STI Forum Side Event – Executive Report
Engineering a Sustainable and Resilient Built Environment and Infrastructure During and Through the Technology Revolution
Date: May 6, 2026

I. Executive Context and Strategic Framing

The STI Forum side event was convened under the leadership of the World Federation of Engineering Organizations (WFEO) at a moment of accelerating global transition. The discussion was framed not as a traditional technical exchange, but as a strategic dialogue at the intersection of infrastructure, technology, and global development priorities.

The core premise guiding the session was clear: the world is entering a period in which the scale and speed of technological change are outpacing the resilience and adaptability of existing infrastructure systems.

Participants consistently emphasized that infrastructure, long treated as a background enabler of growth, must be repositioned as a central strategic lever for achieving the Sustainable Development Goals (SDGs).

The session therefore focused on a fundamental question: how can engineering, science, and industry collectively redesign infrastructure systems to remain resilient, inclusive, and sustainable amid rapid technological disruption?

II. Opening Narrative: Repositioning Engineering in the Global Agenda

The discussion opened with remarks from the moderator and WFEO President-Elect, Dr. K. N. Gunalan, who framed the role of engineering within the global STI architecture. While the UN system has historically emphasized science and technology, Dr. Gunalan identified a critical gap: engineering, as the mechanism of implementation, remains underrepresented in global policy discourse.

This point reflected a broader structural issue, while science defines problems and technology enables possibilities, engineering determines whether solutions are realized at scale.

Dr. Gunalan reinforced this perspective through a forward-looking proposal:

- Elevating “STI” to “STIE,” recognizing engineering as a co-equal pillar
- Positioning engineers as the actors who “build bridges and close gaps,” both literally and systemically.

This framing set the tone for the session and shaped subsequent discussions, particularly those focused on execution, standards, and real-world deployment.

III. Global Reality Check: Infrastructure Gaps and System Fragility

The President of the UN Economic and Social Council (ECOSOC), H.E. Ambassador Lok Bahadur Thapa, grounded the discussion in stark global realities, anchoring the dialogue in both scale and urgency.

Despite decades of progress, significant portions of the global population continue to lack access to essential infrastructure. He emphasized that modern infrastructure systems, spanning energy, water, transport, and digital connectivity, remain unevenly distributed and increasingly vulnerable to disruption. These vulnerabilities are amplified by a range of pressures, including climate change, political instability, and ongoing conflict.

At the same time, Ambassador Thapa underscored the growing economic consequences of these weaknesses. Infrastructure fragility is no longer a localized issue; it represents a systemic global challenge, with material impacts on productivity, economic opportunity, and long-term development trajectories.

Crucially, he reframed the nature of the challenge. While the scale of the global infrastructure gap is widely recognized, the issue is not purely one of financing. Rather, the more fundamental challenge lies in how infrastructure is conceived, designed, and managed over its full lifecycle.

Infrastructure systems built under legacy assumptions are no longer fit for purpose in a world defined by:

- Persistent development gaps
- Increasing digital interdependence
- Rapid urbanization

This perspective established the foundation for a broader discussion focused on system redesign rather than incremental improvement.

IV. Engineering Strategy: From Capacity to Global Systems Leadership

Dr. Seng Chuan Tan, President of WFEO, presented a structured vision for how the engineering community must evolve to meet current global demands. His remarks were organized around four strategic pillars.

1. Engineering Capacity and Workforce Development

A recurring theme was the uneven distribution of engineering capability across countries. In many regions, particularly small island states and developing economies, the absence of strong engineering institutions remains a primary barrier to development.

WFEO's strategy focuses on:

- Strengthening national engineering institutions
- Supporting accreditation and licensing systems
- Building workforce capacity aligned with digital and climate challenges

The underlying message was clear: no country can achieve sustainable development without a strong engineering base.

2. Standards, Governance, and Ethical Frameworks
As technologies such as AI and digital systems reshape infrastructure, governance frameworks must evolve accordingly. Key priorities include advancing global standards and integrating ethical considerations into engineering practice.

Equipping engineers with both technical expertise and decision-making frameworks reflects a shift from viewing engineering as a purely technical discipline toward recognizing its role within broader governance systems.

3. Sustainability and Climate Resilience
Engineering was positioned as the bridge between global commitments (e.g., SDGs, Paris Agreement) and practical implementation.

Key priorities include climate-adaptive infrastructure design, nature-based solutions, and the adoption of low-carbon materials and systems. The emphasis was on translating policy into tangible, deployable solutions.

4. Digital Transformation of Infrastructure
Emerging technologies were presented as critical tools for improving infrastructure performance and resilience, including:

- Digital twins
- IoT-enabled monitoring
- Data-driven asset management

However, a critical caveat was emphasized: technology alone is insufficient; its impact depends on how effectively it is integrated into systems that serve people.

V. Science Perspective: The Global Commons and Long-Term Consequences
Dr. Vanessa McBride of the International Science Council introduced a broader systems-level perspective, emphasizing the interconnectedness and fragility of global systems. Using imagery from the James Webb Space Telescope, she framed Earth as a small and fragile system and the sole repository of human infrastructure, knowledge, and life. This perspective reinforced the concept of the global commons.

While technological advancement has enabled unprecedented connectivity and scale, it has also produced unintended consequences, including environmental degradation and inequality.

A central insight from her remarks was the concept of long-term lock-in: infrastructure decisions made today shape economic, environmental, and social outcomes for decades.

This introduces a critical responsibility for engineers and policymakers:

- To consider not only immediate outcomes
- But also long-term distributional impacts

VI. Industry Perspective: Execution, Energy Systems, and Real-World Constraints
Cameron Martin (Westinghouse) provided a practical, industry-driven perspective, grounding the discussion in implementation realities.

Reframing Energy Systems
A key insight was the need to move beyond a narrow focus on electricity toward integrated energy ecosystems, including:

- Thermal energy
- Hydrogen production
- Industrial process heat

This reflects a broader shift toward system-level thinking in energy infrastructure.

Three Core Execution Principles
Martin highlighted three priorities critical to successful infrastructure deployment:

- Invest in engineering talent: Strong engineering ecosystems attract investment and support broader economic development.
- Plan for safety: Across people, assets, and the environment
- Execute for quality: Anchored in global codes and standards

Global standards, particularly ASME codes, were emphasized as key enablers of consistent, cross-border infrastructure development.

Managing the Pace of Innovation
A key caution was raised: rapid innovation without governance introduces systemic risk. The principle of "going slow to go fast" underscores:

- The importance of validation
- The risks of premature deployment
- The financial and reputational consequences of failure

VII. Development Lens: Food, Water, and Energy Systems
Dr. Ramasamy (FAO) focused on the realities facing developing economies, particularly smallholder farmers.

Approximately 500 million smallholder farmers produce a significant share of the global food supply, yet operate with limited access to infrastructure and technology. At the same time, agriculture remains a major consumer of water and energy, with demand expected to grow alongside the global population.

Despite the availability of advanced technologies, such as AI-driven irrigation, robotics, and data analytics, most smallholder farmers lack access to even basic systems. This creates a critical disconnect: innovation is advancing at the high end, while the greatest need remains at the local level.

Priority areas for engineering intervention include:

- Resilient supply chains
- Irrigation and water systems
- Small-scale mechanization
- Post-harvest loss reduction
- Renewable energy integration
- Community-led infrastructure

The emphasis was on scalable, accessible, and locally appropriate solutions.

VIII. Cross-Cutting Themes and Strategic Takeaways

Several consistent themes emerged across the discussion:

- Engineering as a strategic driver: Engineering must evolve from execution to system leadership
- Technology as a multiplier, not a solution: Outcomes depend on governance, accessibility, and integration
- Infrastructure as long-term commitment: Decisions made today shape outcomes for decades
- Integrated systems thinking: Energy, water, food, and digital systems are interconnected
- Capacity as a primary constraint: Talent, institutions, and governance lag technological capability
- Ethics and inclusivity: Must be embedded at the design stage

IX. Strategic Implications for ESA and International Strategy

The discussion has direct implications for ESA and its international engagement:

- Elevate engineering in global policy engagement: Align with efforts to strengthen the role of engineering within the UN system and SDG implementation
- Leverage codes and standards as a core asset: Expand influence through global standards as a mechanism for scale and impact
- Focus on capacity building in emerging markets: Prioritize regions with structural gaps, including Africa, Southeast Asia, and small island states
- Bridge industry, science, and policy: Leverage ESA's position to convene cross-sector stakeholders
- Shift toward systems-level engagement: Move from individual initiatives to integrated, ecosystem-based approaches

X. Closing Reflection

The session reinforced a central conclusion: the world does not lack technology—it lacks alignment between technology, infrastructure systems, and societal needs. Engineering sits at the center of that alignment. The opportunity for organizations such as ESA is to lead in shaping how that alignment is achieved globally.