

Country	El Salvador
Request ID#	2025000030
Title	Design of an Integrated Platform for Tropical Monitoring and Forecasting to Support Technology Deployment
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Summary of the CTCN technical assistance

El Salvador faces increasing risks from hurricanes, tropical storms, and other tropical weather-related hazards but lacks an integrated, real-time forecasting and early warning system capable of supporting anticipatory action. Current forecasting operations rely heavily on external data processed manually with fragmented tools, limiting operational efficiency, forecast accuracy and lead time, and the effectiveness of early warning services.

This CTCN Technical Assistance (TA) will address these barriers through institutional and technical assessments, the development of a strategic roadmap and system architecture framework for an Integrated Platform for Tropical Monitoring and Forecasting, and institutional capacity development at MARN through structured training, international knowledge exchange, and the design of a sustainable capacity development framework. The outputs of the TA will provide the key technical and institutional foundations for the subsequent implementation of the Integrated Platform through a dedicated investment project.

Key national actors include the Ministerio de Medio Ambiente y Recursos Naturales (MARN), serving both as the National Designated Entity (NDE) and the project proponent, through its Dirección General del Observatorio de Amenazas y Recursos Naturales (DOA). The TA is expected to be implemented over 12 months, laying the technical and institutional foundations for the deployment of a modern and resilient integrated platform that strengthens national tropical monitoring, forecasting and early warning capacities and supports impact-informed decision-making and anticipatory action.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

**National Designated Entity to the UNFCCC
Technology Mechanism**

Name: Jessica Margarita Laguardia
Title: Manager, Climate Management

Date:

Signature:

Proponent (signature of the Proponent is optional)

Name: Daniela Elizabeth Manzano Medrano
Title: Director of the Dirección General del
Observatorio de Amenazas y Recursos Naturales
(DOA)

Name: Mario Giovanni Molina Masferrer
Title: Manager of Geostatistics for Risk
Management and Climate Change of the
Dirección General del Observatorio de Amenazas
y Recursos Naturales (DOA) and CTCN NFP

Date: July, 27th, 2026

Signature:



UNFCCC Climate Technology Centre and Network (CTCN)

Name: Ariesta Ningrum
Title: Director, CTCN

Date:

Signature:

1. Background and context:

El Salvador's geographic location in Central America, with a long Pacific coastline, places the country in a highly exposed position to tropical weather-related hazards. In addition, its complex topography—characterized by volcanic terrain, fertile valleys, and mountain ranges—and its location within the Pacific Ring of Fire increase its exposure to multiple natural hazards, including tropical cyclones, floods, landslides, earthquakes, and volcanic activity. A large share of the population and critical infrastructure is concentrated in floodplains and low-lying coastal and riverine areas, further amplifying exposure to storm surges, flooding, and landslides.

As a result of this high level of exposure, and as reflected in the Global Climate Risk Index 2021, El Salvador is consistently among the world's most climate-vulnerable countries, suffering major human and economic losses from extreme events. Tropical cyclones and other tropical weather-related hazards are key drivers of this vulnerability, repeatedly affecting lives, infrastructure, and livelihoods. El Salvador regularly experiences direct and indirect impacts from tropical systems originating in both the Pacific and Atlantic basins, often accompanied by torrential rainfall, river flooding, and destructive landslides. For example, Tropical Storm Amanda in 2020 alone caused more than USD 200 million in losses, and combined with Cristobal, resulted in an estimated USD 2.9 billion in damages across housing, transport, agriculture, tourism, and social services. Historically, earlier disasters such as Hurricane Mitch (1998) and Tropical Depression 12E (2011) also left severe and lasting impacts. Looking ahead, climate change is expected to influence the intensity and impacts of tropical cyclones and associated extreme weather events, further amplifying existing risks.

Beyond these physical hazards, underlying socio-economic conditions—such as overcrowded housing, insecure land tenure and limited access to social protection—interact with high levels of geographic exposure to further compound the impacts of these events, particularly among poor and marginalized communities that are disproportionately concentrated in floodplains, coastal zones and landslide-prone areas.

In response to these vulnerabilities, the Government of El Salvador has prioritized early warning systems and meteorological infrastructure in its National Climate Change Plan and updated NDCs. In this context, the Dirección General del Observatorio de Amenazas y Recursos Naturales (DOA) under the Ministerio de Medio Ambiente y Recursos Naturales (MARN) has strengthened its monitoring and forecasting capacities but continues to rely on fragmented tools and manual workflows.

Building on these efforts, in 2025 Korean experts from the Korea Meteorological Institute (KMI) and GI E&S conducted a pre-feasibility assessment to identify existing gaps and propose initial concepts for an Integrated Platform for Tropical Monitoring and Forecasting. This effort provided strategic guidance, and it confirmed the need to advance towards an integrated national platform. However, additional technical and institutional work is required to establish the foundations for the subsequent implementation of the Integrated Platform, including detailed assessments, system architecture design, strategic planning, and structured capacity development.

2. Problem statement:

El Salvador faces high climate risks across key sectors—including urban and rural settlements, transport, agriculture, water resources, and public health—driven by multiple climate change stressors, including tropical cyclones, rising temperatures, changing rainfall patterns, more frequent extreme precipitation and drought conditions, and sea-level rise. These drivers result in impacts such as recurrent flooding, landslides, coastal flooding and erosion, infrastructure damage, agricultural losses, water stress, and heightened risks of climate-sensitive diseases. National adaptation priorities

therefore emphasize improved flood management, early warning systems, weather forecasting, and strengthened disease control and surveillance.

However, the full adaptation potential of these measures remains unrealized due to critical technological and institutional gaps. The country lacks an integrated, real-time forecasting and early warning system capable of supporting impact-based and anticipatory decision-making. Forecasting operations still rely heavily on external generated data that are processed through fragmented and manual workflows, with limited data integration, no systematic data assimilation, and no centralized meteorological data infrastructure for large-scale processing and long-term archiving. These gaps constrain forecast accuracy, reduce lead time, and limit the effectiveness of early warning dissemination to key sectors and authorities.

Addressing these barriers through the design of an Integrated Platform for Tropical Monitoring and Forecasting is an essential step towards strengthening climate change adaptation and disaster risk management by enabling risk-informed decision-making, reducing sectoral risks, and supporting timely, evidence-based, and anticipatory action in response to climate-related hazards.

3. Logical Framework for the CTCN Technical Assistance:

Objective:

To strengthen El Salvador's climate change adaptation and disaster risk management capacities by enabling the design of an Integrated Platform for Tropical Monitoring and Forecasting that provides the technical and institutional foundation for improved tropical monitoring, forecasting, impact-based forecasting, and anticipatory action.

Outcome:

Enhanced institutional and technical capacity within MARN and DOA to design, plan, and prepare the implementation of an Integrated Platform for Tropical Monitoring and Forecasting, establishing the technical and institutional foundations for improved tropical monitoring, forecasting, impact-based forecasting, and anticipatory action.

[illegible]

Furthermore, a gender evaluation and gender action plan (GAP) will be prepared and followed throughout the technical assistance (a template will be provided). ¹												
Activity B: Implementation A project steering committee will be formed, consisting of the implementing team (international and local consultants), the NDE, the project proponent(s), and CTCN. This project steering committee will meet at least on a bi-annual basis to report project progress and discuss any questions and challenges.												
Activity C: Post-implementation A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). Project-end communication and dissemination activities will be conducted in collaboration with the CTCN Secretariat, which will include: • Development of a press release • Delivery of a knowledge sharing webinar • Organization of a dialogue with financial institutions for potential follow-on support												
Mandatory deliverables: Deliverable A: Detailed work plan; M&E plan; gender assessment and gender action plan Deliverable B: Project Steering Committee meeting reports Deliverable C: Closure and Data Collection report; press release, webinar, dialogue with financial institutions	X X					X						X X
Output 1: Strategic roadmap and system architecture and management framework for an Integrated Platform for Tropical Monitoring and Forecasting Output 1 will be produced under Activity 1, “Strategic Assessment and System Design for Tropical Monitoring and Forecasting Platform.”												

¹ Additional information is available under Section 10 of the response plan.

This activity will conduct a comprehensive technical and institutional assessment to identify existing gaps, assess system requirements, and define a phased roadmap, system architecture, and management framework for the establishment of an Integrated Platform for Tropical Monitoring and Forecasting.												
Activity 1.1: Needs Assessment and Institutional Gap Analysis - A comprehensive assessment will be conducted to identify gaps in institutional workflows, technical capacities, data infrastructure, and human resources related to tropical monitoring and forecasting within MARN, particularly the Dirección General del Observatorio de Amenazas y Recursos Naturales (DOA). - The activity will include a desk review of existing systems, policies, workflows, and previous assessments, as well as structured interviews with key stakeholders through field visits and institutional mapping workshops.			X									
Activity 1.2: Technical Assessment of Integrated Platform for Tropical Monitoring and Forecasting - This activity will conduct a detailed technical assessment of the system architecture, data flows, monitoring and forecasting tools, and Information and Communication Technology (ICT) requirements for real-time monitoring, data assimilation, and early warning dissemination. It will also review interoperability with regional and global data sources (e.g., NOAA, ECMWF, GEONETCast.) - The assessment will include a technical evaluation of hardware, software, and network infrastructure, as well as existing forecasting tools, supported by field visits to DOA facilities and the data center.			X									
Activity 1.3: Development of a Strategy for the Establishment of an Integrated Platform for Tropical Monitoring and Forecasting A strategic roadmap will be developed to guide the establishment of the Integrated Platform for Tropical Monitoring and Forecasting. The roadmap will include system specifications, phased deployment options, institutional roles and responsibilities, risk management considerations, and indicative cost estimates, and will serve as the technical and institutional foundation for the subsequent implementation of the Integrated Platform.							X					

[illegible]

activities will inform the design of a scalable, certifiable, and practice-oriented training system.												
Activity 2.1: International Knowledge Exchange on Operational Forecasting Systems - One-week technical study visits for selected MARN/DOA staff to Korea to observe operational workflows of the Typhoon Observation System (TOS) within KMA and related institutions. - Technical sessions on system integration, forecasting workflows, data assimilation, and institutional coordination. - Identification of transferable practices to inform the Salvadoran capacity development framework.								X				
Activity 2.2: National Workshops and Design of Training Infrastructure - Technical workshops in El Salvador to assess competency gaps and define training needs across forecasting, ICT management, platform operation, and early warning dissemination. - Development of structured training curricula and certification pathways. - Conceptual and functional design of a dedicated training laboratory, including hardware requirements, simulation tools, data access systems, operational workflow stations, and case-based training modules to support hands-on and on-the-job learning under the subsequent implementation of the Integrated Platform.										X		
Deliverables 2: Capacity Development and Training Infrastructure Design Package 2.1 International Knowledge Exchange Report 2.2 National Workshop Report 2.3 Capacity Development and Certification Framework 2.4 Conceptual and Technical Design for a Forecasting Training Laboratory Infrastructure									X X		X X	

4. Resources required and itemized budget:

Activities and Outputs	Input: Human Resources (Title, role, estimated number of days)	Input: Travel (Purpose, national vs. international, number of days)	Inputs: Meetings/events (Meeting title, number of participants, number of days)	Input: Equipment/Material (Item, purpose, buy/rent, quantity)	Estimated cost (USD) Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan	
					Minimum	Maximum
Mandatory Output: Project Management						
Mandatory Activities: A: Pre-implementation B: Implementation C: Post-implementation	Please allocate 1-5 working days for each of the mandatory reports under Activities A-C Project Manager / Lead ICT Systems Architect, Project Management and Monitoring & Evaluation (M&E) Specialist, Coordinator, Gender Expert (5 days for each Activities A-C)				12,000	15,000 (Including Gender allocation, 5% of total TA budget: 12,500)
Output 1: Strategic roadmap and system architecture and management framework for an Integrated Platform for Tropical Monitoring and Forecasting					167,500	181,200

Activity 1.1: Needs Assessment and Institutional Gap Analysis	[8-12days * 7pp] - Project Manager / Lead ICT Systems Architect - Meteorological Systems Specialist - Satellite Reception and Processing Systems Expert - Senior Operational Meteorologist - ICT Hardware Expert - Project Management and Monitoring & Evaluation (M&E) Specialist - Coordinator	[International travel] - To have in-person discussion with local stakeholders in El Salvador - 12 days	[Workshop] - In-depth assessment for both gap analysis and needs/ technical assessment - About 20 participants	[Items, services for Workshop] - Conference room rental, meals, parking, interpreter - For 20 participants	49,000	50,800
Activity 1.2: Technical Assessment of Integrated Platform for Tropical Monitoring and Forecasting	[8-12days * 7pp] HR Roles and Responsibilities are the same as Activity 1.1				22,000	23,700

Activity 1.3: Development of a Strategy for the Establishment of an Integrated Platform for Tropical Monitoring and Forecasting	[5-7days * 7pp] HR Roles and Responsibilities are the same as Activity 1.1	[International travel] - To have in-person discussion with local stakeholders in El Salvador - 6 days		[Items, services for Workshop] - Conference room rental, meals, parking, interpreter - For 20 participants	36,000	37,800
Activity 1.4: Consolidated As-Is Analysis and BPR/ISP Readiness Design	[10-14days * 7pp] HR Roles and Responsibilities are the same as Activity 1.1	[International travel] - To have in-person discussion with local stakeholders in El Salvador - 12 days	[Workshop] - In-depth assessment for both gap analysis and needs/ technical assessment - About 20 participants	[Items, services for Workshop] - Conference room rental, meals, parking, interpreter - For 20 participants	60,500	68,900
Output 2: Capacity development framework and knowledge exchange programme for the Integrated Platform for Tropical Monitoring and Forecasting					50,500	53,800
Activity 2.1: International Knowledge Exchange on Operational Forecasting Systems	[4-5days * 3pp] - Project Manager / Lead ICT Systems Architect - Meteorological Systems Specialist - Senior Operational Meteorologist	[International travel] - To conduct a technical study visit and knowledge exchange with a meteorological organization such as KMA - 7 days		[Items, services for the training] - Conference room rental, meals, parking, interpreter - For 7-10 participants	36,000	37,300

Activity 2.2: National Workshops and Design of Training Infrastructure	[4-5days * 3pp] HR Roles and Responsibilities are the same as Activity 2.1	[International travel] - To have workshops for officials in MARN DOA - To consult with national stakeholders and validate the proposed capacity development framework and training infrastructure design. - 12 days	[Workshop] - Capacity Building on Tropical Monitoring and Forecasting - About 10-12 participants	[Items, services for the training] - Conference room rental, meals, parking, interpreter - For 10-12 participants	14,500	16,500	
<i>Estimated range of costing for the entire Response Plan</i>						230,000	250,000

5. Profile and experience of experts:

Experts required	Brief description of required profile
Project Manager / Lead ICT Systems Architect (Integrated Forecasting Platforms)	• Description of the responsibilities - Provide overall leadership and coordination of the CTCN Response Plan implementation. - Lead the technical assessment mission and ensure quality control of all technical studies and deliverables. - Oversee the design and integration of the Integrated Platform for Tropical Monitoring and Forecasting, including ICT architecture and interoperability components. - Supervise the preparation of the strategic roadmap, system architecture, technical specifications, and other technical deliverables required for the subsequent implementation of the Integrated Platform for Tropical Monitoring and Forecasting. - Coordinate multidisciplinary experts and ensure alignment with national priorities and CTCN requirements. • Required Profile - Advanced degree in ICT systems, computer engineering, meteorology, or related field. - Minimum 15 years of experience in ICT architecture and early warning or operational forecasting systems. - Demonstrated experience leading international technical assistance or meteorological modernization projects. - Proven experience in system integration and platform architecture design. - Experience in the preparation and implementation of large-scale meteorological modernization or climate technology projects is desirable. - Fluency in English required; knowledge of Spanish desirable.
Meteorological Systems Specialist	• Description of the responsibilities - Lead technical design of the meteorological components of the Integrated Platform for Tropical Monitoring and Forecasting. - Define system requirements for data integration, model coupling, and workflow automation. - Advise on interoperability between observational networks, satellite data, and numerical weather prediction systems. - Contribute to technical specifications for platform architecture. • Required Profile - Advanced degree in meteorology, atmospheric sciences, or related field. - Minimum 15 years of experience in meteorological systems design and operational platform integration. - Experience in system architecture for forecasting centres. - Demonstrated experience working with national meteorological services on modernization projects.
Satellite Reception and Processing Systems Expert	• Description of the responsibilities - Assess existing satellite data reception, processing, and dissemination capacities within DOA. - Evaluate ground station infrastructure, data ingestion workflows, storage systems, and real-time processing capabilities. - Design technical pathways for integration of geostationary and polar-orbiting satellite data into the Integrated Platform for Tropical Monitoring and Forecasting.

	- Recommend upgrades to ensure interoperability with forecasting models, visualization systems, and early warning dissemination workflows. • Required Profile - Degree in meteorology, atmospheric sciences, ICT engineering, or related field. - Minimum 12–15 years of experience in meteorological satellite ground systems and data processing. - Proven experience working with geostationary satellite systems (e.g., GK-2A, Himawari, GOES, Meteosat or similar). - Demonstrated experience integrating satellite products into operational forecasting environments. - Familiarity with satellite data formats, real-time ingestion systems, and visualization platforms.
Senior Operational Meteorologist	• Description of the responsibilities - Support the technical assessment of forecasting tools (WRF, data assimilation methods, etc.) - Design and deliver training modules during workshops and invitational training. - Contribute to the development of the strategic roadmap. • Required Profile - Advanced degree in meteorology or atmospheric sciences. - Minimum 15 years of operational forecasting experience. - Strong knowledge of tropical monitoring and forecasting. - Experience in delivering professional training.
ICT Hardware Expert	• Description of the responsibilities - Conduct a detailed assessment of existing ICT hardware infrastructure supporting meteorological operations within DOA. - Define technical specifications for servers, storage systems, networking architecture, backup systems, and power redundancy required for the Integrated Platform for Tropical Monitoring and Forecasting. - Provide input on high-performance computing (HPC) requirements for numerical weather prediction and data processing. - Develop indicative cost estimates for procurement, installation, and maintenance of ICT infrastructure. - Ensure scalability, cybersecurity considerations, and long-term operational sustainability. • Required Profile - Degree in ICT engineering, computer systems engineering, or related field. - Minimum 10–12 years of experience in ICT infrastructure design for meteorological, climate, or operational forecasting systems. - Proven experience in server architecture, storage systems, networking, and high-performance computing (HPC) environments for numerical weather prediction (NWP). - Experience in infrastructure planning for real-time data processing environments. - Familiarity with system resilience, redundancy, and operational continuity planning.
Project Management and Monitoring &	• Description of the responsibilities - Lead the development of the monitoring and evaluation (M&E) framework for the CTCN Technical Assistance, including

Evaluation (M&E) Specialist.	performance indicators to assess implementation progress, outputs, and expected outcomes. - Support the development and refinement of the theory of change, logical framework, performance indicators, and monitoring arrangements for the Technical Assistance, ensuring consistency across all outputs and deliverables. - Contribute to project feasibility analysis, risk assessment, and sustainability planning. - Ensure integration of gender-responsive indicators and alignment with environmental and social safeguards requirements. - Provide quality assurance for outputs, ensuring consistency between technical design and expected impact. • Required Profile - Advanced degree in international development, public policy, environmental management, or related field. - Minimum 10 years of experience in monitoring and evaluation of climate adaptation or development projects. - Demonstrated experience designing monitoring and evaluation frameworks, logical frameworks, and results-based management systems for international technical assistance or climate adaptation projects is desirable. - Experience in integrating gender and safeguards considerations into project design. - Strong analytical and reporting skills.
Coordinator	• Description of the responsibilities - Support planning, organization, and logistical coordination of stakeholder consultations, workshops, and training activities. - Facilitate communication between the implementation team and national counterparts (MARN, DOA, and relevant stakeholders). - Assist in documentation of meetings, preparation of workshop reports, consultation summaries, and administrative records. - Support tracking of activity timelines and deliverables. - Provide administrative support for reporting and compliance requirements. • Required Profile - Degree in public administration, development studies, environmental management, or related field. - Minimum 5 years of experience supporting climate, environmental, or development projects. - Experience organizing workshops, stakeholder consultations, and technical meetings. - Strong organizational, documentation, and communication skills. - Fluency in Spanish required; working knowledge of English desirable.

6. Intended contribution to impact over time:

The intended contribution of this technical assistance is to enhance El Salvador's adaptive capacity to climate change by strengthening the institutional, technical, and operational foundations required for managing climate-related hazards. The outputs of the TA will provide the technical and institutional basis for the subsequent deployment of the Integrated Platform for Tropical Monitoring and Forecasting, which is expected to improve forecast accuracy and lead time, enable earlier risk-informed and anticipatory actions in support of disaster risk management. These long-term

improvements have the potential to benefit approximately 2.5–3 million people living in high-risk coastal and urban areas.

The subsequent implementation of the Integrated Platform is expected to strengthen multi-hazard early warning systems and anticipatory action, contributing to reduced disaster-related economic losses and enhancing the protection of critical sectors, including housing, agriculture, transport, water resources, and public health.

By strengthening institutional coordination, technical readiness, and risk-informed decision-making, the TA establishes the technical and institutional foundations for the subsequent implementation of the Integrated Platform. In doing so, it supports long-term climate change adaptation and disaster risk reduction, consistent with the Nationally Determined Contribution (NDC), the National Civil Protection Plan, and the Early Warnings for All initiative.

Beyond climate change adaptation, the Technical Assistance will contribute to strengthening disaster risk management by establishing the technical and institutional foundations for monitoring and forecasting tropical weather systems—including tropical cyclones, mesoscale convective systems, tropical waves, troughs, and Tropical Upper Tropospheric Troughs (TUTTs)—that frequently trigger floods, landslides, severe thunderstorms, and other high-impact hydrometeorological hazards in El Salvador. By supporting impact-based forecasting, strengthening national early warning capabilities, and enhancing anticipatory decision-making, the Integrated Platform will enhance national preparedness, improve coordination among risk management institutions, and strengthen the country's capacity to anticipate, prepare for, and respond to disaster risks.

7. Relevance to NDCs and other national priorities:

The proposed technical assistance is fully aligned with El Salvador's national climate and development priorities, as outlined in key strategic documents:

■ Plan Nacional de Protección Civil, Prevención y Mitigación de Desastres (PNPC, 2025)

The PNPC aims to prevent, mitigate, respond to, and recover from disasters of natural and anthropogenic origin, protecting lives, property, and the environment. Its mandate, grounded in the Civil Protection Law (Art. 20) and the Constitution, defines the political, administrative, and technical strategies for disaster risk reduction. The Plan promotes a culture of prevention and resilience, inter-institutional coordination, and community participation, while incorporating international commitments such as the Paris Agreement, the Sendai Framework (2015–2030), and the Central American Policy for Comprehensive Disaster Risk Management (PCGIR-SICA).

■ Nationally Determined Contribution (NDC, 2021)

El Salvador's updated NDC highlights the urgent need to strengthen climate change adaptation and disaster risk management, particularly early warning capacity. Under Adaptation Objective 2: Infrastructure and Services, the NDC commits to “implement integrated multi-hazard early warning systems for disaster risk reduction and climate change adaptation, strengthening technical and institutional capacity.” This Technical Assistance directly contributes to that objective through the design of an integrated ICT-based Platform for Tropical Monitoring and Forecasting, strengthening the technical and institutional foundations required to deliver more timely, accurate, and actionable early warning services.

■ **Nationally Determined Contribution (NDC 3.0)**

The ongoing NDC 3.0 update further reinforces the role of multi-hazard early warning systems, anticipatory action, and climate resilience as national adaptation priorities, consistent with the UN Secretary-General’s Early Warnings for All (EW4All) initiative. The proposed Integrated Platform for Tropical Monitoring and Forecasting provides a key enabling technology to support these priorities by strengthening climate information services, impact-based forecasting, and risk-informed decision-making across multiple adaptation sectors.

■ **Agenda Digital 2020–2030**

Led by the Secretariat of Innovation, this agenda includes Objective 2.5.4: “Promoting the application of new technologies through national and international cooperation.” The proposed ICT-based integrated platform directly contributes by introducing advanced forecasting systems, real-time data analytics, and smart alert mechanisms—fostering innovation and strengthening national preparedness.

8. **Linkages to relevant parallel on-going activities:**

Several ongoing and planned initiatives in El Salvador provide a solid foundation for the proposed CTCN assistance, which will enhance national resilience to climate risks, particularly hurricanes, floods, and landslides.

At the policy level, the **National Climate Change Plan** outlines adaptation and mitigation measures to reduce vulnerabilities and greenhouse gas emissions, while El Salvador’s **updated NDC (2021)** identifies strengthening meteorological infrastructure and disaster preparedness as key adaptation priorities. The **NDC 3.0** is expected to include Early Warning Systems as a national adaptation action. In parallel, the **Post-Disaster Needs Assessment (PDNA)** and **Disaster Recovery Framework (DRF)** developed after Tropical Storms Amanda and Cristobal (2020) recommend institutionalizing disaster risk financing, localized forecasting, and early warning systems.

At the operational level, the **Dirección General del Observatorio de Amenazas y Recursos Naturales (DOA)** under MARN has strengthened forecasting capacities using global and open-source resources, including NOAA hurricane bulletins, ECMWF model outputs, and satellite data from NOAA-GOES and GEONETCast. Forecast products are currently generated through manual processing and visualization workflows. Recognizing these operational limitations, DOA has initiated efforts toward establishing an **Integrated Platform for Tropical Monitoring and Forecasting**.

This initiative has been informed by a **pre-feasibility study supported by the Government of Korea** and implemented by the Korea Meteorological Institute (KMI) in partnership with GI E&S. The study provided institutional diagnostics, system assessments, and strategic guidance for platform design, but did not include detailed system engineering, capacity development frameworks, or financial structuring for implementation.

The proposed CTCN Technical Assistance will build upon this groundwork and complement the ongoing Korea–El Salvador collaboration by translating the findings and strategic recommendations of the pre-feasibility assessment into detailed technical specifications, system architecture, institutional strengthening, and capacity development for the Integrated Platform for Tropical Monitoring and Forecasting. In doing so, it bridges the gap between the initial pre-feasibility assessment and the subsequent implementation of the Integrated Platform, ensuring coherence with national priorities, the PDNA and DRF recommendations, the Sendai Framework for Disaster Risk Reduction, and international initiatives such as Early Warnings for All (EW4All).

9. **Anticipated follow up activities after this technical assistance is completed:**

Following completion of this Technical Assistance, the primary focus will shift towards the implementation of the Integrated Platform for Tropical Monitoring and Forecasting, using the outputs of the TA as the technical and institutional foundation for the project.

1. Strategic Roadmap and System Architecture Framework

The roadmap, system architecture, and technical specifications developed under this TA will serve as the technical and institutional foundation for the subsequent implementation of the Integrated Platform for Tropical Monitoring and Forecasting. The implementation project, to be financed through a national loan, will support the deployment of the required national-scale infrastructure, software, system integration, and associated institutional and capacity development components.

MARN and DOA will use these outputs to guide subsequent project preparation and implementation activities, including detailed feasibility and engineering studies, refinement of cost estimates, procurement planning, phased implementation arrangements, environmental and social safeguards assessments, gender action planning, and investment cost structuring.

The outputs of the TA will also provide key technical and institutional inputs for the Business Process Reengineering (BPR) and Information Strategy Planning (ISP) activities to be undertaken during the implementation of the Integrated Platform. The BPR and ISP activities will further refine institutional processes, operational workflows, information systems, and governance arrangements necessary to support the national-scale deployment, operation, and long-term sustainability of the Integrated Platform within MARN and DOA.

2. Capacity Development Framework

The capacity development framework and training infrastructure concept developed under this TA will be incorporated into the implementation of the Integrated Platform to ensure long-term operational sustainability. These outputs will guide the establishment of structured training programmes, competency standards, certification pathways, and institutional strengthening measures to support the operation, maintenance, and continuous evolution of the Integrated Platform throughout its operational lifecycle.

Role of the NDE and Project Proponent

MARN, acting as both the Project Proponent and National Designated Entity (NDE), will oversee the post-completion follow-up of the Technical Assistance, ensure the continued application of its outputs throughout the implementation of the Integrated Platform, and coordinate monitoring and reporting on their use and effectiveness.

Through this structured transition from technical design to implementation, the TA will ensure continuity between the pre-feasibility assessment, detailed system design, institutional strengthening, and the deployment of the Integrated Platform for Tropical Monitoring and Forecasting. By providing the technical and institutional foundations for implementation, the TA will contribute to strengthening long-term adaptive capacity, disaster risk management, and national resilience to tropical weather-related hazards.

10. Gender and co-benefits:

Embedded in design of the activities:	<i>A gender mainstreaming analysis is mandatory to include for all technical assistances. A gender expert will be assigned to carry out an assessment and evaluation regarding gender mainstreaming and will develop a gender action plan (GAP) to be followed during the implementation of the TA.</i>
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	<i>This will include the following components:</i> • <i>Analysis of gender disparities (assess the situation of gender disparities in the context of the project, including socio-economic, cultural, and institutional factors. Identify areas where inequalities exist, etc.).</i> • <i>Data collection (collect and analyse gender-disaggregated data to understand the specific needs and preferences of different genders).</i> • <i>Adaptive and gender-responsive design (evaluate the project design to ensure that it takes into account the different roles, responsibilities, and interests of different genders. Analyse how the project can empower marginalized genders and promote gender equality).</i> • <i>Gender and innovation ecosystem (evaluate how the proposed technologies could promote women as entrepreneurs).</i> • <i>Gender budgeting (budget allocation to guide gender mainstreaming activities. Also ensure that gender-specific needs are adequately funded).</i> <i>In addition, please describe all support to gender aspects, women’s equality and other co-benefits embedded into the Response Plan (please include a reference to the actual gender mainstreaming-related activities and outputs as described in section 3).</i>
Gender and co-benefits intended as result of the activities:	<i>Please describe all gender aspects, women’s equality and other co-benefits expected as a result of the CTCN technical assistance.</i> Gender Equality and Co-benefits The Technical Assistance will integrate gender mainstreaming across all activities to ensure that the development of the Integrated Platform for Tropical Monitoring and Forecasting contributes to equitable climate adaptation outcomes. A gender-responsive approach will be applied through: • Conducting a gender-sensitive assessment during the institutional and technical diagnostics to identify barriers to women’s participation in meteorology, ICT systems, and disaster risk management. • Ensuring balanced representation of women and men in consultations, workshops, and knowledge exchange activities, with targeted outreach to encourage women professionals’ participation. • Incorporating gender considerations into the capacity development framework, including recommendations for structured training pathways that support women’s professional advancement in technical and leadership roles. • Integrating gender-responsive indicators and recommendations into the technical and institutional outputs of the TA to support gender-responsive implementation and long-term operation of the Integrated Platform. By strengthening women’s participation in climate technology, tropical monitoring and forecasting, and disaster risk management—fields traditionally underrepresented by women—the TA contributes to reducing

	structural gender gaps and enhancing inclusive decision-making in national climate adaptation planning. Other Co-benefits - Social: Enhanced forecast accuracy and lead time will support anticipatory action, targeted evacuation, and risk-informed planning, reducing the disproportionate impacts of hurricanes on socially vulnerable populations, including low-income communities, women-headed households, Indigenous peoples, and persons with disabilities who are often concentrated in high-exposure areas. - Economic: Improved forecasting and early warning capacity will enable anticipatory actions such as pre-positioning of emergency resources, temporary protection of critical infrastructure, timely suspension of vulnerable activities, and activation of contingency plans. While accurate forecasts alone cannot prevent damage, they provide the decision window necessary to reduce avoidable economic losses. By supporting earlier and risk-informed actions, the TA can help lower disaster-related impacts on infrastructure, agriculture, transport, and public services, thereby reducing recovery costs and strengthening fiscal resilience in a highly climate-exposed economy. - Institutional: The TA will institutionalize anticipatory decision-making by strengthening coordination mechanisms, standardizing operational workflows, and improving real-time information exchange between meteorological, disaster risk, and sectoral authorities. This shift from reactive response to coordinated anticipatory action will enhance governance capacity and embed climate risk management into routine institutional processes. - Environmental: Improved forecasting and extended lead time will enable earlier risk management measures to reduce secondary environmental impacts associated with hurricanes, such as uncontrolled debris, contamination, erosion, and damage to fragile coastal and forest ecosystems. By supporting anticipatory actions and better land-use and emergency planning, the TA contributes to safeguarding biodiversity and reducing long-term ecosystem degradation in highly exposed areas.
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11. Main in-country stakeholders in implementation of the technical assistance activities:

In country stakeholder	Role in implementation of the technical assistance
National Designated Entity	Ministerio de Medio Ambiente y Recursos Naturales (MARN) , the lead coordinating institution for the Technical Assistance; responsible for strategic oversight, ensuring alignment with national climate priorities, facilitating inter-agency coordination, providing access to relevant data and personnel, and hosting national consultations and capacity-building activities.
Request Applicant	Ministerio de Medio Ambiente y Recursos Naturales (MARN) , through the Dirección General del Observatorio de Amenazas y

	Recursos Naturales (DOA), which has formally requested this Technical Assistance to enhance institutional and technical capacity for Tropical Monitoring and Forecasting and to advance the establishment of an Integrated Platform for Tropical Monitoring and Forecasting.
Climate Technology Centre and Network (CTCN)	Coordinate the delivery of the technical assistance; mobilize expert organizations; ensure alignment with CTCN procedures and the Paris Agreement's technology framework; provide quality assurance, monitoring, and reporting throughout the implementation.
National Civil Protection	Provide operational data and participate in consultations and technical assessments to support the design and validation of early warning dissemination and anticipatory action protocols within the Integrated Platform.
Korean Meteorological Administration (KMA)/ Korea Meteorological Institute (KMI)	Provide technical knowledge exchange and share operational best practices related to integrated cyclone monitoring and forecasting systems. Contribute expertise during study visits and technical consultations to inform the strategic design, capacity development framework, and system architecture of the Integrated Platform for Tropical Monitoring and Forecasting.
Implementing Institute	Serve as the lead implementing partner responsible for delivering all technical outputs under the Response Plan, including institutional and technical assessments, system architecture and technical design, strategic roadmap development, and preparation of the capacity development framework for the Integrated Platform for Tropical Monitoring and Forecasting. Ensure technical quality, coordination among experts, and compliance with CTCN requirements and timelines.

12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here:*

<https://sustainabledevelopment.un.org/partnership/register/>.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	

	7.1 - By 2030, ensure universal access to affordable, reliable, and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency, and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient, and sustainable	The TA directly contributes by establishing the technical and institutional foundations for improved tropical monitoring, impact-based forecasting, and anticipatory early warning. By strengthening preparedness and risk-informed decision-making in both urban and rural areas, the TA supports safer and more resilient human settlements exposed to climate-related hazards.
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	<i>All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).</i>
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	The TA directly contributes by developing the strategic roadmap, system architecture, and technical design for an Integrated Platform for Tropical Monitoring and Forecasting. By establishing the technical and institutional foundations for its subsequent implementation, the TA will strengthen El Salvador's capacity to

		enhance impact-based forecasting, early warning capabilities, and anticipatory decision-making, thereby supporting long-term resilience and adaptive capacity to tropical weather-related hazards.
	13.2 - Integrate climate change measures into national policies, strategies, and planning	
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning	Through the development of a structured capacity development framework, certification pathways, international knowledge exchange, and the conceptual design of a dedicated forecasting training laboratory, the TA strengthens national human and institutional capacity for climate risk management, impact-based forecasting, and anticipatory early warning.
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth, and local and marginalized communities	
14	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development	
15	Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
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	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	The TA contributes by strengthening international cooperation between El Salvador, the CTCN, the Republic of Korea, and other technical partners through technology development and transfer, knowledge exchange, and institutional

		capacity development. By establishing the technical and institutional foundations for the Integrated Platform for Tropical Monitoring and Forecasting, the TA enhances national readiness for technology deployment and supports long-term partnerships for climate change adaptation and disaster risk management.
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13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	Primary	Secondary
☐ 1. Decision-making tools and/or information provision	☐	☐
☐ 2. Sectoral roadmaps and strategies	☐	☒
☐ 3. Recommendations for law, policy, and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	☐
☐ 6. Research and development of technologies	☐	☐
☐ 7. Feasibility of technology options	☒	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☐
☐ 9. Technology identification and prioritisation	☐	☐

Please note that all CTCN technical assistance contributes to strengthening the capacity of in-country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; and (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance. Furthermore, the NDE together with the project proponent(s) will complete a periodic post-implementation form to track the impact of the activities beyond the technical assistance end date.