

## Annex 1 – Template for CREWS Action Presentation Note

<b>Action Title</b>	Strengthening Early Warning Systems in Belize, Guyana, Jamaica and Suriname through improving Satellite and Weather Radar Data Utilization
<b>Country(ies)</b>	Belize Guyana Jamaica Suriname
<b>Partner Country Entity / Entities</b>	National Hydrometeorological Services of the Target Countries of Belize, Guyana, Jamaica and Suriname With support of the Caribbean Meteorological Organization (CMO) and the Caribbean Institute for Meteorology and Hydrology (CIMH)
<b>Implementing Partner (if submission by Implementing Partner)</b>	Submission by WMO
<b>Implementing Partner Requested (if submission by Partner Country)</b>	<i>Select at least 1:</i> <input type="checkbox"/> World Bank/GFDRR <input checked="" type="checkbox"/> WMO <input type="checkbox"/> UNDRR <input type="checkbox"/> No preference
<b>Action Type</b>	<i>Select at least 1:</i> <input checked="" type="checkbox"/> Continued Assistance <input type="checkbox"/> Analyses and Assessments <input type="checkbox"/> Advisory Services
<b>Early Warning System Element(s) Supported</b>	<i>Select at least 1:</i> <input checked="" type="checkbox"/> Monitoring, detection, analysis and forecasting of hydro-meteorological hazards providing lead-times for action <input type="checkbox"/> Dissemination of timely and authoritative warnings <input type="checkbox"/> Preparedness and response plans triggered by warnings and weather and climate predictions <input checked="" type="checkbox"/> Disaster risk knowledge based on the systematic collection of data and disaster risk assessment
<b>Contributions to CREWS Programming Principles and Results Framework</b>	<b>CREWS Programming Principles addressed:</b> <i>Select all relevant:</i> <input checked="" type="checkbox"/> People-centered <input checked="" type="checkbox"/> Gender-responsive <input checked="" type="checkbox"/> Promotes Coherence <input checked="" type="checkbox"/> Leverage  <b>CREWS Results Framework Outputs to which the Action is expected to contribute to:</b> <i>Select at least one:</i> <input checked="" type="checkbox"/> NMHSs' service delivery improved, including the development of long-term service delivery strategies and development plans

	<ul style="list-style-type: none"> <li><input type="checkbox"/> Risk information to guide early warning systems and climate and weather services developed and accessible</li> <li><input checked="" type="checkbox"/> Info. and comm. tech., including common alerting protocols, strengthened</li> <li><input type="checkbox"/> Preparedness and response plans with operational procedures that outlines early warning dissemination processes strengthened and accessible</li> <li><input type="checkbox"/> Knowledge products and awareness programmes on early warnings developed</li> <li><input type="checkbox"/> Gender-responsive training, capacity building programmes provided</li> </ul> <p><b>CREWS Programme Indicators to which the Action is expected to contribute to:</b>  <i>Select at least one:</i></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Loss of life</li> <li><input checked="" type="checkbox"/> Forecasting and warning capacity</li> <li><input checked="" type="checkbox"/> Access to early warning</li> <li><input type="checkbox"/> Use of risk information</li> <li><input type="checkbox"/> Capacity to disseminate warnings</li> <li><input type="checkbox"/> Capacity to prepare for and respond to warnings</li> </ul>
<p><b>Specific Action and Objectives</b></p>	<p><b>Overall Objective</b>  The project aims to improve national capacity in Belize, Guyana, Jamaica, and Suriname to utilize satellite data for early warning, alongside strengthened radar operation and maintenance capacity in Belize as a pilot for future regional initiatives.</p> <p><b>Outcomes</b>  This pilot project will enhance the technical capacity and operational readiness of targeted countries to effectively utilize satellite data for hazard monitoring and early warning. The proposed project further aims to strengthen national capacity to operate and maintain weather radar systems. Together, these efforts will support more timely and accurate forecasting, better risk-informed decision-making, and improved delivery of EW Services, particularly for vulnerable communities.</p> <p><b>Outputs</b></p> <p><b>1.1 Improved data reception and dissemination infrastructure in Belize, Guyana, Jamaica, and Suriname:</b></p> <ul style="list-style-type: none"> <li>• Install and/or upgrade satellite receivers (GEONETCast Americas) and internet-based systems (UNIDATA IDD) to establish resilient, redundant data reception systems. These systems will be fully compatible with current satellite missions (GOES-R and JPSS) and designed to support the upcoming <a href="#">GeoXO</a> series, scheduled for launch in 2032.</li> <li>• Conduct system updates during face-to-face capacity-building workshops, equipping local technicians with the skills to maintain and troubleshoot infrastructure, fostering long-term operational self-reliance and reducing dependency on external support. (budgeted in 1.2)</li> </ul> <p><b>1.2 Comprehensive training program for technical staff from National Hydrometeorological Services of Belize, Guyana, Jamaica, and Suriname, in strong collaboration with regional training bodies like the Caribbean Institute for Meteorology and Hydrology (CIMH)</b></p> <ul style="list-style-type: none"> <li>• Develop online training materials for satellite data utilization (modules, videos, and manuals) covering: <ol style="list-style-type: none"> <li>a) Training on the installation, repair, and maintenance of hardware/software for satellite and internet receivers</li> <li>b) Troubleshooting technical challenges during system readiness</li> <li>c) Product generation using Python and freely available software</li> </ol> </li> </ul>

- d) Updates on [GeoXO](#) and [NEON](#) missions and the transition to the NESDIS Common Cloud Framework (NCCF)
- Deliver trainings for satellite data utilization:
  - a) Online Phase: Foundational theory and system application using developed training materials.
  - b) Face-to-Face Phase: Two hands-on workshops held for system updates and upgrades, including tabletop exercises as case studies.
- Ensure sustainability and ongoing support
  - a) Establish a regional technical response team composed of experienced satellite data users (volunteer basis) (including those familiar with GEONETCast and UNIDATA systems). This team will offer peer-to-peer support on a best-effort basis during critical phases of implementation, system upgrades, and troubleshooting.
  - b) Define a framework for a regional, volunteer-driven support mechanism, aligned with existing regional coordination efforts, including social media groups and professional networks, to form a sustainable regional knowledge-sharing network. This mechanism will strengthen community-based knowledge retention and capacity sharing

**1.3 Enhanced monitoring of priority hazards in Caribbean region through tailored satellite products and project-supported infrastructure, with a focus on Belize, Guyana, Jamaica and Suriname**

- Conduct a comprehensive regional analysis to identify gaps in satellite data access, processing, and utilization, as well as training needs for effective monitoring of priority hazards.
- Develop and pilot project target country specific satellite products tailored to the user needs, ensuring alignment with national priorities identified in the gap analysis.
- Distribute the products through project-supported infrastructure to enable sustained operational use and potential scalability across the region.
- Continue to promote long-term sustainability through the WMO Satellite Data Requirements Group by collaborating with satellite data providers to support the continued maintenance, enhancement, and regular updates of these products based on evolving user needs and technological developments.

**1.4 Build critical technical capacity for sustainable weather radar operations and maintenance in Belize (as pilot country)**

- Co-develop a specialized factory training program in collaboration with the radar manufacturer, focusing on weather radar operation, maintenance, and communication systems.
- Organize capacity building in this specialized factory training program, initially for two technicians from Belize to build technical expertise and ensure long-term operational reliability and sustainability of the national radar system. (see below, based on a special request from CMO & the National Meteorological Service of Belize)

**Need and Rationale**

Recent assessments highlight a critical gap in technical capacity across many countries in the Caribbean region, limiting their ability to generate effective early warnings for a range of weather hazards. These include the key hazards in the region - thunderstorms, tropical cyclones, heavy rainfall, lightning, strong winds, and heatwaves. This gap puts especially the most vulnerable populations at risk. Satellite data offers a transformative solution, delivering real-time, high-accuracy information essential for weather monitoring, forecasting, and decision-making.

To better understand regional needs, the WMO Coordination Group on Satellite Data Requirements for RA-III (South America) and RA-IV (North, Central America & the Caribbean) conducted a comprehensive survey in 2022. The findings revealed several challenges, including inadequate data reception, storage, and processing infrastructure, as well as frequent technician turnover and persistent hardware issues, which underscore the urgent need for ongoing training. The WMO Early Warnings for All (EW4All) Rapid Assessment on Pillar 2 (Observations and Forecasting) further revealed that many countries underutilize remote sensing data due to limited access and insufficient training. Key infrastructure weaknesses include a lack of redundancy in satellite data reception systems, with many nations relying on websites as their sole backup. Technical capacity gaps are particularly evident among countries equipped with GRB (GOES Rebroadcast) or GNC-A (GEONETCast-Americas) systems, which often lack the necessary training for operation and maintenance. Moreover, the transition to advanced cloud-based data dissemination technologies has been hindered by the need for specialized skills.

The CMO Weather Radar Network, a cornerstone of the region's nowcasting capacity, is constrained by declining technical expertise in radar operations and maintenance. The CMO Operational Radar Group (CORG), established in 2019, has identified limited technician training, loss of institutional knowledge, raw radar data retrieval issues, and insufficient access to dual-polarization training as urgent barriers to operational continuity. Without sustained radar operations and skilled personnel to interpret radar outputs, countries risk missing the most dangerous, rapid-onset events.

This Accelerated Support Window Proposal seeks to address these challenges through a targeted pilot in Belize, Guyana, Jamaica and Suriname. Based on the WMO EW4ALL Rapid Assessment of Pillar 2 and discussions between representatives from these countries and the WMO Coordination Group on Satellite Data Requirements, it has been identified that Jamaica and Guyana lack access to near real-time satellite data, while Suriname and Belize rely solely on cloud-based systems and do not have redundant infrastructure in place. The initiative aims to strengthen EWS by improving satellite data reception, processing, and utilization. This will include the deployment of ground stations capable of receiving GEONETCast data relayed via a commercial satellite, as well as the implementation -or improvement, where applicable - of state-of-the-art cloud-based systems. Key activities will include developing training materials, building example systems, and delivering hands-on training to enhance local technical capacity.

	<p>In addition to satellite-related component, the project will support Belize, as a pilot country, by providing regional training for weather radar operation technicians, as requested by Caribbean Meteorological Organization and the Director of the National Meteorological Service of Belize during the Caribbean SOFF Regional Workshop held in Kingston, Jamaica, in May 2025 (supported through the related CREWS Caribbean 2.0 initiative). Belize specifically identified limited technician training and the loss of institutional knowledge as an urgent barrier to operational continuity. Delivered by the weather radar manufacturer, this training will serve as a model for broader regional implementation, benefiting other Caribbean countries.</p>
<p><b>Alignment</b></p>	<p>The proposed action directly supports CREWS programming principles by being people-centered, ensuring timely and accessible warnings tailored to community needs, and gender-responsive, by promoting inclusive participation and addressing the needs of vulnerable populations. It enhances coherence and leverage by aligning with national and regional strategies, including ongoing SOFF and WMO-supported efforts, thereby maximizing the impact of investment. This action contributes to improved service delivery by strengthening the capacity of the National Meteorological and Hydrological Services, supporting long-term planning, and improving infrastructure and tools needed for forecasting and communication. It also enhances forecasting and warning capacity through the integration of satellite data, real-time monitoring, and training of technical staff.</p> <p>These improvements collectively aim to reduce the loss of life by enabling earlier, more accurate, and actionable warnings. By building institutional and technical capacity, the initiative supports Suriname in delivering more effective, equitable, and trusted early warning services. They directly align with the ongoing CREWS Caribbean 2.0 project – in targeting critical gaps that cannot be covered by the project budget, while at the same time including key stakeholders of the project, and building on project activities (SOFF regional workshop). It further aligns with the ongoing ASW Belize initiative, which supported the development of an SEB analysis for the Met Service, as well as the development of an EW4All roadmap in the country. This process identified critical barriers which through this project proposal shall be addressed – with an impact to the whole region.</p>

<b>Timeframe</b>	12 Months
<b>Action Cost (To be completed by Implementing Partner)</b>	USD 250,000
<b>Attachments</b>	Attachment 1: Budgeted Workplan

## Attachment 1: Budgeted Workplan

Outcome	Output	Activities	Target Country	Indicators	Allocated Budget (USD)
1. Enhanced technical capacity and operational readiness of targeted countries to effectively utilize satellite and weather radar data for hazard monitoring and early warning	1.1 Improved data reception and dissemination infrastructure in Belize, Guyana, Jamaica, and Suriname	Procure/install a turn-key satellite receiver (GEONETCast-Americas) system	Belize Guyana Jamaica Suriname	- # of satellite stations installed and operational - # of stations with redundant data channels - Turn-key system installation completed - Vendor post-installation report submitted	132,500
		Prepare: Antenna Foundation for the antenna + conduit run from the base of the antenna to the indoor equipment	Belize Guyana Jamaica Suriname	- Foundation prepared by each NMHS in accordance with vendor specifications prior to antenna installation	8,000
		Procure internet-based (UNIDATA IDD) system	Belize Guyana Jamaica Suriname	- Delivery of pre-configured single-board computers to each site. - GEONETCast solution integrated	32,000
	1.2 Comprehensive training program for technical staff from National Hydrometeorological Services of Belize, Guyana, Jamaica, and Suriname	- Develop online training materials for satellite data utilization (modules, videos, and manuals) - Deliver trainings for satellite data utilization (online & face-to-face) - Ensure sustainability and ongoing support	Belize Guyana Jamaica Suriname	- # of staff trained  <i>Two workshops to be organized in two of the four countries - Participation of two technicians from the remaining two countries and two trainers per workshop.</i>	23,739
	1.3 Enhanced monitoring of	- Conduct a regional analysis to identify gaps in satellite data access, processing, and	Caribbean Region +	- Gap analysis and list of products completed	No associated costs

	<p>priority hazards in Caribbean region through tailored satellite products and project-supported infrastructure, with a focus on Belize, Guyana, Jamaica and Suriname</p>	<p>utilization, as well as training needs for effective monitoring of priority hazards</p> <ul style="list-style-type: none"> <li>- Develop and pilot project target country specific satellite products</li> <li>- Distribute the products through project-supported infrastructure to enable sustained operational use and potential scalability across the region</li> <li>- Continue to promote long-term sustainability through the WMO Satellite Data Requirements Group by collaborating with satellite data providers to support the continued maintenance, enhancement, and regular updates of these products</li> </ul>	<p>Belize Guyana Jamaica Suriname</p>	<p>- Evidence of activities conducted by the WMO Coordination Group on Satellite data Requirements for RA III and RA IV provided</p>	
	<p>1.4 Build critical technical capacity for sustainable weather radar operations and maintenance in Belize (as pilot country)</p>	<ul style="list-style-type: none"> <li>- Co-develop a specialized factory training program in collaboration with the radar manufacturer</li> <li>- Organize capacity building in this specialized factory training program</li> </ul>	<p>Belize</p>	<ul style="list-style-type: none"> <li>- # of Belizean technicians trained (target : 2)</li> <li>- Post-training feedback or assessment report submitted</li> </ul>	<p>12,500</p>
Travel Costs & Technical Advisory					12,500
<b>Direct Costs</b>					<b>221,239</b>
<b>WMO Project Support Cost (13%)</b>					<b>28,761</b>
<b>Total Project Budget</b>					<b>250,000</b>