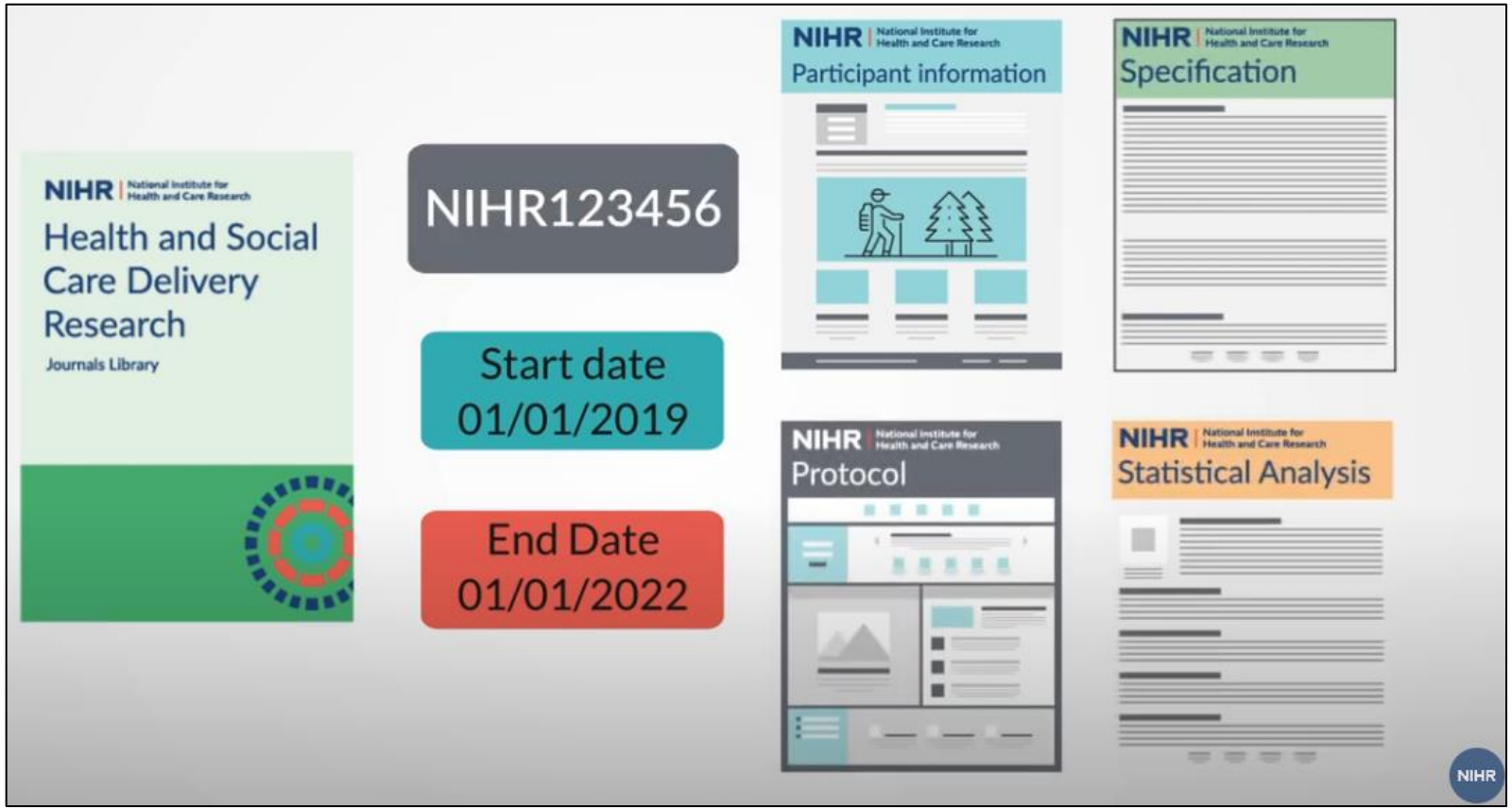
Suggests openness and security should not be seen exclusively as trade-offs

BILL & MELINDA GATES foundation

US' biggest charitable foundation, with focus on global health, **abandons APCs in favour of preprint repositories**

Open and public access to publicly funded scholarly publications and FAIR data

Publishing Models Re-examined



UK: NIHR (National Institute for Health and Care Research)'s **THREADED PUBLICATION** model

Screenshot from NIHRtv YouTube: https://www.youtube.com/watch?v=fjIb3CJNYFs

European Commission: Directorate-General for Research and Innovation, Open research Europe – Towards a collective open access publishing service – Scoping report, Publications Office of the European Union, **2024**, https://data.europa.eu/doi/10.2777/204155

Open Access Publishing Models

Gold Open Access	**(Full Open Access Journals)** Authors pay premium Article Processing Charges (APCs) for an article to be made freely available online for readers, immediately upon publication, usually with an open license for sharing, reuse.
Hybrid Open Access	**(Partial Open Access Journals)** Authors pay premium APCs for an article to be made freely available online for readers. But the rest of the journal is not open access. Institutions are charged with subscription fees for access.
Green Open Access	**(Self-Archival in Repositories)** Authors allowed to self-archive preprint or postprint versions of articles in online repositories, but usually with an embargo period ranging 6 to 24 months.
Bronze Open Access	**(Selective Open Access Journals)** Journal publishers can choose to make certain articles free to access online, in order to promote a certain topic or theme in a journal issue, typically with no open license for sharing, reuse.
Diamond Open Access	**(Dominant model in Latin America, now being considered by Plan S / EU)** Journals do not charge APCs for authors or subscription fees for readers. Publishing are covered by academic institutions, libraries, research organizations, or government agencies

Singapore's Open Access Taskforce

- Formed in June 2019, in response to global developments in OA.
- Chaired by NRF and involved representatives and librarians from the AUs, A*STAR, and MOE.

Objectives:

- To establish a national position on Open Access,
- To establish common guiding principles,
- Review the cost-effectiveness of current publication/subscription models.

Guiding Principles established:

- Preserve timely and full access to publicly funded research,
- Preserve access at a manageable cost to the research community,
- Preserve the freedom of researchers to publish in appropriate journals / venues of their choice.

Recommendations of the Taskforce

- Plan S continues to evolve. There is no urgency for Singapore to be subject to Plan S restrictions on Open Access publishing routes.

- Publications in high impact journals continue to be the benchmark for quality research and remains important for the promotion and tenure process of academic faculty.

- At the same time, it would be important for Singapore to keep up with developments and best practices by the international community.

- An intermediate approach to Open Access is through the Green route (archival of publications in institutional repositories), where the enabling infrastructure is already in place. To achieve high rates of archival, there is a need for Institutions' management to enforce compliance with funders' policy.

- To better manage the overall cost of publications, there is a need for the Institutions to have better sight and tracking mechanisms on APCs made to OA journals.

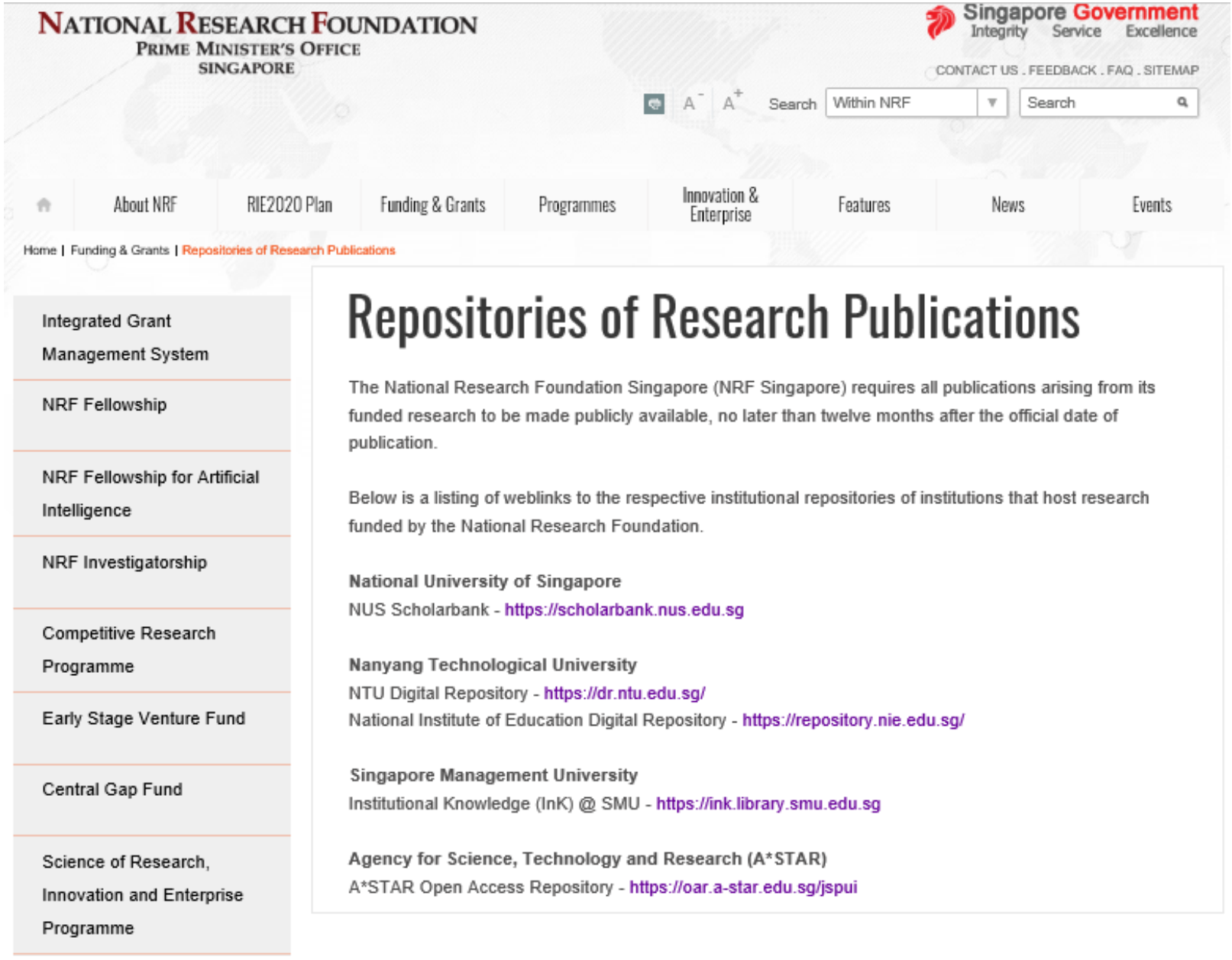
Funders' Publication Policy

- **Funders' policy since 2016**: The Institutions shall ensure that all publications arising from publicly funded Research are made openly available no later than twelve (12) months after the official date of publication.

- **NRF's implementation since 2020**: At the very least, the author-accepted manuscript (AAM) of the publication shall be deposited in the Institution's publicly accessible repository, which is to be listed on the NRF website.

- The respective Offices of Research will be expected to check for compliance, including checks for proper acknowledgement, before endorsing the submission of progress reports.

Institutional Repositories Linked on NRF Website



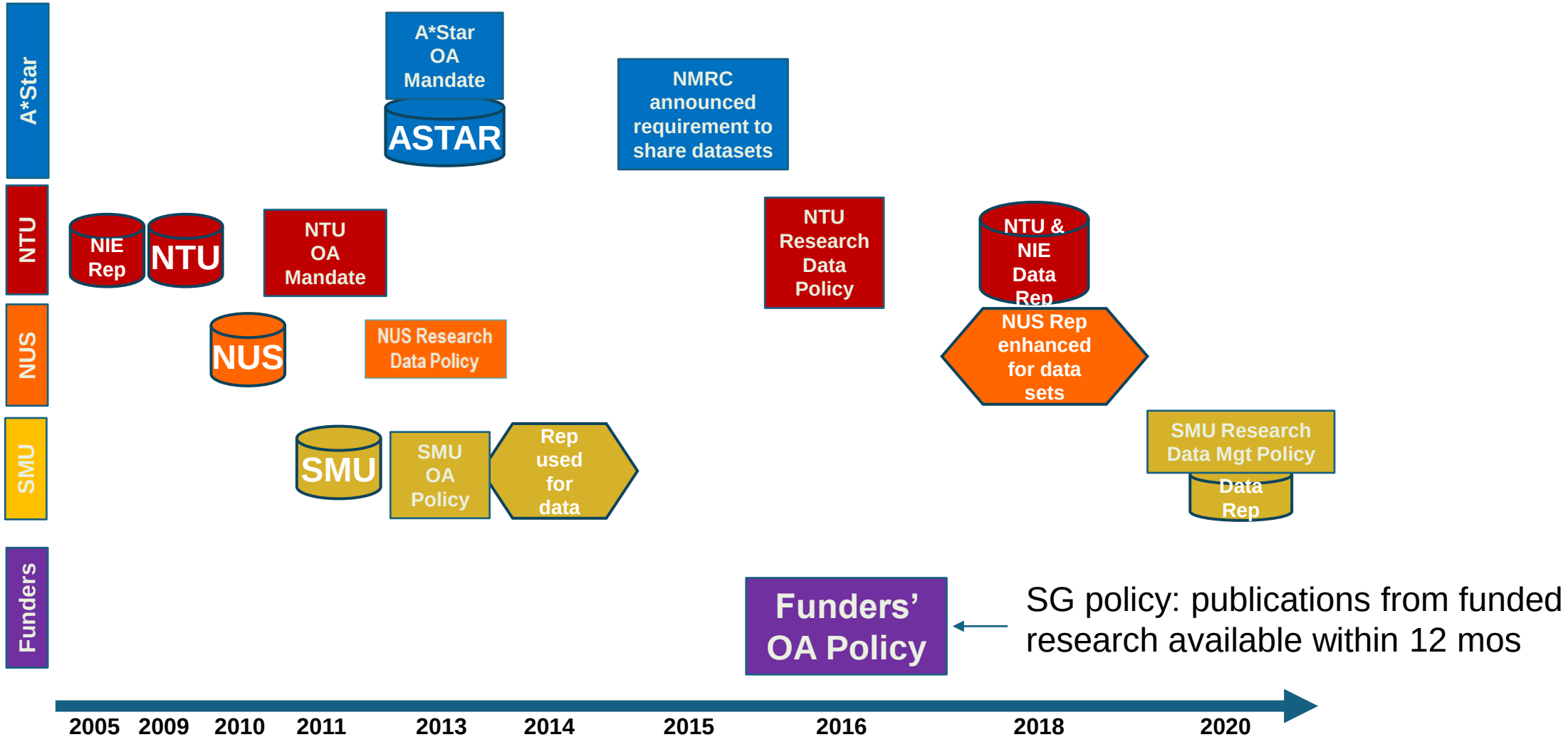
Facilitating the Open Research Impact in Singapore

	Initiatives
Singapore Statement on Research Integrity	2010: "Researchers should share data and findings openly and promptly, as soon as they have had an opportunity to establish priority and ownership claims."
National Medical Research Council (NMRC)	Research Data Governance and Sharing Framework (from 2024): • Data Sharing Plan • Final research data to be shared via NMRC's Research Data Repository
Social Science Research Council	Social Science and Humanities Research Thematic Grant: "Data should be made available to user communities at the earliest feasible opportunity …"
Institute for Adult Learning (IAL)	"All anonymised data generated from the Research will be made available to user communities … no later than 12 months after the end of the Term or official date of publication, whichever is earlier."
Autonomous Universities	• Institutional repositories to support open access to publications and data sharing • Research data policies, guidelines and training

Singapore's AUs have led in Open Science Initiatives

- Between 2005-2021, Singapore's AUs (and A*STAR) have led the establishment of Open Access repositories for publications and datasets. These repositories provide public access to research publications.
- The repositories have adopted the use of persistent identifiers such as DOI, ORCID, and standardised metadata schemes to promote *findability*, *accessibility* and *interoperability*.
- They have established data management policies and guidelines for *reusability* of research data, and promoted the use of open licenses, such as Creative Commons open licenses, to clarify the terms of reuse for search outputs.
- AUs have also established the Singapore Alliance of University Librarians (SAUL) in March 2019, to serve as the point of engagement with journal publishers for favorable agreements on Open Access publishing, journal subscriptions, and use of electronic resources.

Landscape of Open Science Policies and Infrastructure



Impact of Open Science

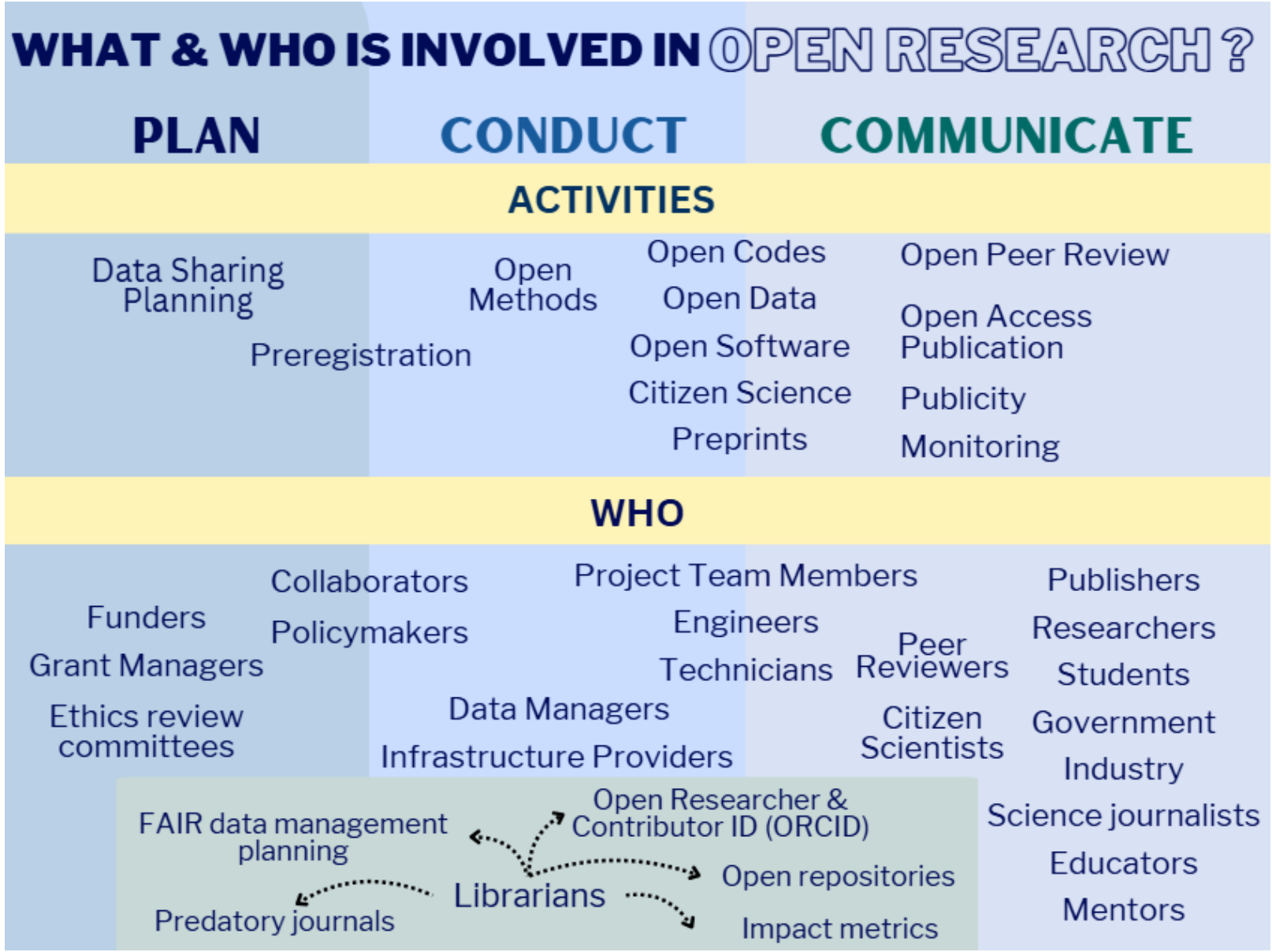
- Some notable examples where Open Science has made impact:

- **COVID-19 Pandemic Response** - Early sharing of the SARS-CoV-2 genome sequence enabled rapid vaccine development. Open access to research papers and data (e.g. GISAID - Global Initiative on Sharing Avian Influenza Data) facilitated global collaboration during the pandemic. Singapore has contributed to sharing of viral sequences, clinical/epidemiological data and monitoring of viral variants.

- **AlphaFold & Protein Structure Database** – Open Access to AI protein structure prediction models and databases have dramatically accelerated research in structural biology and drug development. AlphaFold has computationally predicted structures of 98% of human proteome and been accessed by more than half a million researchers worldwide. It has made a significant impact on biomedical research.

- **Development of AI and its real-world impact** – Open Source was important for the rapid development of generative AI and remains highly favored by AI researchers around the world, including those behind Google DeepMind, Meta, and Singapore's SEA-LION LLM, who seek to accelerate the development, validation and adoption of AI models for real-world impact.

Who contributes to Open Research Impact?



GOH, S. N. (2024). What & Who is involved in Open Research?

Recognising Open Research

Singapore Open Research Awards 2024
https://libguides.ntu.edu.sg/SGopenresearchawards

Let us make Open Research Fabulous, Fruitful and Fulfilling (F^3)!

CALL FOR ACTION TO ALL ACADEMIC INSTITUTIONS!

The Turing Way community illustrated as a garden. *The Turing Way* project illustration by Scriberia. Used under a CC-BY 4.0 licence. DOI: 10.5281/zenodo.3332807

Terima kasih

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감사합니다

Salamat

Thank you

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谢谢

Cảm ơn, cảm ơn bạn

شكرا جزيلا

ありがとうございます

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