

UNDP Contribution to the Secretary General's Report on

"Science, technology and innovation (STI), and the potential of culture, for promoting sustainable development and achieving the MDGs" as part of the 2013 Annual Ministerial Review

I. General

STI contribute to the achievement of MDGs, and will play a significant role in the new development paradigm. The STI have and will play a vital role as enablers of sustainable development, in the achievement of future Sustainable Development Goals and in tackling the current global challenges. Technological and people-centred innovations will be needed to enhance agricultural productivity, strengthen the livelihoods of the poor, advance solutions to persisting public health problems, address climate change through investing in green technologies and sustainable energy access. Technology - based solutions are already demonstrating their potential – for example as delivery mechanisms for social services in the remote areas (e.g., mobile health services, mobile money), that are also cheaper and more transparent. STI solutions that are already available will need to be diffused and scaled-up within and across countries, particularly to the areas or populations that have been disadvantaged. Advances in science and research – if translated into policy realm – will enhance the effectiveness of policy making by delivering evidence and suggesting innovation. Innovation in public policy, but also public investments will be integral to ensuring that STI have an equalising effect on a society and do not reinforce existing inequalities.

Innovation is a key driver behind economic growth and job creation. Studies suggest that increased mobile ownership is linked to higher economic growth. A recent report from India concludes that every ten percent increase in mobile phone subscriptions results in an increase in economic growth by 1.2 percentage points a year.¹ Furthermore, advances in modern technologies and communications have made a broad array of goods and services tradable and may offer developing countries an ample opportunity for technological leapfrogging and for placing themselves at the comparative advantage for trade in global services economy.

¹ Vodafone and ICRIER (2009). "India: The Impact of Mobile Phones." *Moving the debate forward: The Policy Paper Series 9*. Vodafone Group. http://www.icrier.org/pdf/public_policy19jan09.pdf

The vitality of STI for country's development is underscored by the fact that many countries have focused their National and Regional Human Development Reports (HDR) on related subjects.² The Uruguay 2005 report, for example, focuses on the capacity of national productive sectors to develop and spread knowledge and innovation and to implement national innovation systems. The Kazakhstan 2006 HDR evaluates new technologies through the prism of human development, calling for a selective and informed approach that would improve the country's welfare. The 2005 Asia Pacific Regional HDR and the Mozambique 2008 National HDR study conditions and process necessary for integrating ICTs into various sectors with an aim to promote human development and contribute to the achievement of MDGs. The 2010/2011 Arab Knowledge Report urges the establishment of an enabling environment that would prepare the youth in the region to participate in the knowledge society.³ Finally, the 2001 global HDR was devoted solely to advancing human development with help of new technologies.

In developing countries, rural communities find answers to local needs through innovations. For instance, mobile money allows businesses operate more efficiently: farmers can keep track of their milking schedule through SMS and micro-entrepreneurs access market information from remote locations, increasing the speed of trade and reducing travel costs. According to a recent article in the *Economist*, Kenya's exports of technology-related services reached \$360 million in 2010 from \$16 million in 2002.⁴

Policy makers also have recognized the utility of mobile applications in service delivery. Many governments have undertaken –sometimes with partner support - innovative measures in using ICT services to deliver services, especially in hard-to-access areas or communities, including post-disaster or post-conflict environments. Making social transfers through mobile money is found to be a helpful instrument to reach low-income beneficiaries who live in remote or distant areas without access⁵ to banking services or who fear retrieving cash from bank accounts for security reasons. An example of this is in Haiti, where a UNDP supported project beneficiaries receive mobile money to spend specifically on construction materials from certified vendors for repairing or rebuilding their homes. In Bangladesh, the Government and UNDP designed mechanisms where utility bills were paid using mobile phones, cutting out middlemen and hidden costs such as bribe. In 2011, UNDP piloted an innovative mobile-based data

² Human Development Reports are available at <http://hdr.undp.org/en/>.

³ The 2010/2011 Arab Knowledge Report, Mohammad Mohammed bin Rashid Al Maktoum Foundation and The United Nations Development Programme.

⁴ The Economist, 25 August 2012, <http://www.economist.com/node/21560912>

⁵ All examples of UNDP work come from UNDP reporting data.

collection system in Central African Republic for conducting arms and munitions inventories and baseline socio-economic profiles of combatants from mobile field units. As of 2012, 6,400 ex-combatants have been verified and 5,000 disarmed at 21 sites.

Box I: Country Examples

Mobile devices can significantly impact development goals in terms of poverty reduction, democratic governance and crisis response. Strategically deployed, mobile technologies open new, interactive communication channels that help governments expand stakeholder participation, engage people in policy and decision-making processes, foster targeted service delivery to the poor and marginalized and offer greater access to public information. The issue is to identify the most appropriate strategies that will really enhance human development in material, tangible ways. Below are a few examples.

Inclusive participation

For years, development practitioners have promoted participation and participatory models in both policy advice and programme implementation, with varied degrees of success. These days, mobile technologies are doing just that — offering new opportunities for enhancing access and participation for greater numbers of people. One of the first and most well-known platforms for collecting and mapping inputs from citizens is Ushahidi (<http://www.ushahidi.com>) — an open source platform first developed in Kenya to report eyewitness accounts of postelection violence and human rights abuses following the disputed 2007 elections. Its design — requiring only a basic mobile phone with SMS capacity — has allowed it to be widely adopted in other monitoring systems like mapping community needs in Moldova (<http://alerte.md/>), plant disease tracking in Argentina (<https://aqrotestiqo.crowdmap.com/>), and corruption tracking in Egypt (<http://www.zabatak.com/>). It has also been adopted in South Africa to track reports of xenophobia (<http://blog.ushahidi.com/2008/05/26/the-ushahidi-engine-in-south-africa/>), in India where it was used to run a citizen-driven election monitoring platform, Vote Report India (<http://community.ushahidi.com/deployments/deployment/vote-report-india/%20India/>), and in Mexico where it was used to monitor elections (<http://blog.ushahidi.com/2009/06/25/cuidemos-el-voto-monitoring-federal-elections-in-mexico/>).

Public sector modernization

Mobile technologies can reduce bureaucratic holdups for people and streamline work for civil servants. In the Philippines for example, the Bureau of Internal Revenue offers taxpayers the option of paying their income tax returns by SMS. The Bureau has forged a partnership with Land Bank of the Philippines as the accredited agent bank, and Globe Telecom as the taxpayer agent, and utilizes G-Cash, the mobile money service application, which makes tax payments on behalf of subscribers (<http://pantawid.dswd.gov.ph/index.php/about-us>). Brazil's cash transfer programme, Bolsa Familia, is looking into linking with new m-payment systems and the country's Mobile Network Virtual Operator to find more innovative options for reaching the poor (<http://www.mds.gov.br/bolsafamilia>).

Service delivery and responsive institutions

Mobile technologies can enhance service delivery and help reform important governing institutions, from public administration to parliaments to systems of justice. For instance, an m-governance project in Kerala (India) (<http://www.itmission.kerala.gov.in/ksitm-e-governance-projects/146-m-governance.html>) is attempting to integrate advancements in mobile technology with around 90 government departments to create accessible information systems and a comprehensive service delivery platform. Along the same lines, the local government in South Africa's Gauteng province adopted mobile and Internet-enabled services for their Police and Emergency Medical Services to ensure faster, more effective emergency service.

Pro-poor rural development

Significantly for poor people and rural development, mobile technologies are reducing information gaps and restrictions inherent in marketplaces where consumers and producers have little means of comparing commodity prices between distant markets. Google's Trader application, for instance, connects customers and providers in Uganda via SMS to exchange goods and services (<http://www.qooqle.co.ug/local/trader>).

Agriculture

In agriculture, mobile applications are being used to deliver advice, education, pest/disease early warning and marketing information to small-holder farmers. In Uganda, the Collecting and Exchange of Local Agricultural Content (CELAC) project uses SMS to send farming tips to small-holder communities (<http://celac.or.ug/>). The project uses mobile access to advise farmers on new and potentially lucrative micro-agroenterprises, such as livestock and export crops (such as coffee, cotton, tea, tobacco and sugar). Mobile applications like the one used by CELAC make it possible for farmers to network and share knowledge and experiences with other small-holders on best practices, appropriate crop varieties, and good pest management tools (including tracking disease and pest outbreaks). In turn, farmers can improve crop yields, expand market possibilities, and improve their overall food security.

Job creation

Mobile phones can also facilitate employment and help coordinate the informal job market by opening up new venues such as mobile employment platforms for people seeking permanent work as well as day-to-day contractual work. In Palestine, for example, the Souktel project connects employers and job seekers through text message services without the need for an Internet connection (<http://www.souktel.org/>).

Source: [UNDP Mobile Technology Primer, 2012](#)

The demand side for innovation and new technological solutions is as important as the supply side. In order to make a lasting difference in development, STIs must not only respond to specific needs, but also be affordable and scalable. High cost of existing innovations and technologies and other barriers to adoption, be it in energy access, water distribution or health, limits their uptake. A suitable enabling environment can also contribute to demand for innovation. One notable example is an ICT-based innovation that allows workers to register for labour under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). While the law provides the legal guarantee for work, the fingerprint technology provides workers with means to exercise that right (see Box 2).

Box 2: Country Example

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), India

This Act for unskilled manual labor is leading in a new era of technology and financial inclusion for rural communities. A successful example in this line has been the bio-metric based ICT applications, initially tested on the ground in Rajasthan, which aimed at facilitating workers to exercise their rights to work as stated in the Act. Through biometric or fingerprint technology, workers are able to access, by means of an information kiosk, updated information on their application status, number of days worked, wage payments due and, importantly, information on works currently under way in nearby districts. Further, it serves as a convenient, quick portal to register villagers under NREGA. Any information needed by the worker can also be sent through a mobile phone via Short Message Service (SMS).

Source: UNDP, ILO, Global South-South Development Academy. *Sharing Innovative Experiences (2011). The Mahatma Gandhi National Rural Employment Guarantee Act.*

II. Agriculture and food security

Focus on research and innovation for enhancing agricultural productivity will be integral to achieving food security and for the adaptation to climate change. According to FAO, a 70 percent increase in agricultural production will be needed by 2050 to keep up with the population growth.⁶ The frequency of severe droughts and flooding around the world implies that building resilience of agricultural production and producers to climate change will have to become a central objective of agricultural research and innovation. Changes in the climate are already impacting the yields of staple crops such as wheat, rice or maize endangering the very livelihoods of smallholder farmers. New, more climate-resistance crops would make them less vulnerable to rising temperatures and flooding. Innovations in crop and plant breeding have already been successful and will need to be scaled up – e.g., hybrid maize in Zambia and Zimbabwe; cassava varieties in Uganda (that are resistant to severe weather and pest);

⁶ Global Agriculture towards 2050, FAO 2009

Nerica rice in West Africa etc.⁷ Innovative policies and partnerships, particularly with the private sector will also need to be employed to complement efforts of scientific community through investments and diffusion/adaptation of new technologies. Finally, food producers will need assistance in adopting sustainable agricultural practices. Among the many initiatives underway, the UNDP Green Commodity Initiative (GCI) is a public-private partnership that aims at shifting global markets to drive the production and sale of green commodities (that encompass a wide array of agricultural products) instead of current unsustainable practices.

III. Energy and water

Perhaps in no other area STIs will play a greater role than in the area of sustainable energy. Access to energy creates economic opportunities, makes work more productive, improves human health and educational outcomes and reduces the propagation of economic and social inequalities between those who can afford it and those who cannot. Public policy should encourage solutions that address households' energy needs while protecting the health of families. Enhanced access among poor people, especially women to clean cooking technologies would prevent each year nearly 2 million of premature deaths from cardiovascular diseases and cancer associated with solid fuel use and could lower household air-pollution levels and emissions.⁸

At the global level, the Member States and the development community have created a sense of urgency around facilitating access to energy to those still in need and to ensure the technological transfer to sustainable energy that is affordable. The Secretary General's Initiative "Sustainable Energy for All" by 2030 followed by a recent United Nations General Assembly resolution declaring the decade 2014-2024 as the Decade of Sustainable Energy for All are important steps for galvanizing international community, private sector and public sectors and other actors on issues concerning energy for sustainable development.⁹ The resolution underscored "[...] *the need to improve access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources for sustainable development*" and "[...] *highlighted the importance of improving energy efficiency, increasing the share of renewable energy and cleaner and energy-efficient technologies.*"¹⁰

⁷ Africa Human Development Report 2012, UNDP

⁸ The Energy Access Situation in Developing Countries, WHO, UNDP, November 2009

⁹ UNGA Resolution 65/151, December 2012

¹⁰ Ibid.

To make the above objective reality, STIs solutions and further investments will be necessary at the institutional, business practices and technological level. According to the *Global Energy Assessment* a recent report coordinated by the International Institute for Applied Systems Analysis (IIASA), universal access to electricity and cleaner cooking fuels and stoves can be achieved by 2030; however, this will require moving away from “business-as-usual “to embrace changes in business practices, innovations in financing approaches, partnerships of the private and the public sector and adoption and diffusion of already existing affordable technologies, such as solar energy or LED lighting. New technology, solutions or innovation will be essential to reach 1.3 billion people without electricity and 2.6 billion people in developing countries that rely on traditional biomass for cooking and heating.¹¹ Smart partnerships of public sector with the private sector need to be leveraged so that clean and affordable energy is available even in the most remote areas where business risks curtails engagement of the private sector. Political leadership, appropriate priorities and long-term policies, and massive scaling up of programmes are also needed to enhance opportunities for investment.¹²

Innovative solutions, such as decentralized energy options that expand access to energy to underserved populations can power poverty reduction and job creation. Lack of access to energy has shown to undermine business development, employment creation and economic growth. In recent years, off-grid, decentralized energy options - often based on renewable energy sources (such as solar, wind, hydro or biofuels) – have become more available and offer new opportunities for providing energy access where conventional approaches to energy access have not been sufficient, e.g., among dispersed underserved rural populations. Such options enhance rural employment and can create jobs if promoted through a better integration of complementary energy and employment policies, which are often delinked.¹³

Major developing economies are emerging as powerful investors in global energy technology R&D. Public- and private-sector investments are approaching some US\$20 billion which amounts to nearly half of global innovation investments – and are significantly above OECD public- sector energy R&D investments (US\$13 billion).¹⁴ But while R& D is leading to new innovations in technology, the world has witnessed innovations in ways of doing business, financing and setting up the necessary institutions

¹¹ UNGA Resolution 65/151, December 2012

¹² Global Energy Assessment, Toward a Sustainable Future, GEA IIASA, 2012

¹³ Integrating Energy Access and Employment Creation to Accelerate Progress on the MDGs in Sub-Saharan Africa, UNDP 2012.

¹⁴ Global Energy Assessment, Toward a Sustainable Future, GEA IIASA, 2012

that supports the expansion of services to the poorer members of society especially in the ICT sector. This need to be continued and scaled up.

There are ample opportunities to reduce carbon-intensive production processes and transportation systems. These can be achieved through innovative technologies and policy options including alternative energy sources (from long lasting batteries, solar water heaters, to energy-efficient light bulbs); digital technologies in manufacturing (such as 3D printing); genome science; nanotechnology etc. According to the EU's estimates, the global market for "green" technologies is about \$1.25 trillion, which is expected to double by 2020, largely driven by investments in research and development.¹⁵

We have just celebrated the achievement of MDG target 7c on Access to Water - halving the proportion of people without sustainable access to safe drinking water. This gives us reason to celebrate, as it indicates that when there is a concerted effort of all relevant stakeholders, tangible results can be achieved. Yet, climate change, increasing urbanization, environmental degradation are threatening to stall or reverse the gains we have achieved. Low-cost solutions will be needed to improve access to water, its quality and life-cycle in developing countries. As it is the case with access to energy, extending access to water, improving its quality, sustainability and treatment are vital for improving economic, social and health outcomes. 11 percent of the global population still remains with no dependable access to improved source of drinking water.¹⁶ Given that women are typically tasked with collecting water, improved water services would allow them to engage in other economic or household activities. Technologies required for improving the quality of water through treatment and sewers for removing household waste have existed for many years, however they need to become more affordable in order to be adapted and diffused in developing countries. For that to happen, public investment will remain key as well as partnerships with the private sector so that water is available even in the most remote areas. At the same time, local innovations will continue to fill the gap. For example, in agriculture, locally-driven solutions, such as micro-irrigation in India help smallholder farmers increase their yields.

Finally, knowledge and experience sharing across the world (South-South, North South, etc.) will facilitate adoption and transfer of technologies and new ways of doing business, financing and

¹⁵ An Innovation Union, EU Focus, September 2012

¹⁶ Millennium Development Goals Report 2012, UN

delivery of services. Universities, research institutions will have a major role to play in supporting this function.

IV. Health

Science and new technologies can be of crucial importance for improving healthcare and making medicine more efficient. Examples of the use of new technologies include long-distance patient/doctor consultations, diagnosis and even treatment; collection of data for research and diagnosis; or an online cooperation between physicians and medical researchers in different parts of the world. The new technologies also allow for more timely and effective national and institutional responses to epidemics and make management of public health institutions less costly. During the past years, developing countries have been increasingly using ICTs in the provision of medical services, particularly to those living in remote areas with lack of medical specialists. While these new ways of delivering health services hold a lot of promise for developing countries, their success hinges on the capacity of the government to administer and sustain them.

Box 3: Country Examples

In the health sector in particular, there have been many pioneering mobile initiatives improving connectivity and the transmission of information from remote and hard to access areas of the world. Projects like Peru's Nacer programme (<http://healthmarketinnovations.org/program/nacer>) and Rwanda's TRACnet programme (<http://healthmarketinnovations.org/program/tracnet>) give health workers the ability to exchange critical health information such as patient records, by storing health data in central databases accessible by mobile phone and the Internet. UNICEF Malawi has been using a similar SMS system called RapidSMS (<http://www.rapidsms.org/>) which speeds up health data collection and feedback in order to monitor child malnutrition trends.

Source: [UNDP Mobile Technology Primer, 2012](#)

TelMedPak.com: Pioneering Telemedicine in Pakistan

Established in April 1998 in Pakistan, TelMedPak seeks to interconnect hospitals and local doctors. A prototype was set up in a private hospital in Taxila, a small town 20 km from Islamabad. This hospital was equipped with an Internet-enabled PC and a scanner. Store-and-forward teleconsultation was used. The patients' case reports requiring expert medical opinion were emailed to the specialist, who studied the case reports and replied to the hospital. Each patient's complete record was kept strictly confidential with a limited number of people having access to it. This project proved to be very successful.

TelMedPak also launched a pilot project in Gilgit. Case histories with images of x-rays and CT scans were sent through the Internet from Gilgit to Islamabad. A panel of consultants then gave their expert advice on the cases. Internet service providers helped to connect the district headquarters (DHQ) at Gilgit with the surgical unit of Holy Family Hospital, Rawalpindi, where apart from general surgeons, orthopaedics, neurosurgeons and other medical specialists were made available. All the practical modalities of telemedicine were tested. DHQ Gilgit, with only a few doctors, was able to offer patients health services similar to those in developed cities such as Islamabad. TelMedPak aims to establish satellite links and promote collaboration with international hospitals and schools.

TelMedPak.com also serves as a repository of medical information, articles and news alerts on emerging health issues, guidelines on preventative medicine and a directory of practitioners. The site is constantly updated and provides valuable information such as articles on the SARS epidemic. One attractive element of TelMedPak is a small Urdu language section on maternal and child healthcare (<http://www.telmedpak.com/homes.asp?a=995>).

Source: 2005 Regional Human Development Report. *Promoting ICT for Human Development in Asia.*

Improvements in scientific knowledge and development of new technologies open new horizons for physicians and patients and can shape new healthcare. Existing vaccines and immunization programmes already available are a powerful public health tool in the fight against infectious diseases. Ongoing research and development in the medical field will likely lead to further advances against most pressing health problems in developing countries. Yet, not all health innovation needs to be based on high-tech solutions; similarly the adaptation of existing vaccines to conditions of developing countries can be a breakthrough in itself (See Box 4). In the context of public health, more needs to be done to fully harness the potential of modern technologies on the ground. Institutional constraints as well as high cost of medical technologies can make their deployment difficult. Public policy will also need to consider equity issues in regard to access to new technologies and treatment.

Box 4: Country Example

Modern Science Creates Simple Technology - Oral Rehydration Therapy and Vaccines Adapted to Village conditions, Bangladesh

When oral rehydration therapy was developed at Bangladesh's International Centre for Diarrhoeal Disease Research, the Lancet, a leading medical journal, hailed it as possibly the most important medical discovery of the 20th century. Until then the only effective remedy for dehydration caused by diarrhea was providing sterilized liquid through an intravenous drip—costing about \$50 per child, far beyond the budgets, facilities and capacities of most developing country health centres. But scientists found that giving a child sips of a simple sugar-salt solution in the right proportions led to a 25-fold increase in the child's rate of absorption of the solution compared with water alone. During the 1980s packets of oral rehydration salts were manufactured by the hundreds of millions, with most selling for less than 10 cents apiece.

Adaptation to developing country conditions of vaccines for the killer communicable diseases—measles, rubella, whooping cough, diphtheria, tetanus, tuberculosis—was another major breakthrough. The antigens to tackle these six diseases had long been known. But they required sterile conditions and a reliable cold chain—a system of well-maintained refrigerators and cold transport from the point of vaccine production to clinics and village health centres thousands of miles away. Important advances came with technological improvements: a polio vaccine that requires only a drop on the tongue, freeze-dried and more heat-stable vaccines that do not require refrigeration and the development of vaccine cocktails in a single shot. For both oral rehydration therapy and new immunization methods, advances in technology had to go hand in hand with advances in organization. Massive campaigns were developed to spread awareness. Politicians, churches, teachers and non-governmental organizations were enlisted to underscore the facts and help organize the efforts.

Source: 2001 Human Development Report Making New Technologies Work for Human Development, UNDP

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