2025 SIDS NDE Joint Programme

Introduction to Digitalization and NSI

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Digitalization

Relevance of Digitalization in SIDS

Accelerator of climate action across all sectors: Digital technologies, including data platforms, AI, IoT, and satellites, enable better planning, faster decision-making, early warning, and efficient resource management. They are critical to achieving NDCs and long-term strategies.

Particularly important for SIDS: Digitalization helps overcome structural barriers such as geographic isolation, limited human capacity, fragmented systems, and high transaction costs. It enables remote monitoring, real-time data collection, and improved service delivery across islands.

Enabler of systems thinking and integration: Digital tools allow sectors, including energy, water, agriculture, health, and transport, to operate cohesively through shared data, predictive analytics, and coordinated planning.

Key to resilience and risk management: Accurate climate information, forecasting, and communication platforms reduce disaster losses, improve preparedness, and protect vulnerable communities.

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Digitalization – Key insights

AI and machine learning for climate prediction, disaster risk management, and environmental monitoring.

IoT and remote sensing for agriculture, water systems, fisheries, and early warning.

Digital public infrastructure (digital ID, payments, registries) to support inclusive and efficient services.

Digital finance system to enhance the financial stability of smallholder farmers and agricultural cooperatives.

Blockchain and distributed ledgers for MRV, supply chain traceability, and carbon market transparency.

Cloud-based platforms enabling inter-agency coordination and real-time information sharing.

CTCN Technical Assistance

Digitalization-related TA projects since the last NDE Forum:

Country	Title	Status
Samoa	Developing a framework and methodology to estimate carbon sinks from the forestry sector using Earth observation in Samoa	Completed
Multi-country (Pacific): Fiji, Timor-Leste, Nauru, PNG, Vanuatu	Developing a regional roadmap for an open-source knowledge-sharing and capacity-building platform in Pacific island countries	Response Plan Development
Timor-Leste	Formulating a National Electricity Grid Code and Development of a Net Metering Policy in Timor-Leste	Implementation

Examples of Future Technical Assistances

AI-based multi-hazard early warning systems integrating satellite, radar, and local sensor data.

National data governance frameworks for climate and disaster data.

IoT-enabled water management for leak detection, irrigation, groundwater monitoring.

Digital platforms for hydro-meteorological data sharing among ministries and regional organizations.

Cyber-resilience strategies for critical environmental and energy infrastructure.

Smart microgrids with advanced metering, remote diagnostics, and demand response systems.

Cyclone, storm surge, and tsunami forecasting using numerical models.

Geospatial risk mapping platforms for infrastructure and ecosystem management.

Blockchain-based transparency and reporting for carbon markets or climate finance flows.

Incubation of local tech startups developing climate-relevant digital tools for islands.

Digital finance inclusion solutions to expand access to green microfinance and resilience funding tools.

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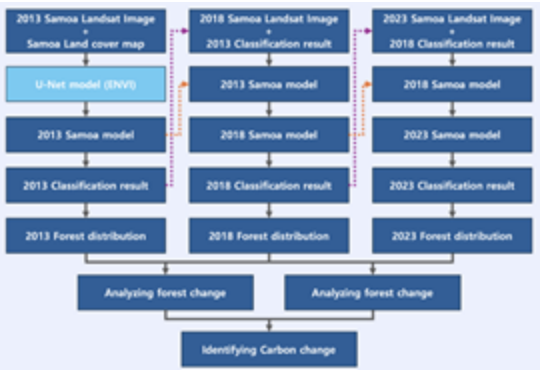
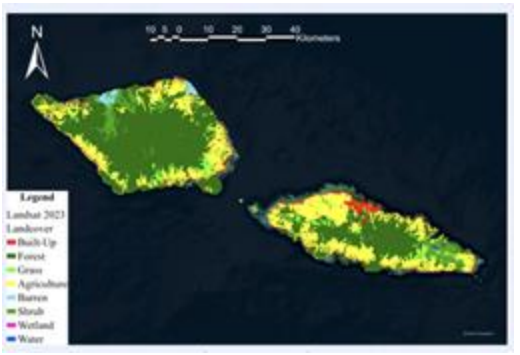
Samoa: Developing a framework and methodology for measuring carbon sinks from the forestry sector using Earth observation in Samoa

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
Policy Assessment	Earth Observation Analysis	Field survey and validation	Model development	REDD+ policy framework
Samoa's LULUCF Status and Policies	Classification of Land Cover and Forest using EO analysis	Validation on preliminary results based on field survey	Developing forest carbon estimation model with local professionals	Developing REDD+ policy framework (ongoing)
• FAO Forest Resources Assessment	• ESA World Cover Map, Landsat analysis • LULUCF matrix development	• Field survey planning with local professionals and relevant ministries	• Developing a guideline for forest carbon estimation model contextualized in Samoa • Improvement of the model based on local knowledge and additional analysis	• Analysis on forest management policies in Samoa • Survey analysis (local experts, relevant officials etc) • Develop REDD+ policy framework for Samoa
• National Forest Inventory • NDC documents review	• Field survey planning • Data gaps and limitation reporting	• Improve the result of the preliminary analysis through validation		

Deep-learning based - U-Net





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Samoa: Developing a framework and methodology for measuring carbon sinks from the forestry sector using Earth observation in Samoa

II -1. What is Code Editor

The Earth Engine Code Editor (https://code.earthengine.google.com/) is a web-based IDE (integrated Development Platform) for the JavaScript API. To get the access for the Code Editor, it is needed to log in with a Google Account. In Code Editor, we can write the script using JavaScript to search, filter, process, analyze and download the satellite images in the GEE catalog. The elements of Code Editor are shown in the Figure 00 provided by GEE.

Figure 00 Elements of Code Editor (Source from Google Earth Engine (GEE))

As our manual is more focused on a land classification task itself than a data processing with GEE, the detailed explanation about Code Editor and JavaScript isn't included. Instead, the simple written codes for each process will be given. If you want to practice Code Editor and JavaScript from the scratch, access to the link below for the official tutorials.

(JavaScript Tutorials of GEE:
https://developers.google.com/earth-engine/tutorials/community/anomalies-analysis-smw-and-gee)

II -2. Data Processing with Code Editor

To acquire clear and task-oriented satellite images, it is inevitable to apply techniques to process them. Therefore, Code Editor has variety of functions to do this. First, to sort out the images from the collection, (1) filter images with the required condition and (2) map cloud and cirrus mask, and scale factors. Then, after selecting the bands that are needed, (3) apply multi-temporal composite with median filter within the target time range. Finally, to fill the missing data where clouds and cirrus exist previously, (4) mosaic the composite image in longer period.

Figure 00 Flowchart of Data Processing with GEE (Google Earth Engine)

The detailed process of each step will be explained in the following section <II -2.1. How to process Landsat Imagery using Code Editor>.

II -2.1. How to Process Landsat Imagery using Code Editor

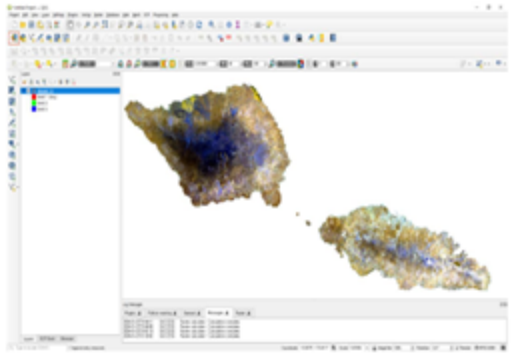
STEP 1. Load Landsat Imagery with Filters

1. Access to Code Editor (https://code.earthengine.google.com/) and log in with your Google Account
2. Upload the boundary of Samoa: Click on Assets > New > Shape files > Source files > Select * Files with extension ".shp, .shx, .dbf" should be uploaded at once
3. Import the boundary shape file to the script: Click on Import into script of the boundary shape file in the Assets
4. Load Landsat 8 Collection using the method (ee.ImageCollection)

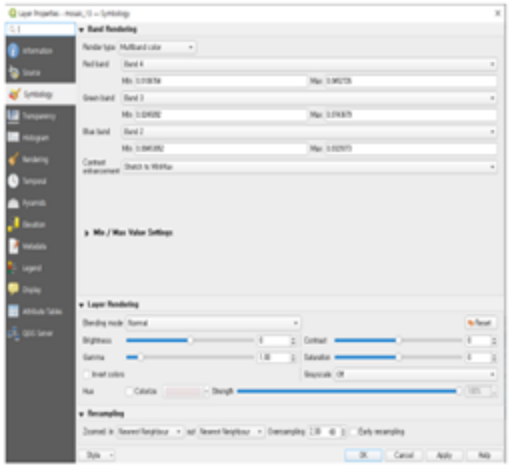
III-2.1.1. How derive NDVI with QGIS

STEP 1. Making true and false color images from satellite image (Practice example)

1. Click Layer > Add Layer > Add Raster Layer
   1) Open the file name as (./mosaic 13 (... .tif))



2. Set multiband color to make a true color image (LANDSAT-8)
   1) Open Properties > Symbology
   2) Select Band 4 as a Red band, Band 3 as a Green band, and Band 2 as a Blue band



3. Set multiband color to make a false color image
   1) Select Band 5 as a Red band, Band 4 as a Green band, and Band 3 as a Blue band

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CTCN Capacity Building

Webinar: AI and Renewable Energy
16 March 2025

Fostering knowledge exchange between Network members with AI expertise and Renewable Energy solutions

In collaboration with UNEP ROAP

Webinar: Scaling Up Implementation of CTCN TAs in Early Warning System for Flood and Drought Management
3 June 2025

Supporting Network collaboration to scale early warning systems for floods and droughts using CTCN technical assistance, innovation, and local expertise

In collaboration with GCF, UNEP-DHI and TEC

Joint Initiative on AI for Climate Action

Capacity Building

Online course

Led by Network member BCI, the CTCN offered a free FinTech course to interested NDEs.

Online materials

CTCN has distributed CB on AI recordings via Youtube channel

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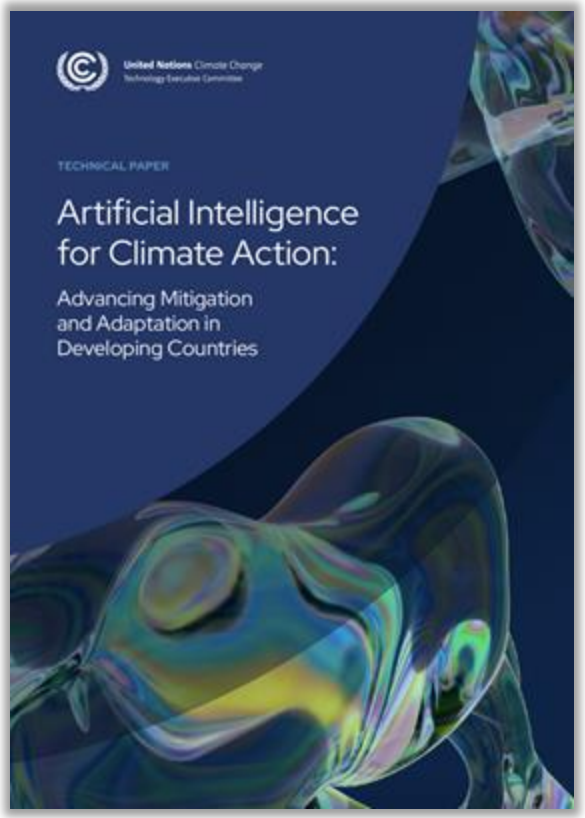
Joint Initiative on AI for Climate Action

Technical Paper

Published by the TEC on 11 July 2025, launched at the AI for Good Summit in Geneva, developed with support from UNIDO and METI Japan.



Key insights

- ***AI accelerates climate solutions:*** Boosts mitigation (e.g., clean energy, emissions reduction) and adaptation (e.g., early warning systems, resilient planning).
- ***Risks for developing countries:*** Digital divides, biased algorithms, and high resource demands may widen inequalities.
- ***Call to action:*** Invest in AI capacity, data access, and governance to ensure inclusive, ethical, and effective deployment.

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Joint Initiative on AI for Climate Action

AI for Climate Action Award 2025

Global award spotlighting open-source AI solutions for climate adaptation or mitigation in LDCs and SIDS. Supported by KOICA.

- Dar es Salaam, Tanzania on 8-9 October 2025
- The forum was attended by approx. 200 participants, comprising government officials from African nations, representatives from IOs such as UNEP, UNDP, World Bank (IBRD), AfDB, and ADB, as well as experts from both academia and industry.

Session 1 (Climate Adaptation and Resilience) presented locally-based AI solutions that can be implemented immediately in developing countries.

In Session 2 (Greenhouse Gas Reduction), participants concurred that small and lightweight AI models tailored to local conditions may serve as a viable alternative for LDCs and SIDS, as opposed to energy-intensive large-scale AI systems.

On the final day of the forum, the **AI for Climate Action Award 2025** ceremony took place. Among 634 submissions from across the globe, the Korea Watershed Management Institute (IWMI) team's "SAFIR (Smart AI-based Farming & Irrigation for Resilience)" received the grand prize.

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National Systems of Innovation

Relevance of National Systems of Innovation in SIDS

Foundation for climate technology development and deployment: A strong NSI ensures that countries can identify, absorb, adapt, and scale climate technologies effectively, linking research, policy, industry, and communities.

Essential for bridging global technologies with local solutions: SIDS and developing countries often rely on imported technologies. NSI enables localization, adaptation to island contexts, and long-term maintenance capabilities.

Strengthens institutional coordination: By aligning ministries, research institutions, private sector actors, and financiers, NSI supports coherent national technology policies and investment pathways.

Drives green jobs and economic diversification: NSI fosters entrepreneurship, supports climate-focused SMEs, and develops local manufacturing and service capabilities for climate technologies.

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National Systems of Innovation – Key insights

Development of national climate innovation strategies that link NDCs, TNAs and national development plans.

Innovation hubs and accelerators supporting digital, energy, water, and agriculture solutions.

South–South learning and regional innovation networks that allow SIDS to collaborate despite geographic distance.

Public–private partnerships to commercialize climate technologies and attract investment.

Youth and university innovation ecosystems that can rapidly prototype and adapt climate technologies.

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CTCN Technical Assistance

NSI-related TA projects since the last NDE Forum:

Country	Title	Status
Fiji	Technical capacity enhancement for climate-resilient agriculture through the revision of national policies and the improvement of data management systems	Bidding
PNG	Pre-feasibility study on Ocean Energy focusing on Salinity Gradient Energy Technology and Electrochemical Ocean Thermal Energy Conversion	Implementation
Solomon Islands	The establishment of an Integrated Coastal Zone Management (ICZM) Plan to protect the mangroves through Ecosystem based adaptation solutions	Completed
Vanuatu	Development of a Green Building Roadmap for Vanuatu	Response Plan Development

Examples of Future Technical Assistances

Development of National System of Innovation (NSI) roadmaps aligned with NDCs, TNAs, and sectoral strategies.

South–South collaboration platforms connecting SIDS with more advanced R&D institutions.

Knowledge-sharing systems to document lessons from pilots, TAs, and demonstration projects.

Design of incubator and accelerator programmes for climate-tech startups.

Climate innovation financing strategies, blending public funds, concessional finance, and private capital.

University–industry collaboration frameworks for Collaborative R&D, testing, localization and commercialization.

Support to develop GCF Readiness or PPF proposals focused on technology innovation and scale-up.

CTCN Capacity Building

Global cRD&D Bridge-Building (CRD2B2) Workshop
Seoul & Songdo, Republic of Korea, Oct 28 – Nov 1, 2024

- Convened 21+ NDEs for collaborative RD&D
- Hosted by the CTCN in partnership with leading Korean research institutes (KIST, KIER, KITECH, etc.)
- Aimed at accelerating joint climate technology research, development & demonstration
- Activities included expert sessions, lab tours, and site visits on topics like green hydrogen

Global CRD2B2 Workshop: Busan, Republic of Korea, Aug 27-29, 2025

- In conjunction with **World Climate Technology EXPO 2025**
- **6 Participants:** 3 NDEs (Gambia, Tajikistan, Zimbabwe) and 3 NDE representatives (Malaysia, Panama, Timor-Leste)
- **Outputs:**
  - Presentation on barriers, enablers and collaboration for the deployment of energy storage system (ESS)
  - Voluntary technology talks with companies and organizations
  - Bilateral meetings with CTCN Network Members
  - Collaboration development with Hyundai Motors CMK Foundation

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CTCN Capacity Building

2024 Voluntary Technology Talk (VTT)

Global (June 3-6) at ENVEX

SIDs and LDCs targeted (Sep 4-6) at WCE

Based on TA analyses, CTCN invited 6 NDEs around the globe and 4 NDEs from SIDS/LDC countries with the highest potential to scale up their existing TAs.

It led to the facilitation of 17 on-site bilaterals with prospective network members and 4 pre-arranged bilaterals with Network members.

2025 VTT on 28 August

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How to assess the performance of the system?

TEC Publications

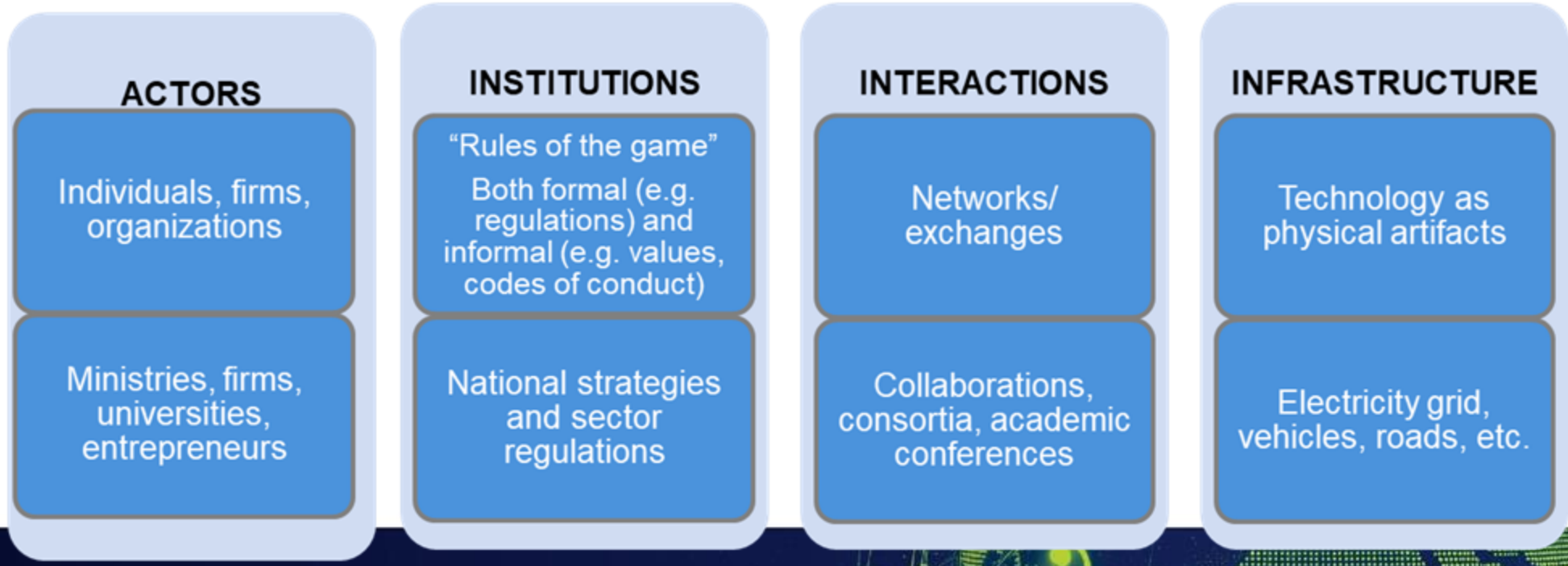
The Summary for Policymakers on "**Good practices and lessons learned on the setup and implementation of National Systems of Innovation**" was published in May 2023

Content

- Aims to assist policymakers in developing countries who are seeking to strengthen their NSI in the context of climate action;
- Presents a two-step approach to analysing NSI;
- Deepen the understanding of selected parts of the Systems and identify measures and approaches that have improved the effectiveness of the national systems in specific cases;
- Provides recommendations on setting up NSI.

What is a System of Innovation?

The **elements** and **relationships** which interact in the production, diffusion, and use of new, and economically useful, knowledge. To achieve this goal, there are some specific activities that should be undertaken to facilitate the innovation process.

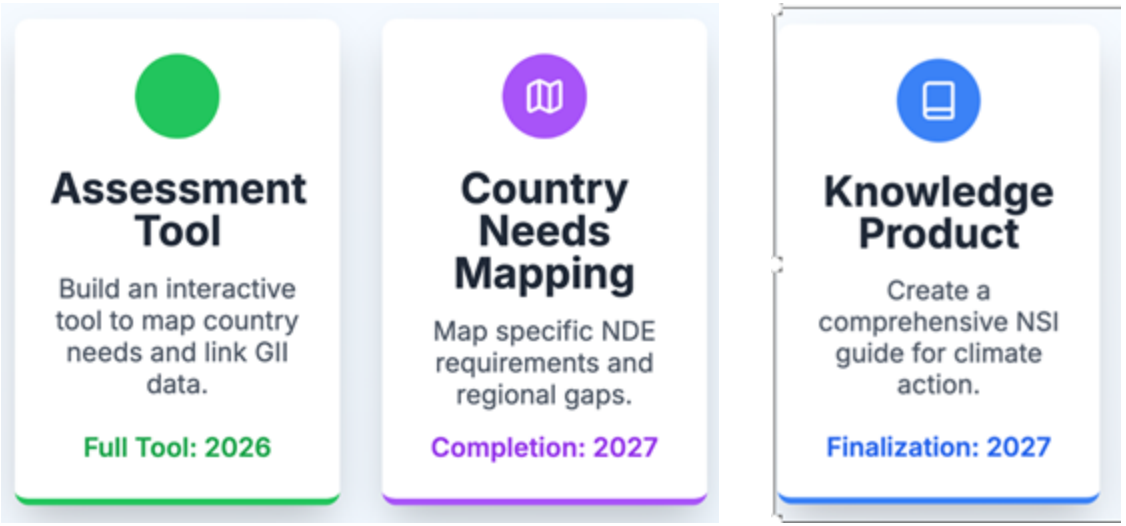


Current TEC work on NSI-Mapping Tool

•Objective of the Mapping tool:

• Builds on TEC's 2015 Policy Brief and 2023 Summary for Policymakers

• **TEC 30 decision**: TEC requested the Activity Group to present an initial concept of a tool to identify country needs for the setup and implementation of National Systems of Innovation (NSI) at TEC 31.



Purpose of the NSI Mapping Tool

- Translate high-level climate technology priorities into implementable strategies
- Provide actionable, finance-oriented recommendations
- Support NDEs and policymakers in strengthening NSIs

Financing Support

- Climate finance alignment
- Investment readiness preparation
- Risk mitigation strategies
- Blended finance mechanisms
- Impact measurement frameworks

Technology Cooperation

- South-South partnerships
- Technology transfer facilitation
- Capacity building programs
- Innovation network development
- Knowledge sharing platforms

CTCN Response Plans

- Technical assistance requests
- Expert deployment coordination
- Technology roadmap development
- Implementation support
- Monitoring and evaluation

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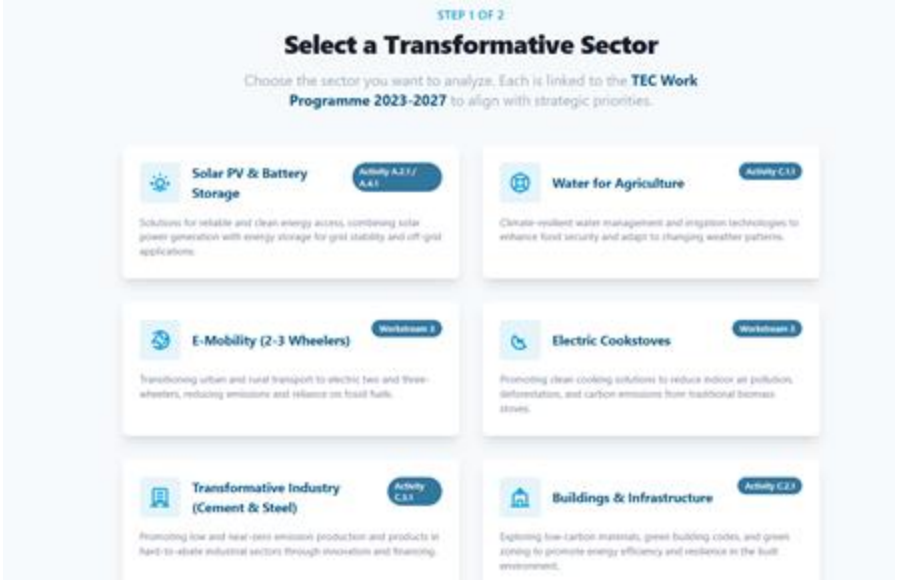
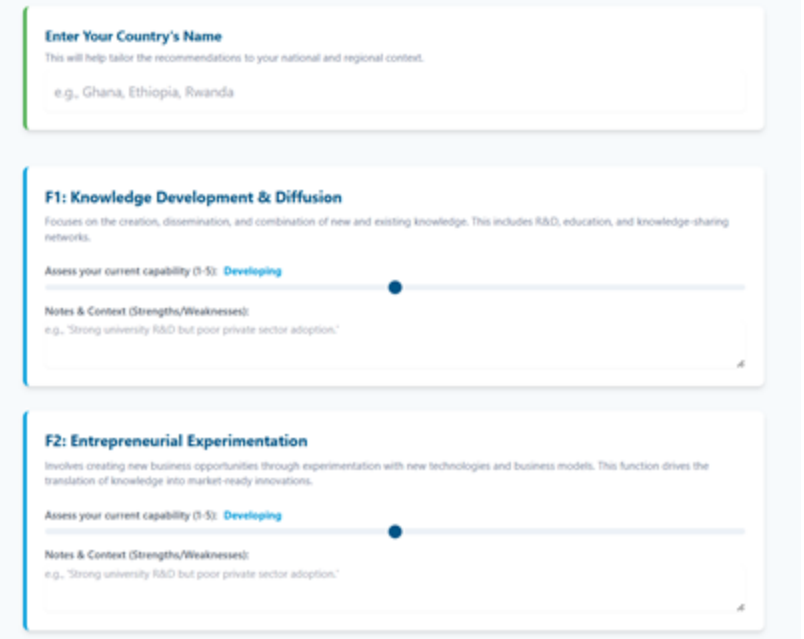
NSI Mapping Tool-Core Features

Stage 1: **Guided sector selection**
Stage 2: **Structured NSI self-assessment**
Stage 3: **AI-powered analysis & generation**
Stage 4: **Catalyst Action Plan (tailored output**)





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NSI Mapping Tool Output- Catalyst plan