E-discussion: Building the future we want with science, technology and innovation (STI) and culture: Phase I

FINAL REPORT
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1. INTRODUCTION

This is a summary report on the first part of e-discussion, which took place from 18 February to 4 March, focused on the critical role of science, technology and innovation (STI) in tackling global development challenges.

This e-discussion was organized jointly by UNDESA, UNDP and UNESCO and moderated by Lidia Brito (UNESCO) and Selim Jahan (UNDP) with the assistance from Ernesto Fernandez Polcuch (UNESCO).

The discussion profited from the active participation of experts on STI (Researchers, Professors, Policy advisors, Staff members of the United Nations). The total number of participants in the e-discussion exceeded 550 registered members, generating more than 780 views and 40 comments, from different countries around the world, during the two weeks discussion. Additional contributions were received by email from experts not formally logged into the "Teamworks" system.

Contributors´ institutional backgrounds included UN agencies (UNDP, UNESCO), universities (U. N. de Quilmes Argentina, UNAM Mexico), research institutes (Bangladesh Rice Research Institute), governmental institutions (Italian National Statistical Institute), civil society organizations (Mision ONGD) and non-affiliated individuals. The e-discussion participants shared their personal and professional experiences, in English, Spanish and Portuguese, on all three main discussion threads posted.

This report aims to provide a synthesis of the E-Discussion including key points, purpose, main contributions and examples of practices as described by the contributors.

2. CONTEXT

The E-Discussion was organized as part of the preparatory process for the ECOSOC 2013 Annual Ministerial Review. Arranged in partnership between UNDESA, UNDP and UNESCO, the e-discussion served as an open, multi-stakeholder forum for practitioners, experts and researchers to share new ideas and formulate critical policy messages to the UN intergovernmental negotiations on the potential of STI and culture for sustainable development solutions.

The E-discussion covered a large range of topics related to Science, Technology and Innovation.

The key messages of the e-discussion include:

- STI is critical to sustainable development.It is through innovation in science and technology that humanity will be able to better address the issues of sustaining

our environment for future generations, while contributing to poverty alleviation and socio-economic development.

- The Post-2015 Development Agenda should include Science, Technology and Innovation in an explicit, cross-cutting manner, while incorporating relevant, sound and quality indicators for measuring and monitoring STI.
- Human resources are key for societies to move towards sustainable development. Science, Technology, Engineering and Mathematics education is a central tool. Women´s potential needs to be fully exploited in STI.
- Developing countries need to establish STI capacities to be active participants in the move towards sustainable development. Technology transfer mechanisms need to be improved and made more flexible.
- The interface between science and policy needs to be strengthened, by fostering STI capacities and establishing proper, participative institutions for STI advice.

3. MAIN CONTRIBUTIONS TO THE E-DISCUSSION

STI, its relevance and importance

In many circles, Science, Technology and Innovation (STI) are recognized as critical for sustainable development. However, there is still a need for further arguments to be developed towards major stakeholders for this idea to become completely mainstreamed. Moreover, in its application, it is fundamental to look closer to the next level of detail. STI activities are multifold and involve different actors. Different types of STI activities (such as R&D, technology transfer, adoption, or adaptation) respond to different needs and have to be promoted in a balanced way in developing countries. None of these, however, can be set aside if societies aim at achieving sustainable development with the support of STI, particularly to put in place evidence-based policies for this aim.

There was a general agreement amongst participants that STI is critical to sustainable development and is an especially important subject for the development of countries and the potential elimination of opportunity gaps, and can play a critical role to solve global problems related to sustainable development.

Technology can be a double-edged sword for human kind, bringing positive and negative impacts in life. Technology helps us solving complicated and time-consuming problems in easier and simpler ways. However, if it is not used properly, technology could be harmful for human being. For example, nuclear energy could bring advanced energy source in one hand, but it could destroy humankind in a blink of an eye. In the end, technology is only a tool; the most important is the one who use or hold the control over it. Therefore, norms in society are important to remind people the boundary of proper use of a technology. Before adopting a new technology, proper technology assessment needs to be carried out, possibly by governments.

The ability of STI systems to deliver depends on continually improving capacity. Yet, capacity is multidimensional and has interrelated characteristics and related challenges. Strong and sound STI systems can reduce dependence on foreign technologies and can increase countries´ capacities to produce and to market technologies to foreign countries or global markets.

It was also largely acknowledged that STI should be integrated into the Post-2015 development agenda, because this would serve as a means of keeping the focus on STI on the front burner for policy makers.

It has been cautioned, however, that increased resources devoted to innovation and technology should not imply greater demand on natural resources. STI activities need to be further oriented towards sustainability and sustainable development. The sustainability science approach could provide orientation towards this goal. In this sense, new science, technology and innovation policies will need to be designed at all levels, aiming at establishing STI policies for sustainable development.

Monitoring and evaluation is one of the major challenges identified. For many respondents, the absence of proper accountability mechanisms was pointed out as one of the main deficiencies of the MDGs. The Post-2015 development agenda should ensure sustained new indicators and accountability. In addition, indicators need to improve quality, in its wider sense, including relevance, timeliness and policy-orientation.

STEM Education and popularization

Human Capital is seen as one of the key factors for STI development in the countries, leading towards the importance of education at all levels, particularly science, technology, engineering and mathematics (STEM). A Knowledge Society requires knowledge workers, but especially knowledge citizens. Access to quality education for all is the first step in this process.

Education for all has been successful in increasing primary and secondary school education and skills development. But particularly for African countries to contribute more effectively to global sustainability will require investing in higher education and STI. African countries need to tap the innate innovative capability of its 50% population the youth through research and development in education science, technology and engineering. Emphasis in education in Post 2015 must be in higher education and science for society.

Universal primary education though essential is not enough given the rapidly changing scenarios where only specialised skills and knowledge will ensure fruitful employment. At one end of this *continuum* will be vocational skills and at the other end will be hyper-specialized but interdisciplinary skills needed in the knowledge economy. Thus some participants proposed that the MDG goal of universal primary education might transition to a broader approach, such as for example “universal skills education”. There is a need for building more technical and vocational schools, particular in poor areas, both rural and urban. Such schools should seek for orientations according to the needs of the area, including its natural resources, in order to be close to the job market

Schools need to further incorporate ICTs and its application to the classroom. This process, combined with quality science education, can support sustainable development in its various pillars, by educating critical citizens, aware of laws and rights and capable of exercising their rights, in fields such as education, health, or livelihoods.

One of the key aspects to link STI and sustainable development is through Education for Sustainable Development (ESD). ESD gives children, youth and adults the knowledge, information and tools they need to make smart decisions to create a sustainable future for all. It is the collective contribution of the world’s education and

learning systems (formal, informal and non- formal) including preschool to higher education, the world's public awareness and information sharing systems, and the world's public and private sector's training systems.

ESD focuses on concerted activities in five major spheres:

1. Access and retention in quality education.
2. Reorienting the current formal education systems from the current underlying focus on traditional development to one focusing on sustainable development. The engagement of higher education is particularly necessary.
3. Engaging and building public awareness and understanding to build an informed society that not only understands the need for wise reform, but also recognizes current or emerging unsustainable policy and practice.
4. Training and re-orienting current practice in all sectors of society, to achieve sustainability and to address deep-seated attitudes and perspectives to social, economic and environmental issues in order to facilitate future training and professional growth.
5. Youth and their Empowerment as key stakeholder for sustainable development pathways to address the global crisis of youth disempowerment and disengagement.

In terms of STEM Education, one of the most concerning issues is the diminishing interest of young people in taking science courses or going into scientific or technical fields. This trend is resulting in low quality and quantity of science human resources, and overall deterioration of scientific and technology literacy in the region. Some of the reasons are the young people's mind-set of seeing S&T as a complicated field with low reward and lack of job availability.

Some recommendations are to change the perception of young people and raise their curiosity in S&T. Government also should increase reward and salary for scientists and engineers, offer more and better scholarships for science and technology students, support funding for S&T research and equipment in schools and universities, redesign the S&T education curriculum, and add more entrepreneurship programmes in S&T majors to increase students' entrepreneur skills in order to create more job opportunities.

In this context it is also important to promote the popularization of science, ensuring equitable access to and use of techno-science, through improved science journalism, as well as networks of STI centres and museums.

One of the keys to success in STI is the development of sufficient quality human resources. Incentives or rewards for STI activities must be increased or improved to motivate more students to pick a researcher career, in universities, government institutions, the non-governmental sector, and in firms.

Technology transfer

The value of Technology transfer and the importance of combining technology transfer and business model innovation were underlined. Technology transfer has been identified as one of the key elements for a more balanced approach to sustainable development between the developed and the developing world. For cross country technology transfer, it is of particular importance to consider institutional design, since the technology is also being transferred between different types of institutions with different degrees of consolidation. Technology transfer at a very large scale requires

proper institutional analysis and design for its success, based on systemic analysis of the STI situation in the country. It needs to be noted, however, that development and transfer of technology no longer follows a North-to-South path. Similarly, knowledge and technology exchange in agricultural sector between the countries of the South will likely continue to increase in the coming years. Another aspect to consider in the technology transfer process is the need for adequate business capacities, particularly in terms of knowledge management.

STI activities, technology transfer, adoption and adaptation in developing countries will be more warmly received if they fit into the lifestyles of the larger part of the population that reside in rural communities. Key in this process is the building of STI capability at all stages of the innovation system to enhance new ideas, processes and products for sustainable development. Technology empowers people by allowing them to expandthe choices in their daily lives with a spill over effect in harnessing such technologies to upgrade subsistence livelihoods to income generation, thus improving the prospects of innovation and prosperity. Local and indigenous knowledge systems need to be taken into account and incorporated into STI activities.

Technology transfer mechanisms need to consider that there are invaluable and undiscovered resources in developing countries, not only technological, but also cultural diversities, which bring up the foundation for sustainable development.

Importance of research and experimental development (R&D)

In a complementary matter, human, institutional, and financial capacities for carrying out R&D need to be promoted worldwide. R&D capacities are not only central to the capacities to adopt and adapt technologies through technology transfer, but also contribute to top level higher education, which spills over into society, wide innovative capacities as well as to issues such as confronting trade barriers with science-based arguments, and approaching local problems in fields such as health (neglected diseases), agriculture or other socio-economic priority areas.

Furthermore, it is important to underline the importance of interdisciplinary and trans-disciplinary research and even “post-normal” science that may assist to discover new approaches and knowledge in this challenging and multidisciplinary field, linking the STI issues to culture and sustainable development. One of the major challenges to achieve the aims of sustainability is the sectorial policies and disciplinary boundaries.

Intellectual property (IP) and access to scientific information

Intellectual property (IP) rights often directly exclude the world’s poor from accessing the end products of investments in STI, constituting a barrier to equitable distribution of existing STI. Furthermore, IP rights are a key issue for technology transfer.

The WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement) sets minimum standards for intellectual property, under which all WTO members must comply (with some exceptions). Unfortunately, these minimum standards often result in the fruits of STI being not accessible to the neediest. IP rights might act as inhibitors for poverty ridden societies but there are also opportunities. In fact there are also voices in total disagreement with the present approach of granting and approving patents.

In recognition of the social and economic needs of all countries, the TRIPS Agreement contains a number of flexibilities countries can use to ensure the benefits of STI are

more evenly shared. Countries need to explore these and build capacities for properly making use of the TRIPS agreement, as well as ensuring that enabling national legislation and frameworks for the use of the flexibilities are ready and in-place for their timely use.

At the same time, in order to improve accessibility to scientific research results, open access to research should be encouraged. In particular, it is noted that all publicly funded research should be made available freely and openly in digital repositories. Digital libraries also improve efficiency, requiring adequate internet access and bandwidth.

Gender Issues in STI

Women are still a minority in science and engineering careers, and in particular in decision making positions. The sub-representation of gender represents a violation of the general principle of justice or equity, but it is also a problem of efficiency because it determines the functioning of society at a less than optimal level. In this way, it undermines the functioning of the main rules of the scientific community. It also involves lower investment in education. Moreover, this scenario coincides with the persistence of institutional and socio-cultural barriers for female researchers, which restrict their career opportunities. Still, dates from previous investigations show that, in the last years, at highest levels the gender gap has decreased.

It the last years the position of women in our society and their role in the STI has improved, especially in the education sector, where most national and regional data show that the gap between men and women has decreased. In many countries, women's educational situation has become equal or higher than men's one. Latin America in particular is the region with the highest proportion of female researchers (45% according to the UNESCO Institute for Statistics).

On the other hand, despite the significant improvements made in recent decades, women holding significant positions related to the STI are far from gender parity.

Many reasons can be identified to explain the current situation, amongst them, cultural issues referring to the role and typical trajectory of women in a given society, joint to the difficulties in proper establishing a balance between career and personal life. In certain male-dominated professions, gender discrimination is still widely present.

There is still need to carry out further studies and develop proper indicators to analyze the causes of this phenomenon, identifying good practices of policies and policy-mechanisms which have influenced the participation of women in STI.

STI and sustainable development

Clean technology isoutpacing biotech and ICT in global investment, achieving a record $386 billion market capitalization in 2010 for example, led by science, innovation and technology investments towards goals such as food, energy and water security. Continued innovations are needed as a base for the next clean tech revolution, as a newwave of industrial transformation, particularly across the Emerging South where it canspur new sources of economic growth and deliver the knowledge economy jobs of tomorrow.

The central importance of STI for development can be analysed from two different points of view. In the framework of economics of innovation it is argued that developing

countries should establish successful innovation systems that will enhance the competitiveness of their economies, increasing the value of its exports, requiring more skilled labour and improving the living conditions of its citizens. On the other hand, the social studies of technology and similar academic views have argued for a more direct way of promoting development through science and technology, by recovering the concept of "appropriate technology" and incorporating newer concepts such as "social innovation", highlighting the role of technologies in social inclusion and exclusion. Technologies should meet specific local needs, and have an open design allowing users to appropriate and modify them to optimize their use and application.

Both perspectives can be potentially conducive towards sustainable development, either through promoting economic development compatible with green economy principles, or through small-scale solutions that adapt to the way of life of communities and respect the environment, with an approach closer to the more comprehensive “green societies” idea. Both views are not antagonistic, and can be combined by decision makers and stakeholders to properly guide STI towards sustainable development, particularly in developing countries.

However, it is argued that not only STI can be oriented towards sustainable development, but that it is actually critical to attain sustainable development at all. A consensus exists that it is through innovation, based on science and technology, that society is better prepared to address the issues of sustaining our environment for future generations, while improving quality of life for all.

STI and poverty eradication

Respondents all agreed that STI can remove poverty and reduce inequality in developing countries. Furthermore, STI is also vital to minimize the ever increasing gap between rural and urban area. However, remarks were made that in-depth studies need to be conducted to better understand these processes. STI policies should be targeted therefore not only to create wealth but to also produce direct social benefits through social inclusion. Apart from Government policies and strategies required for STI to be accessible for those living in poverty, the design of delivery projects is also important, using existing opportunities and providing new ones.

STI needs to become an integral part of development-oriented projects. However, this should not come with an externally-guided one-shoe-fits-all approach. Any development initiative should work with local stakeholders to determine appropriate technologies, including building a local knowledge-base and the human resources needed to support and give sustainability to the project. Moreover, local development problems require local solutions and perspectives. Technological solutions are socially and cultural embedded and must take indigenous knowledge systems into considerations, incorporating technologies that do not damage culture, society and local expertise (appropriate technology) to eradicate poverty. The success of STI in contributing to reducing poverty among poor households must be based on ability to appropriately build or package support to inform policy on the basis of three key market objectives of demand, supply and enabling environment.

STI is also a tool to create jobs both in the urban and rural areas, if adequate environments are put in place where STI systems encourage investment, with better infrastructure, fast commercial courts, reform of market institutions and various types of incentives, coupled to adequate STI capacity in universities and research centres, and enhanced linkages between all the institutions part of the systems.

One of the main instruments of reducing poverty in Africa is the development and application of appropriate technologies for transformation of the vast informal sector. The acceleration of communities' ability to harness for its own use and welfare simple and common technologies such as improved soap making, beekeeping or Shea butter processing (based on traditional technology) adapted from elsewhere has improved the quality of life and wealth creation through the establishment of viable enterprises in many West African countries. Such synergistic partnership between STI stakeholders has the potential in making STI work for society and sustainable development,

E-Science can also act as an important tool in the development of applications in sectors critical to society such as natural disasters, agriculture, water security, health, poverty, education, research and innovation and intellectual property. Many societal opportunities have arisen as a result of the application of e-Science tools, including in relation to dealing citizen choices and science-based evaluation of issues at the heart of society's priorities and preoccupation. Science can contribute to policy design, choice and making, by providing sound, reliable, update information about the natural, social, cultural and economic settings that require intervention and by providing sound and reliable means to measure objectives, strategies, resources and results to all the involved stakeholders.

STI and key Sustainable Development issues

Some of the key focus areas for innovation strategies are ensuring food security by increasing investment in agricultural technologies to raise productivity, finding solutions for reducing costs of medical care, designing low cost housing facilities and provision of water, energy and other infrastructure technologies to the poorest people in each country.

In terms of sustainable energy, the role of STI is quite evident. New knowledge and technological developments are needed to meet the challenges of sustainable energy for all, particularly in address the need of the poor in developing countries while ensuring the new energy sources are environment-friendly.

Renewable energy,especially clean energy in the form of solar, wind, and biofuels abounds in Africa with great potential to provide efficient energy and energy access to rural communities. This abundant clean energy is not being adequately harnessed due to lack of synergy between stakeholders (scientists, engineers, policy makers, private sector, financial investors and local communities). The creation of an active and dynamic synergy of partnership that is based on two principles for engagement:i) improve access and ii) diversifying the energy mix,are crucial for creating employment, reducing poverty, triggering economic growth, maintaining peace and building resilience. STI is critical in all these and must be galvanized to lead in this process of innovation and policy for sustainability.

According to FAO, a 70% increase in agricultural production will be needed by 2050 to keep up with the population growth. Concurrently, as a result of climate change, in many regions farmers' yields are jeopardized by ever more frequent droughts and flooding. For smallholder farmers, the decline in yields of staple crops (wheat, rice, maize) means not only smaller income but threatens their very livelihoods. The question is thus how we can harness STI to help feed the world, adapt the agricultural production to climate change and preserve the environment for us and future generations.

Food security could be better with the use of methods of science, technology and innovation, which should always be done to fulfil the need for food and food security controls. But this must be done with a system that is really appropriate for the benefits actually felt by people in need. Agricultural innovation systems should be built by involving at least four stakeholders:government, education institutions, private sector, and farmers. What usually has happened is that many invention could only “stacked up” in education institutions library, due to lack of funds for implementation or further research.

For many years, farmers in developed countries have benefited from the most current technologies to increase their harvest, improve the production of livestock and decrease the time and effort needed to cultivate the land and the livestock. Even within the developing world, we observe big differences in productivity levels from the highest in the Latin America and the Caribbean region to the lowest in sub-Saharan Africa pointing to massive underinvestment in this sector. STI have an important role to play in bridging the existing productivity gaps between regions and countries.

The existing and future technologies need to become more affordable in order to be adapted by the rural poor in developing countries. Innovative solutions, such as decentralized energy options that expand access to energy to underserved populations in rural communities are another example of technology coming to aid for rural development. 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 among dispersed underserved rural populations.

Rural communities increasingly see their land and natural resources degraded due to climate change, which further weakens their food security. According to a study by the International Food Policy Research Institute, climate change could increase the number of malnourished children by 9.8 % by 2050**.** In the same vain, unsustainable agricultural practices, e.g., overreliance on harmful fertilizers and pesticides for food production pollute groundwater and soil damaging the local ecosystems.

Integrated solutions for food security and energy issues also depend fully on STI. Using environmental friendly technologies to enhance food production, while at the same time exploring technologies and business models to use the agricultural residuals to produce bio-fuel, is a promising option.In carbon sink projects further create value though VER (Voluntary Emission Reduction) trading. Environmental considerations fully included into development strategies are not only an obligation, but also an asset, producing additional revenue.

Interface between science and policy

Enhancing the interface between science and policy requires the establishment, consolidation and empowerment of mechanisms for providing STI advice to governments. STI advice is particularly relevant for risk management, early warning and monitoring systems for new and emerging challenges, natural disasters and extreme events. STI advice mechanisms should be integral to government departments, parliaments and their corresponding commissions, and the justice system, allowing policy to be more evidence-based. STI advisors would act as focal points and linkages with the wider STI community, enhancing dialogue between the stakeholders by communicating in two ways: top-down (from government to science community - academies, NGOs, societies for advancement of science, scientific unions and international scientific organizations) and bottom-up (from science community and

civil society to the government). Advice should be "independent", focussed and balanced, and take into account the different cultures between science and policy, including different time requirements on policy needs and provision of scientific advice. Foreign Affairs are one of the key areas for sustainable development; in this field STI advice would become STI diplomacy. Capacity building for STI advisors and STI diplomats is needed, as well as exchanges (Fellowships) between STI institutions and government departments. For the science-policy interface to adequately work, STI advice mechanisms should be well funded.

For the interface between science and policy to work properly, research facilities, particularly at Higher Education institutions, need to be strengthened, down to the grass root levels to inform policy formulation and public awareness about important issues affecting people's lives such as environmental, social and economic issues.

Better use of academic research tools by government at both national and sub-national levelsought to lead to a stronger partnership working between line ministries at the national level, and municipal authorities and college/schools at the regional and local levels. Only through mutual recognition can such a partnership lead to an effective policy formulation informed by scientific discourse. The research centres are not isolated from, but connected to, its local civic community, which can be a source of huge input and knowledge. It's the civic community and its different strands that set the debate agenda, always with an eye for new challenges and opportunities.

Further research on more participative models of governance could be a key feature to strengthen the interface between science and society. So far, institutional tools have frequently been inadequate and in some cases it often happens that the civil society is not sufficiently involved in the decision-making processes. The new challenges require an effective system of governance in which participation is an act of shared responsibility in decision making. This process should start from identification of problems and needs, analysing potential solutions, resources available, priority and options to establish the mode of response and the actions to carry out in order to identify the needs. This could be one possibility to strengthen the interface between science and society and create knowledge societies which might give to everyone equal access to essential living resources. Moreover, managing environmental problems efficiently requires well-designed public policies or coordination among stakeholders and synergies between university-laboratory-policy makers and civil society, through the creation of networks and associations.

STI and the Post-2015 Development Agenda

While STI could be integrated into the 2015-post development agenda in a cross-cutting manner –much as it has been in the MDGs-, there is an opportunity to give it a stronger presence, recognizing it not only as transversal, but as one of the basic building blocks for achieving sustainable development.

Formulation and adoption of a post-2015 framework should definitely not following top-down or donor-driven approach. However, one of the means for giving STI proper visibility could include a global meeting of heads of statesto discuss STI.

Appropriately incorporating STI into the Post-2015 development agenda should include incorporating goals and the corresponding indicators for monitoring, evaluation and accountability. Indicators selected should relevant, sound and of high quality. New goals and indicators will have to include tools to recognize disparities between regions,

and between population groups within particular countries. Besides, new measures of accountability are needed.

Examples of practices

In Uzbekistan, projects sponsored by agencies such as UNDP, aimed at achieving MDGs as well as other national strategic goals, have incorporated piloting and dissemination of new technologies, such as solar energy systems for remote villages, bio-gas, livestock breeding and management, ICT technologies for increasing the efficiency of public services and public administration, showing clear linkages between STI and sustainable development.

The UN System is supporting developing countries in developing their STI policies. An example is the UNDP-Government of Uzbekistan joint project aimed specifically at supporting the innovation policy and technology transfer in the country. The goal of the project was to strengthen the capacities of the central government and relevant authorities to develop, implement and monitor innovation policies. One of the key components of the project has been increasing the capacities of responsible authorities to gather and analyse STI indicators in line with best international practices, as proposed by UNESCO and OECD. This component, implementedwith the technical assistance of UNESCO, was aimed at supporting policy formulation and implementation through quality evidence and data (statistics), gathered to produce baselines and monitor progress towards specific, measurable, achievable, relevant and time-bound targets. Similar projects have been carried out throughout many African countries in cooperation between UNESCO and the corresponding National authorities. In Latin America and the Caribbean, UNESCO has set up a science policy information platform (spin.unesco.org.uy) to support evidence based policy making.

Using technology to study has been identified as another key opportunity. Mexico City's government used UNAM's Virtual High School in order to serve more than 50,000 out-of-school teenagers and adults in five years. Although almost no student had any previous experience of studying online, this delivery mode has become popular due to its success.

The use of the Internet to access development projects and get in touch with world markets is a technology that can contribute to a sustainable and equitable development. New technologies can increase the access to information of disadvantaged people and, also, can help to create new job opportunities for people living in poverty.

The Forum on China-Africa Cooperation is an example of connecting innovations in clean tech to the goal of poverty reduction through south-south cooperation. Plans focuson areas such as electronics, textiles, machinery, and mineral resource processing. Mainstreaming clean tech science, innovation and development into future economic zones could become a new source of investment and growthin Africa, a base for innovation towards the goal of clean tech for inclusive and sustainable development.Examples of successful policy dialogue can be taken from the case of the dialogue between China and Ethiopia, which helped bringing together the very different perspectives of innovation-producing and innovation-consuming countries. Knowledge suppliers and knowledge consumers have very different perspectives for the knowledge and cooperation is needed to produce joint new knowledge.

Interesting examples are also projects in China under which companies in developed world and companies in China work together to produce innovations with joint IPRs and then transfer the technology to other countries with joint benefits.

A case of reconversion of a company from a traditional industry (textiles) to a green industry (wind turbines) is India's Suzlon. This conversion has led Suzlon to a very quick grow, installing technology in 28 countries It´s R&D facilities are in China, Germany, India and The Netherlands, co-operating with local universities and R&D centres. At its headquarters, Suzlon reports recycling all water and waste and using only wind and solar as well as low-energy air-conditioning.

Examples of new industrial hubs for innovation in clean tech have emerged in places like Masdar City in United Arab Emirates (UAE), and the innovative green economy activities being undertaken in South Korea. One idea could be to explore ways to integrate clean tech science, innovation and product development hubs within new special economic zones, towards rise of "green economic zones (GEZs)".

A community-forestry project in India included literacy training of poor illiterate women, and was implemented in Public Private Partnership through a computer-based training programme. Not only did the women achieve literacy skills in record time through interactive software, but in the process they also acquired computer skills and improved their social standing. Low caste women were envied as the vanguard of technical innovation since the computers used were the first to be seen in the village.

UNDP assisted cash-for-work project in Bangladesh, targeting destitute widowed, divorced and abandoned women who were marginalised in the local community. Baseline data revealed that only 0.3% of them owned a mobile phone. Currently, five years later, 40% of the women own cell phones, to stay connected with each other, NGOs, service providers, suppliers and customers of the micro-enterprises they are now engaged in. This has given a significant push to women's empowerment. In the design of a follow-on project, m-banking is being considered as a means for transferring cash transfer wages.

Science House Foundation, have found that informal science and technology education has an amazing transformational power on children from underserved communities around the world. As part of the MicroGlobalScope project, provide microscopy kits to schools in 26 countries and engage scientists, teachers and local NGOs to participate in the project. The children explore their environment and share their discoveries in an online platform for them to learn the principles of peer-review, critical thinking and intercultural understanding. This represents an example of the intersection between STI and education and culture for sustainable development and achieving the MDGs.
In India, the Government has announced Akaash Tablets to be made available to each and every student. Various challenges remain, such as the need to equip every school with Wi-Fi and providing enough charging points. Furthermore, in India it is there in IITS with SIDBI, proposed for technical skill development centre. These technical institutes may also link with customer care so that their expertise could be used for established and new enterprise after post sale services.

STI have an important role to play in bridging the existing productivity gaps between regions and countries. For example, innovations in crop and plant breeding and in irrigation techniques that help smallholder farmers increase their yields will need to be scaled up (some successful examples include hybrid maize in Zambia and Zimbabwe; cassava varieties in Uganda that are resistant to severe weather and pest; Nerica rice in West Africa or micro-irrigation in India).

Mobile phones are a prime example of an affordable technology that has opened communication channels for poor people in rural communities. In addition to the relatively low cost, mobile phones also require only basic literacy skills, which has made their adoption easy. The application of mobile phones in rural settings to obtain market information and reduce transaction costs has been well documented. But mobile applications are also used to provide early pest or disease warning and even to help farmers keep track of the milking schedule. With Kenya at the forefront of mobile technologies innovations, it is to be expected that they will continue to thrive throughout the developing world.

STI can bring about a real change such as, for example, the adoption of green farming technologies to ameliorate adverse impact of the changing environment. This will require public investments (e.g., in necessary infrastructure, but also in training and education) that would incentivize farmers to adopt to sustainable agricultural practices.
In Somaliland, the issue of dangerous deforestation and resulting desertification as a result of a run-away charcoal processing for local consumption (and overseas commercial) purposes was being discussed country wide. At the local level, the discussion came up with very interesting propositions such as the introduction of the use of slaughterhouse refuse (animal gut waste) as a source of energy. The question was whether the appropriate technology and know-how to extract biogas from this readily available resource can be gotten locally. As this was a wholly new idea that has not been tried in the area before, the University of Burao was asked to look at the feasibility of the scheme in a holistic way (technological, health, economics etc.). The outcome was a positive one with the University research centre championing the viability of such a scheme. The technology was designed locally and tested for accuracy working and proved flawless.

ANNEX: THE PURPOSE OF THE E-DISCUSSION

The purpose of the E-Discussion was to bring together experts, practitioners and policy-makers from around the world to discuss the role of STI and culture in promoting sustainable development, to help define the future global development framework that will succeed the Millennium Development Goals (MDGs). Furthermore the aim was to collect views from a wide range of stakeholders.

ANNEX 1: OPENING MESSAGE

The Role of Science, Technology, Innovation in addressing development challenges by Selim Jahan and Lidia Brito

Dear Colleagues,

We warmly welcome you to Phase I of the e-discussion ***"Building the future we want with science, technology and innovation (STI) and culture"***, which will take place between **18 February and 4 March 2013**, moderated jointly by the United Nations Development Programme (UNDP), and the United Nations Educational, Scientific and Cultural Organization (UNESCO) as part of the 2013 Annual Ministerial Review (AMR) process. The AMR is being organized at a critical juncture as it follows the clear articulation of the 'Future we want', voiced at the Rio+ 20 Summit and comes in time to inform the design of the future global development agenda.

This part of the e-discussion will focus on the importance of STI for development and the critical role it plays in informing our understanding of the mechanisms of sustainable development, developing options for inclusive growth and facilitating development of new technologies and evidence-based practices.

Strengthened STI frameworks could accelerate the progress on the Millennium Development Goals (MDGs) and become a key component of the future global development agenda given their impacts on key issues such as food, water and energy security, public health, and environmental and social sustainability. For example, the power of knowledge, innovation and creativity is critical for the creation of sustainable jobs and robust economies, capable of withstanding fluctuations in global markets. Improved technology and know-how can positively improve all sectors, for example in agriculture technology can increase agricultural productivity to meet the growing demand for food globally. Achieving public health outcomes requires not only access to essential medicines, but also enhanced health systems which promote innovation, address neglected health needs and ensure access to vital medical technologies. Finally, responding to the dual challenge of reducing energy poverty while mitigating climate change would inevitably entail promoting the development, as well as transfer, adaptation and dissemination, of renewable energy and other environmentally sound technologies.

The inherent challenge is to ask ourselves what kind of science, technology and innovation the world needs in order to build sustainable knowledge societies and create stronger connections between science policy and society. Knowing that sustainable development requires the meaningful involvement and active participation of regional, national and local actors, including women and indigenous peoples, both gender issues and the mainstreaming of indigenous knowledge systems are central for consolidating the role of STI in the overall map of sustainable development.

A further challenge for policy makers is to create an environment where development and STI policy build on each other in a mutually reinforcing way. Developing genuine partnerships between the public and private sectors but also between scientific community and policy makers will also be crucial to help harness the potential of STI for development.

Considering the above, we would like to present before you the following three questions. Whenever possible, please bring examples of successful application of new technologies and innovations to enhance people's well-being or country experience in leveraging STI for this purpose. In this sense, this platform could be used to contribute to establishing a bridge between achievements (what has been done) and challenges (what we can and must do in the future).

1) Why is STI critical for sustainable development? What is the role of STI in achieving the MDGs? Why and how should STI be integrated in the post-2015 Development Agenda?

What type of STI activities (R&D, technology transfer, adoption, adaptation) should be promoted in developing countries for supporting sustainable development? What policies and policy instruments should be put in place? What changes are needed in governance structures? Can we measure the contribution of STI to sustainable development? Which indicators could be applied? What should be the benchmarks?

2) How can we ensure that STI benefit those living in poverty or are excluded from society? How can we ensure that existing and emerging innovations and technology can help reduce inequalities and not reinforce them?

How can STI promote inclusive societies? How can STI be shaped (content-wise) to address social needs vs. economic interests? How can research, innovation and entrepreneurship be better connected to benefit the poor? How to better promote / establish a culture of science and innovation, with gender equality and empowering the youth for sustainable development? What is the role of Indigenous knowledge systems? How can indigenous knowledge be mainstreamed into sustainable STI policies and practices?

3) How can the interface between science and policy be strengthened to better serve sustainable development?

While R& D and science find their quick uptake in the private sector, they rarely inform traditional policy-making. How could we ensure that the policy is influenced by new developments in science and research? What mechanism and incentives should be put in place to bridge research, science and policy? What are the lessons learnt and best practices in connecting scientific knowledge to decision and policy-making?

Finally, we are pleased to introduce Ernesto Fernandez Polcuch (UNESCO, Montevideo) who will assist us in the moderation role by bringing in an expertise in STI practice and policies for sustainable development.

We wish you all a fruitful and stimulating discussion!

Kind regards,

Selim Jahan, Director, Poverty Practice, UNDP

Lidia Brito, Director, Science Policy and Capacity Building, UNESCO

ANNEX: E-DISCUSSION TIME-TABLE

- Monday 18 February: official launching of the e-discussion
- Monday 18 February: launching of key issue N1
- Friday 22 February: launching of key issue N2
- Monday 25 February: summary of discussion week 1
- Tuesday 26 February: launching of key issue N3
- Friday March 08: summary of discussion week 2
- Wednesday13March:Closing of the E-discussion
- 05 April: Final Report

ANNEX 2: CLOSING MESSAGE

Dear Colleagues,

Thank you all for your very valuable contributions to the first part of the ECOSOC e-discussion “Building the future we want with science, technology and innovation (STI) and culture”. This part was focused on the importance of STI for development and the critical role it plays in informing our understanding of the mechanisms of sustainable development.The discussion has been fed by the active participation of numerous contributors and generated more than 780 views and 40 comments, from different countries around the world in English, Spanish and Portuguese, during the two weeks discussion.
More than 553 members were involved in the discussion. Contributors included UN agencies universities, research institutes, civil society organizations and individual comments. The e-discussion participants shared their personal and professional experiences. I’m pleased to confirm that the recommendations you made on three topics will be a part of the e-discussion final report, which we will share with you as soon as possible.The E-discussion covered a large range of topics related to Science, Technology and Innovation. This made for a rich and wide-ranging discussion.I want to underscore three key points you raised in our discussion:

- First, your contributions underline that STI is critical to sustainable development and is an especially important subject for the development of countries. Furthermore, STI can play a critical role to solve global problems related to sustainable development and should be integrated in the post-2015 Development Agenda
- Second, it was also clear from the views expressed that future Sustainable Development Goals (and any broad development objective) cannot be achieved without the inclusion of STI. STI can be decisive and a powerful facilitator of economic development, educational programs and environmental protection.
- Third, the discussion left no doubt that partnership between public sector and academic, scientific community and policy makers will also be crucial to help harness the potential of STI for development.

As co-moderator of this e-discussion I would like to thank everyone for their valuable participation and for sharing inputs, ideas and experience. The feedback from everyone was extremely positive; it was really interesting to learn about different perspectives on these issues.

Thank you once again for your contributions and holistic approach and for affording me the opportunity to interact with you during this stimulating first part of ECOSOC E-Discussion.

Ernesto Fernández Polcuch