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Special High Level Event on Transforming Science,
Technology and Innovation in the Least Developed Countries:
Technology Bank and STI Supporting Mechanism

Geneva, 3 July 2013

# A Technology Bank and Science, Technology and Innovation Supporting Mechanism for the Least Developed Countries

*Informal Background Note*

The Office of the High Representative for Least developed Countries, Landlocked Developing Countries and Small Island Developing States
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**CONTENTS**

## 1. CONTEXT

In the Istanbul Declaration adopted at the Fourth UN Conference on LDCs in 2011, the member States of the UN undertook "to promote access of least developed countries to knowledge, information, technology and know-how and to support the least developed countries in improving their scientific and innovative capacity needed for their structural transformation; agree to undertake a joint gap and capacity analysis with the aim of establishing a Technology Bank and a science, technology and innovation-supporting mechanism dedicated to the least developed countries building on existing international initiatives; and welcome the generous offer of the Government of Turkey to host an International Science, Technology and Innovation Centre and encourage commitments in this regard."[1]

The Istanbul Programme of Action for the LDCs (IPoA), adopted by the same conference, recognizes that all LDCs are lagging behind in these critical areas which are key drivers for transformation and have great potentials to change the development landscape of least developed countries if developed and harnessed properly. These countries have often not been able to move beyond outdated technologies that characterize their production processes and outputs. The Programme of Action also emphasized the need for the LDCs to acquire new technologies and build domestic capacity and a knowledge base to be able to fully utilize acquired technologies and promoting indigenous capacity on a sustainable basis.

To that end, the IPoA committed the LDCs and their development partners to jointly undertake on a priority basis "a joint gap and capacity analysis with the aim of establishing a Technology Bank and Science, Technology and Information (STI) supporting mechanism, dedicated to least developed countries which would help improve least developed countries' scientific research and innovation base, promote networking among researchers and research institutions, help least developed countries access and utilize critical technologies, and draw together bilateral initiatives and support by multilateral institutions and the private sector, building on the existing international initiatives."[2]

Pursuant to the above, the United Nations General Assembly, in its resolution A/67/220 of 21 December 2012, requested the UN Secretary-General to take the steps necessary to undertake a joint gap and capacity analysis on a priority basis by 2013 with the aim of establishing a technology bank and science, technology and innovation supporting mechanism dedicated to the least developed countries, building on existing international initiatives."[3] The Economic and Social Council (ECOSOC), in its resolution 2012/26 reaffirmed the mandate of the IPoA in this regard.

The Office of the High Representative for Least developed Countries, Landlocked Developing Countries and Small Island Developing States (OHRLLS) organized a task force, comprising relevant UN system organizations and Turkey as the host country, to follow up on the above mandate. It also launched a substantive study, which will contribute to the report of the Secretary-General to the General Assembly as envisaged in resolution A/67/220. This paper presents, on a preliminary basis, the main aspects of this on-going study.

[1] http://www.unohrlls.org/UserFiles/File/political%20declaration.pdf
[2] http://www.unohrlls.org/UserFiles/File/IPoA.pdf
[3] http://unohrlls.org/docs/ga/A.67.220.EN.pdf

As noted later in this paper, the Technology Bank is conceived as comprising a Patents Bank, an STI Supporting Mechanism and a Research Depository Mechanism, thus responding to the main elements of the Istanbul Declaration and the IPoA in this regard.

## 2. LDCs' STI CAPACITY GAP

The IPoA established "…the aim of enabling half the least developed countries to meet the criteria for graduation by 2020."[4] Achievement of this ambitious goal would require structural transformation including through technological leapfrogging by LDCs. However, building endogenous science and technology capacities of a high standard takes many years;[5] so the compressed graduation timeline of the IPoA suggests an even steeper learning curve, if science and technology (S&T) is to fulfil its potential of equipping LDCs to develop their economic base on a firm footing and better compete in the wider global economy.

No country has been able to embark on rapid economic growth without technological change. It might take many decades for the LDCs to overcome their structural constraints unless they are able to substantially strengthen their STI base and capacity. Thus, technological transforation holds the key to the accelerated growth and development of these countries and, in the process, their graduation from the LDCs group. Thus, the design and purpose of the Technology Bank must be structured to best help in meeting this formidable challenge of LDCs' technological leapfrogging.[6]

The state of science, technology and innovation in LDCs remains poor. Research and development expenditure as a percentage of GDP stood nearly at nil in 2011 in the majority of these counties. There have been growing disparities between the LDCs and the rest of the world in the capacity to generate and apply scientific and technological knowledge. While the OECD on average spent 2.3 per cent of GDP in research and development (R&D), the amount dedicated to R&D in the LDCs where data is available was negligible.[7] Limited resources, including a narrow base of science-literate citizens, contributed to scant scientific knowledge generation, diffusion and application in LDCs. Similarly, limited endogenous R&D capabilities make purchase of technology from abroad one of the most important channels of acquisition of new technologies for LDCs.

In contrast, a number of fast-growing developing economies has in recent years made substantial investments in S&T and related R&D. They have seen their macro-economic development rise accordingly. In so doing, they also have challenged the global S&T/R&D triad of Japan, North America, and Western Europe. The UNESCO Science Report 2010 noted the dramatic increase of S&T investments by leading developing-world nations, and their positive impact on global economic growth, but sounded a cautionary note, "By contrast, the group of least developed countries…still plays a marginal role."[8]

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[4] UN LDC-IV, A/CONF.219/3/Rev.1, paragraph 28, (distributed 23 May 2011)

[5] The late Argentine physicist Jorge Sabato's observed that it takes about 15 years to build a world-class research institute capable of generating its own scientific breakthroughs. Cited by the Global Knowledge Initiative; see, www.globalknowledgeinitiative.org/about-us/index.html

[6] Report of the Secretary-General, "Options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies" (A/67/348).

[7] For instance, Burkina Faso spent 0.20% of GDP in R&D in 2009; Ethiopia, 0.24% in 2010; Gambia, 0.016% in 2009; Lesotho, 0.029% in 2009, Madagascar, 0.14% in 2009 and Uganda: 0.41% in 2009.

[8] "UN Science Report 2010: *The Current Status of Science around the World*," p. 5. UNESCO reviews the state of global science every five years.

Perhaps an illustrative way to depict the situation of science, technology and innovation in LDCs is to look at the number of scientific and technical journal articles published by these countries. Using data from the Institute for Scientific Information's Science Citation Index (SCI) and Social Sciences Citation Index (SSCI), all LDCs combined published 1398 scientific and technical journal articles in 2009, up from 874 in 2001. This meager intellectual production contrasts starkly with what is happening in other countries[9]. Today, some 20 per cent of all science articles published in peer-reviewed international journals is authored by developing-world researchers. That said, this encouraging statistics disguises the lopsided influence of five countries (Brazil, China, India, Mexico, and Turkey) whose scholars contribute over half of the South's science publications.

The total number of published scientific and technical journals articles published in the world was 788,333 in 2009, of which LDCs' contributions were 0.0018 per cent. The LDCs, with around 12 per cent of the world population, produced an almost imperceptible share of scientific and technical articles while the United States, with roughly 4.5 per cent of the world population, produced 26.5 per cent of all scientific and technical papers. Additionally, it seems that differences are becoming more accentuated as the number of articles published seems to be growing faster in other developing countries than in the LDCs.

The number of patents filled by residents of LDCs in their own countries and abroad provides another dismal scenario. Residents in LDCs filled 176 applications in LDCs and abroad in 2011, down from 293 in 2001. The average applications filed for the period 2001-2011 were 302. This is quite meager compared to other countries. For instance, in 2011, Romania filled 1597, Kazakhstan 1821, Belarus 2368 or India 15717, Turkey 5265, Mexico 1863 or Malaysia 1927.

It is important to note that there are many technology transfer provisions in international agreements, conventions and protocols. However, the existing arrangements and mechanisms for technology transfer have not been able to meaningfully benefit the LDCs in building their technological base. Various studies suggest that the existing mechanisms for technology transfer are fragmented and often ad hoc in terms of objective, content and country coverage. There is no global framework or agreement or the mechanism that is comprehensive and all-encompassing for science and technological capacity building in LDCs. These constraints have been alluded to in the subsequent discussions.

Substantial investments of time, effort, and money are required to build the capacity of indigenous S&T and innovation and integrate them into the productive activities to drive greater and more rapid economic growth. As noted above, building a research institution of international standard requires longer term investments stretching over a decade and a half or more. Over that period, considerable effort must go into attracting top-quality human resources, building cutting edge facilities, procuring essential equipment, developing relationships with universities, firms, and markets globally, and securing on-line connectivity to ensure that researchers can readily interact with their peers globally and access current, on-line publications.[10] This developmental model, of course, assumes institutional capacity and funding commensurate to such an ambitious goal.

[9] For instance, Argentina published 3655, India 19917, United States 208600 and Canada 29016 in 2009.
[10] As observed by the Global Knowledge Initiative (GKI)

The chronic underdevelopment of research and development systems in LDCs makes adaptation and absorption of existing technologies necessary, especially in the early stages of industrial upgrading. In fact, many newly industrialized countries started adapting technologies from abroad to their own nascent industrial base before being able to generate their own scientific and technical knowledge. Absorptive capacities require a certain degree of internal technological expertise to be able to assimilate external knowledge and integrate it in a local context.

Imports and foreign direct investment are among the major channels of technology transmission. The structural constraints on LDC's balance of payments, and thus their severely restricted ability to import, have had a dampening impact of technology transfer. Their marginalization in global FDI flows further reinforces the lack of technology transmission. Furthermore, their limited capacity to integrate foreign technology to their particular circumstances reduces their ability to realize the full potentials of such technology. Strengthening innovation capacities to foster adaptation and absorption of foreign technology can greatly accelerate the development of their productive capacities through technological adaptation and absorption, in addition to fostering endogenous R&D. This is the crux of the problem in the LDCs.

The underlying premise of a Technology Bank is that these are complementary facets of the same S&T ecosystem. As such, they should work in tandem and mutually reinforce one another. In addition, they require high-bandwidth Internet connectivity, both to advance research and to enable LDC researchers to participate in the worldwide scientific collaboration that characterizes STI today. Concomitantly, STI in this context presupposes that its LDC practitioners will seek to harness S&T to solve practical, real-world problems confronting their societies and economies today. Where this might involve the application of patented science or technology, LDC practitioners need an efficient gateway to access relevant intellectual property (IP) on affordable or concessionary terms, with credible policies and mechanisms to implement IP thus transferred. Likewise, when LDC rights holders [11] generate new or added value of their own, they should have means and advice on how to get due benefit from such IP.

At the most fundamental level, this implies "applied science." Moreover, a supporting mechanism should help commercialize S&T where LDC research develops new science or adds value to existing technologies. This is not to suggest that basic science is not a worthy goal in and of itself; but most LDC economies simply cannot afford science if they cannot apply it. Nor are LDC researchers likely to win vital and much-needed support from their national policymakers if they cannot demonstrate that their research justifies the budgetary commitments necessary to construct competitive educational and research systems. Building science, technology, engineering and math (STEM) capacities for practical use requires deep and long-term investments at both secondary and tertiary levels.

As an adjunct to applied science, a supporting mechanism must offer fundamental training in entrepreneurship and marketing, since most technical researchers cannot be expected to innately display parallel business skills. Moreover, given the inherently weak bargaining

[11] Rights holders are individuals or groups who hold patents, copyrights, trademarks, or geographic indicators. Under the WTO, the latter category has emerged as protected IP. Currently, Ethiopian coffee growers are seeking a "geographic indication" for their highly regarded coffee beans so that they can recapture the price premium currently claimed by foreign coffee brokers. Other LDCs, such as Rwanda, are employing scientific research to raise the bar for their already top-quality coffee beans.

position of LDC practitioners and the under-developed economies in which they operate, a supporting mechanism should provide direct marketing and patent assistance when engaging advanced and more-developed economies. Finally, an STI supporting mechanism should seek investment capital and donor funding to help take the most promising LDC-generated S&T/R&D to market.

## 3. OUTLOOK FOR AN STI MECHANISM FOR LDCs

While the creation of a Technology Bank to serve LDCs may appear a daunting task, key advances over the past decade enable and facilitate what was, until recently, an unimaginable undertaking. Some of these developments are:

- a successful public-private-partnership (PPP) – namely Research4Life -- that has already embedded a robust and comprehensive technology bank among four UN specialized agencies, and could be expeditiously expanded across the wider family of multilateral development and technical organizations;
- the laying of undersea fibre-optic cables around Africa, to the Americas, and to South Asia and Southeast Asia, affording these still underserved regions access to global S&T collaboration that world-class scientists previously could only obtain by moving abroad;[12]
- multilateral agencies and civil society helping LDCs overcome traditional IP barriers, and demonstrating how intellectual property rights (IPR) regime can be used to their advantage;
- contemporary global initiatives, including health, food security and agriculture, water, climate change, sustainable energy, and gender, which offer multiple intersecting points of synergy for an STI mechanism dedicated to LDCs;
- bilateral and international donor agencies and global funds putting greater emphasis on STI as a generator of macro-economic growth and local problem solving;
- the emergence of South-South and Triangular cooperation, enabling LDCs to learn from more advanced emerging markets that have already recognized the nexus of S&T, structural transformation and global trade;
- expanded geographical interest from global investors to span "frontier emerging markets," which increasingly encompass LDCs; and,
- recently established worldwide NGOs, which are focusing on STI as a generator of economic growth in the developing world, and could prove vital partners to a STI mechanism for LDCs.

Notwithstanding the implications of recent economic crises for development cooperation in general, these conducive developments should contribute to a positive outlook for an STI mechanism for LDCs.

[12] Many scientific luminaries of the South have worked in the North and continue to do so because, as. Prof. Abdus Salam, the late Pakistani Nobel Laureate (Physics), told an interviewer, they seldom find scientists in their home countries with whom they could collaborate. The LDC scientific diaspora is discussed later in this study.

## 4. A TECHNOLOGY BANK FOR LDCs

Technological leapfrogging of LDCs warrants speedy bridging of their technology gaps through (a) the development of endogenous science, technology and innovation knowledge base and capacity and (b) transfer of appropriate technologies. This, in turn, requires that simultaneous attention is paid to three interrelated goals: first, facilitating technology transfer; second, promoting robust endogenous STI capacity building; and third, strong global support and an appropriate institutional mechanism.

Developing endogenous STI capacity includes two main elements: building effective national science, technology and innovation policies and institutions, and substantially broadening access of LDCs' science and technology communities to related research conducted worldwide. To be effective, a technology facilitation mechanism should address these issues in a practical, flexible and collaborative manner involving all relevant stakeholders (box-1).

**Box-1: Success factors for a technology facilitation mechanism for LDCs**

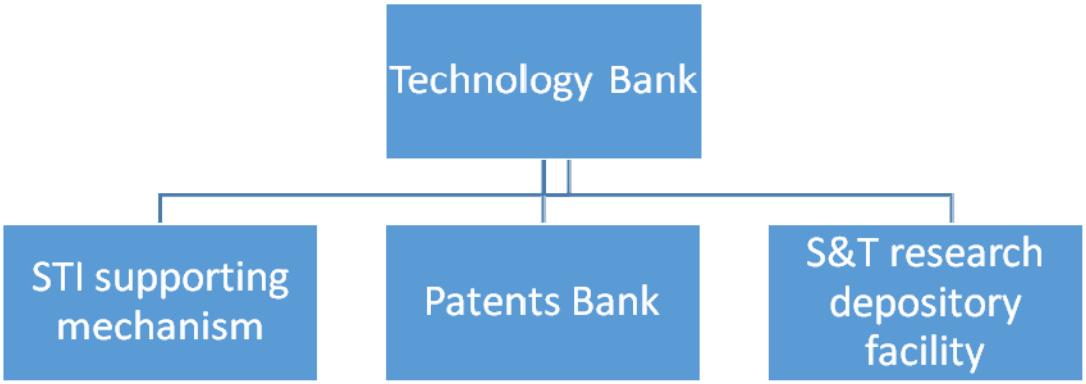
In a recent report of the Secretary-General, a number of success factors for a technology facilitation mechanism were outlined based on lessons learned so far. Of these, the following are considered particularly relevant for the Technology Bank for LDCs:

- Address LDCs' technology gaps throughout the full technology cycle, from research to development, demonstration, market formation and diffusion;
- Foster a truly global, cooperative undertaking in support of LDCs that engages all interested governments and major groups, including the private sector and the academia;
- Greatly improve technology transfer to LDCs, both North- South and South-South;
- Pragmatically address intellectual property rights with a balanced approach towards safeguarding the interests of LDCs and the technology holders including by exploring innovative approaches;
- Ensure LDCs' participation in international networks of collaboration in research, development and demonstration;
- Build partnerships to better coordinate and support implementation of technology-related international commitments, agreements and conventions in favour of LDCs;
- Be practical and flexible in order to quickly adjust to new challenges and opportunities.

Source: Based on report of the Secretary-General, "Options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies" (A/67/348).

A Technology Bank dedicated to LDCs can advance the goals of endogenous STI capacity building and technology transfer in an integrated manner through (i) a Patents Bank, (ii) an S&T Depository Facility and (c) an STI Supporting Mechanism (see chart 1). A blueprint of specific arrangements is not attempted here, which will require wide-ranging consultations with key stakeholders including the host country, LDCs and their partner countries, and relevant bodies of the United Nations, as appropriate. Instead, the following paragraphs outline the rationale and broad functions of these components of the Technology Bank.

**Chart-1: Proposed structure of the Technology Bank**




**(a) Patents Bank**

***Key considerations***

Proponents of greater access to exclusive (i.e., patented) intellectual property for LDCs have long advocated some sort of centralized technology consortia or licensing mechanism that could secure relevant IP at negotiated or concessionary rates for onward distribution to LDC institutions and researchers. For example, UNCTAD advanced the idea of a technology licensing bank offering LDC enterprises technology licences at a subsidized cost, while paying fees to external firms at a market rate, with the difference to be borne by the concerned LDC Government, or donors, or jointly by both. (See box-2).

**BOX – 2: Facilitating technology licensing for LDC firms**

UNCTAD has posited an innovative "technology license bank…acting as a licensing pool for technologies" with three broad functions: firstly, offering LDC enterprises technology licenses for use of the technologies in the pool at a subsidized cost to be borne by the LDC Governments or by donor agencies, or by both jointly; secondly, providing a database of technologies and inventions, along with details of supplier firms, their relative merits and licensing costs; and thirdly, acting as a clearing house for the licensed technologies, thereby reducing bargaining asymmetries between firms in developed countries and those in LDCs. Such a technology license bank is especially useful to promote publicly funded innovations/technologies and environmentally sound technologies.

To encourage firms in the industrialized countries to participate in the technology license bank, the license bank would pay them fees at the market rate, in addition to committing to adhere to internationally agreed standards of IPR protection. The participating industrialized countries' could also be further incentivized through the award of a label (similar to "fair

trade labels" or eco-labelling) certifying that the enterprises are "pro-development", which could be used by the firms to gain goodwill from global markets.[13]

The Patents Bank is proposed along the above lines, but would differ from patent pooling in two key respects: first, it would provide licenses not only for patented products, but also for products that are protected through other forms of intellectual property, thereby covering a wide range of sectors and firms; and second, it would not rely on the altruistic motives of firms in industrialized countries. Besides getting fees at the market price, the firms that own the licenses would also gain from the goodwill generated by "pro-development" labelling.

*Source:* pp. UNCTAD, "The Least Developed Countries Report 2010: *Towards a New International Development Architecture for LDCs*", pp. 214-215, http://unctad.org/en/Docs/ldc2010_en.pdf.

In recent discussions, the International Intellectual Property Institute (IIPI) has suggested that individual rights holders might license some intellectual property royalty-free to a mechanism like the Patents Bank – assuming that such IP can be protected and confined to LDC use. In that instance, the Patents Bank might facilitate hands-on technical assistance from the patent holders. Such support is desirable because most patents are difficult to employ effectively without access to the know-how and trade secrets behind them. The IIPI expressed the belief that a significant number of multinational corporations might deposit patented technologies into such a repository, and provide requisite technical assistance, if the licensing agreements would protect them from having that same IP infiltrate the markets from which these companies derive their profits.

Such assistance ultimately could also benefit donor companies themselves – ranging from large corporations to small and medium size enterprises – if the licenses were drafted in such a way as to give the donors the benefit of improvements or derivative innovations when sold in their own existing markets. In such cases, the licenses could provide a royalty to LDC inventors for their improvements that were marketed in these developed-country markets. [14] The Patents Bank could negotiate appropriate terms on behalf of LDC inventors and provide marketing advice and services. The patent bank could also have a mechanism to arbitrate any dispute arising from the licensing arrangements under its auspices.

Such a win-win formula would enable LDC researchers to modify patented technologies in order to address the particular needs of their own societies, where relatively few high-tech multinationals earn substantial profits outside of agricultural commodities and extractive minerals. Currently, even if LDC scientists invent something of global applicability, they generally lack the capacity and resources necessary to patent, manufacture, and market their inventions. Under this collaborative scenario they could do so. Of course, the LDCs would always retain a license to use the improved inventions within their own territories.

The Patents Bank could also solicit so-called "orphan patents," namely IP held by multinational corporations which they no longer commercialize but must still secure, lest it be exploited by competitors. In some countries, corporations can donate such IP to

13 Alternatively, the Patent Bank could work with the Geneva-based International Standards Organization (ISO) to develop a new certifiable standard. Because the ISO only creates international standards, and does not actually certify them, the Patent Bank could perform that function.

14 An UNCTAD study on Bangladesh found that the local firms are not sufficiently specialized to protect their innovations. This is an area where the Technology Bank can provide tangible support. See, UNCTAD, Least Developed Countries Report, 2007 http://unctad.org/en/Docs/ldc2007_en.pdf

universities and secure a modest tax deduction; but all benefit by not having to pay annual filing fees to various national patents authorities and WIPO.[15]

IP scholars disagree by a wide margin on what percentages of patents have the actual potential to be commercialized, but most put the number quite low. Thus, a Patents Bank might have to sift out technologies from a massive database to help identify those that might have an obvious benefit LDCs. In the absence of such a filter, LDC researchers could be overwhelmed by technologies that are at best marginal.

Still, an LDC researcher or institution might find new applications for transferred IP or identify local commercialization opportunities that never materialized when such IP was patented in the developed world. In those instances, the Patents Bank could negotiate with the original patent holder on behalf of the LDC to monetize value thus added.

As the work of the patent bank would start to bear fruit, one also would expect original IP to emerge from within LDC research ranks themselves. WIPO's Access to Research for Development and Innovation (ARDI) programme, launched in 2009, includes innovative and comprehensive training modules for developing-world researchers to commercialize and patent their research. The Patents Bank could also help LDC researchers recognize and patent such IP.[16] At the same time, the IP ramifications of a Patents Bank would need to be reconciled with the ongoing tech-transfer debate within the World Trade Organization, as discussed below.

***LDC Patents Bank and the WTO TRIPS Agreement***

An LDC Patents Bank could help bridge a fundamental gap which the WTO's 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) has failed to address via technology transfers.[17]

TRIPS Article 66.2 was specifically formulated to close S&T gaps with LDCs: "Developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base."[18] Responding to an LDC critique that this formal commitment was routinely ignored, early Doha Round ministerial negotiators in 2001 agreed that the WTO's TRIPS Council would "…put in place a mechanism for ensuring the monitoring and full implementation of the obligations." Thus, in 2003, the Council enacted an annual reporting requirement, with full updates required every three years.

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[15] In one noteworthy example, Dow Chemical calculated that it saved more than $40 million over five years (1996-2001) by donating over 10,000 patents to US universities, rather than continue to pay filing fees to North American, European, and Asian patent offices.

[16] The IIPI, while recently examining articles published in an ASEAN country's science journals, spotted numerous instances where principal investigators (PIs) had failed to appreciate that they had generated patentable research.

[17] "Technology transfer" conveys two very different, widely used, and easily confused meanings. Among Western universities, tech transfer is a catch phrase for applied science, or "lab-to-market" – as with an engineering school's business incubator. In the current context, however, it refers to the transmittal of advanced technical knowledge from developed countries to the developing world.

[18] www.wto.org/english/tratop_e/trips_e/t_agm7_e.htm

WTO developed-country members have complied, typically with a comprehensive, albeit eclectic listing of examples of their tech transfers. Last year (2012) the US Government report numbered 35 pages, while the EU report (covering major European donor governments) totalled 94 pages. Significantly, most reporting members note that their private sectors, not their governments, are the primary drivers of technology transfer. As an EU report observed: "In their efforts to encourage and promote technology transfer, developed country governments are usually limited by two factors: (1) they do not own the vast majority of such technologies; (2) they cannot force the private sector to transfer its technologies. Incentives can therefore only take the form of encouragement, promotion and facilitation of projects which are part of a global and comprehensive approach to development….Finally, it should be borne in mind that no technology transfer programme is specifically dedicated to least developed countries as such."[19]

As these reports to the WTO verify, technology transfers to LDCs do occur through donor assistance agencies; but such efforts are either incidental to specific country and regional projects, or part of a targeted technical objective (clean water, combating AIDS and malaria, eradicating crop pests, etc.). While commendable, such efforts rarely constitute a coherent tech-transfer plan or purpose, nor do they constitute more than a very small proportion of total development assistance.[20]

In large part, the initiative on behalf of an LDC Technology Bank and STI mechanism partly grew out of frustration that the promise of TRIPS 66.2 has never been realized.[21] One would hope, therefore, that technology transfers under the Technology Bank initiative could attract additional ODA.

The Technology Bank for LDCs, especially its Patents Bank arm, needs to find a way to balance the technological needs of LDCs, on the one hand, and legitimate interests of individual IP holders whose IP is transferred through its aegis. This could be done by reconciling TRIPS 66.1 and 66.2. It should be noted that TRIPS Article 66.1 was due to expire on 1 July 2013. [22] In November 2012, LDCs at the WTO proposed an indefinite extension, for as long as "…the Member is considered a least developed country in the WTO."[23] The LDCs' proposal to the WTO was premised on the fact that their countries have been unable to move beyond outdated technologies and that developing a viable technological base remains a long-term process. Following intense consultations, WTO members agreed on 11 June 2013 to extend until 1 July 2021 the deadline for least developed countries to protect intellectual property under the WTO's TRIPS agreement, with a further extension possible when the time comes.[24]

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[19] WTO, IP/C/W/580, 2 November 2012

[20] The percentage of ODA applied to STI is inherently difficult to quantify. But, the UN Least Developed Countries Report 2007 calculated that only 3% went to research and advanced or specialized training during the period 2003-2005. A decade on, this percentage is almost certainly higher, but probably is still quite low. "Least Developed Countries Report 2007: *Knowledge, Technological Learning and Innovation for Development*" (July 2007) http://unctad.org/en/Docs/ldc2007_en.pdf

[21] This debate has carried over to WIPO, as witnessed by the WIPO development agenda (2007) that seeks "To encourage Member States, especially developed countries, to urge their research and scientific institutions to enhance cooperation and exchange with research and development institutions in developing countries, especially LDCs." (Recommendation 26) www.wipo.int/ip-development/en/agenda/

[22] A separate WTO exemption concerning pharmaceuticals expires on 1 January 2016.

[23] WTO, IPC/C/W/583, 5 November 2012

[24] http://www.wto.org/english/news_e/news13_e/trip_05mar13_e.htm

A simple option to reconcile TRIPS 66.1 and 66.2 might be for the Technology Bank to undertake to protect any IP so transferred, working with participating LDCs to establish a corresponding legal framework within their borders.25 Effectively, this would suspend the TRIPS 66.1 blanket exemption for the particular technology transferred under TRIPS 66.2, as long as it passed through the Patents Bank. Thus, in committing to legally protect any IP transferred under the Patents Bank, the LDC participants would not compromise their more generic TRIPS 66.1 privileges. They would only safeguard IP seen to be of genuine and direct value to themselves, without having to establish a comprehensive and costly IP regime for the full panoply of trade-in-services.

A complete IPR system from the start would pose a monumental undertaking for most of LDCs, especially when the full benefits of IPR are so abstract or years in the making for most of their economies. Instead, they could construct a broader legal framework incrementally, growing as the benefits of homegrown IP took hold. At the same time, a Patents Bank could hold a compensatory reserve fund for rights holders should its arbitration mechanism determine that transferred IP was misused.

Participation in a Patents Bank especially from companies with high potentials would need to be encouraged by the development partners. Likewise, while technology transmitted outside the Patents Bank would remain IPR-exempt (TRIPS 66.1), the corollary is that IPR-exempt technology (unless already "open sourced" or in the public domain) would not benefit from the mechanism's tech-transfer support and assistance, nor from the mechanism's commitment to protect such IP.

IPR coverage under the Patents Bank could be facilitated by the "Enhanced Integrated Framework Initiative for trade-related assistance for Least Developed Countries" (EIF), a US$200 million multi-donor trust fund[26] administered by an inter-agency secretariat based at the WTO.[27] The EIF emphasizes country ownership with no pre-conditions. Each participating LDC undergoes a Diagnostic Trade Integration Study (DTIS), from which they and EIF staff draw up an Action Matrix that feeds into their Poverty Reduction Strategy Papers (PRSP) as required by the World Bank, IMF, and most other donors and lenders before full funding requests can be considered.

Currently, around 15 LDCs have concluded from their DTIS reviews that they require assistance in addressing intellectual property issues. They may not be enamoured of IPR, but evidently have concluded that they need to have a modicum of of IPR protection in order to secure the wider global trade integration they seek. Having thus come to this conclusion on their own, these self-selected EIF countries could be invited to join a pilot group for IP-protected tech-transfers under the Patents Bank. Such efforts will need to be reinforced by adequate funding.

[25] This is in line with UNCTAD's suggestion that an LDC technology licensing mechanism could commit "…to adhere to internationally agreed standards of IPR protection." See, UNCTD, Least Developed Countries Report 2010, ibid.

[26] www.enhancedif.org/EN%20web%20pages/EIF%20toolbox/User_guide.htm

[27] Some 22 governments and the EU are donors. Eight multilateral entities currently comprise the EIF partner agencies – the WTO, IMF, World Bank Group, UNDP, UNCTAD, UNIDO, UNOPS, and the International Trade Centre.

**(b) STI Supporting Mechanism**

As the foregoing would suggest, an LDC Technology Bank should be much more than a passive repository of existing knowledge. While the Technology Bank's greatest and unique asset might be a Patents Bank, building a robust endogenous STI capacity in LDCs and mobilizing international support in this regard will necessitate placing an STI supporting mechanism within the Technology Bank. The need for such a mechanism has been made acute by the internationalization of R&D requiring strong local capacity for acquisition and adaptation technologies. Moreover, scientific infrastructure and human capital are considered among key factors in making technology out-licensing decisions.[28]

There is an increasing interest on the part of developed-world academia to help advance STI in the developing world. Moreover, a number of multinational corporations have established philanthropic foundations that focus on the developing world and have a strong S&T component, such as the Syngenta Foundation for Sustainable Agriculture (SFSA)[29] in Switzerland. Many industries and corporations in both developed and emerging developing nations devote considerable resources to R&D, and could be interested in expanding their research to LDCs. As noted previously, many of the world's most pressing problems faced by LDCs lend themselves to scientific intervention (e.g., agriculture, health and pharmaceuticals, sustainable energy or climate-change adaptation and mitigation, etc) and are best studied in these countries. An STI Supporting Mechanism could harness such opportunities in support of building effective STI policies and institutions in LDCs.

With many entities, including multiple UN agencies, already operating in related arenas, the STI Supporting Mechanism should avoid duplicating their efforts. But LDC participation in such efforts appears hit or miss. An STI mechanism could keep abreast of such initiatives, inform itself of relevant LDC technical and capacity needs, and advocate for their inclusion in a more structured manner. Likewise, the STI Supporting Mechanism could leverage donor-government initiatives.

Material shortcomings are endemic to LDC academic institutions, but S&T faculties are at a special disadvantage given prohibitively high equipment and operating costs inherent to their disciplines. To address this, a coordinated approach will be needed to pool financial resources and material support from both traditional donors and emerging contributors, as well as other stakeholders.

Advanced economies are also home to large diaspora from the developing world, including those from LDCs. While developmental economists have largely focused on the considerable consequences of their economic remittances, such expatriates also comprise a de facto diaspora knowledge network.30 Considering that 30-50% of developing-world professionals trained in S&T may live in the developed world,31 the prospect of tapping into that network

[28] In the past many would have argued that research, development and demonstration would be of relatively little importance to poorer economies, but this is less and less the case, in view of the internationalization of research, development and demonstration and the need to bridge large technology gaps through local adaptation. See, Report of the Secretary-General, "Options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies" (A/67/348), op.cit.

[29] www.syngentafoundation.org

[30] UNCTAD, Least Developed Countries Report 2012: *Harnessing Remittances and Diaspora Knowledge to Build Productive Capacities* (November 2012). http://unctad.org/en/PublicationsLibrary/ldc2012_en.pdf

[31] Lowell, Findlay, and Stewart. "Brain strain: Optimizing highly skilled migration from developing countries." Asylum and Migration Working Paper No. 3, 2004, Institute for Public Policy Research, London.

is alluring. This is especially so for those developing-world expatriates holding advanced degrees (e.g., MD and PhD), as these tend to emigrate at a much higher rate than university graduates in general.32

The STI Supporting Mechanism could explore ways to best tap into this diaspora knowledge network, and perhaps pilot a few country programmes accordingly – with the caveat that creating effective diaspora conduits for knowledge transfer is more difficult than popular perceptions might suggest. For example, while a modest programme launched by France and Senegal has had some success, a US-backed Caribbean Idea Marketplace initiative (including Haiti), launched in 2012, seems unlikely to continue beyond its first year.[33] Worldwide, a fundamental stumbling block is the lack of a comprehensive database for STI-qualified expatriates from the developing world.

Nevertheless, the potential payoff from the standpoint of LDCs is so great that some special effort seems warranted. Not only do LDCs produce fewer S&T-qualified professionals than the developing world at large, their Brain Drain is much worse as well. Nearly twice as many professionals emigrate from LDCs (18.4 per cent) as from other developing countries (10 per cent).[34]

Beyond traditional North-South avenues, an STI mechanism should also encourage capacity building through South-South cooperation. For example, the Brazilian health-research institute, FIOCRUZ, is currently helping Mozambique (an LDC) build and operate a modern pharmaceutical factory for retroviral drugs.[35] The STI Supporting Mechanism could play a complementary role to more traditional donor coordination, by informing LDCs of diverse development initiatives that might prove germane to their own situations.

More pragmatically, the STI Supporting Mechanism could add genuine value by running training and mentorship programmes to teach business and entrepreneurship skills to LDC entities (public and private) and to individual researchers. There is no lack of entrepreneurial spirit among LDC researchers, but researchers who might wish to market their science must know how to craft a business plan that will attract potential investors.[36]

Institutionally, the STI Supporting Mechanism could also advise and support LDC universities for establishing business "incubators" on their campuses. While incubators are now a standard feature at virtually every Western technical university or engineering school, they are absent from most LDC institutions. Ideally, given resource constraints, there might be only one incubator per LDC or regional group of LDCs, and the STI Supporting Mechanism could serve as a constitutive coordinator. As noted in a previous section, multidisciplinary teams define contemporary global research, and a single LDC university or

[32] UNCTAD, Least Developed Countries Report 2007: *Knowledge, Technological Learning and Innovation for Development*"(July 2007). http://unctad.org/en/Docs/ldc2007_en.pdf

[33] "Caribbean enterprise project struggles to involve diaspora," www.SciDev.Net, 4 April 2013

[34] UNCTAD, Least Developed Countries Report 2012

[35] Brazil also possesses one of the world's most impressive metrological institutes, INMETRO. Given that metrology (weights and measures) is foundational to global trade, one would hope that INMETRO might replicate the FIOCRUZ model among the several Lusophone LDCs.

[36] http://gist.crdfglobal.org/gist-programs/business-plan-competition

even an individual country might lack commercial collaborators who otherwise could be available in neighbouring countries, as well as in institutions in the developed world.[37]

A major problem faced by the LDC universities is the lack of connectivity. As the Internet grew during the 1990s, the academic and research institutions that created it were among the first to chafe under its bandwidth limitations. Cutting-edge science imposed ever-increasing data demands. As a result, National Research & Education Networks (NRENs) were spawned in the late 1990s and rolled out over the past decade. NRENs now envelop the developed world – Internet2 and CANARIE in North America, GÉANT in Europe, APAN and TEIN in Asia, and GLORIAD encircling the Northern Hemisphere.

Meanwhile, scientists in the developing world are endeavouring to create their own NRENs, often with vital assistance from their advanced-economy counterparts. Funded by the EC, GÉANT has driven a dramatic rollout of underseas fibre optics around Africa and to Asia. In general, however, developing world connectivity is woefully behind developed-world capacity.[38] In a recent paper examining the failure of African universities to generate IP commensurate to their human resources, leading African NREN technologists posited "…that the current isolation of Africa-based researchers from the global information infrastructure (GII) is a major contributing factor, and that the reduction of such isolation will lead to increased intellectual property output."[39] Most LDC universities also face a serious challenge of campus "last kilometre" connectivity. The STI Supporting Mechanism can offer practical help to bridge this gap through partnerships with major NRENs. Two key NREN partners, Internet2 and the Network Startup Resource Center (NSRC) at the University of Oregon, have indicated interest in joining forces with the an STI mechanism for LDCs to align their activities for greater impact among these countries.

Entrepreneurial research institutes or scientists do not necessarily have to establish up their own ventures if they can market their research achievements and potential to others. These could be local or regional investors. The very successful US-Israel Binational Industrial Research & Development Fund (BIRD) commercializes local R&D by matching investments funds from interested American corporations, many of them major multinationals.[40] Indian officials visited Jerusalem to study its operation, and subsequently created their own fund on the BIRD model. A similar but more modest venture capital fund for LDC scientists could work well, if it could secure initial seed capital. The STI Supporting Mechanism could administer the fund and select the most viable candidates, just as the BIRD and Indian funds do today. It could also provide marketing assistance and advice to LDC clients.

Of course, problem-solving need not imply monetary gain. The US National Science Foundation (NSF), for example, has recently launched a new programme with the US Agency for International Development (USAID) to pair US and developing-world researchers in order to collaborate on issues of common scientific interest – the Partnership

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[37] The notion of incubators as engines of innovation has taken hold at many universities in advanced developing-world economies, particularly among those hosting competitive electronics industries. Unfortunately, most such universities have rejected recommendations for a national incubator consortium, with the unfortunate effect that their accumulated knowledge is dissipated rather than reinforced.

[38] Worcester Polytechnic Institute, one of the smallest but best-equipped engineering universities in the USA, maintains an active exchange program with the Polytechnic of Namibia. WPI found that it had more bandwidth on its campus than in the entire country of Namibia.

[39] "The Impact of Improved Access and Connectivity on Intellectual Property Output in Africa," www.ubuntunet.net/sites/ubuntunet.net/files/the_impact.pdf

[40] www.birdf.com

for Enhanced Engagement in Research (PEER). Equally, vast amounts of scientific know-how exist as open-source knowledge or in the public domain of governmental research across the globe.

Nevertheless, at a minimum, the STI Supporting Mechanism must possess a robust legal department, able to negotiate on behalf of participating LDC institutions. Virtually every research agreement between universities in the developed world includes an IP annex governing proportional ownership or distribution of new IP that might be generated under their mutual collaboration. But, even most developed-world researchers do not always fully understand the finer points of Intellectual Property Rights (IPR), and must rely on their university or corporate legal departments to safeguard their IP.

LDC researchers generally lack such legal resources, and should expect no less support from the STI Supporting Mechanism. This would ensure that LDC scientists and technologists only enter into agreements that protect and reward the parties equally – in the developed or developing world alike – while ascertaining that all parties understand their shared privileges and responsibilities.

**(c) S&T Research Depository Facility**

Already, there are examples of technology repositories serving developing-world STI (box-3). For instance, Research4Life is an innovative public-private-partnership (PPP) between four UN agencies (WHO, FAO, UNEP, and WIPO), global publishers of on-line scientific and technical publications, and several technical partners, including Microsoft. This initiative offers a substantial framework that has expanded and worked well for over a decade. As such, it offers a unique opportunity for an S&T Research depository facility (RDF) under the LDC technology bank to extend Research4Life's benefits well beyond the current partner UN agencies to include other multilateral development and technical agencies.[41]

**Box- 3: Collaborative Research Depository Facilities -- Research4Life and its Partnerships**

First conceived by the World Heath Organization (WHO) in 2001, Research4Life responded to a survey the previous year of countries with average personal incomes of US$1000 or less (just above the LDC threshold today, and somewhat higher in 2000). Some 56% of institutions surveyed had no current subscriptions to international journals. This lack of access to contemporary research in the life sciences was perceived as a systemic obstacle to better health delivery in the developing world.

Subsequent discussions with the International Association of Scientific, Technical and Medical Publishers (STM) led to the launch of HINARI (Health InterNetwork Access to Research Initiative), in 2002. Today, HINARI includes over 160 publishers and 5,300 public institutions in over 100 eligible countries.[42] A year later, in 2003, the Food & Agriculture

[41] www.research4life.org
[42] www.who.int/hinari/en/index.html

Organization (FAO) launched AGORA (Access to Global Online Research in Agriculture), which now includes over 70 publishers and over 2,200 institutions.[43]

In 2006, the UN Environment Programme (UNEP) launched OARE (Online Access to Research in the Environment), with more than 60 publishers and 2,300 institutions.[44] Most recently, in 2009, the World Intellectual Property Organization (WIPO) joined Research4Life with ARDI (Access to Research for Development and Innovation). It includes the developed-world's most important searchable (and otherwise expensive) on-line patent listings.[45]

Strategically, Research4Life's publishing partners include global giants such as Elsevier (Anglo-Dutch), Springer (German), and Wiley (American). Together, they provide access to more than 900 leading journals in the fields of health, agriculture, environment, and technology. Lesser-known journals add a few thousand more. While English tends to be the *lingua franca* of global, peer-reviewed scientific journals, Research4Life also includes periodicals published in several other languages. Nearly 50,000 e-books are currently accessible. Moreover, as the still-nascent electronic publishing industry expands into scientific monographs, the number of pertinent e-books is expected to grow exponentially in coming years.

Access fees, calibrated on a sliding income scale, are kept remarkably low for all developing countries. LDCs, by virtue of their official status at the base of the global income hierarchy, automatically qualify for free access, as do several other developing nations whose relatively higher income levels still remain low. Thus, eventual graduation from LDC status is unlikely to impact free access for years afterwards, and even then only to a marginal annual fee.

To grasp the size of this benefit, one must understand that some very specialized science journals command subscription fees of up to US$20,000 annually. Simply using an average annual subscription fee of $1,700, the WHO calculates that every LDC researcher can access approximately $10 million worth of subscription medical journals annually through their affiliated not-for-profit institutions. That is likely a conservative estimate; the true value could be much higher. Elsevier, for example, reckons that its own data-mining apparatus routinely scans some 20,000 journals and proceedings, yielding around 4 million citations annually. All are available to Research4Life participants. Moreover, Elsevier has developed a proprietary search engine, Scopus, whose thematically driven algorithms dramatically reduce extraneous search results gleaned from scientific literature. Scopus is available at no charge for LDCs via Research4Life, and Elsevier has confirmed that an LDC technology bank could employ it on behalf of qualifying institutions in least developed countries.

Beyond staying abreast of leading-edge research, Research4Life empowers LDC scholars who might wish to publish their own research. Peer-reviewed journals typically require copious citations of other contemporary research, to establish an author's academic credentials, and Research4Life ensures that LDC scholars can remain up-to-date and knowledgeable in their chosen fields. By studying the published work of those pursuing parallel or complementary research, LDC scholars can also discover and locate potential collaborators anywhere in the world.

[43] www.aginternetwork.org/en/
[44] www.unep.org/oare/en/
[45] www.wipo.int/ardi/en/

Nearly every LDC has at least a handful of world-class scientists, or at least academics with that potential. However, they are almost never sufficiently numerous in the same discipline, and would probably still lack "critical mass" if they were. A research depository facility (RDF) under the technology bank could help bridge this gap, offering the potential for LDC S&T investigators to join global research teams "virtually." Given that many of the most urgent global issues (e.g., climate change and sustainable energy) are best studied in the developing world, one might assume that researchers in many of the world's top research universities would welcome an overture from LDC counterparts. The RDF could help broker collaborations with advanced-economy institutions (North-South), across the developing world (South-South), and act as a global facilitator for them all (Triangular).

The RDF could usefully employ a cadre of Tech-bank librarians to assist LDC scholars in their research. While this function in the developed world has been largely subsumed by the ability of individual scholars to conduct their own on-line research, it could well serve those in least developed countries. LDC academics routinely carry teaching loads that would be seen as crushing by their peers in the developed world, constricting time available for research. Likewise, limited access to high-bandwidth networks and powerful computer terminals pose practical constraints that could be overcome with the assistance of external librarians working with the technology bank.

Tech-bank librarians could also help locate the most relevant on-line journals that might welcome submissions from LDC scholars. Likewise, given that writing for peer-reviewed journals is an acquired skill, technology bank staff could conduct on-line training (distance learning) in how to write for scientific audiences and how to get such material published. A parallel communication skill, of course, is how to structure and draft compelling narratives for grant proposals.[46]

At the same time, cross-disciplinary collaboration has become a hallmark of cutting-edge research in advanced economies. For those LDC researchers who are globally competitive, however, the obstacle might not be academic silos at their own institutions. Comparable capabilities in complementary disciplines may not even exist on their campuses.[47] Tech-bank librarians could help such researchers connect with cross-disciplinary scholars in other countries, North and South. Equally, the RDF could vet those on-line journals which might solicit articles from LDC researchers. Unfortunately, there has been a rise of spurious electronic “peer-reviewed” journals that target unsuspecting developing-world scholars.

It will be important for the RDF to address some of the apparent limitations of Research4Life. Despite the latter's enormous promise, relatively few researchers outside those in contact with its four UN partner agencies appear to have heard of it. Significantly, it has not been established or funded to staff and equip a full-time secretariat which might otherwise play the role of coordination and outreach. Without encroaching on the good work undertaken by the current four agencies, the research depository facility could serve that function, as least insofar as it concerns LDCs. Currently, Research4Life operates on the basis

[46] Most top research universities in Europe and North America conduct courses in grant writing for their faculties. Overburdened LDC academics, even if they learn how, will still be challenged to find time for the grant-application process. A technology bank and STI mechanism could help them narrow the search for promising and otherwise overlooked funding streams, and critique their applications before submission.

[47] Conversely, smaller LDC institutions may be less prone to the exclusion and intellectual in-breeding which still pervades many top research faculties in advanced economies.

that an inquisitive researcher will seek out information on a repetitive but single-query basis. The RDF could develop a "push" as well as "pull" capacity, much as on-line media services transmit periodic (daily, weekly, or monthly) computer-generated newsfeeds based on the declared interests of individual subscribers.

More critically, Research4Life's potential has been limited by the difficulty to effectively access and exploit it. Beyond the technical issue of network connectivity, Research4Life has never been funded to provide training to the developing-world scholars for whom it is intended. WIPO, for its part, has developed targeted short (two-three day) courses designed to maximize access to ARDI, its Research4Life component, but financing is limited. Because ARDI emphasizes both research and development, it is explicitly geared to innovation and protecting intellectual property so generated. As such, it seems ideally suited to an STI mechanism intended to help take LDC S&T to market. Thus, the RDF could employ ARDI training modules to dramatically expand Research4Life's development potential across the full range of S&T among least developed countries. Different levels of training could be conducted at a centralized location, in the field, and "virtually" by interactive on-line instruction.

In addition to on-line technical journals and proceedings, a vast array of technical reports is increasingly available and searchable from government labs themselves. The United Kingdom and USA are leading, but this trend is spreading to other countries and rapidly expanding a deep pool of accessible S&T research.[48] The RDF could mine such information to locate promising LDC partnerships with government labs in advance economies, as well as with counterpart institutions funded by those governments' research grants.

## 5. ORGANIZATIONAL ASPECTS: SOME PRELIMINARY CONSIDERATIONS

Thanks to the generosity of the Government of Turkey, a Technology Bank dedicated to LDCs is assured a strong start, which would attract strong contributions from the North and emerging economies. As noted above, finalization of the arrangements as regards organization, functions, governance structure, funding and staffing will require wide-ranging consultations with key stakeholders including the host country, LDCs and their partner countries, OHRLLS and other relevant bodies of the United Nations, as appropriate. Some preliminary considerations as regards governance, funding and stakeholder partnerships are noted below.

### *Governance*

The governing structure of the Technology Bank will depend on the nature of the organization. In the Istanbul Declaration, the generous offer of the Government of Turkey indicates that it will be an international centre. It would be best to develop a governance structure for the Technology Bank on the basis of existing institutional templates instead of reinventing the wheel.

[48] Research Councils UK (RCUK) and the US National Academy of Sciences (NAS) have been especially pro-active in moving research to "open access." The NAS now makes all of its funded research available on-line at no charge (www.nasonline.org), and the RCUK expanded its already exemplary open-access policy in April 2013. (www.rcuk.ac.uk/documents/documents/RCUKOpenAccessPolicy.pdf).

In a recent report of the Secretary-General to the General Assembly, a UN affiliation for a technology facilitation mechanism was considered necessary to ensure global coordination.[49] In such an event, the governance structure of the UN Global Compact could provide useful guidance.[50] The Global Compact has demonstrated that Governments, private sector of both North and South and the civil society can together advance a set of common goals. Because most global S&T/R&D is generated by the private sector, a multi-stakeholder approach and UN-branding similar to that of the Global Compact is likely to bolster the credibility and effectiveness of the Technology Bank. The LDCs and their partner countries, as well as research and academic institutions, private sector, civil society including LDCs' scientific diaspora, could all play appropriate roles in the governance process. Just as the Italian government nominates a member to the oversight body of the International Centre for Theoretical Physics (ICTP) in Trieste, the host Government might also be interested in being represented in the governing structure of the Technology Bank. The role of the OHRLLS and the host country and the key contributors would be critical in the coming days to pull all the stakeholders to the desired goals and as such they will be taking the lead in the governance of the Technology Bank.

***Funding***

Just as the development community has embraced the notion of aid-for-trade, so could it consider supporting an Aid for Science & Technology, especially as it concerns LDCs. This should be in addition to ODA already provided LDCs. The Technology Bank is likely to benefit most from a multi-donor trust fund, supported by traditional donors as well as emerging economies, regional development banks and other multilateral agencies.

Assuming that the host country would also bear a part of funding, other donor governments should be invited to share the cost, especially those who share the view that a tailored and LDC-specific initiative is necessary to ensure that these countries can benefit from the same attention to STI that has accelerated economic progress among more advanced developing economies. Donors could consider funding a concessional finance and investment scheme for STI-oriented start-up ventures. This could be undertaken in concert with existing development-banks, according to their standard management practices but tailored to LDC circumstances.

***Collaboration with stakeholders and partnerships***

Since technological development is a complex phenomenon characterized by the interaction of a plethora of actors that range from businesses, universities, public institutions, etc., the Technology Bank could contribute to combine two key dimensions of successful structural change: technological progress and productive capacity development. It could enter into partnerships with initiatives carried by other international institutions, such as multilateral and national development banks, international agencies, national development agencies, etc. The impact of developing endogenous scientific and technical capacities as well as disseminating new technologies on LDCs can be greatly increased if they are accompanied by regulatory reforms that encourage domestic private sector development, protection of IP, and technical upgrades.

[49] Report of the Secretary-General, "Options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies" (A/67/348), op. cit.
[50] http://www.unglobalcompact.org

The Technology Bank could leverage existing international initiatives. For example, the new UNFCCC/UNEP tech-transfer mechanism (CTCN) disburses no funds itself, but helps worthy projects draw against the Global Environment Facility and the Green Climate Fund. The Technology Bank could help LDC governments and institutions identify and draft competitive proposals for CTCN consideration. Likewise, given that one of the fundamental purposes of the Technology Bank would be to better equip LDCs to compete in the global trading regime, it could help its clients identify relevant STI project proposals that are currently absent from the Enhanced Integrated Framework (EIF). The Technology Bank could also take into the funding streams that are available globally for life sciences, agricultural research, and sustainable energy – all fields of immediate and pressing interest to LDCs.

Just as the UN Global Compact has established a philanthropic Foundation to solicit and welcome private interest, the Technology Bank could do likewise to facilitate partnerships with those global and regional foundations and other private entities from North and South who might share its aspirations and objectives. Similarly, as the Technology Bank seeks to generate more robust STI to prime multinational and regional investment interest in LDCs, a public-private-partnership (PPP) could be structured to welcome business engagement, whether as a form of CSR[51] or as an allied venture-capital (VC) instrument.

In the case of corporate social responsibility, the Technology Bank could work with bodies like the International Standards Organization to develop a system of recognition of corporate support to technology transfer for the world's poorest countries through, for example, "pro-development" labelling. Because the ISO only creates international standards, but does not actually certify them, the Technology Bank could perform that function.

***Way Forward***

The IPoA, as a joint action by the LDCs and their partners, envisaged the establishments of a Technology bank dedicated to the LDCs with a view to enabling them to achieve the goals of the IPoA, particularly to realize the aim of enabling half of the LDCs to meet the graduation criteria by 2020. This paper has elaborated the broad structure and functions of the Technology Bank for this purpose, comprising a Patents Bank, an STI Supporting Mechanism, and a Research Depository facility in a mutually reinforcing manner.

As noted earlier, the OHRLLS has begun a process of consultations to follow up on the mandates of the Istanbul Declaration, the IPoA, the UNGA and the ECOSOC as regards the Technology Bank. Further consultations, serviced by the OHRLLS, are needed to define its structure, functions, governance mechanism, funding and staffing arrangements. These should involve a pool of experts drawn from the host country, LDCs and other interested governments, UN system agencies, as well as other stakeholders, in order to work out institutional details, with a view to achieving an operational Technology Bank before the end of 2014.

[51] As noted elsewhere, both Microsoft and Google have contributed generously to developing-world S&T, as have global scientific publishing houses (Elsevier, Springer, Wiley, etc) and research foundations established by firms such as Novartis and Syngenta.