

Briefing Note on the STI Forum

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SUMMARY OF THE SECOND ANNUAL MULTI-STAKEHOLDER FORUM ON SCIENCE, TECHNOLOGY AND INNOVATION FOR THE SUSTAINABLE DEVELOPMENT GOALS: 15-16 MAY 2017

The second meeting of the Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals (SDGs)—STI Forum—took place at UN Headquarters in New York on 15-16 May 2017. The theme for the Forum was “STI Forum 2017: “Science, Technology and Innovation for a Changing World - Focus on SDGs 1, 2, 3, 5, 9, and 14”. In addition to several cross-cutting sessions, the STI Forum also featured a series of 90-second innovation pitches for the sharing of innovations that provide solutions targeted to these six SDGs. Innovators from around the world were invited to submit their scientific and technological solutions to the challenges posed by the six SDGs and 12 were selected.

The STI Forum is a component of the Technology Facilitation Mechanism (TFM) outlined in the Addis Ababa Action Agenda (AAAA) and the 2030 Agenda for Sustainable Development. The TFM also includes an Inter-Agency Task Team on STI for SDGs (IATT), a 10-Member Group, and an online platform.

The IATT is comprised of several UN agencies, and co-chaired by the UN Department of Economic and Social Affairs (UN DESA) and UN Environment (UNEP). The 10-Member Group was established in January 2016 to work with the IATT to prepare for the STI Forum, and develop and operationalize the TFM’s online platform, among other tasks. It elected as co-chairs William Colglazier, Center for Science Diplomacy, American Association for the Advancement of Science, and Heide Hackmann, International Council for Science (ICSU). The online platform is expected to provide a comprehensive mapping of existing STI initiatives, mechanisms and programmes within and beyond the United Nations.

The TFM was officially launched in UN General Assembly resolution 70/1 in September 2015, which calls on the President of the UN Economic and Social Council (ECOSOC) to convene the STI Forum once a year to discuss cooperation on STI around thematic areas for the implementation of the SDGs. In February 2017, ECOSOC President Frederick Musiiwa Makamure Shava announced that he re-appointed Ambassador Macharia Kamau, Permanent Representative of Kenya to the UN, and Dr. Vaughan Turekian, the Science and Technology Adviser to the US Secretary of State, to continue in their roles as co-chairs.

WELCOME ADDRESS AND OPENING SEGMENT

ECOSOC President Shava opened the second STI Forum on Monday morning, 15 May. He said that for all of the potential of sustainable technology to design solutions for sustainable development challenges, no real progress will be made without action on the ground. Such action-oriented cooperation on STI, he added, might prove not only highly effective but could also bridge divides across borders and between various communities, while strengthening communication and collaboration. Shava added that the STI Forum serves an important purpose in this regard. He noted that a large contingency of young people are participating this year, including as speakers and innovators.

Peter Thomson, President of the UN General Assembly (UNGA), said that the power of STI is clear and we must take the steps to ensure the potential is unlocked to our advantage and can enable us to achieve the SDGs by 2030. He called for: addressing unequal access to technology, innovation and connectivity; establishing strategic partnerships; broadening access by women; and managing the social, political, economic, ethical, security and human rights risks associated with advancements in STI, including protection against cyberattacks, privacy concerns, and loss of jobs due to innovation.

Thomas Gass, Assistant Secretary-General for Policy Coordination and Inter-Agency Affairs, UN DESA, on behalf of Under-Secretary-General Wu Hongbo, said of the 169 SDG targets, there is scarcely a target isolated from technology, further noting that many times the technology is not necessarily high nor does it always come from Silicon Valley.

Ecuador, on behalf of the Group of 77 and China, said that without breakthroughs in technology it will be difficult for developing countries to shift to a sustainable path. She noted: capacity constraints in least developed countries (LDCs), land-locked developing countries, small island developing states, Africa, and conflict and post-conflict countries; international and North-South cooperation remains a fundamental catalyst; negative impacts of illicit financial flows; and the importance of traditional knowledge.

Cameroon, for the African States, said STI can be a “game changer” for Africa, adding that the STI Forum can provide an opportunity for job creation, especially for youth, through enhancing knowledge and experience sharing, while catalyzing capacity building to address the persistent technology gaps across the globe. He called for the operationalization of the technology bank for LDCs and promoting synergies with the TFM.

Bangladesh, for the LDCs, said the LDCs and their development partners agree on the importance of STI for

implementing both the 2030 Agenda and the Istanbul Programme of Action for LDCs. He added that STI can help LDCs cope with climate change, natural disasters, and epidemics, among others. He recommended: enhancing vertical coordination between national, regional and global levels to ensure research and development (R&D) is funded; the transfer of technology and know-how to the LDCs, including through the technology bank for LDCs; increasing concrete South-South initiatives for technology cooperation; and increasing the financing for technology and scholarships for LDCs.

El Salvador, for the Community of Latin American and Caribbean States (CELAC), noted the role of technology in building knowledge societies with competitive advantages in the global markets, and in supporting entrepreneurs and small- and medium-sized enterprises (SMEs). He called for: transfer of environmentally sound technologies to developing countries on concessional and preferential terms; mobilization of sufficient financial resources for addressing existing technological challenges in developing countries; and taking into account indigenous knowledge.

In a video message, Bill Gates, Bill and Melinda Gates Foundation, expressed optimism with regard to the SDGs given the current innovations in technologies, which “even though they are not silver bullets, can unlock miracles.” He thanked the STI Forum’s leadership and welcomed the participation of innovators in the UN.

SESSION 1: HARNESSING STI FOR THE SDGS – THE KEY TO UNLOCKING STI POTENTIALS

Co-Chair Turekian said he was honored to have so many diverse stakeholders in the room and to see how the STI community interacts with the policymaking community. He encouraged participants to think about this building as a laboratory, and interact and discuss the ideas to bend the scientific and innovative curve, by working together, across disciplines, specialties and borders.

Co-Chair Kamau said “This is your forum and it is important that we make this different from other experiences at the UN.” He called on participants to engage in a “multi-logue,” where people coming from different areas engage in discussion. He said that scientists are not clear on how their work and research interfaces with policymakers. The gap between the knowledge and science and policy outcomes is huge, he added, and this gap should be closed. He concluded by asking participants to make this the premier global forum for STI interface with global policymakers.

Elenita Daño, Asia Director, Action Group on Erosion, Technology and Concentration, the Philippines (and TFM 10-Member Group), served as moderator for the session and noted this session will set the scene for the overall STI Forum and provide elements of a vision to harness the potential of STI for sustainable development. Indira Nath, All India Institute of Medical Sciences, National Academy of Sciences, India, spoke about the role of technology in supporting the implementation of SDG 3 (on health). Noting that six out of ten infectious diseases are caused by animals, she called for looking at health in a crosscutting, integrated manner that takes into consideration the whole ecosystem and all the SDGs. To that end, she stressed the need for coordination, communication, and collaboration between sectors and professionals, underlining the role of technology in breaking those silos. Nath also presented several innovations in technology, such as technologies that capitalize on the connection

between the brain and the immune system to address arthritis, and noted that the challenge is to design low-cost technologies.

Taikan Oki, Senior Vice-Rector, UN University, said there is a need to distinguish between invention and innovation, in that an invention is a trigger for the broad innovation that drives social progress. It is important that inventions are socially accepted and new technologies disseminated inclusively across the world, he added. He called for: governments to form STI for SDG panels to set national priorities; enhancing collaboration between different sectors to achieve integration; and convening an open STI conference on the SDGs to enable scientists and diverse stakeholders to discuss how STI can enable progress on the SDGs.

In the ensuing discussion, China described its advances in mobilizing innovation resources and exploring mechanisms for engagement of stakeholders. Ethiopia presented its technology road map, the first of its kind in Africa, which provides information for better technology investment decisions and ways to leverage research and development investment. Canada said the STI Forum should be more of a catalyst and should gather best practices and address how to promote girls to study engineering, science and coding. AidHub called for breaking down silos and working more collaboratively to achieve the SDGs. The ETC Group mentioned concerns with big data. The UN Major Group for Children and Youth asked about how to ensure that innovation is people-centered.

In response, Nath agreed that technologies can cause harm and can cause good, and that she was conscious of privacy concerns with megadata.

SESSION 2(A): KEY PRIORITIES FOR ENGAGING STI FOR ENDING POVERTY IN ALL ITS FORMS EVERYWHERE (SDG1)

John Gibbons, “Babajob in India,” presented his innovation pitch for his company that built a platform for job seekers in India to apply for jobs online and offline and how he wants to make these services available for low income job seekers in other countries as well.

Moderator Gillian Tett, *Financial Times*, opened the panel asking at a time when the world’s biggest companies are using data to transform industry, how digitization and data can be harnessed to not just benefit big companies, but poor people across the global.

Dirk Fransaer, Flemish Institute of Technological Research, Belgium, discussed the need for integration of technology, and social and environmental aspects. He discussed how cleaning up household waste and litter not only solves a health problem but can also provide sustainable energy. He explained that this is not happening because governments and companies cannot manage multiple silos, such as clean water, waste and energy, and invited a private or government actor to demonstrate that this can work on a substantial scale.

Priyanthi Fernando, Center for Policy Analysis, Sri Lanka, noted that in India there are 1 billion mobile phone subscribers, but less than 46% of women overall and less than 35% in rural areas have mobile phones. Some villages even ban unmarried women from using mobile phones, she added. She called for paying more attention to the basic technological needs of women, men and children, especially with regard to sustainable energy. She concluded that if women’s knowledge is valued and the rights of those who have this knowledge are respected, technology can help achieve SDG 1.

Anne Kingiri, African Centre for Technology Studies, Kenya, recommended: rethinking STI policies and practices in terms of the local context; rethinking innovation in terms of social innovation and building local capacity to solve local problems; building capacity of young people, the future innovators and entrepreneurs, through education; and investing in research excellence and reversing the brain drain.

Moderator Tett summed up the panel's main themes as: focus on youth, the social context of technology, focus on women, bottom-up innovation, and breaking down institutional silos.

In the subsequent discussion, China said innovation for poverty eradication will be based on mobilizing resources and focusing personnel to improve production capabilities. Zambia said breaking down institutional silos requires a major paradigm shift and asked how that can be accomplished. The World Blind Union stressed that technologies should be accessible to people with disabilities who have the highest unemployment rates in the world. The UN Major Group for Children and Youth said instead of seeing where women and youth are placed in the economy, we should see where the economy fits into the environment and society.

In response, Fransaer said the scope of the SDGs is much broader than their economic aspects. He said that an example of a paradigm shift is to broaden the concept of sustainable health to keep people off medicine. Fernando called for putting people, including those with disabilities, in the center. Kingiri called for a change of mindset for researchers so that they ask themselves if STI will impact social and economic development. Tett concluded that we have to look at what people need and want.

SESSION 2(B): KEY PRIORITIES FOR ENGAGING STI TO END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE (SDG 2)

Mridul Chowdhury presented his innovation pitch "Farmer Query System in Bangladesh," which connects farmers in rural areas with experts from cities all over the world through smart phones, enabling knowledge exchange.

Ahnna Gudmunds presented her innovation pitch "Virtual Farmers Market in Zambia," which acts like an eBay for smallholders, connecting them with digital, innovative markets.

George Essegbey, Director, Science and Technology Policy Research Institute, Council of Science and Industrial Research, Ghana (and TFM 10-Member Group), called for paying attention to the gender dimension of hunger, highlighting that 60% of the 800 million that are hungry are women and girls.

Wang Ruijun, Ministry of Science and Technology, China, and Chair of the UN Commission on Science and Technology for Development, said developing countries need to be proactive in developing innovation ecosystems for agriculture, for which they need support and investment in people, technology, and infrastructure. He stressed the need for targeting research and funding to key priority areas for each country, including disaster risk reduction.

Nemo Semret, Chief Technology Officer, Gro Intelligence, presented the company's flagship product, which eliminates the need for teams of experts and specialized technical software to answer questions about global food and agriculture, by enabling data discovery and access to predictive modeling at an unprecedented scale.

Jim Gaffney, DuPont Pioneer, US, presented several ways to increase productivity and profitability of smallholder farmers in

Africa by leveraging innovative technologies in maize production and developing access to markets, such as Biofortified Sorghum and CRISPR-Cas (gene editing). He called for connecting smallholder farmers with both input and output markets through technology.

In the ensuing discussion, civil society representatives called for, *inter alia*, enhancing seed and gene banks through enabling policy environments, and overhauling current intellectual property rights regimes that marginalize indigenous knowledge. The World Food Programme noted that eradicating hunger is not only about technologies, but also about looking at new business models.

SESSION 2(C): KEY PRIORITIES FOR ENGAGING STI TO ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES (SDG 3)

In his innovation pitch, Asher Hasan, "DoctHERs," showed how female doctors were excluded from the workforce in Pakistan and how they are now connected to consumers in remote, rural and urban areas by phone. This led to 30,000 paid video consultations to date and impacted over 300,000 lives through screenings, he added, noting plans to impact 20 million lives by 2030.

In his innovation pitch, Adama Kane, "JokkoSante," described how he created a mobile platform for sharing and cross-financing medications in Senegal, incentivizing both pharmacists and patients to work together to get deprived people the medicines they need.

In her introductory remarks, Rachel Kyte, CEO and Special Representative of the UN Secretary-General for Sustainable Energy for All drew attention to the linkages between SDG 3 (health) and SDG 7 (energy), and said by focusing on energy and health as one problem, solutions can be scaled up. She described how energy plays a vital role in strengthening health systems and access, noting that in Africa only 28% of facilities has reliable access to energy and 70% of medical devices in developing countries fail due to poor power. Households using solid fuels lead to death due to indoor air pollution and vaccines that prevent infectious diseases need to be stored at a particular temperature, she added. She called on the private and public sectors to work together to provide solutions.

Panel moderator Paulo Gadelha, FIOCRUZ, Brazil (and TFM 10-Member Group), said that universal health coverage, part of SDG 3, is a key driver for achieving all the SDG targets. He added that health innovations are dependent on the regulatory process.

Livio Valenti, Vaxess Technologies, described a new class of affordable vaccines that don't need refrigeration, a syringe or a trained professional to administer: a patch that can release the vaccine over time. This patch uses a fraction of the vaccine dose, reduces the cost and can potentially include two doses of a vaccine to reduce trips to clinics. He said innovation remains sterile if it cannot become an actionable and accessible tool, adding that entrepreneurship is often the missing link.

Sarah Marniesse, French National Research Institute for Sustainable Development, stressed the need for local innovation, research and capacities, using the example of how bed nets saved six million lives from malaria. She called for: more financing for local research; supporting participation through local innovation and co-creation, noting involvement of the community and other stakeholders is especially critical for novel healthcare solutions;

solving local problems in culturally appropriate ways; and developing innovative digital health technologies for low resource settings.

In the ensuing discussion, the UN Major Group for Children and Youth addressed barriers to access to medicines and healthcare. Zambia called for better healthcare delivery and better technologies beyond mobile phones to limit the spread of infectious disease. Ethiopia agreed with the importance of promoting local research and the need for vaccine technologies where there is limited access to energy. Practical Action asked about the TFM's potential to highlight key things that can be coalesced around as a global community. The International Federation of Hard of Hearing People called for states to provide support to ensure medical technologies are accessible and affordable to all persons with disabilities.

In response, Valenti said that scientists in the lab need to hear how to make technologies better for local communities in Africa and elsewhere. Marniesse noted that research must be accessible to the public, and local research must be more in line with crucial issues. Co-Chair Turekian said it is important to reinforce progress in one area without hurting another.

SESSION 2(D): KEY PRIORITIES FOR ENGAGING STI TO ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

In his innovation pitch by video, Emmanuel Owobu described OMOMI, a company that makes use of mobile technology devices and tools such as phones, tablets, SMS, apps, Interactive Voice Recordings and videos to solve some of the most pressing healthcare problems facing developing countries.

Moderator Myrna Cunningham, Center for Autonomy and Development of Indigenous Peoples, Nicaragua (and TFM 10-Member Group), said that there is growing recognition that gender equality can have a multiplier effect and that expanded opportunities for women and girls can create a more productive economy. She noted that women only account for 28% of the world's researchers.

Susil Premajayantha, Minister of Science, Technology and Research, Sri Lanka, said information and communication technologies (ICTs) are one of the most powerful tools in empowering women and bridging the gender gap, especially through mobile phones. He described how midwives in Sri Lanka use iPads to keep medical records. He also said that they have 335 centers that are staffed by men and women who are trained in technologies and innovation and conduct ICT awareness courses, especially among women and children.

Lana Nusseibeh, Permanent Representative of the United Arab Emirates (UAE) to the UN, described the UAE's massive investments in women's education and health and how they moved more women into STI fields. She said that in the UAE, 56% of science, technology, engineering and mathematics (STEM) graduates are women. She noted that: empowerment for girls begins in the schools, which should encourage STI from an early age; resource allocations matter; and the same problems that reduce women's participation in other fields reduce their participation in the STI field. She called for equalizing support for both men and women.

Dalia Francheska Marquez, Women's Leaders Committee of OAS, Youth United in Action Venezuela, said that only 15% of innovators are women. She said many women avoid scientific careers because of discrimination, and thus access to non-sexist education and incentives for women in STEM careers is essential.

She also called for: an end to economic dependency that limits women; devoting funds for women researchers; and teaching women and girls about the ways they can use appropriate technologies to improve their lives and communities.

During the discussion, Hayat Sindi, Saudi Arabia, stressed the need to find ways to get women to study science, for example, when men designed air bags, they were designed for a man as a driver, but when a woman joined the team, she saw the need for side airbags. China said that more women get patents in China than anywhere else due to their support for female scientists. Zambia said that culture and socialization of women often prevent women from entering STEM professions. She said that change has to begin in the home. Co-Chair Turekian asked what sort of programs exist for fathers of daughters to learn how to be better mentors in science and engineering. The UN Major Group for Children and Youth called for a major structural paradigm shift in order to increase capacity and inclusion of women and girls. Panama asked if women in the UAE were already empowered at the political level.

In response, Premajayantha said that improving STI for women and girls begins with free education and interacting with female scientists at the village level. Nusseibeh said both male and female leadership in her country pushed for women's participation, adding the UAE believes that empowering society through women is not the moral or right thing to do, but is the smart thing to do. Marquez noted that women must have the same education as men so they participate in science and technical careers.

Cunningham concluded that a paradigm shift can only happen if women are involved. She said the main messages from this panel are the role of non-sexist education, the role of parents, and examples of combining ICT with traditional knowledge.

SESSION 2(E): KEY PRIORITIES FOR ENGAGING STI FOR CONSERVING AND SUSTAINABLY USING THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT (SDG 14)

Hayat Sindi, President, Institute for Imagination and Ingenuity, Saudi Arabia (and TFM 10-Member Group), exemplified the importance of technology in finding solutions for storing carbon, improving fishing practices, and pollution cleanup, and transitioning small islands to a blue economy.

Arjoon Suddhoo, Executive Director, Mauritius Research Council, Mauritius, spoke about the role of technology in helping Mauritius transition to a blue economy through collecting the necessary data for harnessing offshore wind energy, ocean wave energy, and ocean current energy, while also supporting the creation of offshore wind farms. He presented three recommendations: demonstrate sustainable economic benefits and incentivize private sector participation; develop applied hands-on STI, including cloud computing, data analytics, the internet of things, and data sharing; and focus on human development, particularly youth. He said the priority of small islands is to stop being small islands by connecting to the world through technology.

Martin Visbeck, University of Kiel, GEOMAR Helmholtz Centre for Ocean Research, Germany, spoke about the role of technology in integration and collaboration on ocean observance, explaining how space observation provides data that is free and available globally. He presented an innovative partnership between Google and an NGO, Global Fishing Watch, that

monitors fishing and the protection of marine protected areas. He further stressed the role of technology innovation in global learning, problem solving, and predicting and modeling at scale.

Matthew Merighi, Blue Water Metrics, US, said Blue Water Metrics is a non-profit that collects data on ocean health by filling the gaps in current ocean data collection, through using the latest technology that allows vessels to collect data during their travels and upload it onto the cloud. He explained that the goal is to overcome the current fragmentation in ocean data collection and develop “one monitoring system for one ocean.” Merighi called for motivating and involving youth in finding solutions for sustainable maritime development.

In the ensuing discussion, participants raised issues related to, *inter alia*: technology design geared at tackling the land-based pollution of oceans; expanding the school curricula on oceans and innovation; approaching doing business at the local level through a social rather than a technological lens, because communities consider that the ocean belongs to them; and promoting gender equality and women’s empowerment in STI for oceans. The UN Food and Agriculture Organization (FAO) introduced “The Global Record of Fishing Vessels Refrigerated Transport Vessels and Supply Vessels.”

SESSION 2(F): KEY PRIORITIES FOR ENGAGING STI TO BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION (SDG 9)

Kevin Lee presented his innovation pitch “Mobilized Construction in Africa,” which de-mechanizes road construction by mobilizing local labor to manually build climate-resilient dirt roads.

Nebojsa Nakicenovic, International Institute for Applied Systems Analysis (IIASA) (and TFM 10-Member Group), noted the increasing inequality between and within counties, which exists on a backdrop of economic growth, and highlighted that the biggest challenge is how to secure investment in infrastructure, including investment from pension funds and insurance companies.

Robert Pepper, Head, Global Connectivity and Technology Policy, Facebook, US, spoke about policies for inclusive internet, which can be achieved through collaboration and partnerships for which technology provides the platform. He presented the Connectivity Campaign, designed to connect the 60% of the world population that is not already connected, and said in 2017 Facebook partnered with the Economist Intelligence Unit to look at internet inclusiveness and found that the gender gap in internet usage is growing. He further noted that the study showed that, in order for internet connectivity to be relevant, people need it to respond to the needs of eGovernment, eCommerce, and eEntertainment, and have local content in local languages.

Joy Tan, President, Corporate Communications, Huawei Company, China, said the Huawei Company has been working on a global connectivity index and found a strong correlation between a country’s ICT investment and its economic growth. They evaluated 15 countries on their performance on SDGs 3 (health), 4 (education), 5 (gender equality), 9 (infrastructure), 11 (urbanization) and 13 (climate change), and found a 90% correlation between ICT development and SDGs’ achievement. She recommended increasing investment in R&D, noting the global investment is only 2% of global GDP, and cross-domain collaboration.

Kamau Gachigi, Gearbox and University of Nairobi, Kenya, presented ways in which the internet of things helps people afford items that they could not otherwise afford, such as energy through solar panels that do not work unless one pays its monthly installments. He introduced Gearbox, which is an initiative that capitalizes on the potential of “makers” (people who have the talent of engineering without having the necessary educational background) to contribute to technology innovation, and highlighted the need to grow the ecosystem for manufacturing and technical universities to provide them with better access to patent regimes and markets. Gachigi also stressed the need to teach youth human-centered design.

In the ensuing discussion, China said it designed a national strategy for broadband connectivity, aiming to build a new generation of ICT infrastructure by 2020 and increase broadband connectivity by 30%. He also presented the “One Belt, One Road” initiative. Zambia discussed changing mindsets with regard to tertiary education: rather than enrolling in universities to get prepared for jobs, incentivizing youth to enroll in universities to acquire skills for entrepreneurship. Bangladesh said the government has 35,000 schools with digital learning classes and 5,000 digital centers for technical training, including on eCommerce, and asked for recommendations that could improve broadband connectivity, which is currently very slow. Civil society participants raised issues related to, *inter alia*: making technological education inclusive for people with disabilities, by integrating technologies that support the respective disabilities; creating policy safeguards for data privacy; and creating participatory engagement systems to include the voice of the marginalized groups such as children, youth, women, and people with disabilities.

SESSION 3: LESSONS LEARNED IN IMPROVING THE IMPACT OF STI ON THE SDGS – HIGHLIGHTING THE CROSS-CUTTING NATURE OF STI

Co-Chair Kamau opened Tuesday’s session by noting that the STI Forum has been presenting ideas that have real potential for transforming people’s lives in a short period of time. He said that the challenge is to take these ideas and demonstrate that policies built on STI can make governments smarter, make the work of policy makers much more focused on outcomes, and make governments more fit for purpose.

Session moderator, Heide Hackmann, Executive Director, ICSU (Co-Chair of the TFM 10-Member Group), noted that ICSU has just launched a report, “A Guide to SDG Interactions: from Science to Implementation,” which proposes a method to identify and score actions across the SDGs and targets. This is an example of the contribution of STI to policymakers on how to transform the SDGs into implementation roadmaps.

Hackmann added that while many fascinating examples and recommendations were discussed Monday, seven stand out:

- Follow multi-disciplinary and integrated approaches that break institutional silos and take into account different sources of knowledge, including traditional knowledge.
- Ensure engagement of all stakeholders in STI policy design, STI adaptation and technology application.
- Develop, adapt and share low-cost technologies to ensure the widest possible diffusion and positive impact of innovation on individual livelihoods.
- Increase focus on women and girls—both in terms of building capacity and engagement in STEM and because access, use and impacts of technologies vary across genders.

- Significantly scale up smart investment by governments, the private sector and other partners to unlock the creative potential of youth, and bridge rural and digital divides.
- Assess both positive and negative impacts of technologies and act accordingly.
- Innovation happens across the world using a variety of technologies, thus its dissemination and partnerships needed to maximize impact should be encouraged.

Augustin Jianu, Minister of Communications and Information Society, Romania, described how his government looked for a model that countries can use to achieve the SDGs, foster innovation, and get from STI to SDG implementation. He said Romania decided to create new opportunities by investing nationally and targeting resources in accordance with national objectives. “Start-up Nation” is a programme that crowdsources for national objectives and harnesses national creativity, creating a strong start-up culture, and provides the largest start-up financing in Romanian history.

Peter Gluckman, Chief Science Advisor to the Prime Minister, New Zealand, said policymaking implies choosing between different options with different trade-offs and thus it is important to create institutional mechanisms that can effectively act as brokers between different branches and institutions of science. He highlighted that the UN has an important role in ensuring the coherence of all international bodies that play a scientific advisory role and called for the creation of a strong UN board mandated to undertake a study of the global ecosystem of scientific advisory bodies, and their linkages with the national institutes. He also stressed the need to designate a single focal point for the science ecosystem in every country.

Mary Snapp, Corporate Vice President of Microsoft Philanthropy, Microsoft Corporation, US, noted that, with advances in technology, there will be disruption and breakthroughs so we need to design ways to manage the resulting anxiety. Snapp identified three key areas where innovation will primarily happen: the physical world, through inventions such as 3D printers or self-driving cars; biological; and digital. She called for education that teaches basic literacy and numeracy but then quickly moves to digital and technical knowledge and skills. She underlined the importance of entrepreneurs and SMEs in harnessing innovation, and the role of technology in facilitating communication between different sectors and organizations, which is essential for the achievement of the SDGs.

In the subsequent discussion, Co-Chair Turekian asked how to connect with the speed and the pace of the fourth industrial revolution. The UN Major Group for Children and Youth asked how to incorporate adopters and users of technology, and what makes governments skeptical of scientific advice? Ethiopia asked how to improve collaboration between academics and governments. The Organisation internationale de la Francophonie spoke about the importance of distributing scientific knowledge in multiple languages. Zambia asked for advice to encourage ministries to understand that science and technology are important for success, and encourage academics to work with governments. South Africa noted that innovation is not limited to higher education and national science councils, but grassroots innovation and solutions must also be acknowledged.

In response, Jianu underlined the importance of first focusing on improving the effectiveness of what exists and then designing new mechanisms or initiatives. Gluckman stressed that science does not make policy but informs the options, and thus

specialized brokers are needed to translate between the scientific and the policymaking communities. Snapp said we have to learn how to talk about technology in ways understandable to both governments and citizens.

Closing the session, Co-Chair Kamau said this year’s STI Forum is underfunded and urged both governments and the private sector to financially support the Forum. He further highlighted the importance of setting the infrastructure backbone in every country to support everyone’s participation in the fourth industrial revolution. Kamau further stressed that governments need to stop listening to external money and ideas and focus on the needs, priorities and solutions of their people. He called for initiatives from the private sector, academia and civil society to implement their ambitious ideas and start making global assessments and proposals without waiting for the UN’s permission.

SESSION 4: NATIONAL STI PLANS AND POLICIES FOR ACHIEVING THE SDGS

Rebecca Firth presented her innovation pitch “Missing Maps,” which uses small satellite imaginary pieces to map parts of places and communities previously unmapped.

Bill Colglazier, Senior Scholar, Center for Science Diplomacy, American Association for Advancement of Science, US (and Co-Chair of the TFM 10-Member Group), saluted the voluntary national reviews of the High-level Political Forum on Sustainable Development (HLPF) and noted the benefits technology can bring in coordinating different stakeholders’ inputs in their creation.

Abdullah Lootah, Director General of the Federal Competitiveness and Statistics Authority, UAE, spoke about UAE’s national innovation strategy, which embeds a culture of both public and private innovation, across different sectors such as: energy, transportation, education, health, water, and outer space. He noted that 2015 was UAE’s “Year of Innovation,” and all federal agencies were asked to invest 1% of their budget in innovation. Lootah presented several governmental initiatives, such as more than 45 free-zone area clusters that are hotbeds for innovation and a solar-powered plane, built in partnership with Switzerland.

Michiharu Nakamura, Counsellor to the President of Japan Science and Technology Agency, discussed the need for definitive action plans to work together to project a vision of a future society where technologies are used for the betterment of humankind. He described Japan’s Society 5.0 STI plan that aims to achieve economic development and resolve social challenges. He recommended coordination among sectors for SDG implementation, a corporate SDG index to create shared values, and ensuring that technology takes root in countries with different social and economic situations.

Marcia McNutt, President, National Academy of Sciences, US, said that in the US, leadership on SDGs has come from the non-profit sector. She said policymakers ignore science at their own peril. McNutt added that we need to find the best ways to design STI policies and instruments for the SDGs, and all relevant stakeholders must be engaged, not just scientists. She called for: engaging STI explicitly in all the SDGs through independent science advisory bodies; rewarding cross-goal coordination; and remaining optimistic because, if not, we don’t think there is a future worth fighting for our children and grandchildren.

In the ensuing discussion, China presented national initiatives geared at combining the implementation of the 2030 Agenda with the implementation of the national STI plan, including

projects on air pollution, and ecosystem restoration. China also announced plans to build green technology banks for sustainable development. Qatar said it allocated 2.8% of its GDP to support innovation and is currently in the process of creating national management information systems to provide a common platform for research and innovation. Swaziland stressed the need to engage, follow-up and collaborate after the STI Forum ends, to foster progress. The UN Major Group for Children and Youth asked what bilateral and multilateral steps governments have taken to remove barriers in access to STI.

In response, Lootah said SDG 17 is about working together as partners and invited Swaziland and others to visit and share information. He added that the SDGs can only be achieved if academia and the private sector work together on R&D, and if Fortune 500 companies spend a portion of their corporate social responsibility budgets on the SDGs. Nakamura said STI for the SDGs should be a common uniting language and can overcome the gap between the science community and policymakers. McNutt said the US is going from an administration that was all in on climate change to an administration that is all out on issues like climate change, thus partnerships with industry, the NGO community and youth are essential since every nation needs to work on STI regardless of national leadership.

In conclusion, Co-Chair Turekian said this Forum has never been designed to be just an annual event but to catalyze action and understand what progress has been made. He urged participants when they leave the UN building and return to their communities and keep these connections going.

SESSION 5: STI CAPACITY BUILDING FOR ACHIEVING THE SDGS

Jiwon Park presented an innovation pitch “CodePhil in the Philippines,” which teaches coding and entrepreneurial skills to students and teachers to address these gaps in the school curricula, and connects students with mentors.

Bailey Ulbricht presented her innovation peach “Paper Airplanes,” which provides free one-on-one technological skills training to refugees and people fleeing from conflict.

Moderator Romain Murenzi, UNESCO, said that Agenda 2030 has strengthened consensus that the SDGs rely on science and there is a need to build effective STI systems that take into account specific local contexts. He highlighted the need for: scientists to be engaged in the decision-making process; investment in STEM research; citizens’ participation in STI; building capacity of women in STEM; and recognizing indigenous and local knowledge.

Geoffrey Boulton, President, CODATA, said attempts to implement the SDGs without exploiting the potential of the digital revolution are a mistake we cannot afford to make. He discussed the importance of capacity-building activities his organization has been doing in Africa and Latin America to develop the skills of scientists and professionals through regional science platforms to exploit the digital revolution. Boulton said that habits and procedures of the non-digital world must be superseded, and called on national entities and major funders to collaborate to provide integrated funding for STI capacity building.

Bitrina Diyamett, Executive Director, STI Policy Research Organization, Tanzania, identified policy gaps that keep poor countries in poverty despite having STI policies in place: policies are not informed by local knowledge; a lack of inter-sectoral policy coordination; poor governance of the national information systems; and lack of expertise on what STI actually

means and implies. She highlighted the need for: STI training for policy makers; training the private sector both in innovation and management; and training trade experts on issues related to automatization and the disruption technology creates.

James Querry, Philadelphia University, US, advocated for the wide-scale adoption of geospatial technology in SDG implementation to: improve data management, analysis and understanding; enhance collaboration; inform sustainable design and planning; and inform evidence-based decision-making. He recommended government officials and scientists work together to break down data silos and promote data sharing. Querry also underlined the importance of increasing citizen engagement, UN funding and technical assistance, and establishing data sharing policies and standards.

In the subsequent discussion, China discussed their capacity-building and training activities, including training workshops for developing country scientists, inviting young scientists to China, and establishing an international research training center with UNESCO. Bangladesh said most policymakers think STIs are not their responsibility and asked how to resolve these issues. UN Environment said that despite many international capacity-building efforts, the challenge is maintaining capacity and recipient countries must assume a leading role in developing their own capacity and taking care of their own development.

National Space Society called for utilizing resources of the solar system for solar energy generation. The UN Major Group for Children and Youth asked how to deal with different streams of knowledge—formal, informal and indigenous—while building the capacity of youth in STI.

In response, Boulton stressed the value of tapping into the incredible intellectual capacity that the crosscutting international STI community provides. Diyamett underscored the need for focusing capacity building on policymaking first, explaining that “you cannot have appropriate science without appropriate policies in place.” Querry invited participants to look outside their organizations for successful examples of solutions to the challenges they face, replicate and scale them up. Murenzi invited countries to put in place comprehensive STI policies focused on education, research, technology transfer, and knowledge acquisition.

SESSION 6: EMERGING FRONTIERS: EVOLVING STI DEVELOPMENTS WITH IMPLICATIONS FOR SDGS

Moderator Miguel Ruiz Cabañas, Undersecretary for Multilateral Affairs and Human Rights, Ministry of Foreign Affairs, Mexico, said that the panel will look at opportunities and challenges related to emerging technologies, particularly disrupting technologies, and what the impact is on the 2030 Agenda.

Xiaolan Fu, University of Oxford, UK, discussed the challenges and opportunities presented by technological breakthroughs in smart manufacturing, 3D printing, big data, open data, robotics and artificial intelligence, among others. She said that there are two groups of emerging technologies: those that provide connectivity and enable humans and those that replace human labor. She called for: policies that guide technical change not replace workers; policies to remedy the negative effects of technology, including job retraining; and policies to assist developing countries to help them with technology transfer, training and encouraging private sector investment.

Ellen Jorgensen, Founder, GenSpace, New York, brought to participants' attention several emerging biotechnologies that will impact the SDGs, including: synthetic biology; improvement in DNA sequencing technologies; high capacity DNA synthesis; chromosome building; precise editing of DNA (e.g. CRISPR); cell-free systems; metagenome and microbiome engineering; tissue engineering; improved imaging systems for living organisms; and modeling (the virtual cell). She also identified several significant impacts of biotechnology on the SDGs such as: improved crops; improved livestock; more sensitive and comprehensive diagnostics; personalized medicine (genome and microbiome); new biotherapies (immunotherapy, gene therapy); targeted, speedy vaccine production; genetic modification of disease vectors; synthetic replacement organs; biofuel production; more sustainable biomanufacturing; and bioremediation.

Jose Ramon Lopez-Portillo, Co-founder, Center for Mexican Studies, noted that we are entering the most disruptive era in human history, driven by exponential technological change, which provides both extraordinary opportunities and huge challenges. Unlike other periods of great transformation, he explained, today the effects are global, immediate, deep, and increasingly irreversible, especially since institutions move linearly while technological change moves exponentially. Unlike the capitalist period, the post-capitalist era, which he said is starting, will be defined by individuals collectivized through technology.

In the subsequent discussion, Tanzania asked about how developing countries can attract foreign direct investment. Fu responded that since automation does not rely on local skills, more companies will invest closer to the source of raw materials, however, income redistribution is needed to benefit local communities.

The International Labour Organization (ILO) asked what role the UN can play in terms of governance of technology processes. Zambia said that the private sector is not supporting advancement in developing countries and is only interested in taking resources out. The Organisation internationale de la Francophonie noted the precautionary principle. The ETC Group expressed concern about issues surrounding microbiology and other stakeholders expressed ethical concerns about gene editing and the impacts of technology on informal workers.

Fu said that although 60% of human activities can be partially replaced, only 10% can be fully replaced. Responding to a question on foreign direct investment (FDI) in Africa, she noted that one of the reasons why it does not happen at a high rate is the lack of skill-trained human resources. Fu also underlined that tax, trade, and monetary policies can be used to gear STI towards social good. Jorgensen said she puts her faith in capacity building for democratizing biotechnology. She said the UN's role is crucial when it comes to the environmental release of biotechnology, such as introducing a new crop into the ecosystem. Lopez-Portillo stressed the need for more research on how, when and with what effects mass unemployment caused by automatization will hit developing countries.

Ruiz Cabañas closed the session by mentioning that the Permanent Mission of Mexico is considering the idea of creating a permanent forum on the impacts of technological disruptions.

SESSION 7: SUPPORTING THE IMPLEMENTATION OF THE TECHNOLOGY FACILITATION MECHANISM

Heide Hackmann, Executive Director, ICSU (and Co-Chair, TFM 10-Member Group), said the big question is how the Forum can sustain momentum to expedite the delivery of the

TFM. She highlighted the power that the UN and the STI Forum have to convene a diverse community of funders and expertise and leverage their resources to support the TFM for SDG implementation. She gave the example of an expert meeting of the TFM 10-Member Group the previous week with representatives of nine funding communities on how to finance the SDGs, which generated the idea of convening a larger meeting of these communities. There was agreement, Hackmann noted, that the SDGs represent a new social contract for the global community, and the respective funding communities recognized their role in unlocking financing and technological potential to support the goals. She announced that the TFM 10-Member Group will report back at the 2018 STI Forum on the progress of this collaboration.

Shantanu Mukherjee, Chief, Policy Analysis Branch, Division for Sustainable Development, UN DESA, presented updates on the TFM's online platform, which will assess both online and offline STI initiatives, offering all stakeholders the opportunity to engage. He said the platform needs to be dynamic, with updated content and an effective search engine, and incentivize constant engagement. He added that the platform should serve as the main node that connects a wide variety of national and regional networks. Financing the platform remains a challenge, he noted, and solutions need to be found.

Klaus Tilmes, Director, Trade and Competitiveness, World Bank, discussed the mapping exercise of existing UN STI initiatives, which was undertaken following the model of a global expenditure review. He said the mapping exercise found that: STI is the second means of implementation for the SDGs after financing for development; there are 23 STI-related commitments in the AAAA; 26 of the SDG targets are related to STI; and there are 20 UN agencies with some known STI involvements. He noted the exercise identified 1,600 UN STI initiatives, including 2,600 staff, a US\$1 billion budget, and US\$120 billion in loans and grants.

Nina Harjula, Global Cold Chain Alliance (GCCA), and Nia Ltd., Finland, spoke about GCCA that connects companies, researchers and finance, with the goal of connecting local innovators with finance and global markets. She suggested the Forum take up one SDG at a time and they could bring their innovative companies to help solve problems. She also suggested that GCCA's online platform can be used in conjunction with the TFM online platform.

Kurt Vandenberghe, Director, Climate Action and Resource Efficiency, European Commission, discussed Horizon 2020, the EU's programme that funds research and innovation projects both in Europe and around the world. He said about €6.5 billion go to projects that support sustainable development through Horizon 2020. Vandenberghe recommended: the STI Forum learn from stakeholders, public authorities and funders to work together and experiment with new solutions; funding for building capacity for people to participate in international programmes and projects; and the STI Forum identify factors that promote international cooperation.

In the ensuing discussion, China presented the green technology bank that it is currently building to provide support to developing countries on issues related to, *inter alia*, climate change, health, and energy. Qatar recommended the enhancement of education systems through online platforms that offer eLearning and through quality STEM programmes at all levels in schools. Zambia recommended: the African countries come together starting at the next STI Forum to really discuss the way

forward for exploring their potential and catch up with the rest of the world; reforming the World Trade Organization to compel the private sector to invest in the developing countries that are left behind; and investing in a mapping exercise focused on Africa to reflect the investments made in STI in different areas. Bangladesh announced the launch of an innovation fund that supports start-ups that come with disruptive technological solutions.

Representatives of civil society addressed issues related to, *inter alia*: the leadership and governance structure of the TFM; the need to develop standards and protocols to increase harmonization and coherence between existing and emerging platforms, in order to increase their value-added and effectiveness; the support the European Commission could offer to the TFM; the need for contextualizing STI solutions; creating intersessional sessions of the STI Forum and continuing the dialogue online; and ways in which people with disabilities can be included in public procurement schemes of STI initiatives.

In response, Mukherjee stressed the need for the dialogue on the TFM to remain global and multi-stakeholder because innovations all over the world, such as self-driving cars, need harmonized regulatory frameworks. Tilmes agreed with Zambia that there is an STI gap that is widening especially in Africa, strongly linked with global value chains. He added that the STI mapping exercise opened the World Bank's eyes to the need for a multilateral framework to manage STI initiatives. Tilmes said public procurement should include incentives for the private sector to take into consideration marginalized groups. Harjula brought up the need for engaging regional stakeholders, since the TFM online platform should also be managed regionally. Vandenberghe called for a focus on the quality of STI investment, which should include both incentives and rewards for including end users.

Co-Chair Kamau concluded by expressing concern about the TFM, noting that he wants to see the TFM work, but he doesn't see enough examples of individuals who are able show that they actually use a facilitation mechanism for technology transfer. Nevertheless, he said, the STI Forum has demonstrated that there are examples of innovative ideas that will have real impact. He called on countries to identify chief scientists and give them a place of privilege to lead the charge of driving science and technology. He expressed hope that ECOSOC ensures the STI Forum has a bigger, better platform next year to find the means and ideas to make the world a better place for all of us.

CONCLUSIONS AND WAY FORWARD

In the closing session, Bill Colglazier, Co-Chair of the TFM 10-Member Group, said the side events this year have been extremely good and welcomed the innovation pitches that opened many of the Forum's sessions. He invited Member States to support the TFM politically and financially and saluted the idea of a roadmap for the TFM, which was suggested by a civil society representative. He invited participants to think of incentives for strengthening the science-policy interface through the UN and for catalyzing effective collaboration. As main take-aways from the Forum, he identified: the crosscutting potential of STI; the importance of capacity building and stakeholder engagement; the need to make the business case for private sector investment in innovation for the SDGs; the importance of roadmaps for tracking progress; the centrality of ICT infrastructure expansion to current development and STI efforts; the need to focus on match-

making between existing problems and existing solutions; and the necessity for the STI Forum to conduct a "horizon-scanning" exercise on the changes happening in the STI field.

Co-Chair Kamau thanked everyone and specifically recognized the participation of the ministers who did not only attend but also challenged the Forum. He hoped all participants found this a useful exercise, adding some of the ideas exposed here have real promise. He called on the UN to re-establish its scientific advisory board, since this is necessary for the Organization to provide the global leadership it needs. He concluded by noting that "the fourth industrial revolution—the cyber revolution—is upon us and we have no choice but to jump on board." There is no negotiation with change and the momentum of history, he said, so we have to maximize the opportunities the best we can.

Co-Chair Turekian thanked everyone for their trust in the Co-Chairs. He noted that a linear progression over the years will not get us where we need to be; it has to be geometric. He added that last year we were happy that we held the Forum at all; this year we had many more innovators and entrepreneurs; and next year we have to do even better.

In his closing remarks, ECOSOC President Shava said the two days showcased what is possible when youth and innovators bring their talent and energy to service the SDGs, and invited Member States to continue supporting them. He saluted the recommendations that the Forum advanced on ways to align STI national plans with the SDGs and to incentivize the STI community to gear its efforts toward the SDGs. He added that the STI Forum should be built on other international STI conferences and showcase their best results. He thanked Co-Chairs Kamau and Turekian, the members of the TFM 10-Member Group, and all the participants for having brought their contributions. He also reminded participants that the STI Forum's recommendation will be presented to the HLPF in July 2017.

ECOSOC President Shava closed the STI Forum at 6:20 pm.

GLOSSARY

AAAA	Addis Ababa Action Agenda
ECOSOC	UN Economic and Social Council
FDI	Foreign direct investment
HLPF	High-level Political Forum on Sustainable Development
ICSU	International Council for Science
ICTs	Information and communication technologies
LDCs	Least developed countries
R&D	Research and development
SDGs	Sustainable Development Goals
SMEs	Small- and medium-sized enterprises
STEM	Science, technology, engineering and mathematics
STI	Science, technology and innovation
TFM	Technology Facilitation Mechanism
UAE	United Arab Emirates
UN DESA	UN Department for Economic and Social Affairs
UNEP	UN Environment