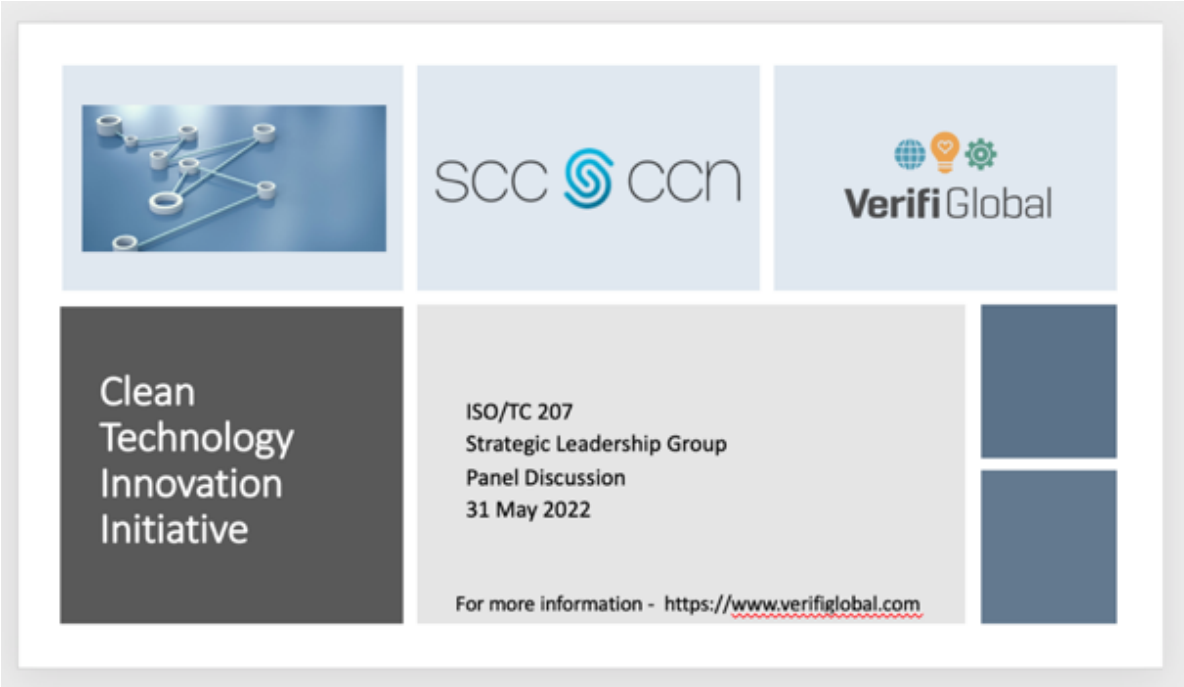


Clean Technology Innovation Initiative (CTII) Update
ISO/TC 207 Strategic Leadership Group Panel Discussion - 31 May 2022

Outline

Preface

The purpose of this document is to:
- Make the case for linking technology innovation, standardization, and the UN SDGs
- Provide a strategic framework for innovative technology deployment
- Introduce relationship mapping as a decision support tool to help navigate pathways from problems/challenges to viable/sustainable solutions.

The target audience is individuals/organizations with shared objectives and stakeholders with specific requirements that see the potential benefits of CTII participation and collaboration.

1. Introduction to the Clean Technology Innovation Initiative

The Clean Technology Innovation Initiative (CTII) is a joint project between the Standards Council of Canada and VerifiGlobal. The project aims to generate greater awareness and interest in the standardization process with particular focus on the activities of the International Organization for Standardization Technical Committee on Environment (TC 207).

The Standards Council of Canada (SCC) is a crown corporation within the Canadian Innovation, Science and Economic Development portfolio. SCC oversees Canada's national standardization network and facilitates the development and use of national and international standards, as well as accreditation services, to enhance trade competitiveness, technology innovation, environmental quality, and societal well-being.

VerifiGlobal helps clients demonstrate and communicate the benefits of innovative solutions through independent performance benchmarking and verification, advancing eco-efficient solutions that create value and reduce risk. Its mission is to strengthen long term, sustainable performance through improved efficiency, quality assurance and accountability. VerifiGlobal conducts environmental technology performance verification in accordance with the ISO 14034 ETV Standard, using qualified technical organizations with sector specific expertise.

VerifiGlobal and the Standards Council of Canada (SCC) launched CTII in 2021 to advance global sustainability. CTII is examining the role of innovative technologies and standardization in achieving the United Nations Sustainable Development Goals (UN SDGs).

Innovation and effective standardization are both essential for the realization of positive, sustainable outcomes.

> **Innovation** is a driver for transformative change and can serve as a starting point for inclusive and sustainable economic and societal development. Innovation is inherently cross-sectoral and multidisciplinary, encompassing knowledge generation, the formulation of forward-looking strategies, and the implementation of proactive measures, leading to positive results.
>
> **Standardization** helps optimize compatibility, interoperability, safety, repeatability, and quality. Standardization provides structured methods and reliable data to facilitate the normalization of innovative solutions, making it easier to disseminate leading-edge ideas and knowledge.

With growing demand for innovative green technologies, products and services, environmental performance standards need to be better understood and positioned to effectively support sustainable development goals. The capacity to assess benefits and risks needs to be strengthened, enabling the selection and deployment of effective solutions and the transformation of institutions and infrastructure. Ensuring market relevance of innovative solutions requires a commitment to shared performance objectives with a focus on evidence-based outcomes.

The Clean Technology Innovation Initiative has two parts:

> **Part one** aims to reach consensus on the principal process elements and relationships that enable the development and deployment of innovative environmentally sound solutions, and the essential linkages to existing and proposed standards.
> These key relationships will be represented in the form of a generic relationship map.
>
> **Part two** involves assessment and analysis of key issues and opportunities in selected sectors where the relationship map could effectively be applied.
> The initial examples will be used to illustrate solution pathways, exemplifying how relationship mapping and performance benchmarking can be applied to untangle complex issues and add value.

ISO/TC 207 – Linking Innovation and Sustainability

ISO/TC 207 Technical Committee (TC) on Environment is a leader in the development of environmental management standards and tools to support of sustainable development.

The International Organization on Standardization (ISO) was created in 1947 to "promote scientific, technological and economic cooperation and standardization…to facilitate the international exchange of goods and services."

TC 207 was established in 1993 as an outcome of the Rio Earth Summit, initially focusing on the development of the 14000 series of standards to "level the playing field" for trade agreements. TC 207 provides standards which address environmental and climate impacts, including related social and economic aspects, in support of a sustainable future.

The collective efforts of TC 207 focus on essential linkages and relationships encompassing:

- National Standards and Standards Development Organizations (SDOs)
- The UN Sustainable Development Goals (SDGs)
- UNFCCC, IFRS, others
- Other ISO Technical Committees
- Industry Associations and Innovation Clusters
- Government Departments and Agencies

All **United Nations Sustainable Development Goals (UN SDGs)** are important. ISO/TC 207 standards support 16 of the 17 UN SDGs and many of the SDGs are supported across subcommittees.

The SDGs currently targeted by the Clean Technology Innovation Initiative for mapping purposes are:

SDG 9 Industry, innovation and infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 6 Clean water and sanitation - Ensure availability and sustainable management of water and sanitation for all

SDG 7 Affordable and clean energy - Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 11 Sustainable cities and communities - Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 12 Responsible consumption and production - Ensure sustainable consumption and production patterns

SDG 13 Climate action - Take urgent action to combat climate change and its impacts

SDG 14 Life below water - Conserve and sustainably use the oceans, seas and marine resources for sustainable development

SDG 15 Life on land - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

2. Challenges to innovation and sustainable development

Public and private organizations are often challenged when considering environmental issues and new international agreements in the context of their activities and business operations. They are not always fully aware of the benefits and pivotal role of standards in assessing environmental performance.

Although the UN SDGs constitute a holistic, transformative global vision, linking innovation to the goals requires mutual understanding and trust through meaningful community engagement, a shared understanding of problems to be addressed, and processes for coordination, inclusion, and consensus.

Furthermore, technology development and deployment is complex, involving scientific and technological issues, significant financial commitments, and a multiplicity of environmental, political, social, and ethical considerations, which can be difficult to resolve. This raises questions about societal well-being, quality of life, the impacts on ecosystems, and the need for flexible approaches in addressing potential health and environmental risks over extended time horizons.

Four things are important to consider in relation to this:

Uncertainties - There are many aspects of innovative technology development and deployment where knowledge is lacking. The divergent nature of issues, different domains of factors involved (e.g., some technical, others societal), and inherent complexities mean that decisions about innovative technologies are often made in the face of uncertainty.

Systems - Innovative solutions cannot be reduced to technical issues alone. A systems perspective is needed that considers the key factors influencing the development and adoption of innovative technologies and how they interact. Multiple variables, complex interactions, and non-linear behaviours are fundamental characteristics of innovation, which can often be counter intuitive. It is therefore

practical to consider strategic frameworks and flexible approaches that provide opportunities for new learning and experience to emerge, with broader engagement and increased potential for public acceptance.

Risks - Many aspects of technology are controversial, with differing opinions on most aspects, ranging from societal objectives and program goals to implementation strategies and institutional arrangements. It is unlikely that all values can be fully reflected in a single set of goals and objectives; nor can all values be satisfied equally by a single solution; hence, distinct trade-offs are inevitable. An additional factor is political complexity, given the multiple jurisdictions and levels of government responsible for energy, environmental and resource management policies. Although public perceptions of risk are largely based on core values and ethical considerations, acceptance of a particular solution is often primarily driven by economic considerations.

Time - Not all components within the system are completely understood or controlled over time. The development, deployment and adoption of innovative clean technologies is embedded in a complex, dynamic system comprising multiple variables, interactions, and conditions which change over time. Governments change, new technologies emerge, public perceptions evolve, and economic conditions fluctuate.

3. Enabling innovative technologies

As highlighted below, key ingredients for clean technology innovation include:

Value-based procurement and early adoption of clean technology solutions - Benchmarking and verification to provide evidence of technology performance, thereby strengthening the procurement process and making it easier to build the case for adopting innovative solutions.

Evidence based regulations and policies to support technology innovation – Use of technology performance verification in addressing environmental regulatory requirements and approvals.

Transformative financing to accelerate technology deployment – Use of technology performance benchmarking and verification to support decisions on the financing and market deployment of innovative, sustainable technology solutions.

Workforce training and capacity building –Establishing “living laboratory” networks to develop and demonstrate innovative technology solutions and build the essential workforce and capacity to successfully deploy these technologies.

Effective international collaboration – Continued outreach, collaboration, and integration of efforts to accelerate market acceptance and deployment of innovative technologies.

Linking to this are three important enablers for accelerating eco-innovation and investment in clean technology.

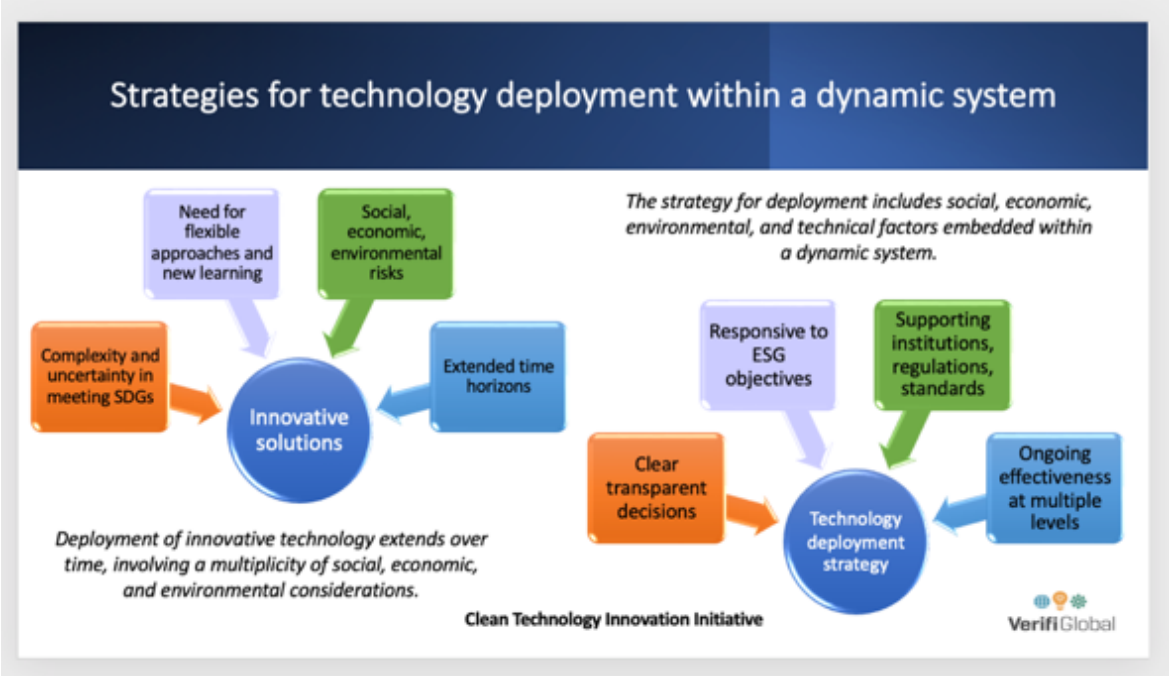
Leadership and co-operation - To a large extent, institutional infrastructure is already in place to facilitate leadership and cooperation through various existing governmental platforms and mechanisms.

Effective engagement -Standards encompass specifications, regulations, and protocols that ensure things work properly, interactively, and responsibly. However, achieving global environmental sustainability goals, such as the UN SDGs, requires placing greater emphasis on integrated approaches and innovative solutions, coupled with enhanced efforts to engage with key stakeholders and interested parties.

Benchmarking and Verification - Performance benchmarking and verification are decision support tools that can be applied within an integrated framework to encourage mutual understanding and build trust among stakeholders.

As illustrated below, the deployment of innovative technology extends over time, involving a multiplicity of social, economic, and environmental considerations, including:

- Complexity and uncertainty in meeting SDGs
- Need for flexible approaches and opportunities to incorporate new learning
- Social, economic, environmental risks
- Extended time horizons



The technology deployment strategy includes social, economic, environmental, and technical factors embedded within a dynamic system, thereby enabling:

- Clear transparent decisions
- Responsiveness to ESG objectives
- The harnessing of supportive institutions, regulations, and standards
- Ongoing effectiveness at multiple levels

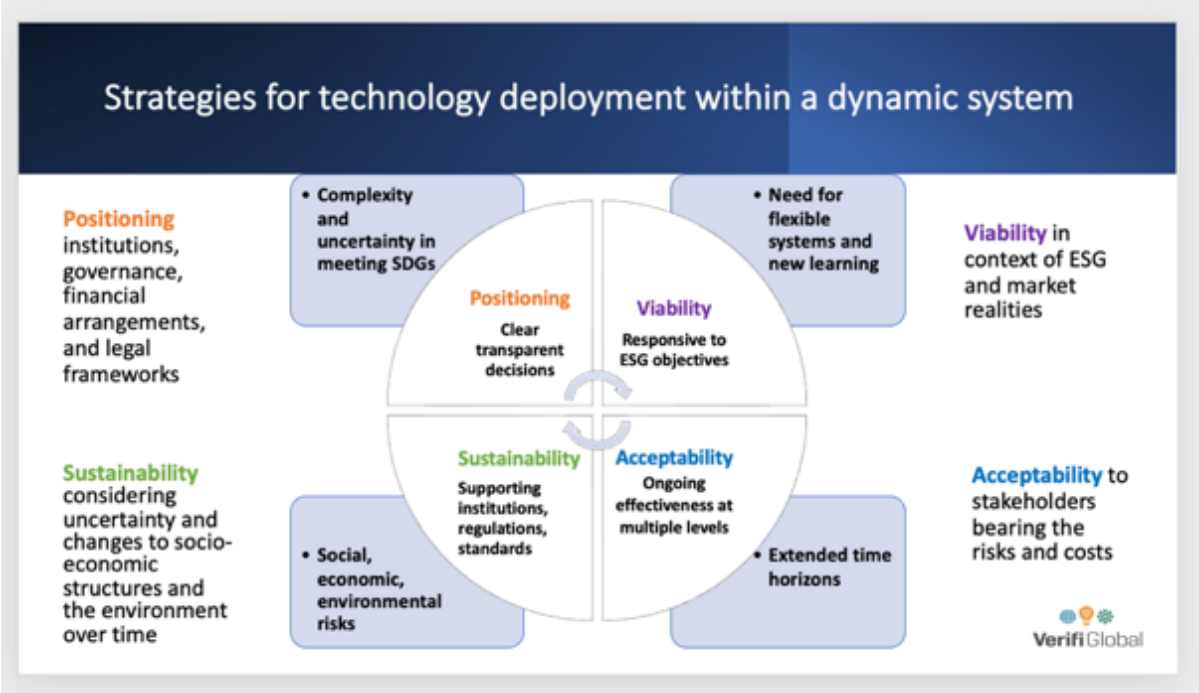
Attainment of sustainability goals requires a holistic perspective incorporating over-arching considerations that affect the realization of desired outcomes. This includes:

Positioning effective strategies for change within a system that includes the necessary institutions, governance, financial arrangements, and legal frameworks.

Viability of innovative solutions in the context of environmental, social, governance (ESG), and economic realities**.**

Sustainability of proposed solutions and expected outcomes, considering uncertainty and possible changes to socio-economic structures and the environment over time.

Acceptability of proposed solutions and expected outcomes by those communities and stakeholders who will bear the risks and costs.



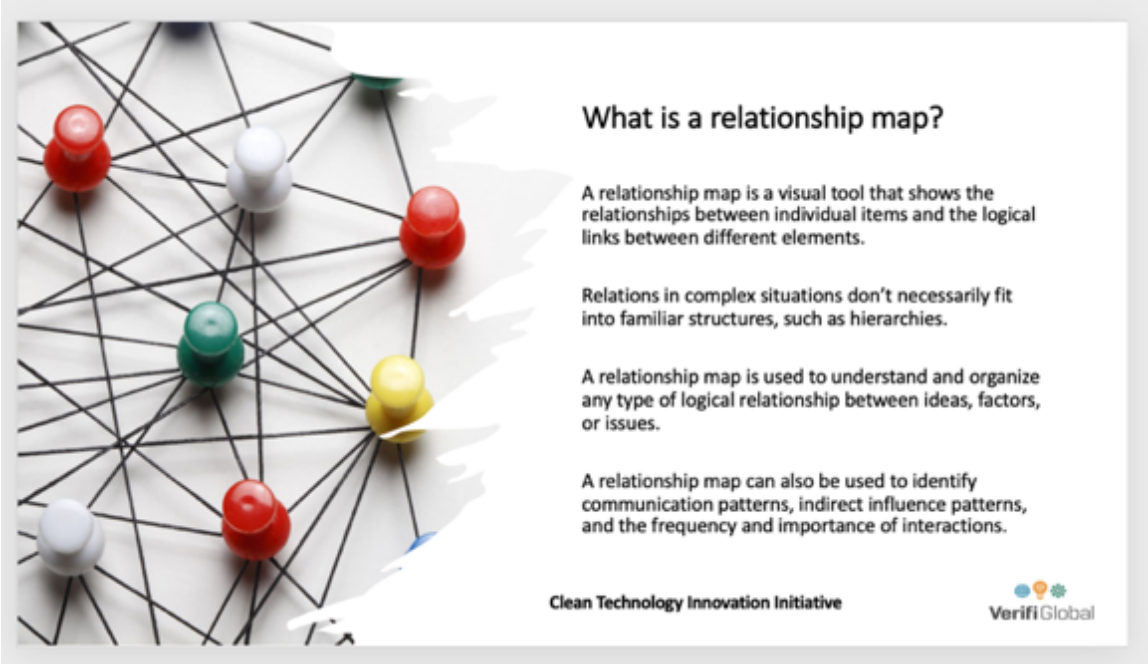
Given the unique challenges associated with innovative technologies (including the myriad of ethical, social, economic, financial, legal, environmental, and technological factors), the benefits of a comprehensive, adaptive approach are clear.

The time dependence of activities associated with the deployment of innovative technologies means that some technologies and management options will co-exist over time. Rather than focusing on singular technological solutions to the exclusion of all others, a flexible process with actions that could be improved, accelerated, slowed, or changed might be advantageous, keeping options open while optimizing the effectiveness of new and existing solutions.

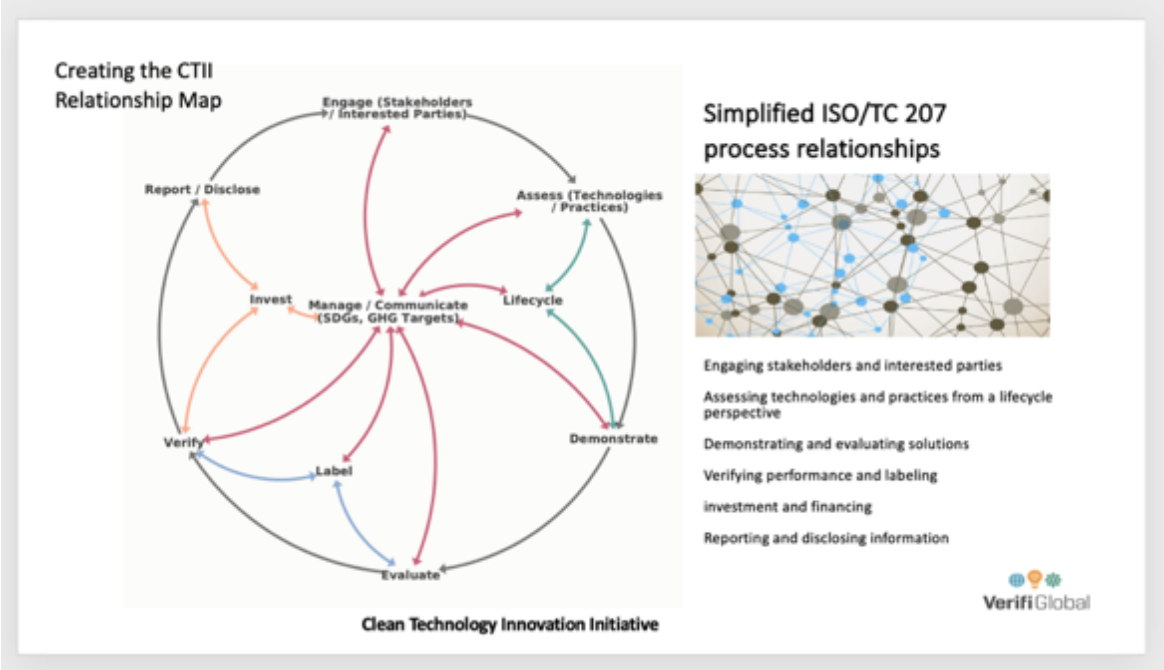
4. Creating the CTII relationship map

Relations in complex situations don't necessarily fit into familiar structures, such as hierarchies. A relationship map serves as a visual tool showing the relationships between individual items and presenting the logical links between different elements. It can be used to understand and organize any type of logical relationship between ideas, factors, or issues. Links can be in any direction and between any number of items. A relationship map can also be used to identify communication patterns, indirect influence patterns, and the frequency and importance of interactions.

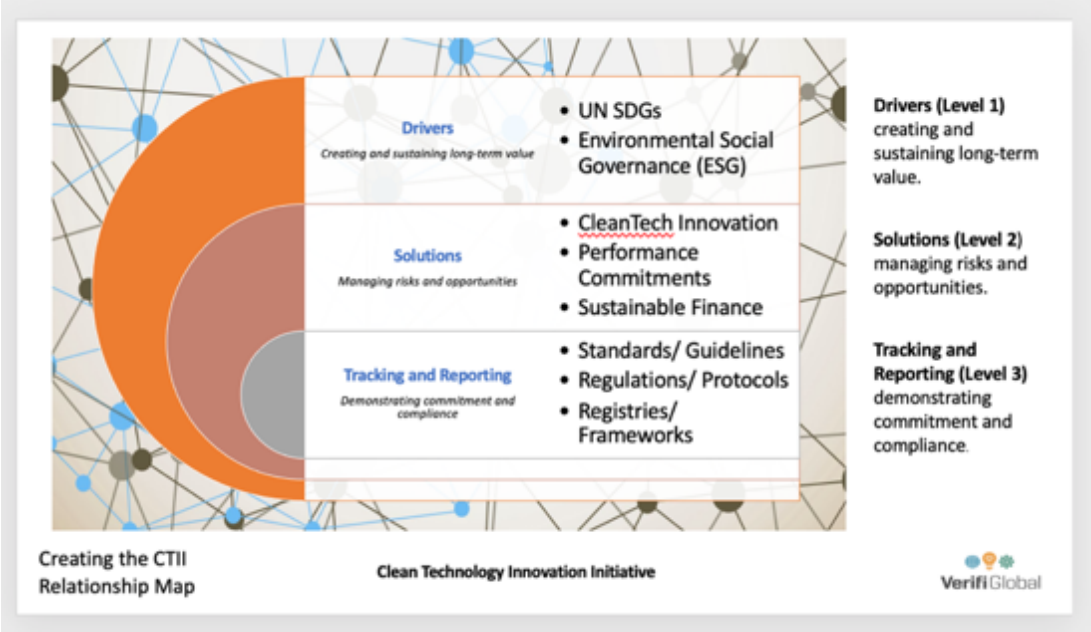
Under the Clean Technology Innovation Initiative, a relationship map (or influence diagram) is being created as part of a flexible decision support framework. This will assist in charting pathways toward successful development and deployment of innovative technologies that meet sustainable development goals.



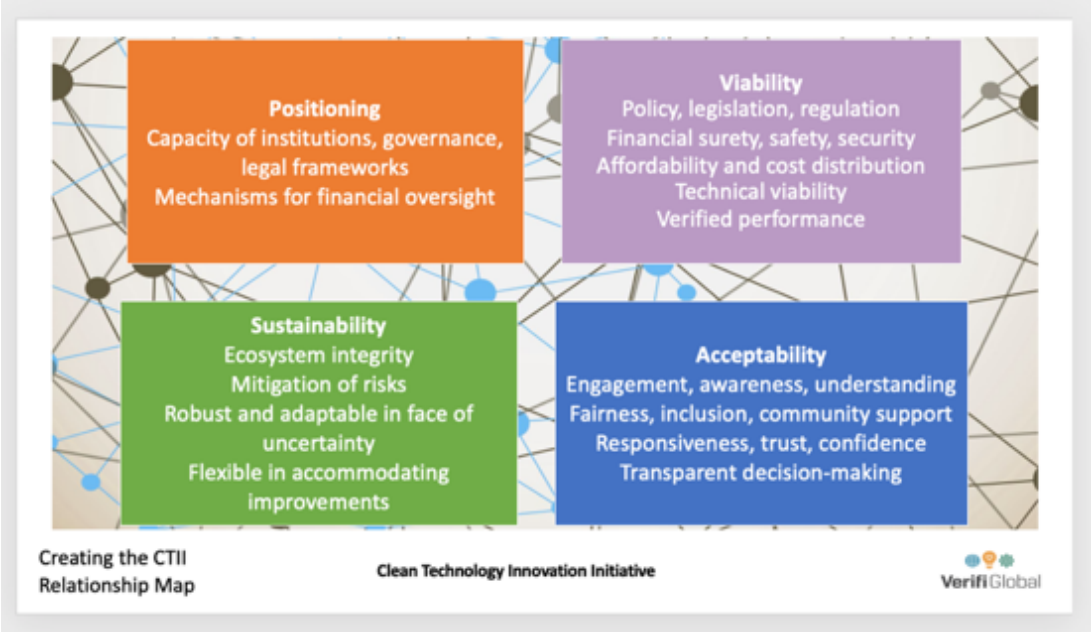
The figure below is a simplified example of a relationship map for various ISO TC 207 decision support processes. It identifies key activities and processes which influence management and communication of SDG goals and GHG targets, including: Engaging stakeholders and interested parties; Assessing technologies and practices from a lifecycle perspective; Demonstrating and evaluating solutions; Verifying performance and labeling; Investment and financing; Reporting and disclosing information



The figure below highlights a 3-level framework for understanding the connections between high level aspirational goals (e.g., the UN SDGs) and other levels of activity (e.g., solutions implementation and reporting on progress). Within the framework, three primary relationship levels are identified: Drivers, Solutions and Tracking.



Creating the CTII relationship map requires highlighting the underlying key factors and causal relationships which would influence the implementation of an innovative technology deployment strategy and the realization of sustainability goals.



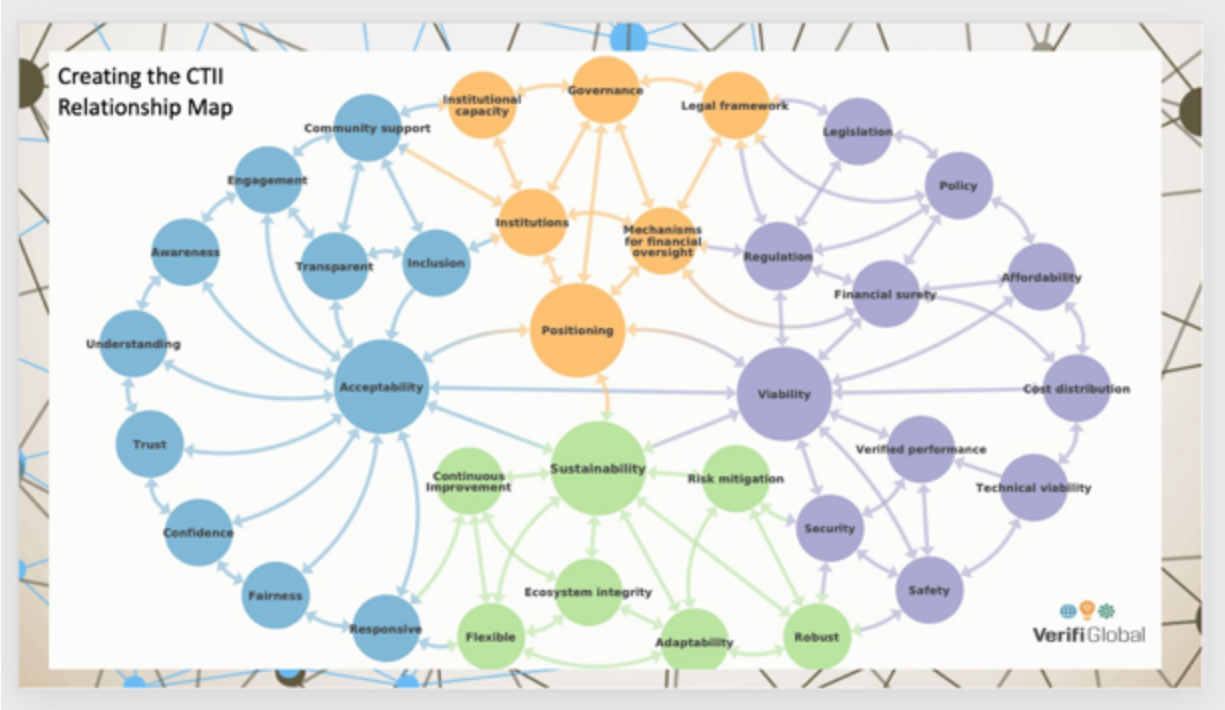
Positioning effective strategies for change within a system that includes the necessary institutions, governance, financial arrangements, and legal frameworks - Different options are available for deploying innovative clean technologies that purport to achieve sustainable development goals. Each option exists within a system that supports the development and deployment of innovative technologies through their operating lifecycles. This includes the necessary institutions, governance, financial arrangements, and associated legal frameworks to determine the overall costs and how these costs would be distributed through populations and across generations over the timeframe during which the technologies will be managed.

Viability of innovative solutions in the context of environmental, social, governance (ESG), and economic realities - The viability of innovative technologies and their deployment is influenced by prevailing political and economic realities, which change over time. Policy, legislation, and regulation to a large degree dictate the necessary legal frameworks and mechanisms for financial oversight. Policy, in turn, is shaped by social values and pressures exerted by special interests, reflecting social values across a wide range of attitudes about the acceptability of innovative, non-conventional solutions. While the costs and implications of innovative clean technologies may last for generations, the economic pressures at the time of decision-making will influence both the sense of urgency and affordability of any proposed solutions.

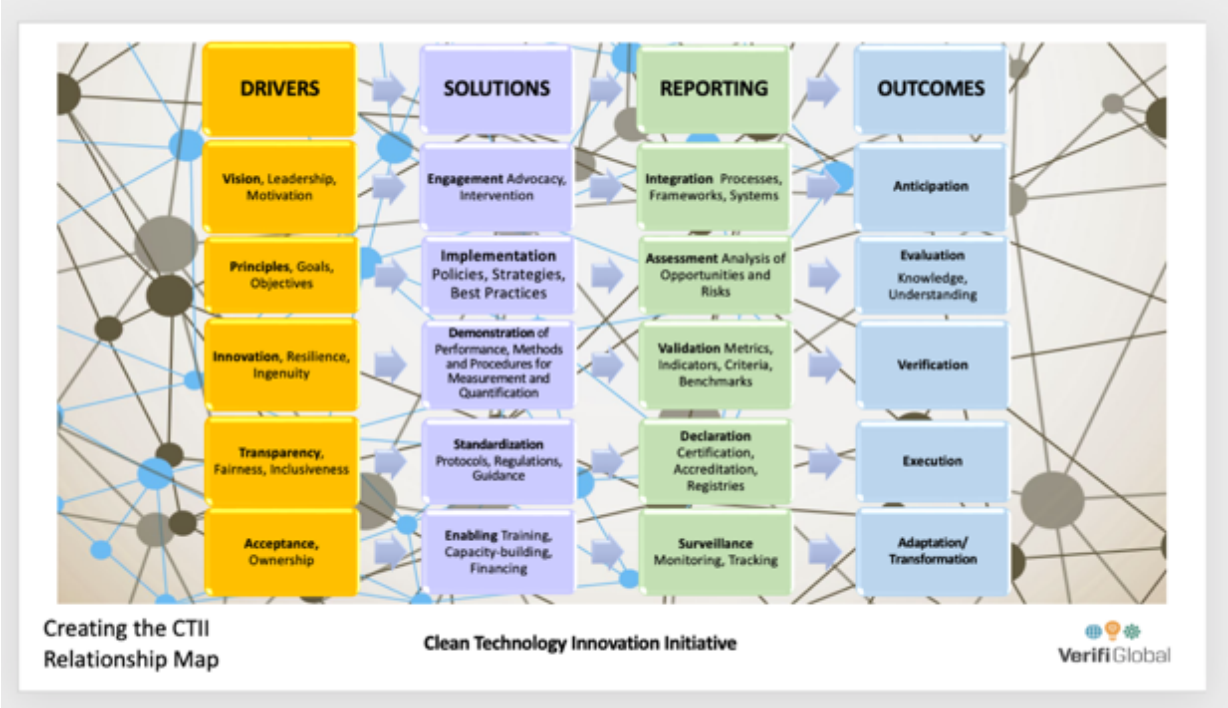
Sustainability of proposed solutions and expected outcomes, considering uncertainty and possible changes to socio-economic structures and the environment over time - Questions concerning environmental sustainability relate to the robustness of technology in the face of uncertainty and possible changes to social structures and the environment over time. Included in this the capacity to withstand extreme natural or human-driven events. As more is learned, it is important for the technology deployment strategy to be flexible in accommodating improvements, and adaptable should critical needs arise, or superior technologies become available.

Acceptability of proposed solutions and expected outcomes by those communities and stakeholders who will bear the risks and costs - Decisions about innovative clean technologies ultimately must be supported by those communities and stakeholders who will bear the risks and costs. Public acceptability will be influenced by the characteristics of a given technological solution, the extent to which these characteristics are responsive to the concerns and values of stakeholders, and the process by which decisions are made. Acceptance of an innovative technology, with its inherent risks and costs, must also meet public perceptions of fairness, safety, affordability, and inclusion. The public must have trust in the decision-making process and in the institutions responsible for implementation and management of the technology over time. Confidence can be elevated through effective public participation and transparency in the decision-making process.

As shown in the figure below, emerging from this is a systems view of strategic elements and key factors influencing innovative technology deployment.



The figure below provides an alternate perspective on the drivers, solutions, reporting, and intended outcomes that align with innovative technology deployment.



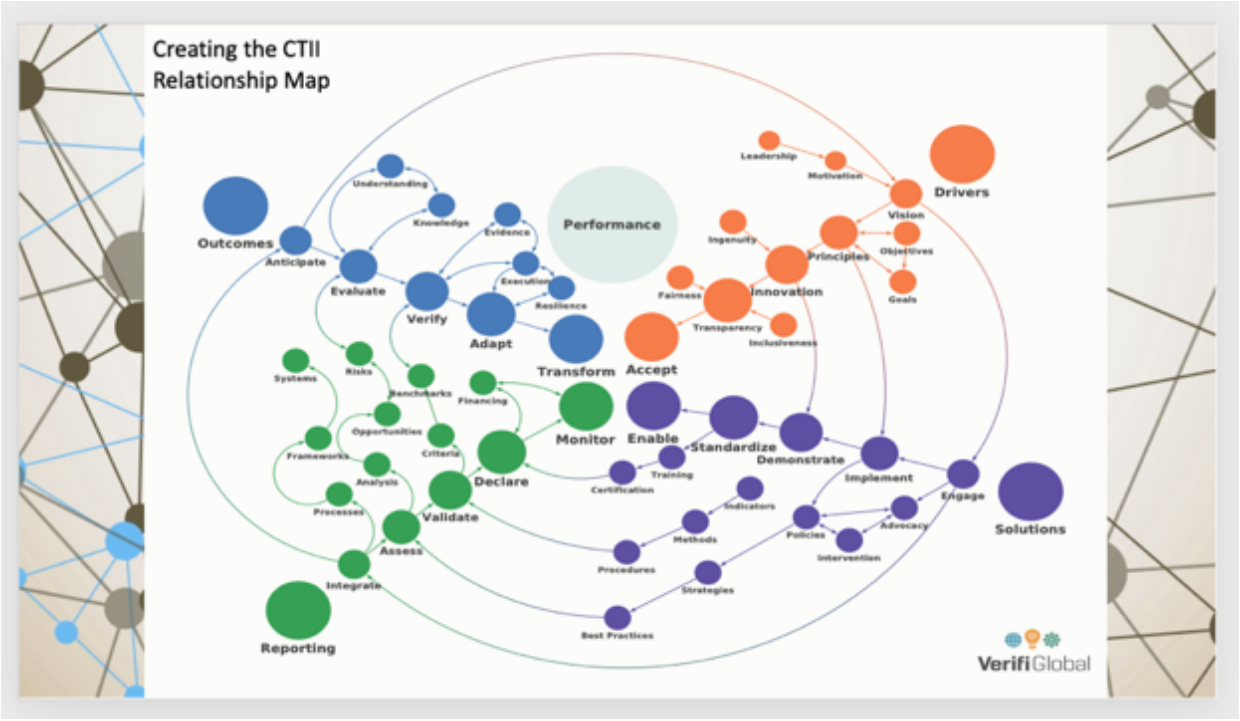
Drivers – Innovative solutions that address sustainable development goals encompass a range of technologies, services, and management approaches, catalyzed by the following drivers:

- Vision, Leadership, and Motivation, which form the basis of engagement, advocacy, and intervention
- Principles, Goals, and Objectives, which provide the foundation for the development and implementation of policies, strategies, and best practices
- Innovation, Resilience, and Ingenuity, as core drivers for demonstrating performance and the establishment of methods and procedures for measurement and quantification
- Transparency, Fairness, and Inclusiveness, to guide the standardization process and the implementation of protocols and regulations
- Acceptance and Ownership, as drivers to enable training, capacity building, and financing.

Outcomes – Intended outcomes at each level can be characterized as:

- Anticipation, through integration with processes, frameworks, and systems
- Evaluation, through assessment and analysis of opportunities and risks
- Verification of performance coupled with validation of metrics, indicators, criteria, and performance benchmarks
- Execution supported by declarations, certifications, accreditation, and curated registries
- Adaptation and Transformation, guided by surveillance, monitoring, and tracking.

Emerging from this is a corresponding, alternate systems view which highlights the drivers, solutions, reporting, and intended outcomes of innovative technology deployment.



5. Expected outcomes and next steps

Expected outcomes of the Clean Technology Innovation Initiative include:

- Increased awareness and understanding regarding the role of standardization in supporting global sustainability, including how the 'cross-cutting' family of ISO TC207 standards are relevant to both global and national challenges and opportunities.

- A web-based, integrative AND interactive relationship map (or tool) to visualize how global sustainability goals and international standards interact and relate to each other in a systematic way.

- Effective application of existing and proposed environmental standards in support of technology innovation and the realization of global sustainability objectives.

The 'Clean Technology Innovation Initiative' relationship map will be publicly accessible on the VerifiGlobal website.

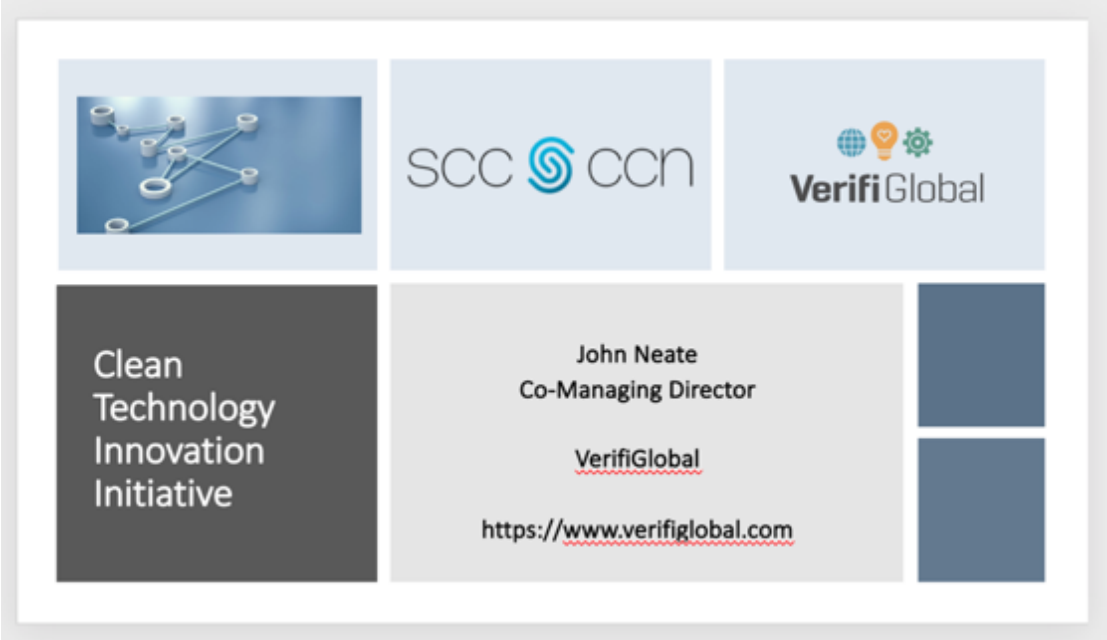
CTII next steps involve ongoing relationship mapping at 3 levels, including:

Drivers (Level 1) - Creating and sustaining long-term value driven by SDG goals, Environmental Social Governance (ESG) objectives, and other commitments.

Solutions (Level 2) - Managing risks and opportunities through technology innovation, verified performance, and the development, implementation, and financing of sustainable solutions.

Tracking and Reporting (Level 3) - Demonstrating commitment and compliance based on evaluation, reporting and disclosure as standards/protocols rapidly evolve

There are many opportunities to become involved in further development and application of the CTII relationship map, please contact VerifiGlobal to find out more.



Appendix A – Examples of CTII work-in-progress

A-1 Climate change mitigation and adaptation

Under the Clean Technology Innovation Initiative, a relationship map is being developed as part of a flexible decision support framework that can assist in charting pathways toward successful development and deployment of innovative technologies that meet sustainable development goals.

Clean technology innovation is critical to solving global environmental challenges, such as climate change. As a result of global compacts, corporate commitments, and other initiatives to address climate change, significant growth in low-carbon technology development has occurred in the past five years. We need to ensure that new technologies perform as claimed and impacts are measurable and verifiable. Tied to this is the importance of:

- Sustainable development goals (the UN SDGs) address climate risks and impacts,
- ClimateTech innovations with the relevant standards and protocols to support them, and
- Continuous evaluation and improvement as standards/protocols rapidly evolve.

Multiple new and existing carbon offset and removal credit markets have developed to address targets and commitments:

- 23% of Fortune 500 companies have committed to carbon neutrality by 2030, and carbon negative commitments will be the next phase
- 10 gigatons/year carbon removal are needed by 2050
- All business sectors are impacted and ESG achievements are becoming critical to investment and financial performance.

There are also rapidly developing standards, protocols, guidelines for carbon removal (e.g., Microsoft, Stripe, Shopify), as well as existing and changing carbon offset accounting protocols.

Global competitions (such as the $20M NRG COSIA Carbon XPRIZE, and the $100M Musk Carbon Removal XPRIZE) are driving tech development and markets, and hundreds of new technologies are developing, gaining investment, and seeking credits.

Technology and carbon offsets by themselves will not meet the need. New innovations are required to achieve all targets. As carbon becomes valued, technology impacts need to be verifiable.

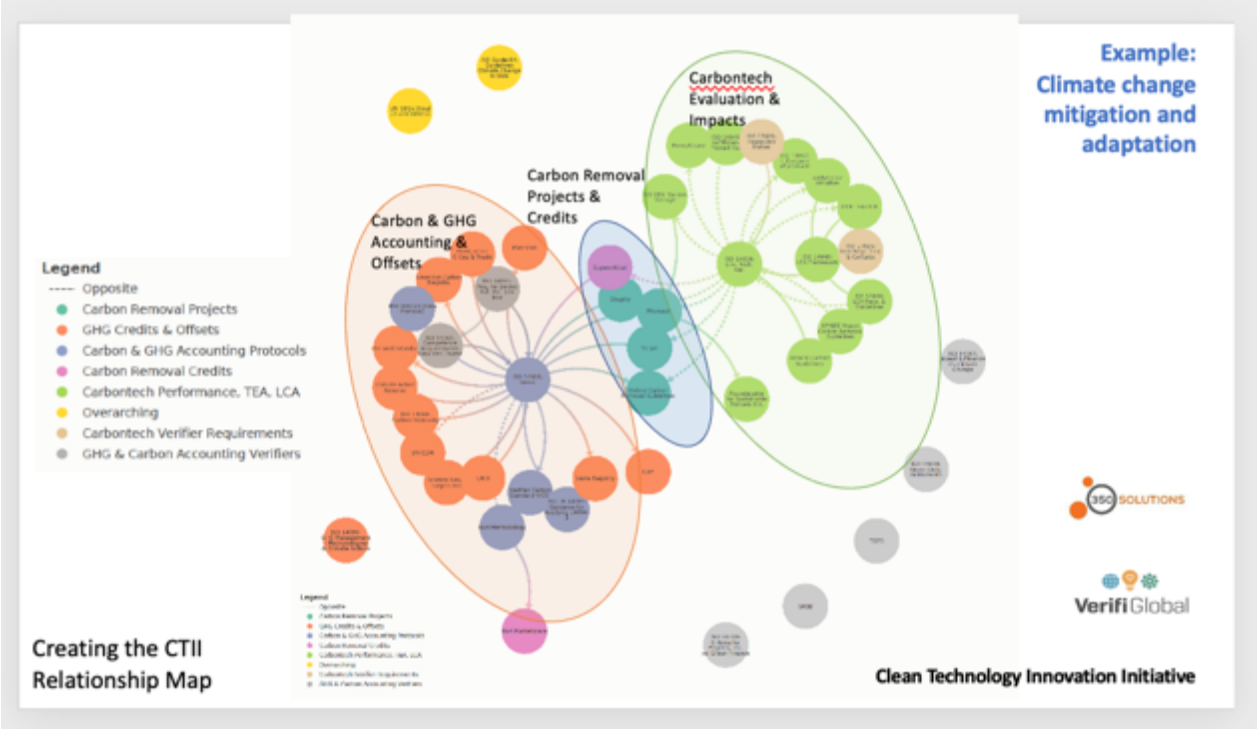
When developing new technology innovations, various standards and protocols come into play throughout the technology development lifecycle. These standards and protocols should provide useful information to stakeholders (including investors, purchasers, regulators, tech developers) about the technology through the development and deployment processes. Consensus approaches are needed to evaluate and verify impacts, performance, and credits.

Rapid growth in the CarbonTech sector causes development of new guidelines and protocols at a rapid pace, out of necessity. Stakeholders may want standards and guidelines to be implemented for a variety of reasons, which sometimes reduces consensus, leading to multiple standards or guidelines, and making the CarbonTech sector more complicated.

Examples of key questions that need to be addressed are:

- Does the technology work? What are its potential impacts? Is it worth investing?
- When implemented, how much carbon is it actually removing, or offsetting – in a real-world, large-scale project?
- Does the environmental performance meet requirements specified in its sustainability linked loan?

This is a working example of how climate change mitigation and adaptation processes and relationships are being mapped.



A-2 Water efficiency and resilience

A principal focus of the Clean Technology Innovation Initiative (CTII) is the positioning of innovative technologies, products, and services to support sustainable development goals. A holistic perspective on water efficiency and resiliency is central to valuing water and the role of natural capital and ecosystem services.

Water is the focus of United Nations Sustainable Development Goal 6 - Clean water and sanitation for all. Water is also connected to other SDGs. The SDG goals for sustainable cities and for climate action are two examples. Water's connections to other SDGs reflects that they are not intended to be pursued separately. They should be viewed as a whole, guiding social, economic and environmental development, which requires integrated policies and transformative approaches.

The water sector recognizes the significance of a wide range of factors affecting progress, pointing to a need for a systems-based approach. For example, cities have local water supply, waste management and stormwater systems, with each component inextricably linked within a larger urban system and part of a complex basin in which competing demands for finite water come from many sectors, including food, industry, health, energy, transport and the environment.

The context of water and its reach across a wide range of SDGs points to the importance of breaking down siloes and building institutional capacity to support cross-sector dialogue and performance benchmarks, leading to tangible outcomes with measurable results.

SDG progress therefore depends on cross-sector policies and action. Whether aimed at strengthening institutions, mobilising financing, delivering sustainable consumption and production, or building resilience for populations, national governments need to address issues cutting across individual sector silos.

Under the Clean Technology Innovation Initiative, a relationship map is being developed as part of a flexible decision support framework that can assist in charting pathways toward successful development and deployment of innovative technologies that meet sustainable development goals. This is an example of how TC 207 processes and relationships could be mapped to highlight the many important elements related to water efficiency and resiliency.