STI FORUM

Science, Technology & Innovation for the Sustainable Development Goals

Eighth annual Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals

Session 2: Integrated Solutions to Make Progress Across SDGs 6, 7, and 9

(15:00-16:30 EDT, 3 May 2023; in-person, Trusteeship Council Chamber)

Background

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity. Among these goals, SDGs 6, 7, and 9 focus on clean water and sanitation, affordable and clean energy, and industry, innovation, and infrastructure, respectively.

The provision of clean water and sanitation (SDG 6) is critical not only for human health and well-being but also for sustaining ecosystems, supporting agriculture, and enabling economic growth. The transition to affordable and clean energy (SDG 7) is crucial for reducing poverty, improving health, and mitigating climate change. Food systems must undergo a significant transformation to achieve food security (SDG 2) and ensure that everyone has access to safe, nutritious, and sufficient food. Climate action (SDG 13) is closely linked to the other SDGs, as it impacts water resources, energy systems, food production, and the overall resilience of societies.

As the world faces an increasingly complex and interconnected set of challenges, including climate change, energy security, water scarcity, and food security, it is essential to identify integrated solutions that address these issues simultaneously. The current “polycrisis”, long foretold by sustainability science, highlights the need for a more holistic approach to problem-solving that embraces the synergies and trade-offs across the SDGs. This session aims to explore the potential of innovative technology and integrated solutions in addressing the energy, food, water, and climate crises, with a particular emphasis on SDGs 6, 7, and 9.

Sustainable development highlights the need for integrated approaches to finding solutions that are commensurate with the challenge of achieving economic, social and environmental goals that are often interlinked. The climate–land–energy–water (CLEW) nexus is of great importance for sustainable development. Water, energy and land are needed to grow food. Some food crops can also be used as biofuel. Power plants require water. Energy-intensive seawater desalination increasingly provides water for drinking and agriculture. Water and energy infrastructure is needed to spur development and vice versa. In many parts of the world, a changing climate exacerbates some of these already strained links. Increasing droughts call for increased energy inputs for irrigation and limit the use of hydropower plants. In some SIDS, as well as in drought-sensitive areas, these impacts of a changing climate are already a reality. In many cases, these links are so significant that they cannot be neglected by policy and call for integrated approaches.

Scale of climate, land, energy, and water (CLEW) nexus, impacts, and interlinkages

The scale of the CLEW issues affects billions of people. There are an estimated 0.8 billion people without access to electricity, 2.5 billion people without access to clean cooking facilities, 2 billion without access to clean and safe drinking water, 3.6 billion lack adequate sanitation services, 0.8 billion who are chronically hungry and 2.3 billion moderately to severely food insecure. And looking into the future, billions of people are expected to continue be affected - as many as 5.7 billion people could be living in areas where water will be scarce for at least one month per year by 2050.

The scale of interlinkages between CLEW issues and their technology impacts is large:

Water is required for energy production, including cooling power plants, extracting and processing fuels, and generating hydropower. About 10 per cent of global freshwater withdrawals are used for energy production. Conversely, much energy is needed for water supply, treatment, and distribution. At the global level, seven per cent of commercial energy production is used for managing the world's freshwater supply, including for extraction, purification, distribution, treatment and recycling. An estimated 4 per cent of global electricity consumption is devoted to water and wastewater services alone. Integrated solutions, such as water-efficient energy production and energy-efficient water systems, can help achieving SDGs 6 and 7.

Agriculture is the biggest consumer of freshwater resources. About 70 per cent of human freshwater use is for irrigation, and 22 per cent is for industry, most of which is for thermal cooling in power plants and manufacturing. Roughly four per cent of final energy use is in agriculture, and food processing and transportation uses an increasing additional energy amount. About half of the demand increase for maize and wheat has been due to biofuel production.

By 2050, agricultural production will need to increase by about 60% to meet the food demand of a growing global population, which will intensify the pressure on already scarce water resources. Integrated solutions, such as sustainable irrigation practices, precision agriculture, and water-efficient crop varieties will be essential.

Energy is required for various agricultural activities, including land preparation, irrigation, harvesting, and food processing. On the other hand, agriculture and food waste are also a source of bioenergy. Energy use for desalination and pumping for irrigation constitutes a large share of energy use in some developing countries. Correlations between energy, water and food prices are further evidence for close interconnections. In particular, the fuel and food crises of recent years have illustrated a close relationship between food and oil price indices, which reflects the use of oil for fertilizer production and agricultural machinery, as well as the impact of oil price increases on biofuels demand.

Climate change is one of the most pressing challenges of our time, with far-reaching consequences for human societies and the environment. To limit global warming to 1.5°C, as set out in the Paris Agreement, global greenhouse gas emissions must be reduced by 45% from 2010 levels by 2030 and reach net-zero by 2050. Climate change impacts water availability, which in turn affects energy production and food security. Furthermore, the production and consumption of energy and food contribute to greenhouse gas emissions, exacerbating climate change. Integrated solutions, such as renewable energy, sustainable agricultural practices, and water-efficient technologies will be essential.

Innovative technologies and integrated solutions

The rapid deployment of *renewable energy technologies*, such as solar, wind, and hydropower, is essential for achieving SDG 7 and mitigating climate change. And improving *energy efficiency* across various sectors, including industry, buildings, and transportation, can significantly reduce energy use and greenhouse gas emissions.

The adoption of *sustainable agricultural practices*, such as conservation agriculture, agroforestry, and organic farming, can help increase crop yields, enhance soil health, and reduce environmental impacts. *Precision farming* technologies, such as satellite tech, remote sensing, and drones, can enable farmers to optimize the use of inputs, such as water, fertilizers, and pesticides, resulting in higher productivity and lower environmental impacts.

Water-efficient technologies, such as drip irrigation, rainwater harvesting, and wastewater reuse, can help reduce water consumption in agriculture and other sectors. Additionally, the adoption of decentralized water systems and the use of nature-based solutions, such as wetlands and green infrastructure, can enhance water security and resilience to climate change.

Investing in *climate-resilient infrastructure*, such as energy-efficient buildings, smart grids, and flood-resistant transport systems, can help reduce greenhouse gas emissions and enhance the adaptability of societies to the impacts of climate change. The integration of green and blue infrastructure, such as urban forests and permeable pavements, can also contribute to climate change mitigation and adaptation efforts.

The role of sustainability gap financing

Sustainability gap financing is crucial for supporting integrated solutions that have wider societal benefits but may be less profitable in a narrow business sense. Public and private investment in research, development, and deployment of innovative technologies and integrated solutions can help overcome financial barriers and accelerate progress towards achieving the SDGs. Instruments such as grants, concessional loans, guarantees, and blended finance can help mobilize the necessary resources for projects with high social and environmental impact but lower financial returns.

Collaboration between governments, development agencies, multilateral institutions, and private sector actors is essential for leveraging financial resources and expertise in support of sustainability gap financing. Additionally, capacity building and technical assistance can help developing countries access and utilize these financial instruments effectively.

The *integrated approach* to addressing the energy, water, food, and climate crises is essential for achieving the SDGs and building a sustainable future. By promoting innovative technologies, fostering global collaboration, and supporting high-impact actions, the UN and its partners can help drive progress towards the SDGs aspirations.

Objectives

The main objectives of the session are to: (a) examine the current "polycrisis" and its implications for the global community; (b) highlight the interconnections between energy, food, water, and climate crises and the trade-offs and synergies between them; (c) identify the most effective technology solutions in energy, food, water, and climate that minimize major trade-offs and optimize synergies across other areas; (d) discuss the need for sustainability gap financing and its potential in promoting solutions with wider societal benefits; (e) foster collaboration among UN Member States, scientists, engineers, academia, private sector, and civil society to drive progress in achieving SDGs 6, 7, and 9; (f) identify high-impact and synergistic global actions to drive SDG progress.

Format

The session will be organized as follows:

- Overview presentation: An expert representative of the 10-Member-Group will provide a comprehensive overview of the integrated solutions to the energy, food, water, and climate crises, focusing on the interconnections and synergies between these challenges.
- Panel discussion: A moderated panel discussion will allow the experts to delve deeper into the topics and share their insights on sustainability gap financing, collaboration, and global actions to drive SDG progress. Invited experts will present specific case studies showcasing the most effective technology solutions in energy, food, water, and climate that minimize major trade-offs and optimize synergies across other areas.
- Q&A session: The audience will have the opportunity to ask questions and contribute to the discussion.

Guiding questions

The discussion will be guided by a series of questions:

- What are the most promising integrated technology solutions that address the energy, food, water, and climate crises simultaneously, and how do they minimize trade-offs and optimize synergies across other areas?
- How can the UN and its Member States foster greater collaboration among different stakeholders in promoting innovative solutions to achieve SDGs 6, 7, and 9?
- What role can sustainability gap financing play in supporting integrated solutions that have wider societal benefits but may be less profitable in a narrow business sense?
- How can the UN and its partners identify and promote high-impact and synergistic global actions to drive SDG progress?
- What lessons can be learned from successful case studies, and how can these be replicated and scaled up to achieve a broader impact?
- What are your most important recommendations for policy action and high-impact initiatives to be considered at the SDG Summit in 2023 and the Futures Summit in 2024?

Supporting documents/publications

The following *science-policy briefs* have been prepared by TFM stakeholders on emerging science and technologies this year (will be available here: https://sdgs.un.org/tfm/STIForum2023):

- Joni Jupesta et al, Digital Traceability on Agriculture Industry towards Net Zero GHG Emissions in Developing Countries: Case of Southeast Asia, United Nations University, Japan
- Johannes Trüby et al, How green hydrogen conquers the world – An outlook on the global clean hydrogen market, Deloitte, France
- Alejandro Mentaberry et al, La bioeconomía como camino para el desarrollo sostenible, Instituto Universitario para el Desarrollo Productivo y Tecnológico Empresarial de la Argentina, Argentina
- Botto et al, Solar Radiation Modification and youth perspectives on its governance, World's Youth for Climate Justice, the Netherlands
- Christoph Ernst et al, Bioeconomy in Argentina in support of the implementation of the Agenda 2030, ILO, Switzerland

- Thien-An Tran Luuet al, AI Application for Solid Waste Sorting in Global South, Van Lang University, Viet Nam
- Anh Quan Nguyen et al, Atmospheric water harvesting using solar energy technology, Van Lang University, Viet Nam
- Azmery Afnan et al, Policy Considerations for Successful Implementation of Anaerobic Digestion in the Global South, State University of New York, United States
- Caterina Ossio et al, The Potential of Gene Editing in Wastewater Bioremediation, Wageningen University & Research, the Netherlands
- Anne-Tara Singh et al, Blockchain and IoT for water - A Game-Changing Opportunity or a Risky Proposition?, Wageningen University & Research, the Netherlands
- Joël Hollander et al, Printing Applications for Solar Microgrid Implementation in Remote Areas, Wageningen University & Research, the Netherlands
- International Centre for Genetic Engineering and Biotechnology, Trends and future prospects of genome editing in human and plant health, Italy
- International Centre for Genetic Engineering and Biotechnology, Existing and advancing trends in -omics development for the study of complex biological interactions in different organisms, Italy
- Huadong Guo, Developing the SDG Satellites for Measuring and Evaluating Indicators of SDGs, International Research Center of Big Data for Sustainable Development Goals, China
- Catarina Baptista et al, Bridging the science-policy-society gap for water management: lessons learnt from the G-STIC international conferences, VITO, Belgium
- Christine Xu, A New Way of Designing Fisheries Management to Support SDG 14, Aquatic Life Institute, United States
- Marlene Kanga, Sustainable and Climate Resilient Solution for Water Services - from Policy to Implementation – a Case Study , World Federation of Engineering Organisations, Australia
- Bocchetto et al., STI Policies to enhance the role of the bioeconomy as a vector of sustainable development in the Norte Grande of Argentina: a foresight study, Instituto Nacional de Tecnología Agropecuaria and Instituto Nacional de Tecnología Industrial, Argentina
- David Schatsky et al., Full-spectrum innovation: What is needed to create the low-carbon economy, Deloitte, United States
- David Silvestre, The difficult marriage of biopharma and the sustainable development goals, Université de Liège, Belgium
- Anastasia Gracheva, The Russian Federation’s Challenges in Response to SDG Goals 13 and 15: A Stakeholder Perspective, University of Pennsylvania, United States
- Nizar Al Halasah et al., Promoting green techn in the Arab countries, Jordan
- Altaf Hussain Samo et al., Strategizing for the Innovation and Sustainability of Green Agriculture Enterprises, Sukkur IBA University, Pakistan
- Muhammad Tariq, Sustainable Dairy Production in Pakistan: Lesson Learned and Way Forward, University of Agriculture, Faisalabad, Pakistan
- Javaria Nasir, Developing and accessing adaptation strategies against climate vulnerability in cotton wheat cropping system, University of Agriculture, Faisalabad, Pakistan
- Alejandro Pablo Arena et al., Strategies, technologies and policies recommendations aimed at a more sustainable food and beverage sector in Argentina, National Technological University, Argentina

- Ahmed Ali Khalifa et al., Developing a Market Solution to Control Global Warming within 1.5°C, Qatar University, Qatar
- Daniel Xue, Strategies for mitigating the global energy and carbon impact of artificial intelligence, University of Virginia, United States
- Patricia Agupusi et al., The Importance of 'Ordinary' Science, Technology, and Innovation and the Science-Policy Interface in sub-Saharan Africa, Worcester Polytechnic Institute, United States
- Jonathan Andre Morales Marroquín et al., Biodiversity and Environmental policy challenges in Central America towards natural resource governance, University of Campinas, Brazil
- Crystal H. Brown, Sustainable Solutions for Climate Change Adaptation in Africa: Combining Indigenous Knowledge and Modern Technology, Worcester Polytechnic Institute, United States
- Vanderleia Radaelli et al., The role of Science, Technology, and Innovation in Industrial Decarbonization in Latin America and the Caribbean, Inter-American Development Bank, United States
- Heike Brugger et al., Energy Efficiency Vision 2050: How will new societal trends influence future energy demand in the European countries?, Fraunhofer Institute for Systems and Innovation research, Germany
- Muhammad Tariq, Future policy interventions for the development of livestock sector in Pakistan, University of Agriculture, Faisalabad, Pakistan