**Harnessing the Contribution of Science, Technology, and Innovation
For Achieving the 2030 Agenda and the 17 Sustainable Development Goals**

Prepared by the 10-Member Group to support Technology Facilitation Mechanism
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As the 10 Member Group appointed by the U.N. Secretary General to support the Technology Facilitation Mechanism (TFM), we wish to provide our views on how science, technology, and innovation (STI) can most effectively accelerate achieving the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda.

The Multi-stakeholder STI Forum and the On-line Platform of the TFM are aimed at providing not only relevant advice and input to the High-Level Political Forum, but also facilitating the efforts of all people of the world and broad segments of our societies in being able to harness STI for realizing the universal aspirations exemplified by the SDGs. The three highest priorities of the TFM in our view are focused upon: (i) actions and policies that strengthen STI capabilities and build human capacity at the individual, organizational, and political levels in every country, (ii) platforms for sharing knowledge, information, experiences and advice on relevant policies, actions, partnerships, technologies, and research and development (R&D) outcomes, and (iii) mechanisms for developing national and international STI Action Plans and Roadmaps (including plans for R&D and technology deployment) for achieving the SDGs individually and collectively without leaving any SDG behind.

Science, technology, and innovation play a central role in human development and have always done so in the past. Scientific knowledge has come from many sources, including investigations in the social, behavioral, and management sciences as well as in the physical, biological, engineering, and medical sciences; from fundamental research as well as from applied R&D; and from indigenous and traditional knowledge systems as well as from organized international science communities. STI has been the main driver of economic growth and development since the onset of the industrial revolution. With the advent of "knowledge societies" and the current rapid pace of new technological advances, STI must be seen as a primary mechanism for achieving all the SDGs and realizing the Secretary General's call to focus the 2030 Agenda on people, planet, peace, prosperity, and partnerships. Because the applications of STI can also be used in ways that cause harm to people and create challenges and threats to achieving our universal goals, our choices in how to harness STI to maximize the social, economic, and environmental benefits while managing the downsides and problems become paramount.

Here are our nine major observations and recommendations at the onset of the first Multi-stakeholder STI Forum taking place on June 6-7, 2016, at the United Nations:

(1) <u>STI and Human Capacity Building</u>

Actions and policies that strengthen STI and human capacity building in every country are needed to create knowledge-based, innovative societies that utilize scientific evidence to help inform policy and inspire science-based solutions. Required are wise investments in human capital such as in education and training at all levels and in establishing a "social safety net" to ensure that all people have the opportunity to reach their full potential. Also needed are investments in fundamental and applied research, technology development and deployment, and in enabling institutions and infrastructure. Also required are increased investment in STI and sound government policies and actions: that facilitate "bottom up" innovation by entrepreneurs, indigenous and local communities, private companies and universities; that reduce corruption, permit freedom of inquiry, and establish rule of law; that enable meaningful participation of women and marginalized sectors; that expand private sector job creation, investment and trade; etc. All of these steps can help to unleash the creativity of individuals, communities, institutions and firms, to create new jobs, expand economic growth, and accelerate scientific and technical advances in all human endeavors to achieve the SDGs for all people and countries.

(2) <u>Societal Action Plans and Roadmaps</u>

A commitment to developing national and international STI Action Plans and Roadmaps for achieving the SDGs individually and together is essential for making progress. These plans require input and participation from all sectors of society in every country -- government, private companies, academia, civil society, and people acting individually and collectively -- harnessing knowledge, insights, and advice from all sources. Periodic feedback and evaluation from the STI community -- on what is working and not working in the action plans -- is needed to permit corrections and improvements to policies and actions and to create real "learning societies."

(3) <u>Identifying knowledge gaps and initiating solutions-oriented research</u>

Despite the availability of a vast body of knowledge of direct relevance to many areas of sustainable development, the effective implementation of the SDGs will need to identify and address major knowledge gaps across different domains, disciplines and regions of the world. Every country should endeavor to fill these knowledge gaps, particularly those most relevant for its own situation. To contribute effective, transformative solutions to a series of interconnected social, economic and environmental challenges, researchers will need to engage in inter- and trans-disciplinary research, engaging more effectively not only with colleagues working in other disciplines/fields, but also with other knowledge partners - with

decision makers, practitioners, business leaders, civil society, indigenous and local communities and other stakeholders – in the co-design and co-production of innovative, solutions-oriented knowledge, policy and practice. This new type of science collaboration is promoted notably through *Future Earth – research for global sustainability*."(1)

(4) <u>ICT Tools and Forums for Learning from Each Other</u>

Sharing information, experiences, best practices and advice among countries/communities/individuals on policies, actions, partnerships, and technologies can be enhanced through many venues and tools such as the multi-stakeholder STI Forum and on-line platform of the TFM, and through new information and communication technologies (ICT), including social media and mobile broadband. These communication tools can effectively connect researchers, innovators, developers, investors, and deployers of technologies and solutions with those who need scalable, affordable and appropriate answers to development problems and challenges. Tools alone are not sufficient as sharing and learning is needed beyond technologies; innovation is required in our thinking, mindset, management, and policies as much as in our hardware.

(5) <u>Integrated Assessments linked to Transparency and Accountability</u>

The SDGs have many inter-relationships and inter-dependencies. Achieving them all together will require integrated assessment tools to find the best pathways to make optimal tradeoffs and maximize multiple-benefits. Systems analysis thinking becomes essential to address this full spectrum of sustainable development challenges.(2) With accountability and transparency and participatory approaches involving various stakeholders, this type of research can help (i) to understand "how deep transformations—for example in health, education, agriculture and food security, energy, ecosystem management, population, urban development, and access to basic infrastructure–can be pursued at the required scale, pace, and integration" and (ii) to assess "the necessary investments … compared with the costs of inaction" … and thereby "understand better how to identify trade-offs and exploit the synergies of tackling multiple goals simultaneously."

(6) <u>Important Role of Private Sector and Partnerships of Multiple Stakeholders</u>

The largest worldwide investments in developing and deploying technologies are coming from – and will continue to come from – the private sector. Companies own most technologies, and their investments far exceed those of overseas development assistance agencies of developed countries. This fact does not undervalue the critical role of public sector investments in R&D, which in many sectors have provided the backbone for innovations that were scaled up and commercialized by the private sector. For sustainable development, it especially important to create policies and partnerships that help to align the interests of companies with achieving the SDGs.(3) Technology may be transferred via public-private

partnerships of multiple stakeholders in addition to traditional mechanisms such as foreign direct investment and trade, South-South cooperation, and development assistance. Governments can stimulate the necessary flow through policy frameworks, which can include support for innovative public-private partnerships. Successful technology transfer is not primarily about the transfer of the hardware, but of the soft skills and institutions that allow developing countries to effectively adapt and use technologies and to build their own innovative ecosystems based on their specific needs and situations.

(7) Support For Those Left Behind Everywhere

The challenge of achieving the SDGs applies to all countries. As a prime example, poverty eradication is about the global North as well the global South. The richest countries – including their public and private institutions and STI assets -- have a special responsibility to support the least-developed countries and the people who have been left behind in both rich and poor countries in making progress on achieving the SDGs. Especially important is sustained support and targeted investments and collaborations in STI and human capacity building, in knowledge sharing and research on effective solutions and technologies for addressing the most important needs, in developing the most effective policies and actions, in creating incentives and partnerships with the private sector, civil society and other stakeholders to provide deployable solutions, and in creating South-South and North-South collaboration.

(8) Strengthening the Science-Policy Interface in Every Country

Every society can benefit from strengthening its science-policy interface and creating a "science advisory ecosystem" whereby its inclusive scientific and technological community can provide input and advice on public policy issues where scientific and technical insights are essential. (4) The goal is for every country to have high quality, objective, independent and credible scientific advice – free of politics and special interests, independent of government control, based on diverse sources of knowledge, and conveyed to the public as well as to the government. Political leaders necessarily incorporate value judgments and other considerations that go beyond science in their decisions, but objective and independent scientific advice can help lead to wiser decisions. It is in the interest of all countries to have decisions informed by the best scientific information, conveyed transparently, without bias and with accurate representation of scientific uncertainties.

(9) Building Peaceful Societies, Accountable Institutions, and Conflict Resolution Tools

The greatest threat to achieving the SDGs is the real possibility of more wars, conflicts, and terrorism occurring in regions of the world over the next 15 years. SDG #16 focuses on building peaceful societies and accountable institutions. The

U.N. will continue to have an essential role in minimizing wars and conflicts with skillful diplomacy and peacekeeping actions. STI can also be important in providing tools and applications relevant to this overarching goal of peace-building and ensuring personal security and respecting human rights of people everywhere including in post-conflict societies.

The countries of the world have a special opportunity with the 2030 Agenda. The focus on utilizing STI for achieving the SDGs complements the motivation of countries to build more innovative societies to ensure prosperity, security, and competitiveness. The potential exists worldwide for new innovative technological and behavioral solutions, more rapid economic growth, faster poverty eradication, more effective protection of the environment, increased transparency and accountability of governments and non-governmental institutions, and more harmonious relations between countries. The SDGs may be our most important guide for realizing this optimistic outcome.

References:

(1) Future Earth (http://www.futureearth.org)

(2) A good example of systems analysis thinking in a scientific assessment effort to provide fact-based information on possible synergies and tradeoffs involved in achieving all 17 SDGs and addressing the full spectrum of sustainable development challenges is "The World in 2050" project. (note: source of subsequent quotes) (http://www.iiasa.ac.at/web/home/research/researchProjects/TWI2050.html)

(3) A good example of an innovative partnership addressing SDGs is the Low Carbon Technology Partnerships initiative that involves more than 160 companies and 50 partners to lead action plans for development and deployment of low-carbon technology. (http://lctpi.wbcsd.org)

(4) A recent international initiative that is focused on capacity building for strengthening science advice to governments is the International Network of Government Science Advice. (http://www.ingsa.org/)

Postscript: Attached are brief personal perspectives on important additional considerations.

E. William Colglazier - Two areas where scientific and technological advances are crucially important are energy technologies (lowering the cost of clean, non-carbon based energy technologies and carbon sequestration) and information, communication, and computer technologies (providing new information and analytics that can help us to make smarter decisions and provide more effective services and faster innovation in every sector addressed by the SDGs). Rapid advances in biotechnology and nanotechnology and in advanced manufacturing will

also have great potential for affecting many sectors. The biggest challenges will likely be in legacy sectors, such as manufacturing, construction, and transportation, where new innovations are needed to expand (rather than reduce) employment and ensure that more people move out of poverty into the middle class.

Myrna Cunningham Kain - There is a need for science to consider and for STI to encompass different knowledge systems, including indigenous and traditional knowledge, in order to produce holistic but locally adapted approaches to sustainable development challenges. Innovation has always been produced by societies diverse in local contexts and value systems, so that this diversity should be reflected in an approach to STI and with a particular view to the SDGs this would be necessary in order to not leave anyone behind. In order for STI to fulfill an enabling and empowering role, the free availability and accessibility of science, technologies and innovations need to be ensured.

STI are crucial instruments for implementation of SDGs as well as ensuring well-being of indigenous peoples (e.g. ICT connectivity and health technologies in remote areas). However, the unintended consequences and the way STI are applied need to be taken into account, as STI can be both conducive to preserving but also potentially damaging to indigenous cultures. We should consider the need of technology assessments to account for intentional and unintentional impacts of technologies that can be of adverse effect and contribute to trade-offs between pursued sustainable development outcomes.

Elenita Daño – Powerful new technologies such as nanotechnology, synthetic biology and geoengineering are being proposed and promoted to address development challenges without prior evaluation and no regulation. Harnessing the potentials of new technologies and innovations to achieve the SDGs requires a concomitant emphasis on a strengthened global, regional and national capacity to monitor and assess the social, economic, cultural, health and environmental implications of technologies. An effective technology governance system should be anticipatory, impartial, universal, aware of the need to deal with the risks arising from interactions among multiple technologies developed for different purposes, and ensure that countries and corporate interests do not unilaterally make decisions that may have global impacts. Assessments should accompany the development of the technology from science to shelf, before a new technology is released in order to minimize waste and risk. Monitoring and assessment of new technologies at the global, regional and national levels must be based on the Precautionary Principle and must involve the participation of potentially affected communities and sectors of society.

Xiaolan Fu - Innovation is costly, risky and path dependent. The developing countries are hence constrained from creating most of the breakthrough innovations and catching up with the advanced economies. As a result, making new and existing technologies available to people who need them through technology

transfer to and within the developing countries is essential for the development of technological capabilities in these countries. This is critical to equip the developing countries with the capabilities to achieve the sustainable development goals. In this regard, greater roles should be played by international cooperation and by university-industry collaboration. Good use of information and communication technology will help the global community to accelerate this process. The online platform that the TFM is developing is an important step forward to overcome this important bottleneck.

Paulo Gadelha - We consider the areas of Health and Sustainable Development as almost Siamese areas. Health is an individual and collective right, articulating the productive basis and innovation to human rights, equity and social inclusion. In the Brazilian case, as in other countries, the Health sector is responsible for around 10% of the GDP. Once we achieve a good relation between the Health sector and SDGs, the social and economic effects should be extremely expressive to the Agenda 2030. Health also plays a double role as a prerequisite and indicator to SDGs. We should also highlight that the Health sector is a platform of new paradigms with an impact in the countries innovation systems and in the Technology Facilitation Mechanisms (TFM) - such as microelectronics, nanotechnology, fine chemicals, biotechnology, Information Technology - and that articulates virtuously the public, private and academic sectors. In Brazil we have a good example on how, in recent years, through the shaping of the Health Economic Complex policy, Health achieved an important role as an attractor to bring together innovation systems, productive policies and the answers to social needs integrating public policies and public-private partnerships.

Heide Hackmann - The global scientific community is rallying to respond to the complex and converging set of challenges posed by Agenda 2030. Key to that response is an emphasis on the need for integrated, collaborative approaches to the production and use of scientific knowledge. This involves harnessing scientific efforts from all regions of the world, working across the boundaries of scientific fields, and engaging with other decision-makers, policy shapers, practitioners and citizens in open, networked knowledge arenas aimed at collaborative learning and problem-solving. In this solutions space, science takes it place alongside other types of knowledge to co-create transformative, solutions-oriented knowledge for the global public good. This understanding of 'open science' requires a paradigm shift in our prevailing science policy thinking and practice – one that moves away from competition to collaboration, from valuing the contribution of science through the lens of national economic growth and competitiveness to supporting science as a public enterprise working for a sustainable and just world. The onus is on science policy makers who set research priorities, allocate funding, evaluate and reward research, to secure the conditions of possibility for open science and support the global scientific community in responding to the social imperative it entails.

Romain Murenzi - As hundreds of people converge to the United Nations headquarters to attend the "First Annual Multi-stakeholders Forum on Science,

Technology and Innovation (STI) forum for sustainable development Goals (SDGs)", we learned the positive and encouraging news of the appointment by the UN Secretary General, H.E. Ban Ki-Moon, of the Governing Council of the "Technology Bank for Least Developed Countries (LDCs)". As indicated in the feasibility study submitted to the UN Secretary General on September 23, 2015, by the High Level Panel (appointed for this purpose): (i) the Tech Bank will be a key instrument in ensuring that the LDCs are no longer left behind in achieving internationally agreed development goals, especially the Sustainable Development Goals (SDGs); (ii) It will support building science, technology and innovation capacity for the poorest countries of the world. This definitely proves the commitment that the UN and International Community have to help poor nations in achieving the SDGs as indicated in goal 17: "Strengthen the means of implementation and revitalize the global partnership for sustainable development". (http://www.un.org/esa/ffd/wp-content/uploads/2014/12/10Dec14-Rahman-Presentation.pdf)

Nebojsa Nakicenovic - The Sustainable Development Goals (SDGs) are holistic, inclusive, indivisible, and aspirational. Treating the 17 SDGs individually will hamper the realization of possible synergies and avoidance of potential conflicts and implementation barriers. This already indicates that a systems perspective is essential for identifying sustainable development pathways in integrated, interdisciplinary, multi-scale approaches that consider social, economic and environmental dimensions to look across borders and sectors in order to identify feedbacks, tradeoffs and possible conflicts and synergies. Fortunately, there exist combinations of resources, technologies, lifestyles and policy frameworks that could toward fulfilling SDGs and achieving a long-term transformation toward sustainable future for all. All of them imply a fundamental decarbonization of the energy systems, land-use patterns which foster preservation of ecosystems, new water management systems and new behaviors. Common to all is the need vigorous improvement of efficiencies, new technologies and new practices. It is about doing more with less.

Hayat Sindi - Energy is the prime mover, and is most important technological problem to be solved, as this catalyses information, communication, biotechnology, food, and every other sector linked to the SDGs. Artificial intelligence and machine learning is intrinsically sustainable (as they are software/intellect driven and do not consume raw materials) and will help steer this energy to optimise the vibrant interplay between SDGs. Standing back, a core challenge of Agenda 2030, also relates to leveraging the strength of STI across all sectors - through deep human capacity building. (This is best captured by the term social innovation which embraces a social goal, and the power of science.)