BACKGROUND PAPER

The state of science, technology and innovation in the Global South

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Office for South-South Cooperation

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Background

For the Global South, science, technology and innovation (STI) are essential to overcoming systemic challenges, including acute climate impacts, persistent poverty and resource scarcity. With some of the fastest-growing populations, countries of the Global South require innovative solutions such as renewable energy for climate resilience, digital platforms to improve education and biotechnology for healthcare advancement.

Amid global crises and the urgency of the 2030 Agenda for Sustainable Development, STI offers transformative potential. It supports low-carbon economies, fosters social inclusion and drives equitable growth, aligning directly with the Sustainable Development Goals (SDGs). These factors position STI as a cornerstone of sustainable development strategies.

This brief explores the main challenges and potential of STI to catalyse transformative changes in developing countries, emphasizing the importance of investments, equitable access and use, South-South cooperation (SSC) and inclusion.

Key data-driven **insights** generated from recent reports include:

a. **The Global South is struggling with persistent gaps in infrastructure, investment and skills.** According to the Organisation for Economic Co-operation and Development (OECD), only 1 in 5 developing countries invests more than 1 per cent of gross domestic product (GDP) in research and development, creating systemic barriers to innovation. According to the 2021 United Nations Educational, Scientific and Cultural Organization (UNESCO) *Science Report*,[1] Internet penetration rates in some regions remain below 40 per cent, limiting digital access and hindering participation in the global economy. Environmental sustainability topics aligned with SDGs 12 (responsible consumption and production), 13 (climate action), 14 (life below water) and 15 (life on land) received minimal donor attention between 2000 and 2013, with funding totalling under $25 billion.

b. **Multiple recent South-South cooperation initiatives proved key to the development and deployment of scalable solutions, particularly regarding renewable energy and public health.** Countries such as Brazil and India have emerged as innovation leaders in the Global South, demonstrating the potential of targeted STI policies. Such countries are also actively sharing knowledge in their respective area(s) of strength with other countries of the Global South.

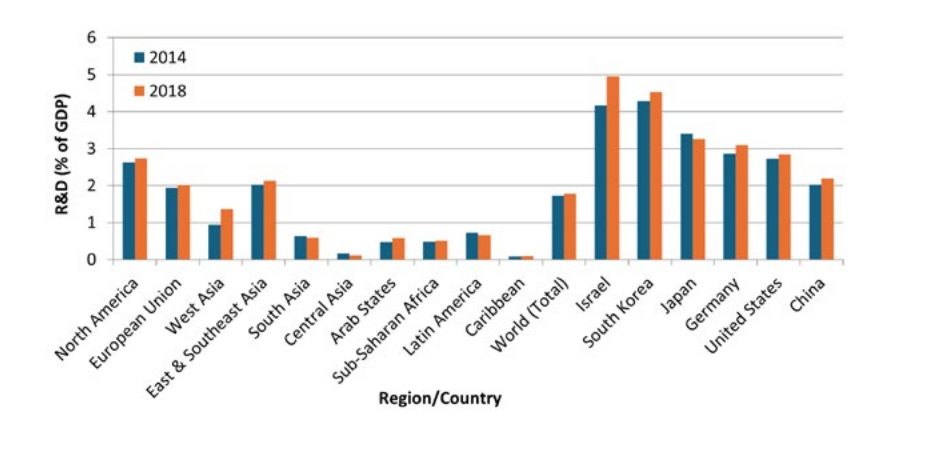
c. **Emerging technologies and inclusion are being more widely adopted in the Global South.** Technologies such as artificial intelligence (AI) and biotechnology are being adopted to address localized challenges, such as improving agricultural resilience and access to healthcare. However, only 30 per cent of women in the countries of the Global South engage in science, technology, engineering and mathematics (STEM) fields, highlighting a need for greater gender inclusion. AI is projected to contribute up to $15.7 trillion to the global economy by 2030, with emerging markets of the Global South playing a crucial role in this growth.[2] McKinsey research estimates that AI applications can potentially unlock an economic value of $11 trillion to $18 trillion annually. Countries such as India are emerging as key players in the AI landscape, with tech giants such as Microsoft and Amazon investing billions in computing infrastructure to support AI development.

[1] UNESCO, UNESCO Science Report 2021: The Race against Time for Smarter Development (Paris, 2021).

[2] World Economic Forum, Harnessing Artificial Intelligence for the Earth, Fourth Industrial Revolution for the Earth Series (Geneva, 2018).

Data and visualization of key trends

Figure 1. Investment in research and development as a share of GDP, by region and selected country, 2014 and 2018 (%)

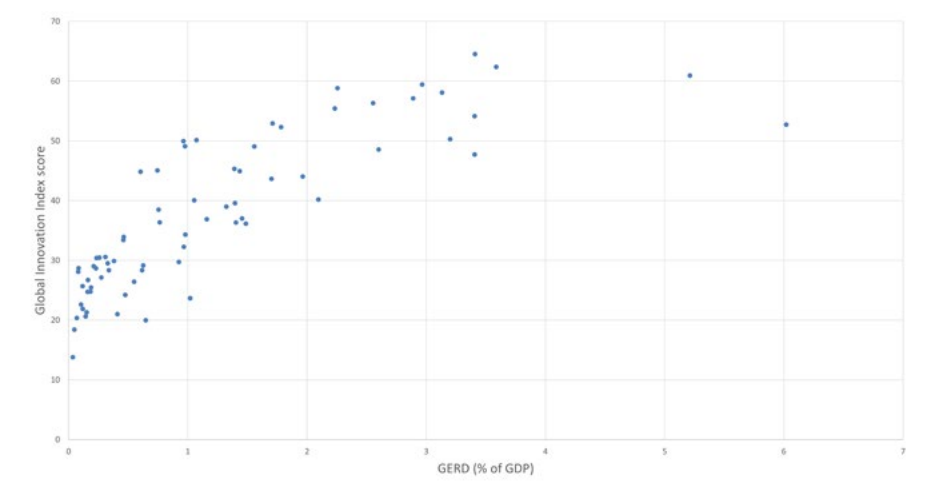


Source: *UNESCO Science Report 2021*, p. 34.

The key **insights** from the analysis of the trends for the last five to 10 years are:

- Research intensity in Latin America has remained stagnant, with Brazil leading at 1.17 per cent of GDP in 2020. Other countries, such as Colombia and Mexico, invest below 0.3 per cent of GDP in research. This stagnation reflects challenges such as limited Government funding and reliance on universities for research rather than industrial innovation.
- Egypt has seen growth in research and development (R&D) investments, increasing from 0.64 per cent of GDP in 2013 to 0.96 per cent in 2020. Similarly, the investment of Thailand rose from 0.44 per cent in 2013 to 1.14 per cent in 2018. These trends indicate a growing recognition of the importance of R&D in fostering innovation.
- Many Sub-Saharan African and Central Asian countries invest less than 0.15 per cent of GDP in R&D, reflecting systemic challenges such as economic instability and insufficient prioritization of STI in national budgets.
- There is a correlation between the Global Innovation Index (GII) rankings and gross expenditures on R&D (GERD).

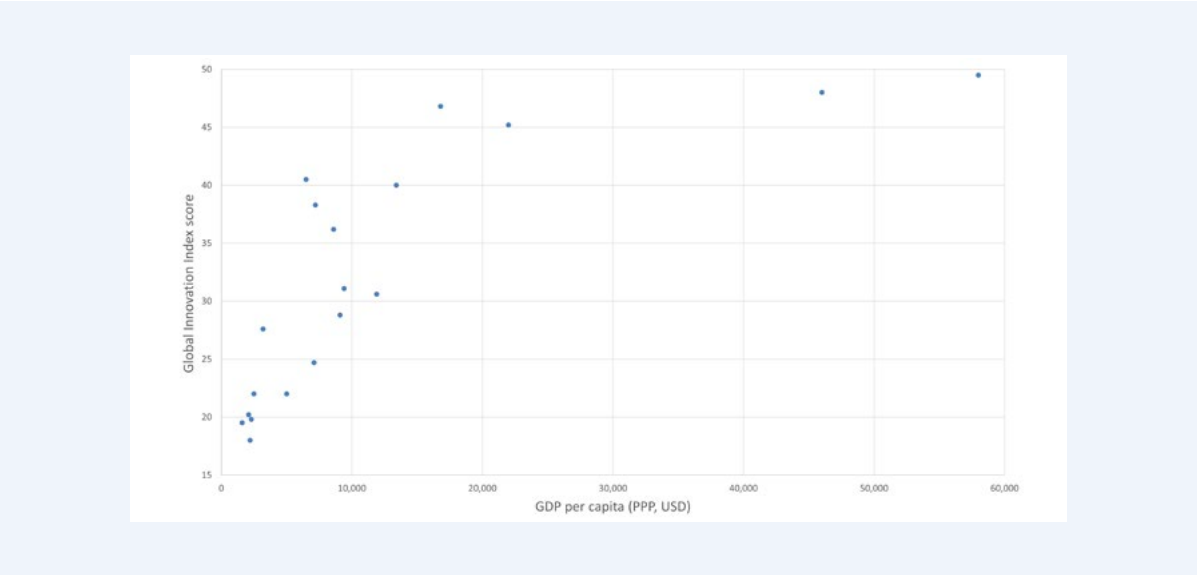
Figure 2. Comparison of GERD as a percentage of GDP and GII score, by country



Source: United Nations Office for South-South Cooperation (UNOSSC), using data from the World Intellectual Property Organization (WIPO)-Institut européen d'administration des affaires (INSEAD) Global Innovation Index and UNESCO GERD data.

(a) GII overperformers and science and technology (S&T) cluster map

Figure 3. Innovation outperformers relative to economic development



Source: UNOSSC, using data from WIPO-INSEAD GII (2024) and UNESCO Institute for Statistics.

Economy	Top-100 clusters
China	26
United States	20
Germany	8
India	4
Republic of Korea	4
France	3
United Kingdom	3
Japan	3
Canada	3
Australia	3

Source: WIPO Statistics database, April 2024. Retrieved from Global Innovation Index 2024; Unlocking the Promise of Social Entrepreneurship (Geneva, 2024), p. 75. Available at https://www.wipo.int/documents/d/global-innovation-index/docs-en-2024-gii-2024-clusters-top100-ranking.pdf.

The key **insight** from the analysis of the trends for the last five to 10 years is that, while innovation capabilities in the Global South are improving, challenges such as uneven progress, limited patent activity and gaps in commercialization of research remain significant. Countries such as Indonesia, Pakistan and Uzbekistan have consistently outperformed relative to their economic development, demonstrating strategic prioritization of innovation. India leads the lower-middle-income group, showcasing its robust innovation ecosystem, followed by Viet Nam and the Philippines. Countries such as Madagascar, Rwanda and Togo have shown consistent improvement in the GII rankings. Rwanda, in particular, has been an innovation overperformer for 12 consecutive years. Collaborative efforts, more coherent and potentially convergent policy frameworks, and enhanced funding for R&D are essential to bridging these gaps.

(b) Women in STEM

A key **insight** is that while women constitute around 33 per cent of researchers globally, with notable progress in Southeast Asia and the Arab States, they remain underrepresented in engineering and technology fields, emphasizing the need for targeted policies to close gender gaps in STEM.[3] Women's representation drastically decreases at senior levels. In many countries, women make up less than 10 per cent of members in national science academies, reflecting a stark gender imbalance in leadership positions in science and technology.

Mapping and condensed description of the South-South and triangular cooperation solutions available on the UNOSSC South-South Galaxy platform

A total of 181 solutions from the data set address or are related to the identified insight on infrastructure, investment, skills gaps, digital access or environmental sustainability. Two representative examples are UN Climate Technology Centre & Network (CTCN) and Family Farming Project in Guinea-Bissau.

A total of 250 solutions address the second insight regarding South-South cooperation initiatives focused on renewable energy, public health and knowledge-sharing. Representative examples include Desert to Power Initiative, Eliminating Mother-to-Child Transmission of HIV and Syphilis in Thailand through South-South Cooperation and Reciprocal South-South Personnel Exchange within the Framework of Institutional Cooperation.

A total of 374 solutions address the third insight related to emerging technologies, AI, biotechnology, agricultural resilience, healthcare and gender inclusion in STEM. Three representative examples are Organization for Women in Science for the Developing World PhD Fellowships, Climate Smart Agriculture in Pakistan and Triangular Cooperation Project on Sustainable Development in the Lower Mekong Basin Based on the Water-Energy-Food Nexus.

Reviewed reports

McKinsey Digital (2024). Technology Trends Outlook 2024. Available at https://www.mckinsey.com/~/media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/the%20top%20trends%20in%20tech%202024/mckinsey-technology-trends-outlook-2024.pdf.

OECD (2023). *OECD Science, Technology and Innovation Outlook 2023: Enabling Transitions in Times of Disruption.* Paris: OECD Publishing. Available at https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/03/oecd-science-technology-and-innovation-outlook-2023_fb6e6c20/0b55736e-en.pdf.

UNCTAD (2023). *Technology and Innovation Report 2023: Opening Green Windows – Technological Opportunities for a Low-carbon World.* Geneva, 2023. Available at https://digitallibrary.un.org/record/4007851?ln=en&v=pdf.

UNESCO (2021). *UNESCO Science Report: The Race against Time for Smarter Development.* S. Schneegans, T. Straza and J. Lewis (eds). Paris: UNESCO Publishing. Available at https://digitallibrary.un.org/record/3945690?v=pdf.

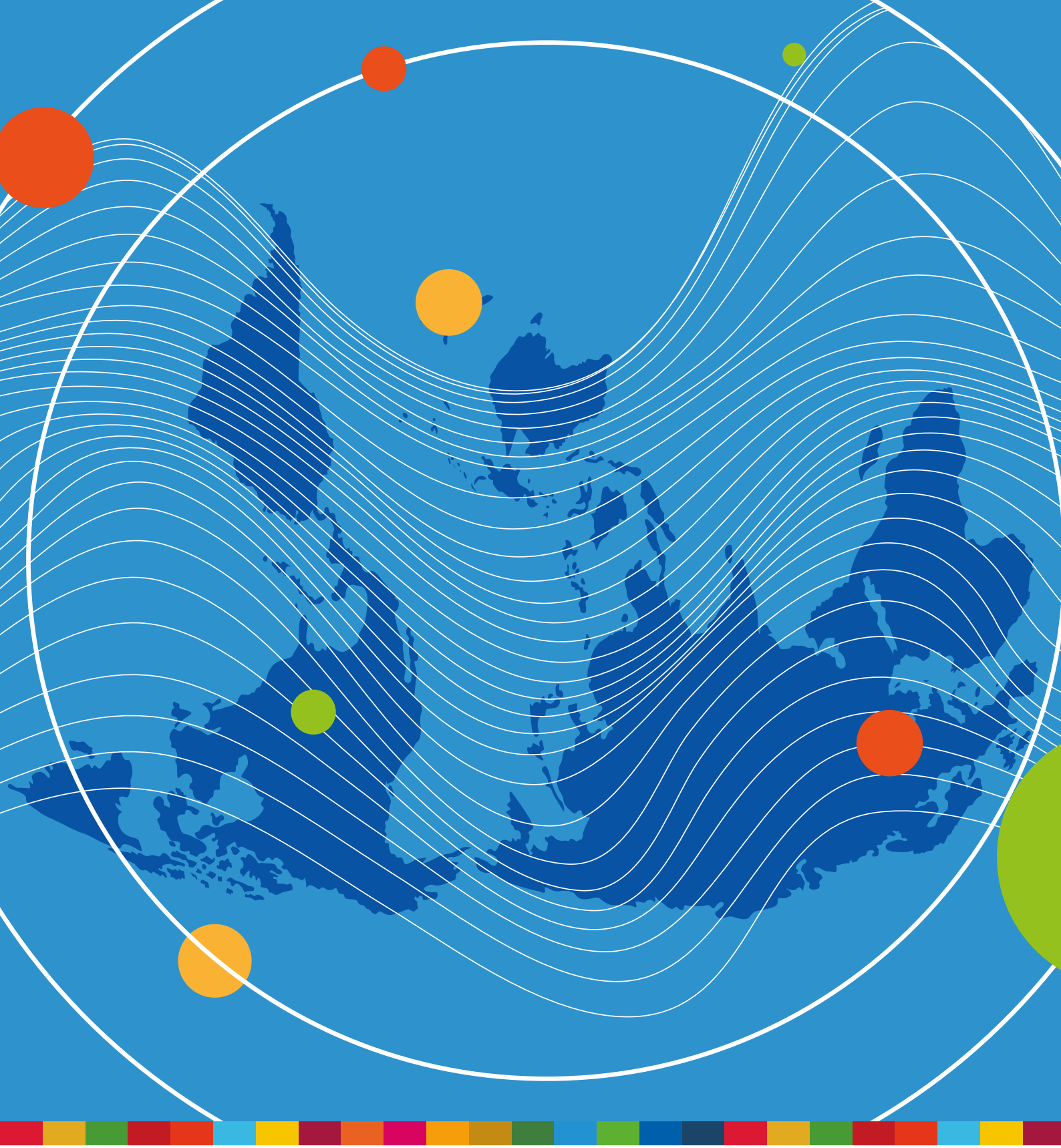
_____ (2024). Fostering Science for All: International Decade of Sciences for Sustainable Development, 2024–2033. Paris: UNESCO. Available at https://unesdoc.unesco.org/ark:/48223/pf0000391158.

_____ (2024). *Science, Technology and Innovation Policy Instruments for the Sustainable Development Goals: A Global Outlook.* Paris: UNESCO. Available at https://unesdoc.unesco.org/ark:/48223/pf0000389665.

WIPO (2024). *Global Innovation Index 2024: Unlocking the Promise of Social Entrepreneurship.* Geneva: WIPO. Available at https://www.wipo.int/web-publications/global-innovation-index-2024/assets/67729/2000%20Global%20Innovation%20Index%202024_WEB3lite.pdf.

World Economic Forum (2018). *Harnessing Artificial Intelligence for the Earth*. Fourth Industrial Revolution for the Earth. Geneva. Available at https://www3.weforum.org/docs/Harnessing_Artificial_Intelligence_for_the_Earth_report_2018.pdf.

[3] Susan Schneegan, Jake Lewis and Tiffany Straza, eds., UNESCO Science Report 2021.



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