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POLICY BRIEF

THE NEED TO PROTECT SCIENCE, TECHNOLOGY AND INNOVATION FUNDING DURING AND AFTER THE COVID-19 CRISIS*

The coronavirus disease (COVID-19) outbreak has infected more than 2,950,000 people and killed more than 202,000 worldwide to this date.[1] While the overall economic impact of this outbreak is still unfolding, there are strong indications that it will cause the largest economic downturn since the 2008 financial crisis.

This policy brief makes a case for protecting science, technology and innovation (STI) budgets during the COVID-19 crisis and its aftermath, based on the fact that continued investments in STI will be critical to the achievement of the 2030 Agenda for Sustainable Development. Even though developing countries as a group have recorded continued growth in R&D expenditure over recent years, the absolute levels remain small and their STI capabilities limited. It is therefore crucial for developing countries to reinforce their commitments to protect investment in STI and to design recovery packages that leverage technology and innovation for sustainable development.

Key points

- Stability and predictability of funding for science, technology and innovation are critical for the ability of national innovation systems to support sustainable development.
- During and after the COVID-19 crisis countries, particularly in the developing world where innovation systems remain fragile, should protect science, technology and innovation resources from austerity drives given their long-term implications for development strategies.
- The policy responses proposed in this policy brief introduce concrete steps in effectively continuing investments in science, technology and innovation, both during and after the crisis, towards the achievement of the 2030 Agenda.

The importance of stable, predictable research and development expenditures at times of crisis

The 2008 financial crisis provides an example of a widespread, profound international economic shock that can be compared to the likely impact of COVID-19. At that time, for the countries for which there is a consistent data set for expenditure on R&D and that had in place innovation systems on which changes on the levels of expenditure could have significant impact (mostly those in the OECD), two different sets of trajectories can be observed:

On the one hand, **countries with more knowledge-intensive economies and more developed innovation systems suffered less from the 2008 financial crisis and did not impose austerity on R&D expenditures.** On the other hand**, countries that entered the 2008 financial crisis with weak budgetary efforts in STI and consequently weaker innovation systems showed less macroeconomic resilience, which led to budgetary tightening on R&D expenditure which in turn further weakened their innovation systems and their chances to move to more knowledge-intensive growth**

[1] WHO (2020). Coronavirus disease (COVID-19) Pandemic. Available at https://www.who.int/emergencies/diseases/novel-coronavirus-2019 (accessed on 29 April 2020).

* This document has not been formally edited.

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patterns. Countries that decreased public R&D expenditures turned to alternative financing mechanisms (loans, guarantees, co-financing, competitive funding, etc.) and undertook consolidation and streamlining of existing policies and programmes, with uneven results given the lower maturity of their innovation systems. Thus, a trend of growth in public R&D expenditures was reversed, jeopardizing the results of previous investment and with subsequent impact on private investment in technology and innovation.[2,3]

Because the outcome of research and innovation investments is particularly subject to uncertainty and risk, **maintaining continuity and a long-term perspective in public support to STI is critical.** There is evidence that government expenditures to encourage R&D in the business sector are more effective when they are stable over time: firms hesitate to invest in additional R&D if they are uncertain of the durability of government support.[4,5] Predictability and long-term perspectives in funding are also critical for research undertaken by academic institutions.

Similarly, **investment in human capital can suffer from stop-and-go policies** and lead to difficulty in retaining skilled human resources. Faced with unstable academic research systems, gloomy career prospects and salary cuts, promising researchers and other skilled workers are likely to switch to other career paths or migrate to countries where STI investments are stable or continue to grow.

A science, technology and innovation policy response to the COVID-19 crisis

The following are some policy considerations for STI funding decisions in response to the COVID-19 crisis:

1. **During the crisis, support research and development activities as part of emergency measures and of recovery packages**

Within an overall context of public funding of STI that should remain stable or grow during the pandemic, and considering the nature of the COVID-19 crisis, in the short term it is suggested that priority should be given to measures such as:

- Grants for R&D carried out by academic or public institutions as well as by the private sector on vaccines, therapeutics and diagnostics to treat or prevent the spread of the coronavirus, particularly those that focus on the specific needs of developing countries;
- Grants for preparedness, response and prevention research, with a particular emphasis on digital technologies;
- Prioritize procurement for health system infrastructure, labs, equipment and supplies from firms with a stronger commitment to innovation;
- Emergency loans to firms (particularly SMEs) conducting R&D relevant to COVID-19 and that were financially hit by the crisis.

It will be equally crucial that recovery packages include a strong component of fiscal support to STI and to innovation-intensive activities. For instance, smart recovery packages could present an **opportunity to prioritize investments in innovation-enabling infrastructure, particularly for the digital economy, and support the transition to renewable energy and more environment friendly manufacturing and services.** Along this line, 13 European climate and environment ministers have signed a joint article calling for a European green deal in response to COVID-19.[6] Similar considerations would be relevant to other regions, including in the developing world.

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2 Izsak K et al (2013). Impact of the Crisis on Research and Innovation Policies. Available at https://ec.europa.eu/research/innovation-union/pdf/expert-groups/ERIAB_pb-Impact_of_financial_crisis.pdf (accessed 6 April 2020).

3 ILO (2020). A review of global fiscal stimulus April. Available at https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_194175.pdf (accessed 6 April 2020).

4 Guellec D and Potterie B van P de la (2000). The Impact of Public R&D Expenditure on Business R&D.

5 Mitchell J et al (2019). Tax incentives for R&D: supporting innovative scale-ups? Research Evaluation, 29(2):121–134.

6 Gewessler L et al. (2020). European Green Deal must be central to a resilient recovery after Covid-19. Available at https://www.climatechangenews.com/2020/04/09/european-green-deal-must-central-resilient-recovery-covid-19/ (accessed on 17 April 2020).

2. After the crisis, revisit and strengthen the budgetary commitments to support research and development

A lesson from the 2008 financial crisis was that countries with weaker innovation systems suffered more from it and that subsequent R&D budget reductions made them unable to build the innovation systems they would need to become more resilient, knowledge-based economies. This is a particularly relevant lesson for developing countries where innovation systems are in most cases nascent and frail. Even though in the decade after the 2008 financial crisis **developing countries achieved higher average annual growth rates of R&D expenditures** than developed countries (and even faster rates than in GDP growth), **their R&D expenditures remain significantly smaller as a percentage of GDP than in developed countries and far below the levels that would be compatible with the ambition of the 2030 Agenda for Sustainable Development (see table).** Hence, the importance of protecting investment in STI should be noted even in the difficult fiscal environment that can be expected after the COVID-19 crisis.

Once the most pressing emergency situations have been addressed, countries need to revisit and strengthen their budgetary commitments to support R&D. In doing so a "forward guidance" approach (committing to a growth path of future government R&D expenditures) can be an effective tool. Already some regional organizations have set targets for R&D expenditure as percentage of GDP such as the European Union's 3 per cent target and the African Union's 1 per cent target.[7] Likewise, developing countries could revisit and set their targets and, importantly, establish their spending trajectory towards them. This way, governments can not only treat R&D expenditures as "protected funding lines" but also ensure and signal the continuity and predictability of government R&D support to other stakeholders.

3. Support a systems approach to policymaking that includes natural sciences, engineering and social sciences

While a global public health crisis unfolds, it is inevitable that most attention is focused on medical and public health responses that can deliver solutions to the immediate problems of stopping the spread of disease and healing the sick. **However, a systems approach that emphasizes multidisciplinary and multisectoral approaches, is likely to be the most effective strategy to improve the preparedness and resilience of societies against future similar threats.** This requires sufficient flow of resources to support not just biomedical research and innovation but a much broader range of scientific and technological knowledge and its practical applications.

It has been observed that the resilience and the ability to recover from the COVID-19 outbreak will require capabilities in and coordination among not just medical science and public health but also in a wide range of disciplines. These include data science, sociology, psychology, mass transit systems engineering, supply chain management, ICTs and digital technologies, political science and economics, just to name a few. Public R&D budgets need to support not only the generation of new knowledge in this broad range of disciplines, but also the institutions and mechanisms that enable cross-sectoral, multidisciplinary collaboration among those different communities of practice.

Growth of research and development expenditures, by development status groups

	R&D expenditures (average annual growth rate, 2007–2017)	GDP (average annual growth rate, 2007–2017)	R&D expenditures as percentage of GDP (average, 2007–2017)
Landlocked developing countries	5.0%	5.8%	0.23%
Small island developing States	2.5%	0.9%	0.98%
Sub-Saharan Africa	4.4%	4.4%	0.37%
Least developed countries	6.2%	5.1%	0.21%
Low income countries	7.2%	4.0%	0.28%
Lower middle-income countries	4.5%	5.5%	0.46%
Upper middle-income countries	10.2%	5.0%	1.23%
High income countries	2.3%	1.4%	2.34%
World	4.3%	2.6%	1.65%

Source: UNESCO (2020). Science, technology and innovation: Gross domestic expenditure on R&D (GERD), GERD as a percentage of GDP, GERD per capita and GERD per researcher; UNCTAD (2020). UNCTADstat: Gross domestic product.

Note: Groups overlap with each other and some countries belong to more than one group.

[7] UNESCO (2019). New UIS Data for Sustainable Development Goal 9.5 on Research and Development. Available at http://uis.unesco.org/en/news/new-uis-data-sdg-9-5-research-and-development (accessed 9 April 2020).

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4. Ensure international cooperation and coordinated policy responses

COVID-19 is now rapidly spreading to the developing world where the capacity of public health systems and the financial resources to address the pandemic are both lower than in developed countries. International cooperation is more critical than ever, and all relevant actors should work together to fund, design and deliver solutions, particularly when it comes to developing science and technology-based solutions.

The United Nations has launched a $2 billion global humanitarian response plan to fund the fight against COVID-19 in the world's poorest countries that includes support for R&D.[8] The United Nations IATT, an interagency group of which UNCTAD and the Department of Economic and Social Affairs are co-conveners, has issued a call for innovative solutions worldwide to combat COVID-19. UNCTAD, in collaboration with the United Nations Commission on Science and Technology for Development, has also issued another call for the sharing of COVID-19 related national policies and experiences around which international collaboration can be developed. Calling for a scaled-up global response to COVID-19, several non-profit and private sector organizations are helping speed up the development of COVID-19 treatments and vaccines, while urging international financial institutions and Group of 7 and Group of 20 Governments to provide immediate funding to fill urgent gaps.[9]

As a vast number of different actors engage in research worldwide to combat COVID-19, the coordination efforts become more critical. In this effort, WHO has set up protocols and roadmaps to identify global research priorities and standards for better alignment of research by different groups.[10] Also, WHO has endorsed the creation of a voluntary intellectual property pool whose content could be shared for developing drugs, vaccines, and diagnostics, which would particularly benefit developing countries.[11] Further, open access to scientific work has been facilitated, where a large number of data and findings related to COVID-19 that are only a few days (or sometimes hours) old, are now made openly available for the community.[12]

A global pandemic is a textbook example of a critical problem where **the sum of isolated efforts by national governments provides much inferior outcomes than international collaboration.[13] The positive externalities of STI investments in such a situation could be huge and decisive in the effort to ensure that the most vulnerable members of the international community are not left behind.**

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[8] United Nations Coordinated Appeal (2020). Global Humanitarian Response Plan COVID-19 March. Available at https://www.unocha.org/sites/unocha/files/Global-Humanitarian-Response-Plan-COVID-19.pdf (accessed 6 April 2020).

[9] Geulette M (2020). Canada pledges C$275M for coronavirus R&D, adding to global funding rush. Available at https://sciencebusiness.net/news/canada-pledges-c275m-coronavirus-rd-adding-global-funding-rush (accessed 6 April 2020).

[10] WHO (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 6 March 2020. Available at https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---6-march-2020 (accessed 6 April 2020).

[11] Silverman E (2020). WHO director-general endorses a voluntary intellectual property pool to develop Covid-19 products. Available at https://www.statnews.com/pharmalot/2020/04/06/covid19-coronavirus-patents-voluntary-pool-world-health/ (accessed 24 April 2020).

[12] Younes G A, et al (2020). COVID-19: Insights from Innovation Economists.

[13] UNCTAD (2020). Coronavirus: Global pandemic amplifies the critical role of international research collaborations in science and technology.