



Science, Technology & Innovation for
the Sustainable Development Goals

Session Background Notes

**the 4th Annual Multi-stakeholder Forum on Science, Technology and
Innovation for the SDGs**

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Contents

<i>Session 1: Emerging technology clusters and the impact of rapid technology change on the SDGs</i>	3
<i>Session 2: Strengthening capacity and policy for the development of STI roadmaps</i>	7
<i>Special event 1: Launch of exhibition of innovative technology solutions for SDGs</i>	10
<i>Session 3: STI for education and decent work for the future (SDG4 and SDG8)</i>	11
<i>Session 4: Gender and STI for SDGs</i>	16
<i>Session 5: A Brighter Future – Youth, Innovation Ecosystems and Development</i>	18
<i>Session 6: STI for inclusive and equitable societies (SDG10 and SDG16)</i>	20
<i>Special event 2: Roundtable on STI roadmaps for SDGs - the technical perspective</i>	23
<i>Session 7: STI for taking action to combat climate change and its impacts (SDG13)</i>	25
<i>Session 8: Linking science, technology and innovation of indigenous people, culture and traditional knowledge and the achievement of the SDGs</i>	28
<i>Session 9: Supporting the implementation of the Technology Facilitation Mechanism – the way forward for joint action – and closing</i>	29

Session 1: Emerging technology clusters and the impact of rapid technology change on the SDGs

Background

Impacts of rapid technology change on the SDGs

The fast pace of technological change in recent years in fields such as robotics, artificial intelligence, biotechnology and nanotechnology are having broad impacts on the economy, society and environment. Such disruptive technologies can be vital for breakthroughs in achieving the SDGs, but they can also have un-anticipated consequences, exacerbate inequalities, and constrain economic catch-up development. Calls for a more responsible and ethical deployment of such technologies must contend against those who fear that damping down on innovations may deprive people of benefits. To harness the benefits and reduce any downside negative risks, countries need to be able to make informed decisions, while also building skills and capabilities for the future. Multi-stakeholder engagement is important, as many of these advances are initiated in the private sector and academia, but then have differentiated impacts across groups of people and societies.

Automation impacts employment and the capacity of developing countries to catch up with countries at the frontier of technological development.^{1,2} It has important implications for future technology perspectives in areas of greatest concern to developing countries. It also has important cross-border implications for the development perspectives of countries.³ As technology change is fundamentally cumulative in nature, technology change in one country ultimately leads to lock-in of specific technology clusters across borders in many countries and thus can potentially constrain certain development options and paths. Automation emerges in many areas, from industrial production to household services and personal assistants, encompassing both physical tasks and purely virtual ones.

Related but separate issues include artificial intelligence (AI) technologies which have increasingly managed to replace cognitive tasks previously carried out by humans. The AI field is rapidly advancing and promises enormous and exponentially improving productivity gains, but it has also raised concerns about extreme inequality expected to be a consequence of widespread application of AI. Some experts raise concerns about the potential emergence of machine super-intelligence.^{4,5} Some experts also assert that bottlenecks need to be addressed: data dependence, non-transferability, energy use, semantic gaps, and reliability. Human centred AI with dignity, diversity and inclusion should be strengthened.⁶

Biotechnology is another area which has advanced rapidly with many new applications in recent years. Biotechnology refers to the set of capabilities to decode and manipulate DNA to endow new characteristics in an organism. It allows the development of completely new products. To harness the benefits and reduce any downside negative risks, countries need to develop a whole set of scientific capabilities, tools, and expertise. For strategic capacity building, an understanding of broad contours of the future landscape of biotechnology products is needed. New frameworks for risk assessment need to be identified and areas in which risks relating to products of biotechnology need to be well understood.

Other cases include hydrogen as a clean energy source potentially replacing methane and leading to more renewable alternatives. CRISPR and gene drives to edit the human genome to avoid genetic diseases, improve crop resilience. Emerging technologies will affect STI roadmaps moving forward. Developing countries need to find ways to use new

¹ Technology at work v2.0. The future is not what it used to be. Citi GPS and Oxford Martin School, Jan. 2016.

² Economist (2016). March of the machines – What history tells us about the future of artificial intelligence – and how society should respond. Economist magazine, 25 June 2016.

³ Evidence shows that automation has started reversing offshore outsourcing and relocated economic activities back to high-income countries that are technology leaders.

⁴ Bostrom, Nick (2006). "How long before superintelligence?" Linguistic and Philosophical Investigations. 5 (1): 11–30.

⁵ Müller & Bostrom (2016), pp. 3-4, 6, 9-12.

⁶ Workshop on Science, Technology and Innovation for SDGs, ESCAP, Bangkok, Thailand, Report Session 4: p14-15

technologies to leapfrog, harnessing their potential while minimize the risks. For countries lack capacity to have foresight into the impacts of emerging technologies on society and environment, guidelines from the UN can be helpful.

Work of TFM, STI Forum, and General Assembly

The first annual Multi-Stakeholder Forum on STI for the SDGs in 2016 noted the fast pace of technology change in recent years with areas of ICTs, energy technology, biotechnology, nanotechnology, and neuro-technology, including big data, artificial intelligence, automation, robotics, and 3D printing.⁷ Subsequent STI Forums in 2017 and 2018 also identified these issues as high priority action areas for the TFM.

To-date, the IATT has organized 10-Member Group meetings in Mexico, as well as substantive sessions in TFM-related meetings⁸ to systematically take stock of current trends and explore policy perspectives on the impact of new and emerging technologies on sustainable development.⁹

DESA, ECLAC and UNCTAD co-organized under the TFM umbrella another “Expert Group Meeting on Rapid Technological Change, Artificial Intelligence, Automation, and their Policy Implications for Sustainable Development Targets” in 2018.¹⁰ The meeting systematically discussed impacts of these technologies on selected SDGs/targets and elaborated on artificial intelligence and the ethical dimensions.

At the STI Forum in June 2018, UN Chief Economist, ASG Mr. Elliott Harris presented preliminary IATT findings¹¹, in line with General Assembly resolution A/RES/72/242¹². These findings were based on inputs from over 100 contributors and built on evidence from eight meetings and sessions under the TFM umbrella; ten recent UN system reports; written inputs from IATT and the 10-Member Group, and 39 science-policy briefs. Major contributions were made by UNCTAD, DESA, UNU, ECLAC, ESCAP, ESCWA, ITU, ILO, WIPO, and World Bank staff, and by the International Council for Science and the Major Group on Children and Youth. The scope and scale of the impacts of rapid technological change, both positive and negative, and across the full range of economic, social, and environmental dimensions require us to engage actively with the issues:

- *Great potential:* The potential benefits of new and rapidly changing technology clusters are so great for the SDGs and beyond that we cannot afford not to make wise use of them.
- *Technology risks and gaps:* Technology change has never been neutral, creating winners and losers, involving risks, and potentially exacerbating gaps and inequalities. The UN has an important role in promoting action on these issues.
- *Development impacts of cheap automation and AI:* Rapidly declining costs of new technologies can broaden access to the benefits of technology and enable much more rapid development, but they also present extraordinary policy challenges that call for an extraordinary level of international cooperation. Many countries may need to find new development pathways that incorporate these technologies and to rethink employment and income distribution issues.
- *Employment impacts:* The overall employment effects will depend on the specific circumstances within sectors and various local contexts. Computers and robots could replace as many as half of all human jobs in the coming decades - essentially precluding traditional routes to achieve economic development in some countries, but they could also create many new jobs. It is unclear how jobs losses and job creation will compare and how they will be distributed, however, we need to be prepared for different scenarios to unfold.
- *Preparing for the impacts:* Governments will need to re-think and re-organize how they match the supply of skills to the rapidly evolving job market needs in formal and informal education systems. Some TFM experts call for testing proposals for technological unemployment insurance, guaranteed income policies, and a range of other compensatory social policies.
- *Natural environment:* New materials, digital, bio-, and nanotechnologies, and AI all hold great promise for a range of high-efficiency water and renewable energy systems that could be deployed in all countries and catalyse the

⁷ Table 3-3 in “Perspectives of scientists on technology and the SDGs” and Annex 3 in the Global Sustainable Development Report 2016

⁸ e.g., in Paris and Incheon in 2017

⁹ e.g., sessions in CSTD and ITU’s AI for Good Summit in 2017 and 2018

¹⁰ <https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=2857&menu=1634>

¹¹ <https://sustainabledevelopment.un.org/index.php?page=view&type=20000&nr=3905&menu=2993>

¹² http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/72/242

global move towards sustainability. However, despite efficiency increases, AI and all the other emerging technologies clusters will require ever-increasing electricity with its associated pollution and wastes (e.g., e-waste, nano-waste, and chemical wastes), which calls for incorporating environmental considerations into the design of these technology systems from the start.

- *Strengthening the science-policy interface*: Our knowledge and understanding of new technology trends – especially in developing countries - need to be expanded as the basis for well-founded actions and policies. TFM experts proposed building partnerships and interfaces with universities, labs, innovation incubators, and private sector entities that are at the forefront of this technological change, potentially in the form of a discovery lab or a network of interfaces between the policy makers and technologists at the frontier, facilitating the exchange of real-time information, engagement, and policy insights.
- *Norms and ethics*: Calls for a more responsible and ethical deployment of new technologies have to be balanced against concerns that excessive restraints on innovations may deprive humanity of many benefits. Ethical and normative considerations that should guide our thinking on these issues have to spring from our shared vision - the values contained in the UN Charter, the Universal Declaration of Human Rights, the Rio+20 outcome “The Future We Want”, and most recently the 2030 Agenda on Sustainable Development.
- *Multi-sectoral and multi-stakeholder engagement*: Fostering policy coherence and multi-stakeholder dialogue is more important than ever - coherence across policies for macro-economy, science and technology, industrial development, human development and sustainability; and multi-stakeholder dialogue to present different perspectives, arrive at shared understanding and establish trust.

In December 2019, Member States adopted UN General Assembly resolution A/RES/73/17¹³ and invited the CSTD and the TFM to strengthen synergies. In line with this guidance, the IATT continues its substantive and synthesizing work on the impact of rapid technology change on the SDGs. For further details, please refer to the TFM website.¹⁴

In July 2018, the UN Secretary General established a High-level Panel on Digital Cooperation, in order to strengthen cooperation in the digital space among Governments, the private sector, civil society, international organizations, academia, the technical community and other relevant stakeholders. The Panel has raised awareness about the transformative impact of digital technologies through consultations, calls for inputs and a public debate on how to ensure a safe and inclusive digital future for all, taking into account relevant human rights norms. The Panel is ad hoc and is expected to submit their final report this year.¹⁵

Objectives

This session will discuss emerging technologies and their impact on the achievement of the SDGs, as well as desirable policy responses. Various emerging technology clusters such as AI, biotechnology, and nanotechnology will be discussed.

Format

The session will be structured as a moderated panel discussion (5 minutes per panelist), followed by an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- What opportunities and risks does recent rapid technology change have for developing and developed countries? What are the implications for SDG pathways?
- Which disruptive technology clusters should be considered as transformative for reaching the SDGs as a whole? How can countries best prepare for these changes?
- What are your three most important recommendations for policy and concrete action?

¹³ http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/73/17

¹⁴ <https://sustainabledevelopment.un.org/tfm>

¹⁵ <https://www.un.org/en/digital-cooperation-panel/>, <https://digitalcooperation.org/>

Supporting documents/publications

- Report of the Secretary-General: The impact of rapid technological change on sustainable development (E/CN.16/2019/2), 04 Mar 2019, https://unctad.org/meetings/en/SessionalDocuments/ecn162019d2_en.pdf
- CSTD 2018-2019 Intersessional Panel, 15-17 Jan. 2019, Issues Paper on The impact of rapid technological change on sustainable development, https://unctad.org/meetings/en/SessionalDocuments/CSTD2019_Issues01_RapidTechChange_en.pdf
- UN (2018). Presentation of informal findings by the Technology Facilitation Mechanism in response to General Assembly Resolution A/RES/72/242, delivered by UN Chief Economist, Elliott Harris, New York, 5 June 2018, https://sustainabledevelopment.un.org/content/documents/27061ASG_Session_1_STIF_2018_Copy.pdf
- Policy briefs and IATT materials on the impacts of rapid technology change, see <https://sustainabledevelopment.un.org/tfm> (by the time of the Forum)
- Co-chair's summaries of the STI Forum 2018, UN document E/HLPF/2018/6, http://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2018/6&Lang=E
- UNCTAD (2018). Technology and Innovation Report 2018, UNCTAD/TIR/2018, <https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2110>
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- Co-chair's summaries of the STI Forum 2016, UN document E/HLPF/2016/6, http://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2016/6&Lang=E
- Expert Group Meeting on Exponential Technological Change, Automation, and Their Policy Implications for Sustainable Development, organized by DESA, ECLAC and the Government of Mexico, 6-8 Dec. 2016, <https://sustainabledevelopment.un.org/unsystem/index.php?page=view&type=13&nr=2042&menu=23>
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- ITU (2017). AI for Good Summit, Geneva 7-9 June 2017, <https://www.itu.int/en/ITU-T/AI/Pages/201706-default.aspx>
- UNCTAD (2017). Chapter III: Robots, Industrialization and Inclusive Growth. Trade and Development Report 2017, http://unctad.org/en/PublicationChapters/tdr2017ch3_en.pdf
- ILO (2017). The Future of Work We Want: A Global Dialogue. http://www.ilo.org/global/topics/future-of-work/dialogue/WCMS_570282/lang--en/index.htm
- Workshop on Science, technology and Innovation for the SDGs, Republic of Korea, 29 Nov – 1 Dec 2017, co-organized by DESA, UNCTAD and UNOSD, https://sustainabledevelopment.un.org/content/documents/17745Meeting_report_final.pdf
- UNCTAD (2018). Technology and Innovation report 2018, http://unctad.org/en/PublicationsLibrary/tir2018_en.pdf
- ECLAC (2018). Data, algorithms and policies – redefining the digital world. https://repositorio.cepal.org/bitstream/handle/11362/43515/4/S1800052_en.pdf
- Expert Group Meeting on Rapid Technological Change, Artificial Intelligence, Automation, and Their Policy Implications for Sustainable Development Targets, Mexico City, 26-27 April 2018, <https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=2857&menu=1634>
- ITU (2018). AI for Good Summit 2018, <https://www.itu.int/en/ITU-T/AI/2018/Pages/default.aspx>

Session 2: Ministerial Segment: Strengthening capacity and policy for the development of science, technology and innovation roadmaps

Background

Integration of science, technology and innovation policies with national sustainable development strategies

Science, technology and innovation (STI) governance and policies that are coherent with national development plans and sustainable development strategies are critical for progress towards the Sustainable Development Goals (SDGs). Many countries are yet to establish conducive institutional arrangements, policy practices and political priorities.

Political ownership at higher levels and more integrated approaches, such as whole-of-government and whole-of-society approaches, can help harnessing STI for a new global vision of attaining economic, social and environmental sustainability. The whole-of-government approach cuts across the different levels of government, to strengthen the policy coherence between sectors, including through various concrete measures, and shared goals and targets. The whole-of-society approach aims to ensure coordinated cooperation between decision makers and representatives of stakeholder groups, to build broad ownership of STI for SDGs.

Once national visions, priorities and action plans are articulated through STI for SDGs roadmaps, and progress is tracked and gaps and challenges are identified accordingly, opportunities for STI contribution to accelerate progress can be highlighted at both national and global levels. Increased coordination among national and international partnerships can help improving coherence of national STI policies and complementarities among development partners within overall development visions and strategies.

The challenge is how to harmonize methodologies and foster real learning environment to develop and implement effective STI for SDGs roadmaps, and re-think international cooperation in the field of STI policy, in a coherent way to ensure that “no one is left behind.”

Outcomes of the discussions on STI roadmaps in previous sessions of the STI Forum

The 10-Member Group and other participants of the STI Forum and of various HLPF session have called for STI roadmaps for the SDGs at least since 2013.

In the first STI Forum 2016, there was a dedicated session and a prominent section of the proceedings was dedicated to “*Science, technology and innovation action plans and technology road maps*” alongside complementary sections on “*Enhancing the coherence of STI policy*” and on “*Creating robust science advisory ecosystems at all levels*”. Paragraphs 24 and 25 of the Co-chairs’ summary of the Forum provided further insights: “*Science, technology and innovation policies need to do a better job of linking to and tackling development challenges. Flexible science, technology and innovation action plans and technology road maps at the national and global levels are needed to support the achievement of the Goals. They could be a means of uniting all interested stakeholders, including financiers, to work towards common goals and to benefit from periodic scientific analysis. They require leadership and need to be adequately resourced. Whole-of-economy approaches will be needed. Innovation ecosystems have to function effectively, be economically sustainable and provide shared value.... The design of science, technology and innovation action plans should be inclusive and involve all stakeholders from the outset.... Participatory technology assessment and prospective analysis (e.g., of the impact of technologies on employment) could be useful. There is a role for foresight and horizon scanning exercises going forward, including for examining technologies that are currently risky and unproven. A project on the world in 2050 was mentioned in that context.*”¹⁶

In the STI Forum 2017, there was another session on STI roadmaps, in view of popular demand. It discussed STI policy failures and explored options for more efficient governance approaches, including responsible research and innovation approaches. It identified new STI policy trends and opportunities and called for increased inter-agency cooperation and the development of guidelines for STI policy development, in line with the national strategies to achieve the SDGs.

¹⁶ UN document (E/HLPF/2016/6), http://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2016/6&Lang=E

Paragraphs 39, 71, 72 and 73 of the Co-chairs' summary of the Forum provided further insights: *"Most countries have development plans that mention the role of science, technology and innovation, and some knowledge infrastructure is in place through institutions and ministries. However, developing countries face a severe lack of capacity in science, technology and innovation systems, infrastructure, trade and investment policy. In addition, despite significant capacity-building efforts, many poor countries fail to make significant progress, as maintaining and retaining newly established capacities remain serious challenges. Against this background, Governments, the United Nations development system and development partners should prioritize open and inclusive capacity-building in science, technology and innovation policymaking, including related policy research, especially on demand-side innovation policies that trigger knowledge use, as well as private sector training. Investors should support comprehensive science, technology and innovation policies that take the Sustainable Development Goals' interlinkages into account.... The cross-cutting nature of the Sustainable Development Goals (their interdependencies, potential trade-offs and synergies) and of science, technology and innovation requires holistic approaches and strategies. In this context, multidisciplinary and integrated approaches are necessary to take into account different sources of knowledge (including traditional knowledge). Recent large-scale disease outbreaks are a case in point, as early warnings have been made more difficult by institutional silos between animal health monitoring and human epidemiology.... Science, technology and innovation road maps and action plans that have a particular focus on accelerating progress towards the Goals are essential. They are needed at the subnational, national and global levels, and should include measures for tracking progress. These road maps incorporate processes that require feedback loops, evaluate what is working and not working, and produce continual revisions that create a real learning environment. They are most effective if built up with stakeholder engagement and when they contribute to 'smart Government'.... 'Deep dives' are needed for each Goal for which road maps could help prioritize actions and promote cross-sectoral collaborations, as was illustrated by the forum's dedicated sessions on Goals 1, 2, 3, 5, 9 and 14."*¹⁷

In the STI Forum 2018, built on the earlier discussions of STI roadmaps and highlighted in particular the need for action-oriented design of STI roadmaps; global partnerships; national-level roadmaps; action plans at national and subnational levels; and stakeholder engagement. Paragraphs 108 to 111 of the Co-chairs' summary of the Forum provided further recommendations on STI roadmaps and action plans for the SDGs: *"The cross-cutting nature of [STI and the SDGs].... requires holistic approaches and strategies. Multidisciplinary and integrated approaches are necessary to take into account different sources of knowledge, including local and indigenous knowledge.... [STI] road maps and action plans that aim to accelerate progress towards the Goals need to be developed at the national and subnational levels, ideally with measures for tracking progress and in line with national and global development strategies.... [STI for SDGs] road maps can be strategic tools for ensuring policy coherence and linking with solutions, public policies and good practices.... [STI for SDGs] road maps are most effective if built up with stakeholder engagement in science, technology and innovation policy design, adaptation and application. Public-private partnerships and other forms of collaboration should be fostered with scientists and engineers in companies at the technology frontier. 'Deep dives' are needed for each Goal for which road maps could help prioritize actions and promote cross-sectoral collaborations, as was illustrated by the forum's dedicated sessions on Goals 6, 7, 11, 12 and 15.... It was suggested that a group of Member States could lead the way by undertaking serious efforts over the coming year to develop their own versions of [STI for SDGs] road maps and reporting on their experiences at the high-level political forum in 2019."*

In response to the interest in broad-based STI roadmaps, IATT has launched a consolidated initiative to promote such plans under the TFM. The present session in the workshop could share expectations, review the progress and recommend specific ways forward.

Objectives

During this session the ministers will present national and sub-national initiatives related to design and review of STI for SDG roadmaps and related policy actions. The session will also discuss potential support to strengthen international partnerships in the area of capacity-building on STI for SDG roadmaps.

Format

The session will be structured as a list of high-level statements, and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the Co-Chairs.

¹⁷ UN document (E/HLPF/2016/6), http://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2017/4&Lang=E

Questions for discussion

The discussion will be guided by the following questions:

- What are existing country practices and early pilot experiences in terms of STI roadmaps and action plans?
- What institutional mechanisms are needed for cross-sectoral engagement of government entities and multiple stakeholders for timely horizon scanning, tracking progress and corrective actions?
- What international collaborations or mechanisms are needed for exchange of experiences and partnerships on STI for SDGs?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- Draft Guidebook on Development of STI Roadmaps for the SDGs
- IATT Issues Brief on STI Roadmaps for the SDGs
- Global Pilot Programme on STI for SDGs roadmaps

Special event 1: Launch of exhibition of innovative technology solutions for SDGs

Background

In support of the 4th annual *Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals* (“STI Forum”) in 2019, the UN in collaboration with the *Global Innovation Exchange* launched a *Global Call for Innovations for the Sustainable Development Goals* (SDGs) for innovators, scientists, entrepreneurs and sustainability change agents worldwide to submit their innovations as workable solutions for sustainable development and six SDGs that have been selected for focus in 2019 in particular: SDGs 4 (quality education), 8 (decent work and economic growth), 10 (reduced inequalities), 13 (climate action), and 16 (peace, justice and strong institutions). The aim of the call was to support promising technology solutions through networking among communities of innovation pioneers, innovation scale-up, innovations implementation in the broad areas of SDGs 4, 8, 10, 13, and 16 which will be reviewed in the *UN High-Level Political Forum on Sustainable Development* (HLPF) in July 2019.

Objectives

The special event aims to offer an opportunity for the top innovators from around the world to present their work to members of the diverse and high-level audience attending the STI Forum 2019; to raise awareness of key technological solutions for SDGs and the Call for Innovations initiative; and to contribute to networking between relevant stakeholders and facilitating development, transfer and dissemination of relevant technologies for the SDGs. It should also contribute to mobilizing stakeholders and technology champions to engage in partnerships focused on specific technological solutions, lead to new development ideas, and provide ideas on how to scale-up technology solutions submitted through the Global Call. Ultimately, the event might lead to a list of concrete, concise and understandable examples of how technologies already contribute, in order to support SDG implementation – an outcome in which the HLPF may be interested.

Format

A series of moderated 3-minute remarks, followed by a visit of the exhibition space and informal exchange among participants.

Session 3: Science, technology and innovation for quality education (SDG4), decent work and economic growth for the future (SDG8)

Background

Quality education (SDG 4)

Education plays a key role in building sustainable, inclusive and resilient societies and has reciprocal linkages with almost all other SDGs. On one hand, education contributes to improved physical and mental health; promotes gender equality and can reduce inequality. It increases the productivity of individuals and strengthens the potential for economic growth by developing competencies and skills needed for decent work and professional skills needed for sustainable development. On the other hand, lack of progress on other SDGs can constrain access to education. Technology will play a very important role in the future of inclusive and quality education. The following table provides an overview of SDG4 and its targets.

SDG 4	Targets under SDG 4	
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1	By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal-4 effective learning outcomes
	4.2	By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education
	4.3	By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
	4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
	4.5	By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations
	4.6	By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy
	4.7	By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development
	4.A	Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, nonviolent, inclusive and effective learning environments for all
	4.B	By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries
	4.C	By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing states

What are some of the trends in progress towards SDG 4? Primary education enrolment in developing countries has now reached 91 per cent. Since 2000 the percentage of out-of-school children of primary-school-age has declined from 40 to 22 per cent in sub-Saharan Africa, and from 20 to 6 per cent in South Asia.¹⁸ However, important challenges remain. At the global level, the participation rate in early childhood and primary education was 70 per cent in 2016, up from 63 per cent in 2010, but still falling short on reaching all children. The lowest rates are found in sub-Saharan Africa (41 per cent) and Northern Africa and Western Asia (52 per cent). Enrollment rates for pre-

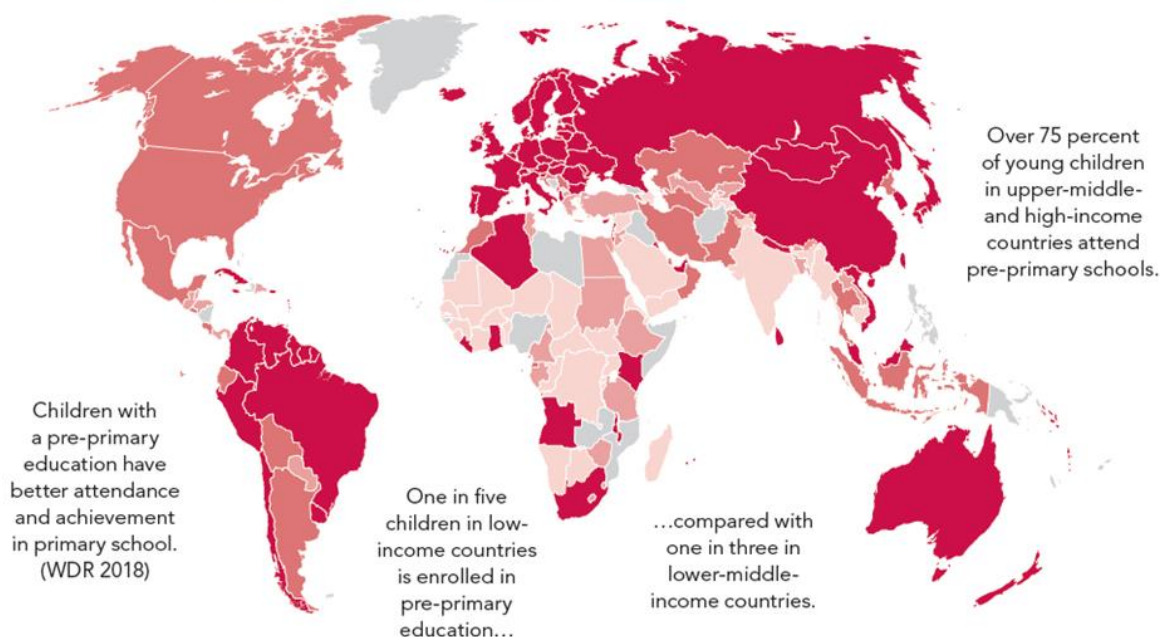
¹⁸ UNESCO Institute for Statistics (UIS Data Centre)

primary children are lower than for primary enrollment with children missing important formative education (see figure).

Gross pre-primary enrollment ratio, most recent value in 2011–16 (%)

SDG 4.2

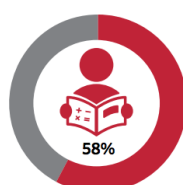
0–25 25–50 50–75 75 and over No data



Source: UNESCO Institute for Statistics. World Development Indicators (SE.PRE.ENRR).

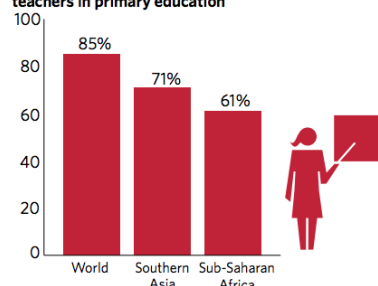
An estimated 617 million children and adolescents of primary and lower secondary school age worldwide—58 per cent of that age group—are not achieving minimum proficiency in reading and mathematics. In 2016, an estimated 85 per cent of primary school teachers worldwide were trained; the proportion was only 71 per cent for Southern Asia and 61 per cent for sub-Saharan Africa. In 2016, only 34 per cent of primary schools in LDCs had electricity and less than 40 per cent were equipped with basic hand washing facilities (see figures).

More trained teachers are needed for quality education



More than half of children and adolescents are not achieving minimum proficiency in reading and mathematics

Percentage of trained teachers in primary education



Given the trends just outlined, this session will focus on what difference technologies can make in terms of SDG4 progress? One example is open and affordable digital education which can promote equal opportunities and reduce inequalities by ensuring every child has access to high quality content. Many initiatives by universities, NGOs and governments, as well as partnerships among these have emerged in recent years in this regard.

Decent work and economic growth (SDG 8)

SDG 8 captures two main economic themes that are strongly interlinked – economic growth and employment/decent work. More people in decent jobs can lead to more inclusive economic growth, and vice versa. Putting job creation at the heart of economic policy-making and development plans, will not only generate decent work opportunities but also more robust and poverty-reducing growth. It is a virtuous circle that is as good for the economy as it is for people and potentially for the planet as well. Decent work is both a means and an end of the 2030 Agenda. At the same time Agenda noted that creation, development and diffusion of new technologies and associated know-how, including the

transfer of technology on mutually agreed terms, are powerful drivers of economic growth and sustainable development. The following table provides an overview of SDG 8 and its targets.

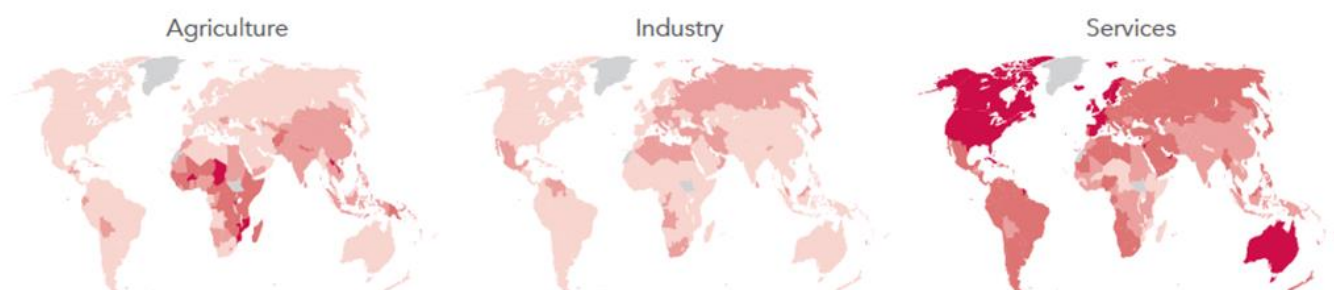
SDG 8	Targets under SDG 8	
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.1	Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries
	8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors
	8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.
	8.4	Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead
	8.5	By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
	8.6	By 2020, substantially reduce the proportion of youth not in employment, education or training
	8.7	Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms
	8.8	Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment
	8.9	By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
	8.10	Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all
	8.A	Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries
	8.B	By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization

Progress towards SDG 8 has been mixed. While global labour productivity has increased and unemployment decreased, major gaps remain in terms of employment opportunities for young people, safe and secure working environments, access to financial services, and issues related to informal employment. Agriculture continues to dominate employment in South Asia and Sub-Saharan Africa, while most workers in Europe, Central Asia, Latin America, the Caribbean and North America are employed in the service sector (see figure).

Employment by sector, 2016 (% of total employment)

SDG 8.2
SDG 8.3

0–25 25–50 50–75 75–100 No data

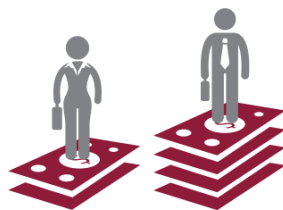


Source: ILO. World Development Indicators (SL.AGR.EMPL.ZS; SL.IND.EMPL.ZS; SL.SRV.EMPL.ZS).

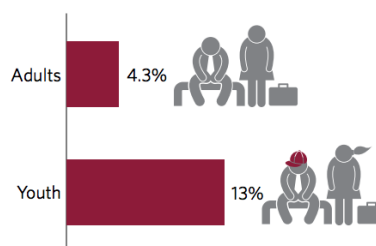
The global unemployment rate in 2017 was 5.6%, down from 6.4% in 2000. Yet, globally another 470 million jobs will be needed to accommodate new entrants to the labor market between 2016 and 2030, purely due to demographics.

In 2016, globally, 61% of all workers (or 51% when excluding the agriculture sector) were engaged in the informal sector. Earning inequalities remain a matter of concern (see figure). Youth continue to be three times more likely to be unemployed than adults. Globally, the women's labour force participation rate was at 63 per cent compared to 94 per cent for men. Women continue to do 2.6 times the unpaid care and domestic work that men do.

Earning inequalities are still pervasive:
men earned **12.5 per cent more** than
women in 40 out of 45 countries with data



Youth were **three times more likely**
to be unemployed than adults in 2017



STI might support new educational and technological opportunities for workers in developing countries. Mobile money platforms, such as M-PESA; micro-credit, such as M-Shwari; and digital integration of value chains via apps have been found useful in this regard. The session will discuss lessons learnt and good examples for consideration.

Interlinkages between SDG 4 and SDG 8

Interlinkages between SDG4 and SDG8 are multiple and fundamental. Preparing for a rapidly changing future of work requires quality education and life-long learning. And knowledge embodied in technology has proven the most important long-run driver of economic growth and development. Economists have proposed multiple channels through which education may affect growth¹⁹ – not merely the private returns to individuals' greater human capital but also a variety of externalities. STI plays a special role in promoting simultaneous progress towards SDG4 and SDG8 by transforming the way in which business is being done everywhere and by creating new employment opportunities and changing prerequisites for almost all forms of employment.

Objectives

The session will discuss ways and means in which science, technology, and innovation can better support SDG4 (quality education) and SDG8 (decent work and economic growth). The session will focus on how to adapt education and research systems to prepare for a rapidly changing future of work. It will identify opportunities and challenges, good practices and policy recommendations.

Format

The session will be structured as a moderated panel discussion (3 to 5 minutes per panelist), followed by young innovators presentations, and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- What difference can science and technologies make in supporting progress on SDG4 and SDG8? What are the most effective approaches and technology solutions? What are the main challenges? What lessons have been learnt?
- How are SDG4 and SDG8 interlinked? Which science and technology solutions are a win-win for progress in both SDG4, SDG8 and other SDGs?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- 2019 Global Education Monitoring Report, UNESCO, <https://en.unesco.org/gem-report/report/2019/migration>

¹⁹ P. Aghion, L. Boustan, C.Hoxby, J. Vandenbussche, The Casual Impact of Education on Economic Growth: Evidence from U.S. March 2009, Harvard University Scholar Report

- Global Wage report 2018/2019, ILO, https://www.ilo.org/global/publications/books/WCMS_650553/lang-en/index.htm

Session 4: Gender and STI for SDGs

Background

SDG 5 Introduction

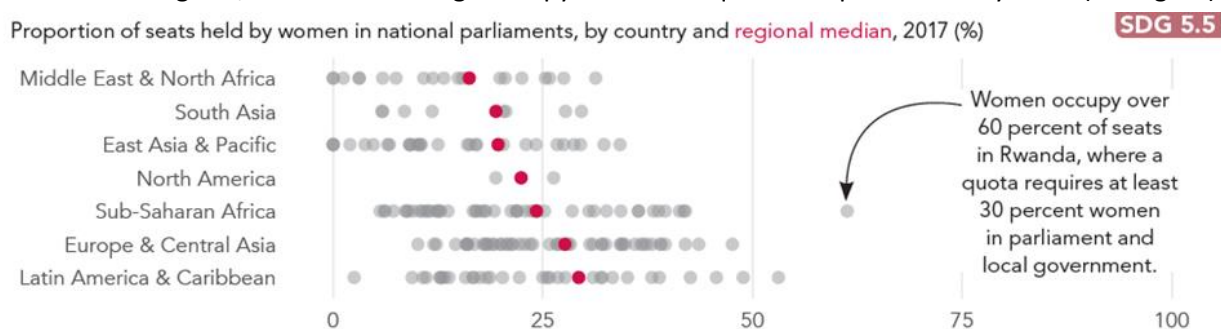
There are concerns that without the equal contribution of women and girls to STI including ICTs, the world might not make full use of the many potential female creators, innovators and scientists, and their essential contribution to solving the world's major problems. Closing the gender gap in the entire STI system throughout the cycle of education and employment is thus extremely important. It pertains to R&D, entrepreneurship, leadership, and decision-making. Similarly important is women's economic empowerment, in order to enable women and girls to make informed life choices and fully participate fully in society. To provide just one example relating to SDG target 5.5., the reality in some parts of world is that women lag men in business ownership. In every region, less than half of firms are even partially owned by women (see figure).



Note: Aggregates are based mostly on low- and middle-income countries.

Source: World Bank Enterprise Surveys. World Development Indicators (IC.FRM.FEMO.ZS).

Gender should also be considered in all stages of technology design and policy. Otherwise, technology design might reinforce gender inequalities by excluding women from technology access and through reinforcing and amplifying gender stereotypes. Instead technology design could aim to involve gender-balanced stakeholders. Designs that prevent women from access have economic, health, and safety implications that reinforce inequalities. Example of such problematic technology design include tools and machinery that are physically inoperable for women excluding them from the workforce; toilet designs in refugee camps that lack essential safety and hygiene elements exposing women to health and safety risks; and AI-based recruitment algorithms such as Amazon's that automatically selected primarily male applicants for further processing based on past empirical data. Most recently, NASA was forced to cancel what would have been history's first all-female spacewalk due to a lack of spacesuits that are designed to fit its female astronauts. Without thoughtful technology design to avoid biases, these technologies can reinforce existing inequalities. Similar concerns apply to the political level where women remain underrepresented in most parts of the world. Across regions, women on average occupy less than a quarter of parliamentary seats (see figure).



Source: Inter-Parliamentary Union. World Development Indicators (SG.GEN.PARL.ZS).

Improving women and girls' quality of life remains a global challenge. Science and technology solutions can make contributions to their education, employment, leadership opportunities, political representation, and quality of life.

Progress towards SDG 5 has been mixed. More than 100 countries have taken action to track budget allocations for gender equality. Targeted gender-responsive programs and projects have been created, such as the Magna Carta of women, programs on women in science, She for We, and gender mainstreaming evaluation frameworks, and many other initiatives. The proportion of women in paid employment outside the agriculture sector has increased from 35 per cent in 1990 to 41 per cent in 2015. Yet, gaps remain. For example, women in Northern Africa hold less than one in five paid jobs in the non-agricultural sector.

Objectives

This session will discuss issues related to attracting and retaining women in STI/STEM fields, including women in social science. It will address problems of supporting women entrepreneurship, gender challenges and trends in the labour market and improving access to capital.

Format

The session will be structured as a moderated panel discussion (5 minutes per panellist), followed by questions and answers and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- What are the main STI/STEM related challenges and solutions for women and girls and gender equality, including challenges faced by women in the labour market?
- How STI could be leveraged to empower women and girls?
- What are the policy measures and good practices to attract and retain women and girls in STI/STEM related fields, achieve gender parity and fully leverage women and girls' potential?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- Sustainable Development Goals report 2018, UNDESA
- Measuring gender equality in science and engineering: the SAGA science, technology and innovation gender objectives list (STI GOL), Working Paper 1, UNESCO / Outcome document for Women and Girls in Science Day
- SDG Progress Report 2018

Session 5: A Brighter Future – Youth, Innovation Ecosystems, and Development

Background

Young people are a force for development, technology and innovation at all levels. They tend to be pioneers and first adopters of new ideas and technologies. Most importantly, young people are the leaders of tomorrow. Decisions made today will have long term implications, often with consequences that will only be realized in hindsight. Therefore, neglecting youth and their rights and responsibilities typically leads to long-term economic and social consequences. Intergenerational equity is a core principle of the Rio process since 1992 and of sustainable development in general. Hence, it is essential to ensure that science, technology and innovation policies and solutions designed today do not jeopardize the capabilities of future generations to deal with their challenges through technology lock-in and path dependence. This can be done in numerous ways, for example, by providing spaces for young scientists in science advisory systems, community-based technology assessment, simulations to forecast short-and-long term consequences of STI policies/solutions, and spaces for peer-learning and mentorship.

Globalization trends, such as technology change, connectivity and flows of people, finance, goods and ideas, and new forms of work and education, have the potential to foster inclusive and equitable development, provided the right policies are in place without which benefits might not be equally shared between and within countries. Innovation ecosystems have the potential to link globally-agreed aspirations with local implementation, promote opportunities for lifelong learning, and ensure an enabling environment to turn ideas into impact that promote sustainable livelihoods. This involves the complex network of stakeholders such as universities, communities of practice, professional societies, academies of science and engineering, national institutions, private and public organizations, and more. In this regard, the role of young people is essential, last but not least because they tend to be better tuned in to understanding risks of new technological systems, data privacy, cyberbullying, and the environmental issues.

The STI Forum is interested to hear views of the younger generations on what kind of science, technology and innovation policies and solutions they would like to see, and why these would be preferable from a long-term perspective. In particular, what is their view on intellectual property rights systems, technology transfer, technology banks, statistical capacity, and the future of work.

Objectives

The session will discuss ways and means of building sustainable innovation ecosystems of the future commensurate with SDG aspirations. There will be a focus on the role and perspectives of youth, including with regard to national research and engineering institutions and infrastructures.

Format

The session will be structured as a moderated panel discussion (5 minutes per panellist), followed by questions and answers and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- How can science, technology and innovation systems be organized to fully engage youth for sustainable development? In particular, how can young and early career scientists better engage in policy processes related to science, technology and innovation? What barriers do they face, and how can they be overcome?

- How to improve the access of youth to resources, including capital, knowledge, and tools, to promote youth-led innovation ecosystems?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- Background Note “Empowered, Included and Equal” for ECOSOC Youth Forum 2019
- Concept Note “How to use science, technology and innovation to facilitate youth engagement, development and resilience” for ECOSOC Youth Forum 2018

Session 6: STI for inclusive and equitable societies (SDG10 and SDG16)

Background

Reducing inequality within and among countries (SDG 10)

SDG 10 refers to reducing inequality within and among countries. It refers to inequality in terms of income, growth, social policy, financial markets, trade, and migration encompassing inequalities in both opportunities and outcomes (see table).

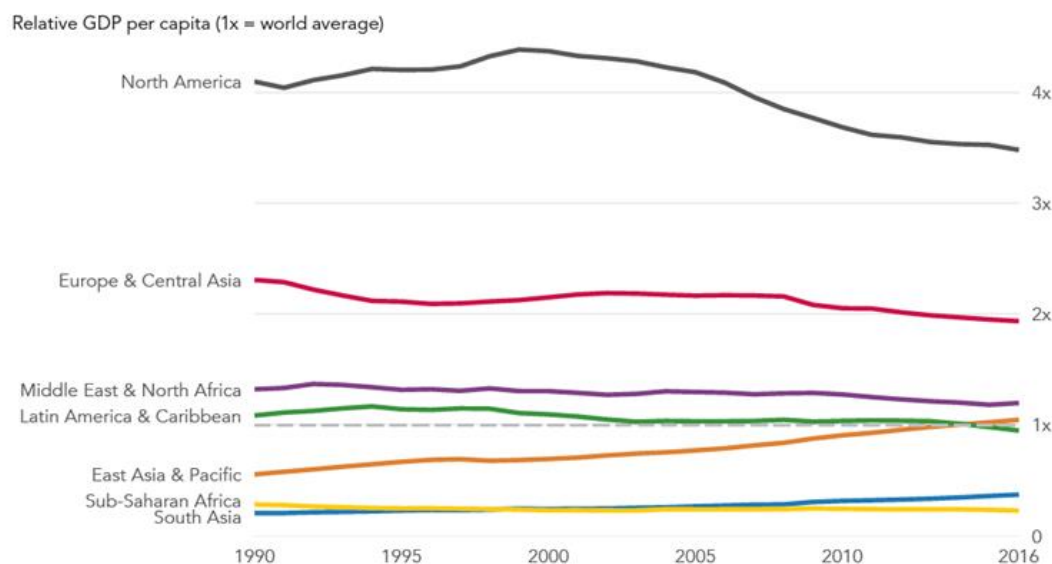
SDG 10	Targets under SDG 10	
Reduce inequality within and among countries	10.1	By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average
	10.2	By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
	10.3	Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
	10.4	Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
	10.5	Improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations
	10.6	Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions
	10.7	Facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies
	10.A	Implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with World Trade Organization agreements
	10.B	Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes
	10.C	By 2030, reduce to less than 3 per cent the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5 per cent

Today's inequality across countries and regions remain significant. North America is 3.5 times richer than the world average, but its relative incomes per capita have been falling. By contrast, relative incomes in South Asia and East Asia have been rising (see figure). There has been some progress toward reducing inequality- for example, by increasing zero-tariff access for exports from LDCs and developing countries, and providing additional assistance to LDCs and small island developing States (SIDS). Between 2010 and 2016, in 60 out of 94 countries for which data was available, the incomes of the poorest 40 per cent of the population grew faster than those of the average population. In 2016, over 64.4 per cent of products exported by LDCs to world markets and 64.1 per cent of those from SIDS faced zero tariffs, an increase of 20 per cent since 2010. Developing countries overall had duty-free market access for about 50 per cent of all products exported in 2016. At the same time, wealth concentration is high, with 26 billionaires owning as much as half the global population²⁰; poverty is stubbornly persistent in some pockets with more than half of the world's extreme poor living in Sub-Saharan Africa²¹; and disparities in education, health and income still run deep along the lines of gender, urban/rural location, and country of birth. Global inequality, in terms of gaps between countries' mean incomes, has reduced, but income inequality has increased in most countries.²² Therefore, progress will need to accelerate to reduce growing disparities within and among countries.

²⁰ Oxfam (2019). Public good or private wealth. Oxfam Briefing Paper, January 2019.

²¹ For example, see <https://www.un.org/sustainabledevelopment/progress-report/>

²² Milanovic.B.Roemer.J.(2016). Interaction of global and national income inequalities. Journal of Globalization and Development. Vol.7. No. 1. July 2016.



Source: World Bank, International Comparison Program database. WDI (NY.GDP.PCAP.PP.KD).

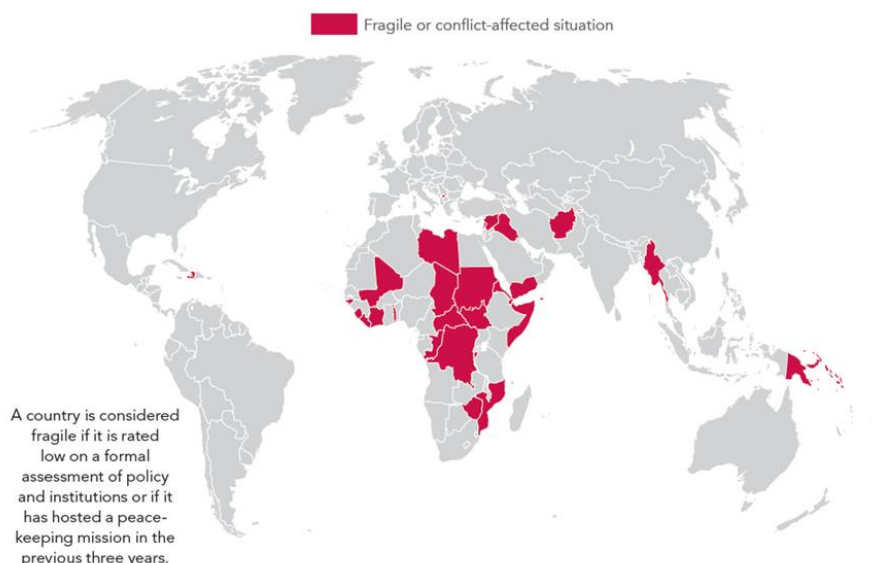
Technology transfer and local innovations are essential for increasing productivity and wages and reducing inequalities within and among nations. Knowledge-sharing is important, both within and outside formalized education systems. Technology is crucial for progress, but can be accompanied by inequality if measures are not taken to counter inequalities in access and use. It is important to recognize that technology development in certain sectors, such as health and water acutely impact the poor and thus might require government support to optimize market incentives. This session is expected to discuss science and technology solutions to addressing inequality in all its dimensions. Examples might include multi-lingual knowledge platforms and machine translation to reduce language barriers (the likes of Google translate and YouTube). Another UN system example is WHO's global medicine platform to promote fair and transparent pricing for medicines.

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels (SDG 16)

SDG 16 is both an outcome and enabler of sustainable development. At the same time, SDG 16 targets while touching on distinct issues, are closely linked across the whole set of SDGs (see table). SDG 16 contains targets of varying scope – some narrowly defined, others broader, serving to express underlying principles of the 2030 Agenda such as peaceful, just and inclusive societies, constituting the foundations for sustainable development. Innovation, such as pro-poor, inclusive, grass-roots and social innovation, could potentially solve problems that are not adequately addressed by markets.

SDG 16	Targets under SDG 16	
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	16.1	Significantly reduce all forms of violence and related death rates everywhere.
	16.2	End abuse, exploitation, trafficking and all forms of violence against and torture of children.
	16.3	Promote the rule of law at the national and international levels and ensure equal access to justice for all.
	16.4	By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime.
	16.5	Substantially reduce corruption and bribery in all their forms.
	16.6	Develop effective, accountable and transparent institutions at all levels.
	16.7	Ensure responsive, inclusive, participatory and representative decision-making at all levels.
	16.8	Broaden and strengthen the participation of developing countries in the institutions of global governance.
	16.9	By 2030, provide legal identity for all, including birth registration.
	16.10	Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements.
	16.A	Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime.
	16.B	Promote and enforce non-discriminatory laws and policies for sustainable development.

Regions of the world continue to suffer from violence and armed conflict within and between societies. Advances in the rule of law and access to justice remain uneven. However, progress is being made in regulations to promote public access to information, albeit slowly, and in strengthening institutions upholding human rights at the national level.



Source: World Bank. <http://www.worldbank.org/en/topic/fragilityconflictviolence/brief/harmonized-list-of-fragile-situations>

Objectives

The session will discuss ways and means in which science, technology, and innovation can better support SDG10 (reducing inequalities) and SDG16 (peace, justice, and strong institutions). The session will focus on how to achieve inclusive societies in a rapidly changing world. It will identify challenges and needs, good practices and policy recommendations.

Format

The session will be structured as a moderated panel discussion with several rounds of interactions between the moderator and the panelists based on the questions for discussion, followed by Q&A, and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- What are the most effective ways for science, technology and innovation to support the achievement of SDGs 10 and 16? What are the knowledge, research and implementation gaps?
- What are good institutional examples of effective and transparent policies, institutional and R&D systems?
- How can access to knowledge and technology facilitate peace, justice and strong institutions?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- Sustainable Development Goals report 2018
- World Inequality Report 2018 <https://wir2018.wid.world/>

Special event 2: Roundtable on STI roadmaps for SDGs - the technical perspective

Background

The 2030 Agenda, adopted at the United Nations Sustainable Development Summit in September 2015, positioned Science, Technology and Innovation (STI) as key means of implementation of the SDGs, and launched the UN Technology Facilitation Mechanism (TFM). The Annual Multi-Stakeholder Forum for Science, Technology and Innovation (STI Forum), supported by the Inter-Agency Task Team on Science, Technology and Innovation for the SDGs (IATT), has been the main fora for TFM to discuss topics of common interests of Member States and STI stakeholders in context of the 2030 agenda, such as on STI for SDGs roadmaps.

Overall, the TFM's work on STI roadmaps for the SDGs has forged a certain level of consensus among UN experts on guiding principles and methodologies for STI roadmaps at the national level. Elements of a global initiative or international assistance programme on such roadmaps have been discussed within TFM. Most recently, a guidebook on how to develop STI roadmaps for the SDGs

re designed to be flexible enough to be adapted to specific regional and national conditions while also remaining ambitious enough to accommodate global SDGs challenges and STI opportunities.

Technically, "six-step" approach has been mapped out, to i) define objectives and scope; ii) assess current situation; iii) develop vision, goals and targets; iv) assess alternative pathways; v) develop detailed roadmap; and vi) monitor, evaluate and update roadmap. Fully integrating key inputs (stakeholder consultations, expertise, data and evidence base) helps governments maximize the overlap among the three related national plans – namely, national development plan, SDGs plan and STI plan – underpinning effective STI for SDGs roadmaps. Based on these technical approaches, a proposed global pilot programme is initiated to build capacity for and scale up adoption of the Member State's STI for SDGs roadmaps, and promote international partnerships in support of design and implementation of STI for SDGs roadmaps.

Objectives

The roundtable will discuss the UN work and collaboration on development of the guidebook on building STI roadmaps for SDGs as a policy-making and communication tool for Member States. It will also present a proposed global pilot programme on STI roadmaps to build capacity for and scale up adoption of the Member States' STI roadmaps for the SDGs. The session will discuss about various stakeholders' perspective on the development of the STI Roadmaps for achieving SDGs. In particular, the meeting will offer an opportunity to share vision/views with regards to

- examples of conventional technologies and emerging technologies, such as Artificial Intelligence, in the context of achieving SDGs and how private sector can support STI for SDGs roadmaps;
- role of international partnerships, including through north-south, south-south, multilateral and multi-stakeholder cooperation, to promote effective design and implementation of STI for SDGs roadmaps by UN member states;
- examples of institutional arrangements and policy planning approaches, through pilot experiences, to formulate effective STI for SDGs roadmaps;
- how to contribute to the discussions on global partnerships for strengthening capacity for development and implementation of STI for SDGs roadmaps; and
- concrete recommendations on advancing national practices and international partnerships around STI for SDGs roadmaps.

Format

The session will be structured as a moderated panel discussion (3 minutes per panellist), the panel discussion will be followed by interactive discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- How do we harness frontier technologies in the context of STI roadmaps?
- What are approaches to balance policy coherence across sectors and deep dive analysis of goal-specific roadmaps?
- What can official development assistance (ODA), public-private cooperation and other global partnerships help to build necessary capacity and promote investments in STI?

Session 7: Science, technology and innovation for taking action to combat climate change and its impacts (SDG13)

Background

The 2030 Agenda and the Paris Agreement in 2015 have provided support to the coherent implementation of climate action and sustainable development objectives. With the completion of the Paris Agreement rule book at COP24, the urgent focus is now on closing the ambition gap, including through new nationally determined contributions (NDCs) by 2020, and on scaling up climate action both in adaptation and mitigation.

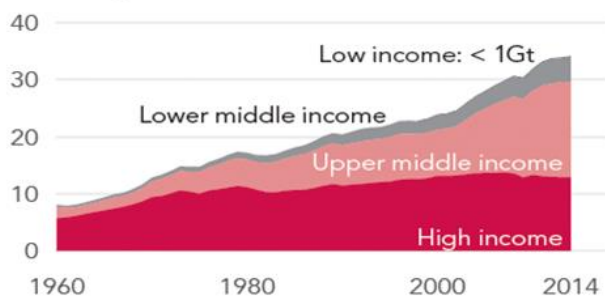
Featured explicitly in Agenda 2030 as SDG 13, climate action is also deeply interconnected with many of the other goals and targets. For example, enhancing climate resilience is cross-cutting across multiple SDGs, while the energy transitions envisaged in SDG 7 can be expected to contribute significantly to lowering greenhouse gas (GHG) emissions relative to business-as-usual pathways, thereby contributing to the objectives of the Paris agreement. Similarly, more sustainable industrialization (SDG 9), sustainable food production systems and resilient agricultural practices (SDG 2), and changing patterns of consumption and production (SDG 12) can all contribute towards low-emission pathways, the creation of new kinds of jobs and long-term progress towards eradicating poverty and other deprivations.

SDG 13	Targets under SDG 13	
Take urgent action to combat climate change and its impacts	13.1	By 2030, Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
	13.2	By 2030, Integrate climate change measures into national policies, strategies and planning
	13.3	By 2030, Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
	13.A	By 2030, Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
	13.B	By 2030, Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

The IPCC's 2018 Special Report on the impacts of global warming at 1.5 °C above pre-industrial levels identified the critical consequences of such a temperature rise, as well as the coming decade as being the only window within which actions to stay within this limit can succeed. This is also the window within which the SDGs are expected to be achieved. The report highlights strengthened multilevel governance, institutional capacity, policy instruments, technological innovation and transfer and mobilization of finance, and changes in human behavior and lifestyles as enabling conditions that can enhance the feasibility of mitigation and adaptation options to achieve the goals.

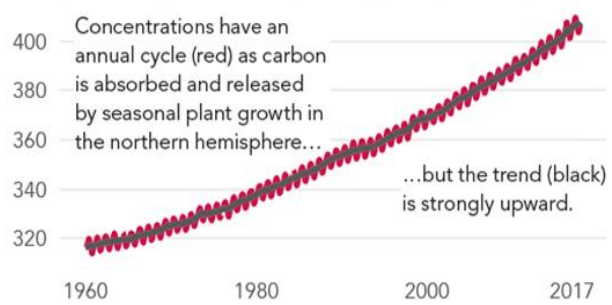
SG13 progress, however, is falling short of what is needed to meet the targets of the global agenda by 2030. According to the Sustainable Development Goals Report 2018, the year 2017 was one of the three warmest on record and the five-year average global temperature from 2013 to 2017 was also the highest on record. Rising sea levels, extreme weather conditions and increasing concentrations of greenhouse gases continue unabated (see figures). This has led to calls for accelerated action by Governments for implement the Paris Agreement on Climate Change.

Annual CO₂ emissions, by income group (Gt)



Source: Carbon Dioxide Information Analysis Center. World Development Indicators (EN.ATM.CO2E.KT).

Atmospheric CO₂, at Mauna Loa, Hawaii (parts per million)



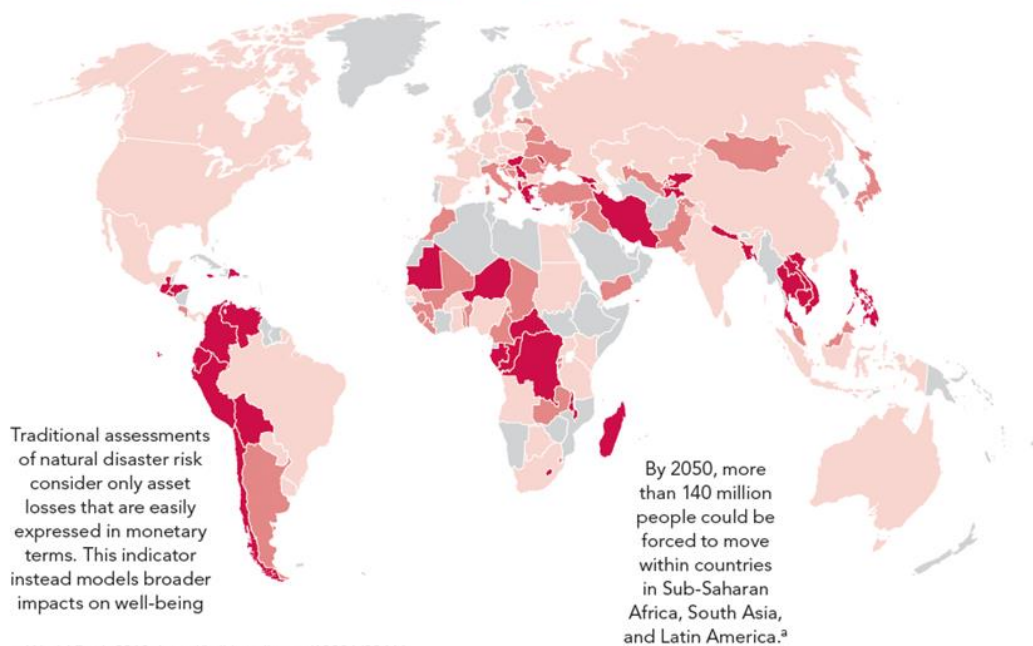
Source: Tans, P / NOAA/ESRL & Keeling, R / Scripps Institution of Oceanography. <http://www.esrl.noaa.gov/gmd/ccgg/trends>

Low-income countries tend to be more vulnerable to natural disasters due to extreme weather the probability of which is increased by rising temperatures. The risk to well-being is greater than narrow measures of asset loss suggest. And, most importantly, the risk falls more heavily on the poor within all countries (see figure).

Risk to well-being (% of GDP per year)

0.0–0.5 0.5–1.0 1.0 and over No data

SDG 13.1



a. World Bank 2018. <http://hdl.handle.net/10986/29461>

Source: World Bank 2017. <http://hdl.handle.net/10986/25335>

Fossil energy use accounts for roughly two-thirds of global greenhouse gas (GHG) emissions. It thus has tremendous potential in mitigating climate change and supporting the achievement of SDG13. In terms of mitigation, a sectoral perspective is most important. In this regard, the largest sources of global GHG emissions are electricity and heat production, and fossil fuel retrieval, processing and distribution (35%); agricultural production and land use (24%); industry (21%); transportation (14%); and buildings (6%). Science, technology and innovation development can facilitate further decarbonization necessary to achieve the climate targets. The use of policies and financial frameworks to grow green technology markets can combat climate change, reduce pollution and create a more sustainable society. Enabling technologies are facilitating and advancing the deployment of renewable energy. For both current and evolving technologies, it is critical to ensure that international technical and financial support is available to facilitate action in developing countries and that signals are provided to innovators by governments to create sustainable markets for low-carbon technologies, fill in R&D funding gaps, and create enabling infrastructure.

Because of the cross-cutting nature of the SDGs and the Paris Agreement, and of science, technology and innovation, holistic approaches and strategies will be required. Likewise, strengthened partnerships between the private sector, academia, non-governmental organizations and young people will be essential.

The successful technological innovation should include a sound national system of innovation, market push and pull factors, innovation beyond technology, inclusive and equitable engagement of stakeholders, and collaboration.

Mechanisms to facilitate sharing technology, policy, financial solutions and resources for climate change action have been established, e.g. Japan-India Technology Platform.

Objectives

The session will discuss ways and means in which science, technology, and innovation can better support SDG13 progress. This may include aspects of international cooperation, capacity-building, and the facilitation of development, scaling up, adoption, and dissemination of climate-relevant technologies. The session will identify challenges and needs, good practices and policy recommendations.

Format

The session will be structured as a moderated panel discussion with several rounds of interactions between the moderator and the panelists (5 minutes each) based on the questions for discussion (below), followed by questions and answers and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- Which STI approaches, actions or policies have proven successful for significant greenhouse gas emissions mitigation and adaptation? What are the most crucial technologies and supporting institutions? What are the potential for the various technology options?
- What are the main remaining knowledge and implementation gaps that call for more research and technology development? What level of resources has been dedicated to them? Which partnerships would be needed at local, national and global levels?
- What would be your three key recommendations for policy and concrete action?

Supporting documents/publications

- 2018 Sustainable Development Goals report
- IPCC 2018 Report
- SDG7 Policy Brief # 15 – Interlinkages between Energy and Climate Change - <https://sustainabledevelopment.un.org/content/documents/17498PB15.pdf>
- STI Forum 2018: Summary by the Co-Chairs
- https://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2018/6&Lang=E
- Technology Executive Committee Brief: Technological innovation for The Paris Agreement <http://unfccc.int/ttclear/tec/brief10.html#Brief10>
Report of the Secretary-General: The role of science, technology and innovation in increasing substantially the share of renewable energy by 2030 (E/CN.16/2018/2) https://unctad.org/meetings/en/SessionalDocuments/ecn162018d2_en.pdf

Session 8: Linking science, technology and innovation of indigenous peoples, culture and traditional knowledge, and the achievement of the SDGs

Background

In the 2030 Agenda, Member States emphasized the importance of strengthening the science-policy interface and maximizing the power of partnerships with a wide range of stakeholders and constituencies. Indigenous peoples are critical partners for achieving sustainable development, and they are custodians of local and traditional knowledge systems that can, alongside formal science, offer solutions to intractable development challenges. Local and traditional knowledge, rooted in the close relationship between indigenous peoples and the natural world, brings fresh perspectives and a body of evidence based on the lived experience of their communities—evidence that can help shape sustainable development policy in myriad ways.

The goals under review this year—on education, economic growth, inequality, climate change and effective institutions—can all benefit from the local and traditional knowledge. When indigenous peoples have a seat at the table, their perspectives can shape policies and programs on inclusive curriculum development, for instance, or nature-based climate change adaptation plans, in ways that would not be possible if formal science were the only source of knowledge. By finding synergies between formal science and local and indigenous knowledge, policy makers and development practitioners can expand their tool box for creating solutions and help ensure that policies and programs are culturally respectful and truly leave no one behind.

The importance of local and traditional knowledge is recognized across the international system, and the STI Forum has been enriched in the last two years by dedicated sessions on the topic, drawing from the expertise of the UN system and beyond. By showcasing indigenous voices, the Forum seeks to understand what conditions and partnerships are necessary for local and traditional knowledge to be appropriately mobilized, together with formal science, to achieve the SDGs

Objectives

This session will discuss how to find synergies with indigenous and traditional knowledge and local technologies relevant to the achievement of the SDGs. It will also present recommendations on how better highlight and mainstream the role of indigenous knowledge.

Format

The session will be structured as a moderated panel discussion with several rounds of interactions between the moderator and the panelists based on the questions for discussion (below), followed by questions and answers and an interactive plenary discussion. The session will close with a brief presentation of main outcomes of the discussion by the moderator.

Questions for discussion

The discussion will be guided by the following questions:

- How can policy makers and development practitioners create synergies with local and traditional knowledge and grassroots technologies for achieving the selected SDGs?
- How can local and traditional knowledge help ensure that STI for SDGs leaves no one behind?
- What are your three most important recommendations for policy and concrete action?

Supporting documents/publications

- STI Forum 2018: Summary by the Co-Chairs
https://www.un.org/ga/search/view_doc.asp?symbol=E/HLPF/2018/6&Lang=E

Session 9: Supporting the implementation of the Technology Facilitation Mechanism – the way forward for joint action – and closing

Background

Paragraph 70 of the 2030 Agenda for Sustainable Development announced the launch of a "Technology Facilitation Mechanism" (TFM) to support the implementation of the Sustainable Development Goals (SDGs). The TFM will facilitate multi-stakeholder collaboration and partnerships through the sharing of information, experiences, best practices and policy advice among Member States, civil society, the private sector, the scientific community, United Nations entities and other stakeholders.

The TFM comprises three components: the United Nations Interagency Task Team on Science, Technology and Innovation for the SDGs (IATT) together with the 10-Member Group of representatives from civil society, the private sector and the scientific community; the annual Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum)' and the TFM online platform as a gateway for information on existing science, technology and innovation initiatives, mechanisms and programs.

Despite limited resources, significant progress has been made towards a full operationalization of the TFM. IATT membership has increased to comprise 42 UN entities and it essentially brings together more than 100 experts among its staff who in an informal and voluntary way exchange experiences and coordinate their work at the working level. They also work closely with the 10-Member Group and representatives of the academic, business and NGO communities they represent. Compared to the past, this is an unprecedented level of cooperation on science and technology across the UN. The IATT work is organized in a number of subgroups which focus on key areas of work, including delivering joint training workshops based on resources pooled from across the UN system; support for the platform development; STI roadmaps for the SDGs; new and emerging technologies and the impacts of their rapid change; gender and STI; and the typical Secretariat functions.

To-date, the IATT conducted two joint training workshops – one in Jordan focused on the Arab region and one in Panama focused on Central America, with several others planned for other world regions in the coming months provided minimum funding can be secured. These workshops have demonstrated to expert knowledge and potential of working as one-UN in direct response to member States demands. Similarly, the STI roadmaps work has made great progress. It has developed a joint guidebook and had several expert consultations to prepare for pilot projects to support development of national STI roadmaps for the SDGs (see session 2). The new and emerging technologies group has collected, synthesized inputs from within the UN system and external expert communities on the impacts of rapid technology change on the SDGs and coordinated their work (see session 1). The gender and STI group has collected, synthesized information from UN entities and coordinated their work (session 4).

Since its beginnings in 2016, the STI Forum has attracted a lot of interest, including from academic, NGO and private sector communities that are not typically involved in UN debates. In fact, several thousand people have been engaged so far. In addition, the STI Forum has catalyzed and built cooperation with related, regular conferences and Forums, such as the Global Solutions Summit and the G-STIC Conference series.

Regarding the online platform, IATT and 10 -Member Group have worked together to operationalize it. In 2018, the IATT focused on advancing the capabilities and design of a prototype of the online platform and also expanded the network of partners and potential users. It also worked on outreach and advocacy, creating a "brand" for the online platform—now known as "2030 Connect"—and developed a plan to secure the necessary funding. 2030 Connect now includes an upgraded search function and improved connectivity across all partner databases. It provides access to a wider range of sectors and resources, ranging from publications to training opportunities to technology offers and technology requests.

Among the most important constraints are lacking funds for the TFM activities – as many of the joint activities are not appropriately included in the participating entities work programmes. Most of the TFM activities including the mandated 10-Member Group and the online platform remain unfunded.

In view of the SDG Summit in September 2019 and the expected review of the SDGs this year, it is an opportune time to take-stock of where we are with the TFM and how we would like to proceed in the coming years. Reflections and ideas in this regard by the IATT and 10-Member Group will be made available on the TFM Website in preparation for the Forum.

Objectives

This session will take stock of where we are after three years of Technology Facilitation Mechanism (TFM), discuss ideas for the way forward and for an effective, science-based, solutions-oriented, multi-stakeholder and collaborative TFM.

Format

The session will be structured as a moderated panel discussion (5 minutes per panelist), followed by Q&A and an interactive discussion. The moderator will close with a brief summary of take-away messages and proposals for consideration.

Questions for discussion

The discussion will be guided by the following questions:

- What are the lessons-learnt from the start-up phase of the Technology Facilitation Mechanism (TFM)? What is the best way forward?
- How could to raise adequate resources for the TFM of the future?
- What are your three most important recommendations for concrete action?

Supporting documents/publications

- Lessons learnt from the start-up phase of the UN Technology Facilitation Mechanism (10/2015 – 05/2019), Informal working paper by the IATT to guide their own work, to appear on <https://sustainabledevelopment.un.org/tfm/> by the time of the Forum
- 2018 IATT Background Paper for Science, Technology and Innovation for SDGs Roadmaps https://sustainabledevelopment.un.org/content/documents/19009STI_Roadmap_Background_Paper_pre_STI_Forum_Final_Draft.pdf