FINANCING FOR DEVELOPMENT: PROGRESS AND PROSPECTS

Report of the Inter-agency Task Force on Financing for Development 2017
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Chapter III.G

Science, technology, innovation and capacity-building

1. Key messages and recommendations

Technology and innovation are at the heart of economic, environmental and social development. Over the past several decades, there has been important progress in access to many technologies, particularly in information and communications technology (ICT). Nonetheless, two years after the adoption of the Addis Ababa Action Agenda, access remains uneven within and between countries, with the greatest growth in technology investments occurring mainly in developed regions and some developing countries. Substantial divides in access rates to certain technologies—the Internet, for example—persist between men and women as well as between urban and rural areas.¹

Knowledge and technology transfer from developed to developing countries is a necessary part of ensuring access to technology, since many technologies are initially developed in industrialized countries. However, the conventional view that technology is developed in the North and simply transferred to the South is misleading. Technology transfer involves more than the importation of hardware: it involves the complex process of sharing knowledge and adapting technologies to meet local conditions. The science, technology and innovation (STI) performance of a country, as well as the economic and social impact of STI, are affected by the quality and level of interactions and flows of knowledge between agents in the innovation system—such as firms, universities, research centres, public agencies and intermediate organizations. These interactions are enabled by infrastructure, market forces and public policies. The systemic nature of the innovation process underlines the need to incorporate scientific and technological knowledge into national development strategies and plans in order to make effective use of innovation.

The Addis Agenda thus speaks both to building domestic capacities for innovation and to the role of international cooperation and support. Building an innovative economy is based on a range of actions—including interactive learning, information exchange, timely availability of finance and other resources, and effective collaboration among the private sector, universities, research centres, policymakers and other actors—as well as improved governance. Countries should work to develop national strategies for STI comprising policy, regulatory and institutional frameworks that strengthen the enabling environment and enhance interactive learning, while also strategically allocating resources and providing adequate infrastructure.

In response to the subdued and somewhat procyclical nature of public spending for research and development (R&D) in some countries, Governments should introduce policies to ensure that government spending on R&D remains stable and long-term oriented. At the same time, they should use a variety of tools to incentivize greater private investment. Some progress has been made on the Addis Agenda commitment to consider setting up innovation funds where appropriate. More efforts in this area are encouraged at the subnational, national, regional and global levels.

At the international level, United Nations Member States committed to supporting the efforts of developing countries to strengthen their scientific, technological and innovative capacity. Official development assistance (ODA) for research and development to African countries, least developed countries (LDCs) and landlocked developing countries (LLDCs) has increased modestly since the financial crisis. There is also scope to strengthen and leverage South-South cooperation in promoting STI development. In 2016, the United Nations held the first Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals as one element of the Technology Facilitation Mechanism and established the Technology Bank for LDCs. For the Technology Bank, it will be critical to establish the financial base as soon as possible to ensure that all LDCs can benefit from the new institution.

Capacity-building is an integral part of the global partnership for sustainable development. The data on international funds for financial and technical assistance to African countries, LDCs, LLDCs and small island developing States (SIDS) indicates a recent decline in disbursements for capacity-building to all four country groups. ODA providers should aim to step up their contributions for capacity-building in the context of fulfilling their overall commitments. Efforts at peer learning should also be increased.

2. National and international trends in science, technology and innovation

Science, technology and innovation play a central role in the implementation of the 2030 Agenda for Sustainable Development across all Sustainable Development Goals (SDGs). For example, ICT can be used to map the needs of the poor in support of development initiatives to eradicate poverty, or to ensure last-mile delivery of food, drugs and other disaster relief. There is, however, concern that the benefits of technology may not be available to all. Ensuring that STI is inclusive and beneficial to all will depend on sound policy and regulatory frameworks, the strategic allocation of resources, adequate infrastructure, and international cooperation and support for those most in need.

Innovation is at the basis of technological development. However, innovation is not limited to new breakthroughs: most innovation involves incremental improvements and adaptations of existing technologies, processes and organizational structures. China and India, in particular, have become global leaders in some sustainable technologies, such as solar and wind technology, and electric and hybrid-electric vehicles, in part because they were able to improve existing technologies and production processes. Some LDCs have also begun to develop domestic technological capacities and successfully build new industries, such as the solar photovoltaic industry in Bangladesh.

An example of a technology that is rapidly evolving is Blockchain, which records information and shares it via a peer-to-peer network using state-of-the-art cryptography. This technology makes transactions possible without an intermediary and thus has the potential to reduce service costs and increase financial inclusion. However, it is important to note that blockchain services are still in early stages and a number of issues, including data and privacy protection, regulatory oversight, and the overall contribution to sustainable development need further discussion, especially at the international level due to their cross-border nature.

2.1 Global expenditure for research and development

Since 2000, total (public and private) spending on R&D as a proportion of GDP has grown in all country categories, although the global distribution of spending remains uneven, with five economies accounting for 59 per cent of global public R&D spending in 2014 and 25 economies accounting for 90 per cent.2

The 2008 world financial and economic crisis in 2008 did not have a significant immediate impact on global spending for R&D. Global spending on R&D as a percentage of gross domestic product

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GDP increased from 1.56 per cent in 2007 to 1.64 per cent in 2009, partly because R&D spending was included in stimulus packages by some countries. However, from 2010 to 2015, public spending on R&D in many developed countries as well as some emerging economies contracted. Growth rates in total R&D expenditure were largely supported by private investment. In contrast, in developing countries, public spending on R&D continued to increase. As a result, LDCs, LLDCs, SIDS and middle-income countries witnessed an incremental increase in their total spending on R&D (figure 1). Nonetheless, other than middle-income countries, the growth in spending was still below growth in developed countries, meaning that the gap between developed and most developing countries continued to grow.

The decline in public spending on R&D in developed countries following the global economic and financial crisis has led to fears of fluctuations and procyclical behaviour in investment, with R&D declining during periods of economic slowdowns. Based on these developments, one recommendation is for Governments to introduce policies to ensure that government spending on R&D remains stable and long-term oriented, in contrast to the R&D expenditure incurred as part of short-term stimulus packages directly after the financial crisis.

2.2 Facilitating the innovation process through National Innovation Strategies

Both public and private actors contribute to the innovation process, which is generally composed of four interdependent phases: research, development, demonstration and diffusion. In addition, market formation can be added for new markets, such as for some clean technologies that do not automatically develop after the diffusion stage. The government is often the main actor in basic research, through funding for universities or public research laboratories. Development and demonstration, which are based on entrepreneurial experimentation, generally take place within firms. However, financing for these advanced stages of product development is gener-

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Box 1: Social innovation

In addition to technological, process and structural innovation, United Nations Member States agreed in the Addis Ababa Action Agenda to promote social innovation that supports societal well-being and sustainable livelihoods. In the absence of both an agreed definition of social innovation and indicators to measure how social innovation contributes to social well-being and sustainable livelihoods, case studies can illustrate some recent developments of innovations aimed at improving human well-being. These approaches have the potential to address the needs, interests and perspectives of poorer, marginalized communities, and serve non-market and environmental goals, which can be relevant for countries with low levels of innovation capabilities to realize the Sustainable Development Goals.

For instance, in response to the Ebola outbreak in 2014, the United States Agency for International Development (USAID) collected more than 1500 ideas for combating the disease. The Agency then identified 14 of these ideas for their potential effectiveness and some are already being implemented. Other examples of pro-poor and inclusive innovation include the Mectizan low-cost refrigerator created in India that can be easily and inexpensively built (at about $30 to $50), and collaborative initiatives, such as the Unilever Shakti initiative, aimed at strengthening women’s empowerment and capacity-building in poor communities. Several countries and international organizations are also implementing social innovations, such as organic farming by smallholder farmers (Thailand) and women’s information and communications technology-enabled entrepreneurship (UN Women).8

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8 United Nations Commission on Science and Technology for Development.
ally limited, particularly in the so-called valley of death, during which the investment risk is still high but government financing often limited. Funding for this stage often comes from entrepreneurs’ own savings or from family members. Venture capitalists tend to fund projects that have already been demonstrated in the marketplace, although they have been hesitant to take risks associated with some investments in some new technologies, especially in developing countries. Thus, the development phase of many new technologies—and particularly sustainable technologies—often needs to be supplemented by government policies.

At the national level, the impact of STI on sustainable development is closely linked to the quality of policy frameworks, innovation strategies and supporting infrastructure, ranging from roads to Internet access. Spending on R&D needs to be linked to policies that create an enabling environment for innovation and support entrepreneurship to ensure that innovations can be deployed for sustainable development. Policies should be designed in an integrated manner as part of the innovation system, to encourage interaction and knowledge-sharing among domestic and international firms, research institutes, universities, policymakers and other actors. Furthermore, STI policies should be coherent with other development policies—trade, foreign direct investment (FDI), and education, for example. For developing countries, initiatives to enhance absorption capacity and facilitate the diffusion of innovation deserve special attention.

Countries have a variety of options for providing incentives for the promotion of STI. They can utilize the tax system or other incentives to nudge the private sector to invest in STI. National innovation funds are one instrument identified in the Addis Agenda that countries can use to allocate resources for R&D.

2.3 Innovation funds

In the Addis Agenda, Governments committed to “consider setting up innovation funds where appropriate, on an open, competitive basis to support innovative enterprises, particularly during research, development and demonstration phases”.7 As noted in the Agenda, such funds create diversified portfolios, which spread risk across multiple investments,

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so that gains from winning investments compensate for losses from failures.

Innovation funds have been established to support innovative enterprises or public institutions, particularly during research, development and demonstration phases, as defined by national strategies. In combination with the distribution of funds to STI activities, public and/or closed-end innovation funds can also act countercyclically, providing resources for STI during economic slowdowns. Innovation funds can also stimulate competition among potential fund beneficiaries. Furthermore, they can foster collaboration by linking STI actors and stakeholders across different sectors. Different types of innovation funds would allocate resources differently, with some sectors needing financing for basic research, while others might have a greater need for financing during later phases, such as development or demonstration. Innovation funds should also be inclusive and support diverse sources of knowledge.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) Science Report from 2015\(^8\) provides a baseline snapshot of more than 35 innovation funds globally. The list includes 6 innovation funds from developed countries and more than 29 funds from developing countries, including some LDCs and LLDCs. Some of the funds were set up as early as the 1990s, but most were established in the last ten years. Total financial resources reported for these funds are several hundred million dollars. Most funds are endowed with domestic public resources. In some cases, this includes earmarked revenues, such as taxes on the profits of mining or energy companies. Some funds also utilize private investment; although, to date, co-mingled investment by public and for-profit private actors has been limited.

Existing national innovation funds support activities across various sectors and different stages of the innovation process, with a concentration in general science and technology as well as sectors such as clean energy and health. Several innovation funds in developing countries also focus on agriculture.

While most funds concentrate on the provision of financial resources, some also offer technical advice.

In addition to national funds, there are international innovation funds. The Global Innovation Fund (GIF), for example, was established by the Governments of Australia, Sweden, the United Kingdom of Great Britain and Northern Ireland, and the United States of America, in partnership with Omidyar Network. The GIF invests in a range of innovations in developing countries, which have potential for social impact on a large scale, with innovation broadly defined to include new business models, policy practices, technologies, behavioural insights, or ways of delivering products and services that benefit the poor.

### 2.4 International cooperation for STI

In addition to national efforts, international cooperation plays an important part in strengthening science, technology and innovation. ODA for R&D in areas such as education, medical, energy, agriculture, forestry, fishery, technology and environmental, as well as research and scientific institutions, peaked in 2006 as a result of a strong increase in one-time contributions from some bilateral donors in certain sectors. A low point was reached during the financial crisis (figure 2). Since then, only a modest increase was observed in LDCs and LLDCs, although ODA to African countries recovered to some extent. The share going to SIDS remained relatively low.

The Development Cooperation Forum (DCF) has underscored how development cooperation modalities and instruments—such as technical and financial support, capacity-building, and policy change support—if carefully deployed, country-owned, and delivered through effective channels can facilitate innovation to achieve the 2030 Agenda for Sustainable Development. To deliver on such a challenging promise, development cooperation providers and recipients will have to share a common understanding of what constitutes successful technology innovation at different stages of the technology cycle. Furthermore, donors need to provide long-term capacity-building and bring together resources, actors and actions that respond

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...to development needs and the specific social, economic, political and institutional contexts. Such a careful approach, supported by dedicated analysis and policy dialogue at the global level, can help propel technology innovation and ensure that STI supports national and global development priorities, including the 2030 Agenda for Sustainable Development.

Regarding R&D for vaccines and medicines, at the end of 2015, the Global Alliance for Vaccines and Immunizations (GAVI) initiative had secured full funding for its 2011-2015 strategic period, with cumulative funds totalling $12 billion since its inception in 2000. As a result, GAVI exceeded its goal to immunize an additional 243 million children between 2011 and 2015. GAVI is funded through a mix of contributions from Governments and philanthropy, as well as by innovative finance mechanisms such as the International Finance Facility for Immunisation (IFFIm), which frontloads aid payments.

South-South cooperation on STI could potentially make an important contribution by providing access to complementary knowledge, offering context-specific solutions and overall STI capacity-building. However, the limited available data suggests that, as of now, technology-driven FDI among developing countries is still relatively small. Furthermore, South-South technology-driven FDI is dominated by flows from a few countries and with a heavy focus on ICT (47 per cent of total South-South technology-driven FDI) and design, development and testing (DDT) (36 per cent). Pure R&D investments only account for about 10 per cent. While countries in Asia—where the technology-driven FDI growth rate is 1 per cent—continue to receive the highest total amount, inward South-South technology-driven FDI growth is higher in Africa.


For certain vaccination programmes to be effective in serving public-health goals, such as containing the spread of contagious diseases, it is important that a certain level of coverage will be quickly reached. Thus, the International Finance Facility for Immunisation restructures existing financing by issuing bonds backed by long-term official development assistance pledges from donor countries with the objective of generating upfront financing.
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(15 per cent) and Latin America and the Caribbean (14 per cent). Outward technology-driven FDI is growing, especially from Africa (20 per cent, particularly from Mauritius and South Africa) and Latin America and the Caribbean (14 per cent, particularly from Argentina, Brazil and Mexico), although from a low base. It is important to note that the growth is caused predominantly by flows going to countries in the same region.\footnote{WIPO (2016). *The Global Innovation Index 2016: Winning with Global Innovation.* Available from http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016.pdf.}

3. **Actions by the United Nations system**

Progress was made on a range of actions by the United Nations system in order to strengthen overall cooperation and support on science, technology and innovation.

3.1 **Establishment of the Technology Bank**


The main objective of the Technology Bank, as set out in its charter, is to support LDCs in building the STI capacities required for the transformation of their economies, eradication of poverty and fostering sustainable development. The Technology Bank will (i) strengthen the capacity to identify, absorb, develop, integrate and scale up the deployment of technologies and innovations, including indigenous ones, as well as the capacity to address and manage intellectual property rights (IPRs) issues; (ii) promote the development and implementation of national and regional STI strategies; (iii) strengthen partnerships among STI-related public entities and with the private sector; (iv) promote cooperation among all stakeholders involved in STI, including researchers, research institutions, public entities within and between LDCs, as well as with their counterparts in other countries; (v) promote and facilitate the identification, utilization and access of appropriate technologies by LDCs, as well as their transfer to the LDCs, while respecting IPRs and fostering the national and regional capacity of LDCs for the effective utilization of technology to bring about transformative change.

As operational units, the bank will comprise a Science, Technology and Innovation Supporting and Enabling Mechanism (STIM) and an Intellectual Property (IP) Bank. The STIM is expected to strengthen STI capacities of LDC Governments and other stakeholders. This would be achieved through the promotion of national and regional innovation ecosystems that can attract outside technology, stimulate domestic research and innovation, and help resulting products reach the market stage. The IP Bank is intended to support LDCs in building domestic and regional capacities in the areas of IPRs and technology-related regulations. Furthermore, the IP Bank is set up to facilitate technology transfer on voluntary and mutually agreed terms and conditions and, as part of the process, help accelerate LDC beneficial integration into the global IP system and technology markets. Thus, the IP Bank will act as a conduit between IP holders and relevant actors in the LDCs to facilitate access and use of appropriate IPRs covering desired technologies. Finally, the IP Bank will also help LDC stakeholders identify,
access and use appropriate technologies no longer covered by IPRs protections.

The Technology Bank will be financed by voluntary contributions from Member States and other stakeholders, including the private sector and foundations, to a dedicated trust. It is estimated that the Technology Bank will require an annual budget of $35 million to $40 million to have an impact in all LDCs. Therefore, during the initial phase of the Technology Bank, it will be critical to establish the financial base of the new institution.

3.2 The Technology Facilitation Mechanism

The Technology Facilitation Mechanism (TFM) consists of a United Nations Inter-agency Task Team on Science, Technology and Innovation for the Sustainable Development Goals (IATT-STI), a collaborative Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals (STI Forum) convened by the President of the United Nations Economic and Social Council (ECOSOC), and an online platform to serve as an information gateway to STI initiatives within and beyond the United Nations.

The IATT-STI was established in September 2015 under the chairmanship of the United Nations Department of Economic and Social Affairs and the United Nations Environment Programme. Its membership comprises 31 organizations of the United Nations system. In January 2016, the Secretary-General appointed a 10-Member Group to Support the Technology Facilitation Mechanism (10-MG), which consists of ten high-level representatives of academia, civil society and the private sector, to support the IATT-STI and the President of ECOSOC on the STI Forum.

The first STI Forum was convened on 6-7 June 2016. It was attended by more than 600 participants representing 81 Governments and more than 350 scientists, innovators, technology specialists, entrepreneurs and civil society representatives. Participants discussed the mobilization of science, technology and innovation for the SDGs; options for strengthening science, technology and innovation capacity; literacy; policy coherence; and the role of international cooperation in strengthening science, technology and innovation, in addition to other issues. Going forward, the STI Forum should continue to strengthen the dialogue between Governments and all stakeholders to facilitate the exchange of ideas and building of new partnerships.

The TFM online platform will establish a comprehensive mapping of and gateway to information on existing STI initiatives, mechanisms and programs at the United Nations and beyond. Second, it will provide access to information and experiences, including best practices and lessons learned, related to STI facilitation initiatives and policies. Third, it will support the global dissemination of relevant open-access scientific publications. In response to the mandate from the 2030 Agenda for Sustainable Development, an independent technical assessment for the development of the online platform is underway and scheduled to be presented at the 2017 STI Forum (15-16 May 2017). The IATT-STI and the 10-MG have initiated consultations and developed terms of reference for the independent technical assessment. It will include sections on (i) architecture, functional requirements and user groups; (ii) stocktaking, benchmarking, best practices, and lessons learned from existing relevant online platforms, within and beyond the United Nations system; (iii) recommendations on management and governance structure and regular quality control of the platform; and (iv) an assessment of the benefits and potential financial costs. The online platform will also include a preliminary collection of existing technology applications and initiatives that address sustainable development challenges.

4. Capacity-building

Support to capacity-building is an integral part of the global partnership for sustainable development. The Organization for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC) data on international funds for financial and technical assistance to African countries, LDCs, LLDCs and SIDS (SDG Indicator 17.9.1) show that

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after a substantial increase between 2005 and 2010, disbursements to all four country groups declined again between 2010 and 2014 (figure 3). While the OECD DAC statistics may underreport the amount for technical assistance because they do not include the value of donor expertise provided as part of projects, the decline in disbursements is still a concerning trend.

Capacity-building and peer learning are important components of South-South cooperation, although it is not possible to measure detailed financial and technical contributions. Several organizations of the United Nations system have served as brokers for initiatives to support South-South cooperation that are designed to build human and institutional capacities for the implementation of national plans and strategies in developing countries.

Measures to strengthen the effectiveness of capacity-building are ongoing. For example, a joint initiative by the United Nations, International Monetary Fund, World Bank Group and OECD presented a report to the Group of Twenty on how to enhance the effectiveness of external support in building tax capacity in developing countries. The initiative aims to better coordinate capacity-building support to developing countries, deliver joint outputs and strengthen the interactions between standard-setting, capacity-building and technical cooperation. However, more needs to be done by both providers of international support and recipient countries. Capacity-building can also be supply-driven or, in some cases, influence national policies, resulting in country ownership being undermined by donor priorities. From the recipient perspective, it is often a lack of capacity itself that can make it difficult to take ownership in the relationship with international donors.

As a follow-up to the commitments in the Addis Agenda, several multi-stakeholder partnerships were launched to support capacity-building in the context of financing sustainable development. One example is the Addis Tax Initiative (ATI), which

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**Figure 3**

*Financial and technical assistance commitments, selected years, 2000 – 2014 (Billions of constant 2014 United States dollars)*

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is supported by more than 45 countries along with regional and international organizations that committed to double their support for capacity-building by 2020. To support the achievement of its commitments, the ATI will hold its first conference on tax and development in June 2017. The Initiative Tropical Agriculture Platform, facilitated by the Food and Agricultural Organization, developed and approved a framework on capacity development for agricultural innovation systems.