

Background note for the 9th Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals

Prepared by the United Nations Group of Ten High-level Representatives of Civil Society, Private Sector and Scientific Community to Promote Science, Technology and Innovation for the SDGs (“10-Member-Group”)

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Background on the strategic thematic areas of artificial intelligence, climate change, and the SDGs

In the face of accelerating climate change, the burgeoning capabilities of artificial intelligence (AI), and the urgent pursuit of the Sustainable Development Goals (SDGs), the convergence of these domains presents both formidable challenges and unprecedented opportunities. As governments, the private sector, and the academic science and engineering communities come together at the Multi-stakeholder Forum on Science, Technology, and Innovation for the SDGs (STI Forum), the focus is on harnessing the transformative power of science, science advice, and a wide range of technology solutions, most notably AI, to address the pressing challenges of climate change and achieve the SDGs by 2030. This background note outlines key issues, actions, and policy challenges, providing an initial framing for the discussions at the Forum.

Artificial Intelligence: Opportunities and Challenges

AI offers unparalleled opportunities for advancing human knowledge and solving complex problems. Most notably, it holds the promise to make a decisive difference in our capabilities to achieve the SDGs. Its applications can drive efficiency, innovation, and economic growth, impacting all sectors, from agriculture, to healthcare, energy, education, and transportation, among others. They should enable evidence-based decision-making across all these areas and also take into account the range of perspectives of various communities and population groups, including women and minorities. A plethora of such “AI4Good” applications is emerging in all corners of the world. They not only provide new livelihoods but could conceivably reduce global inequalities, provided it is accessible and affordable to all, which should thus be the key objective. The alternative is a “winner-takes-all” future where AI enriches a few and billions are left behind. Hence, governance is key that supports open scientific and technological cooperation geared to solving our most intricate challenges.

The rapid development and deployment of AI also pose significant challenges, including ethical concerns, data privacy issues, and the potential for increased inequality and job displacement. Governments, the private sector, and academia must address these challenges by developing robust ethical frameworks, ensuring transparent and responsible AI use, and fostering inclusive growth that benefits all segments of society. For example, AI could greatly affect the availability of jobs, potentially closing development opportunities on a large scale. By 2030, AI might replace up to 400 million traditional jobs, but it could also create new jobs – our knowledge of the net effects remains highly uncertain, as well as what kinds of people with specific skill sets can get new jobs and what kinds of people lose jobs. AI’s market value might reach as much as 7% of world GDP by that time. Hence, AI could also greatly exacerbate global inequality, if it remains unaffordable and inaccessible to many.

But there is also a darker side of AI. We know that the way a question is framed influences how AI answers the question. Research has well documented how the design of social media and inaccurate data sharing are causing worldwide challenges to trust not only in democracy, but also trust in modern science and medical treatments, such as vaccines, with tragic consequences – arguably the antithesis of progress. Misinformation and disinformation is a top security threat to the world in 2024 according to the World Economic Forum.

The role of AI in amplifying such misinformation and disinformation is important to assess and address. AI can also be used for surveillance activity and to control people, resulting in shrinking civic space. AI has also been shown to reproduce our biases and inequalities, hence potentially amplifying our inequalities to unprecedented new levels. Proposals for using AI to supplement teacher shortage could be problematic as using AI appropriately and accurately requires guidance. While AI can be used to fast-track blood test results and analysis of scans, AI cannot replace the need for doctors and their diagnosis.

Action on climate change and Earth system-related SDG challenges: urgency, safety and equity

Given recent climate trends, the urgency of action on mitigation of climate change and adaptation to the changes can hardly be overstated. With global temperatures rising, sea levels increasing, and extreme weather events becoming more frequent, the need for immediate and coordinated action by governments, private sector, science, and the general public is considered critical. Atmospheric CO₂ concentrations measured at Mauna Loa Observatory have reached a record of almost 423ppmv in January 2024 - one third higher than in 1960 and likely higher than in millions of years. According to the Intergovernmental Panel on Climate Change (IPCC) reports, immediate global action is required, aiming to reduce GHG emissions by 45% from 2010 levels by 2030 and to net zero by 2050. It requires a multidisciplinary approach that spans the sciences, engineering, and social sciences.

Climate change is inextricably linked to essentially all economic activities and various environmental and Earth system processes. The SDGs and their targets highlight ambitious objectives for many of them. Science has further explored thresholds for key domains, such as aerosols, climate, water, biodiversity, and nutrients, beyond which these bio-geophysical systems could collapse, leading to significant harm to humans and nature. The Earth Commission, established by Future Earth and the Global Commons Alliance, has estimated that 7 of 8 global thresholds have been crossed, concerning 52% of the world's land area where 86% of the people live. If not addressed today, this could have long-term consequences for sustainable development, pushing back decades of progress on many SDG targets that are already off track.

With the 2030 Agenda commitment to leave no one behind, it is also imperative that the development of AI and action to tackle climate change are approached in ways that meet the needs of the poorest with the best (high performing) available technologies rather than with business-as-usual technologies. STI can be employed to ensure access to food, water, energy and infrastructure (housing and transport) while also maintaining a healthy environment. The world has already breached many environmental thresholds, even as decent living needs are not being met for billions. To achieve a safe and just pathway for all on this planet, we will need to leverage STI to transform how we do business, invest, trade and consume to eradicate poverty and hunger and reduce the global cumulative damage to the Earth systems on which all our long-term wellbeing ultimately rests.

Interlinkages between AI and climate change and other environmental issues

AI and machine learning technologies have the potential to significantly impact climate change mitigation and adaptation strategies. By analyzing vast datasets, AI can improve climate modeling, enhance renewable energy forecasts, optimize resource use, and monitor deforestation and biodiversity loss. It has been estimated that with current trends AI has the potential to reduce global GHG emissions by about 4% by 2030.

However, the energy use of AI systems themselves poses a sustainability challenge. Data centers alone already require about 1% of global electricity demand. AI increasingly competes with other energy uses, with important socio-economic implications. AI's significant environmental and climate footprint calls for balanced considerations, international cooperation and management, and the development of more energy-efficiency AI models. AI also uses freshwater for onsite water cooling of its servers and for electricity generation; since climate impacts on water, the question is where will this additional water come from. AI encourages huge amount of electronic wastes.

Global research cooperation and funding

Addressing the global challenges of climate change and sustainable development requires unprecedented levels of research cooperation and funding. International collaborations can leverage diverse expertise and resources, accelerating progress towards the SDGs. Global spending on R&D has increased to US\$2.5 trillion from all sources (or 2.5% of World GDP), but the funding effort is heterogeneous across the World. The research output, as measured by the number of scientific articles published, indicates that a catching-up has happened: while in 1996 the scientific articles with authors in low- and middle-income countries (LMIC) were 14% of all the articles published in the World, in 2022 the same percentage grew to 55% (data from bibliometric database Scopus). This makes global research cooperation essential for the advancement of knowledge for the high-income and low- and middle-income countries. Alliances among research funders could foster research that targets the Sustainable Development Goals and also help bridge gaps between science, technology, and policy. Strengthening global research networks and increasing investment in science and technology are essential for fostering innovation and achieving tangible outcomes.

Scientific and technological solutions for SDGs 1, 2, 5, 13, and 16

Besides SDG13 on climate action, this Forum also explores scientific and technology solutions and innovations for making progress on eradicating poverty (SDG1), ending hunger (SDG2), promoting sustainable peace and resilience (SDG16), and women-centred solutions (SDG5). For example, technological advancements in renewable energy, carbon capture and storage, and climate-resilient infrastructure are critical. Scientific research is essential also for exploring sustainable agriculture practices, water resource management, and biodiversity conservation. Bridging science and tech divides could significantly contribute to eradicating poverty and ending hunger, as well as advancing gender equality. In particular, innovations in AI-driven precision agriculture, mobile health technologies, and digital education platforms can provide scalable solutions to these enduring challenges. According to FAO, digital agriculture could increase agricultural productivity by 70% by 2050, feeding up to 9.7 billion people globally. Digital innovations can also play a key role in promoting sustainable peace and resilience. Moreover, AI when used to optimize a specific goal may cause other problems – farmers using AI to optimize productivity may ignore the ecosystem damage it causes. Early warning systems for natural disasters, conflict prediction algorithms, and platforms for community engagement and resource sharing can enhance societal resilience and peacebuilding efforts. In particular, AI-driven early warning systems for natural disasters have the potential to reduce disaster response times by up to 50%, saving countless lives annually.

Special STI policy challenges for SIDS, Africa, LDCs and LLDCs

In designing and implementing STI policies to tackle the challenges outlined above, a number of groups of countries face special challenges that will also be a focus of discussions in the STI Forum 2024.

Small Island Developing States (SIDS) face unique challenges, including vulnerability to climate change impacts and limited resources for technological development. Annual economic losses due to climate-related disasters average 2 to 3% of GDP. Policies might focus on building climate resilience, enhancing digital infrastructure, and ensuring access to renewable energy technologies. Enhancing SIDS' resilience requires a doubling of current climate adaptation funding to these regions.

For *Africa*, addressing the digital divide, fostering innovation ecosystems, and investing in education and capacity building are crucial. Only 28% of Africa has Internet access, compared to a global average of 59%. Closing this digital divide by 2030 would require an estimated investment of US\$100 billion in digital infrastructure. Policies might support sustainable economic development, leveraging AI and technology to address health, education, and agricultural challenges. However, the energy for such AI needs to be provided by non-fossil fuel energy to avoid lock-in, and the water needed for AI needs to be factored in given that water budgets are often over allocated already.

Least Developed Countries (LDCs) require targeted support to overcome structural challenges and harness the potential of science and technology for development. This includes improving digital access, supporting technological entrepreneurship, and investing in sustainable infrastructure.

Landlocked Developing Countries (LLDCs) face particular challenges in accessing global markets and resources. Policies might focus on improving connectivity, fostering regional cooperation, and developing transport and digital infrastructure. According to WTO, LLDCs face trade costs 1.4 times higher than coastal developing countries, but digitalization can considerably reduce them with potentially outsize socio-economic benefits.

Science, technology, innovation and governance

There is increasing scientific evidence that there are limits to environmental resources, referred to as planetary boundaries and earth system boundaries. Scholars have shown that safe and just Earth system boundaries for climate, fresh water, nutrients, aerosols and biodiversity have been crossed globally, although the basic needs of people world-wide have not been met. This requires drastic reduction in the use of all our resources (land, water, energy) in order to meet the basic needs of the poorest as required by the SDGs, and reallocation of these resources between different uses, users and regions. Technologies that minimize resource use are critical. New innovative governance systems are needed to ensure the reduction in the overuse of resources while ensuring that all can escape from poverty. In this context the environmental footprint and social consequences of AI needs to be accounted for to determine the conditions under which specific uses of AI are encouraged (e.g. that AI is powered by non-fossil energy, and that its energy demands are factored in and do not displace other energy demands in society) and others (e.g. AI that leads to spreading misinformation) are discouraged. Accountability and ethical training of people producing AI materials is critical to ensure that the knowledge being amplified by AI is scientifically accurate and does not reproduce injustices that would aggravate the achievement of the SDGs in terms of maintaining our ecosystems and biophysical systems (i.e. staying within the safe and just Earth System Boundaries), meeting minimum needs, ensuring jobs and other social goals of access to education and healthcare.

Conclusion

The STI Forum 2024, with its focus on AI, climate, and the SDGs presents a critical opportunity to look toward the future and align global efforts towards sustainable development. Against this background, it is expected to provide important inputs for the discussions at the Summit of the Future later this year. By addressing the outlined issues and challenges, stakeholders can work with governments and international institutions to leverage the transformative potential of AI and other technologies to accelerate progress on climate action and the SDGs. The path forward requires collaborative, inclusive, and innovative approaches that ensure the benefits of technological advancements are shared by all, particularly the most vulnerable, ensuring a resilient, equitable, and prosperous future for all nations and communities.

Objectives of and participation in the Forum

The STI Forum brings together a wide range of stakeholders from Member States, UN system, civil society, academia, private sector and various science and technology communities to help harness science, technology and innovation (STI) for achieving the Sustainable Development Goals (SDGs). It has become a venue for facilitating the establishment of networks, for improving the science-policy interface, and for promoting development, transfer, and dissemination of technologies for the SDGs.

Participants include Ministers and senior government officials, scientists and engineers, innovators and entrepreneurs, and representatives of organized science and technology communities, the United Nations and other international organizations.

Themes of the Forum

The STI Forum provides important inputs and scientific-technological perspectives to the High-Level Political Forum on Sustainable Development (HLPF) 2024 and its annual review of SDG progress¹ – this year’s focus will be on scientific and technological solutions for the following SDGs:

- Goal 1: End poverty in all its forms everywhere;
- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
- Goal 13: Take urgent action to combat climate change and its impacts;
- Goal 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; and
- Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

In line with the HLPF theme, the STI Forum’s overall theme for 2024 is *“Science, technology and innovation for reinforcing the 2030 Agenda and eradicating poverty in times of multiple crises: the effective delivery of sustainable, resilient and innovative solutions”*.

STI Forum co-chairs have also decided on *two strategic thematic areas of focus on realizing the benefits and addressing the challenges of artificial intelligence and climate change*.

The STI Forum is also expected to explore the broader contributions of STI to the SDGs, as a contribution to the deliberations at the Summit of the Future in September 2024.

Follow-up to the Forum

The STI Forum 2024 is part of a continuum of annual events from 2016 to 2030, each building cumulatively upon the last to progressively develop a roadmap of policy, solutions and practical initiatives to harness STI for the SDGs.

The Forum also connects, on a reciprocal basis, to similar sector-specific or regional initiatives undertaken with similar objectives. This arrangement and the UN Inter-agency Task Team on STI for the SDGs (IATT) workstreams enable a sustained follow-up that engages many organizations and individuals.

¹ The theme of the 2024 HLPF has been decided as “reinforcing the 2030 Agenda and eradicating poverty in times of multiple crises: the effective delivery of sustainable, resilient and innovative solutions” and will review SDGs 1,2,13,16, and 17.