



# Sectoral Guide on Climate Information and Early Warning Systems

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# OUTLINE



**Context: Why invest in CIEWS?**

**Pathway 1: Climate Information Services**

- Modernisation of hydromet services
- Regional hydromet programmes

**Pathway 2: Impact-Based MHEWS & Early Action**

- Multi-Hazard Early Warning Systems
- Anticipatory Action/Forecast-based Action

**Pathway 3: CIEWS for investment and financial decisions**

- Climate-resilient infrastructure
- Climate analytics for managing financial risks in public and private sector markets

**Catalyzing Public and Private Sector Finance**

**Drivers of paradigm-shifting pathways and cross-sectoral linkages**

**Case Studies**



# CONTEXT

# Why invest in CIEWS? (I)



- Disasters worldwide 1970–2019:
  - 79% hydromet hazards
  - 56% of deaths and 75% of economic losses
  - 1.4 million deaths in LDCs
  - 0.2% of GDP
- Disasters increasing as climate change gathers pace
- Significant risk to the Paris Agreement and SDGs
- Desired transformation:
  - investments for both adaptation and mitigation
  - reliable Climate Information Services and Impact-Based Multi Hazard Early Warning Systems to support well-informed, science-based decision-making

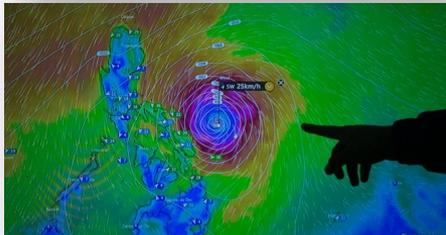


# Why invest in CIEWS? (II)



- 2019 NDCs show a significant demand for CIEWS: Request for hydromet modernisation from
  - 96% of countries in Africa
  - 83% in Asia
  - 82% in South America
- WMO CIEWS assessments:
  - 49% of countries have fully established CIS user interfaces
  - 52% of countries in Africa, 21% in Asia, 42% in South America, 14% of South West Pacific, 16% of SIDS and 49% of LDCs have no fit-for-purpose MHEWS

# Why invest in CIEWS? (III)



- Growing demand for GCF to support CIEWS
  - 21 % for modernising hydromet (generation of CIEWS)
  - 79% for sector applications (use of CIEWS)
- Paradigm shift achieved through:
  - systematic investment in CIEWS value chain
  - incentivising use of CIEWS for investments and analytics
  - supporting long term planning and preparedness
  - promoting low emission and climate resilient development
- Without GCF support, the majority of developing countries will not be able to establish and operate the fit-for-purpose hydromet services required to achieve this paradigm shift

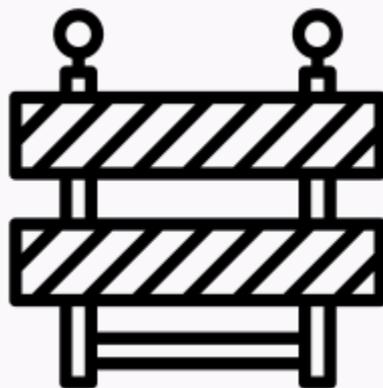
# BARRIERS AND OPPORTUNITY FOR GCF'S IMPACT



Lack of enabling environment for **institutional effectiveness**



Lack of coverage and scale for effective service delivery in terms of quantity and quality of **hard infrastructure** and inadequate **soft infrastructure** for ensuring delivery and uptake of information.



**Uncoordinated interventions** limit the effectiveness of existing support to developing countries.

Limited governmental finances and **budgets** allocated to NMHS & NDMA.



The **complexities of forecasting**

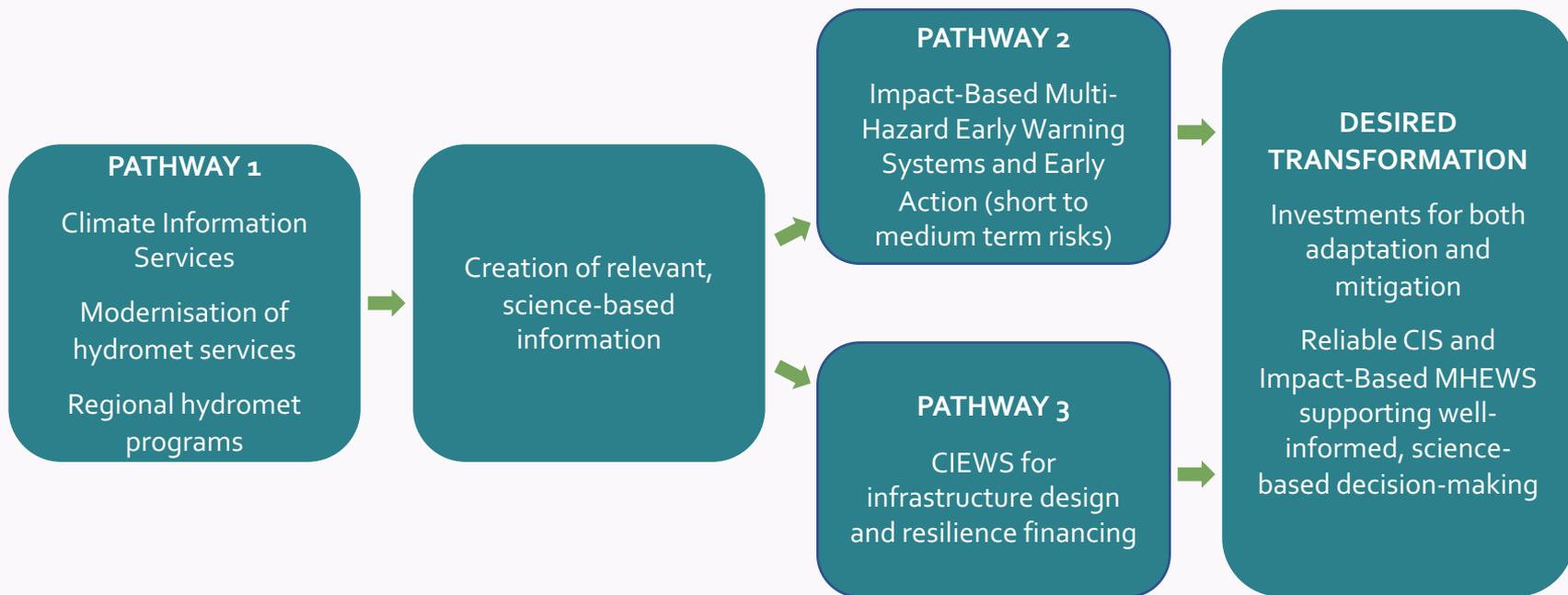


**Market barriers** to creating enabling conditions



# PARADIGM SHIFTING PATHWAYS

# CONCEPTUAL FRAMEWORK OF THE PARADIGM-SHIFTING PATHWAYS



# PATHWAY 1: CLIMATE INFORMATION SERVICES



## *Making robust climate services widely available*

- Supporting development of CIS through modernisation of hydromet services:
  - technical capacity development (optimization, gap-filling and upscaling)
  - digital technologies/e-infrastructure to transform the generation, management and delivery of climate services
  - Operationalization of the GFCS
  - business delivery models (PPP, GBON/SOFF, blended finance)
  - drive uptake and investments (policy, governance and political)
  - institutional effectiveness
- Enabling creation of relevant, science-based information for pathways 2 and 3
- Two subcomponents:
  - modernisation of hydromet services
  - regional hydromet programmes (economy of scale)

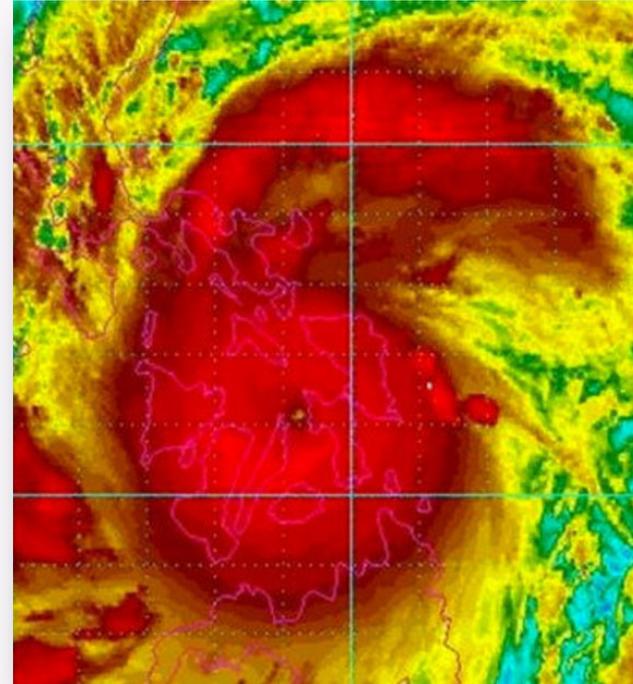


## PATHWAY 2: IMPACT-BASED MHEWS AND EARLY ACTION



### *Making robust early warning and early action services widely available*

- Modernize disaster management and related agencies, CBO and partners to ensure that investments in CIEWS result in:
  - lives saved
  - livelihoods and development gains protected
  - climate-related risks managed more effectively
- Focus on short- to medium-term risks by optimising, establishing and scaling up mechanisms for delivering IB-MHEWS, linked to:
  - community development programmes
  - governments and shock-responsive social protection mechanisms
  - International preparedness and response
  - private sector business continuity programmes
  - Forecast-based financing/action, insurance
- Two subcomponents:
  - impact-based MHEWS
  - anticipatory action (forecast-based action)



# PATHWAY 3: CIEWS FOR INFRASTRUCTURE DESIGN AND RESILIENCE FINANCING



- Climate information supporting systemic resilience frameworks; asset design and structuring; and innovative financial solutions. Improving availability of CIEWS data to help increase resilience against climate-induced damages.
- The development of CIEWS analytics for climate-resilient infrastructure will support consideration of shocks (extremes) and stresses across different decision timelines from day-to-day operations and management through to designing and planning for long-term climate change.
- The development and application of CIEWS analytics for policy and decision-making in adaptation, mitigation, and disaster risk finance and investments constitute a paradigm shift for asset owners across all GCF result areas. It will support the digital economy, weather derivatives and commodities markets, and insurance companies in protecting their investments against medium- to long-term risks.
- Five private sector areas to maximize mobilization and impact: climate funds, financial institutions, project finance, climate markets, climate technology and Innovation





# CATALYZING PUBLIC AND PRIVATE SECTOR FINANCE

## Finance

- Delivering the paradigm shift for CIEWS will require mobilisation of finance at scale
- GCF has a role in delivering this, due to flexibility of financing instruments and ability to take more risks (test, demonstrate, unlock finance)
- Given nature of the area, grant finance will often be important, but are opportunities for loans, co-financing, blended and private finance
- E.g. digital technologies, climate analytics for managing investment and financial risks

## Financial Barriers

- Existing NMHS budget deficits and availability
- Political economy – climate finance landscape
- Market failures (barriers to private investment)
  - Information
  - Positive externalities – social return higher than private return
- Challenges
  - Revenue streams and financial viability
  - Bankability
- Access to finance at local and for most vulnerable

# GCF Financial Portfolio



Instrument	Transformational Potential	Examples
Grants <i>Readiness support</i> <i>Project preparation</i> <i>Technical assistance</i> <i>Results-based grants</i>	GCF can support <ul style="list-style-type: none"><li>-Planning and institutional capacity building,</li><li>-Technical assistance</li><li>-Pipeline development, project identification, and project preparation</li><li>-Project grant financing</li></ul>	GCF project Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines,
Loans	GCF can provide <ul style="list-style-type: none"><li>-Concessional lending to match long-term nature of public investments</li><li>-Finance to leverage co-financing</li><li>-Concessional private sector loans</li></ul>	Co-financing with MDCs, for example the Niger Basin (PIDACC/NB)
Insurance	GCF can play a role in de-risking new insurance products, market development, including financing technical assistance for new insurance services or other emerging financial instruments in this area.	GCF project Africa Integrated Climate Risk Management Programme is addressing insurance barriers and strengthening climate weather information services

# GCF Financial Portfolio

Instrument	Transformational Potential	Examples
Guarantees and equity	<p>GCF can help to de-risk investment</p> <ul style="list-style-type: none"> <li>-GCF can issue partial (first loss) risk guarantees</li> <li>-Can be an anchor investor in equity funds</li> </ul>	<ul style="list-style-type: none"> <li>•GCF project Acumen Resilient Agriculture Fund (ARAF), providing a GCF equity broadly matching co-financing equity.</li> </ul>
Bonds	<p>Targeted bonds can help overcome financing barriers to both public and private investment.</p> <p>GCF can provide partial credit guarantees to de-risk bond issuance, or support capacity building for the creation of resilience bond facilities</p>	<ul style="list-style-type: none"> <li>• Catastrophe bonds (disaster bonds) and resilience bonds</li> </ul>
Public-private partnerships	<p>Leverage private investment for public delivery</p> <p>GCF can play a role in technical assistance and institutional strengthening for climate-targeted or climate proofing PPP infrastructure</p> <p>GCF concessional finance can be used to engage private sector with acceptable risk-reward conditions</p>	<ul style="list-style-type: none"> <li>• Allocating climate risks in PPPs, with tools to increase government capacity to manage.</li> </ul>



# DRIVERS OF PARADIGM-SHIFTING PATHWAYS AND CROSS- SECTORAL LINKAGES

Sector	Actions across the drivers of the GCF Strategic Plan			
Climate Information and EWS	Transformational planning and programming	Catalyzing climate innovation	Mobilizing finance at scale	Coalitions and knowledge to scale up success
<p><b>Pathway 1:</b> Climate Information Services</p>	<ul style="list-style-type: none"> <li>• Support establishment of National Framework for Climate Services to strengthen generation and uptake of climate services</li> <li>• Mainstream CIS in policies and plans across all priority sectors</li> <li>• Enhance CIS for projects across the 8 result areas, NAPs, NDCs and national development plans</li> <li>• National and regional optimisation of investments in hydromet</li> </ul>	<ul style="list-style-type: none"> <li>• Support establishment of National Operationalize GFCS at scale</li> <li>• Enhance hydromet service provision, optimising infrastructure through regionalisation and gap-filling.</li> <li>• New public-private partnership business delivery models</li> <li>• E-infrastructure to reduce cost and enhance efficiency</li> <li>• Create enabling environment for growth in hydromet services</li> </ul>	<ul style="list-style-type: none"> <li>• Optimise GCF financial instruments to match needs of beneficiaries</li> <li>• Innovative financing solutions (including blended finance)</li> <li>• Enhance resource mobilise from SOFF, GEF, AF</li> <li>• Ring-fence national climate funds and other funding sources for hydromet services</li> <li>• Scale up government budgetary allocation for hydromet services</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge platforms for sharing best practices in modernisation of climate services</li> <li>• Institutional collaborative platforms to enhance knowledge in CIS, digital technologies and business delivery models</li> <li>• Identify best practices and lessons learned to strengthen political, policy and governance capacity in hydromet services</li> </ul>

Sector	Actions across the drivers of the GCF Strategic Plan			
Climate Information and EWS	Transformational planning and programming	Catalyzing climate innovation	Mobilizing finance at scale	Coalitions and knowledge to scale up success
<b>Pathway 2: Impact-Based MHEWS and Early Action</b>	<ul style="list-style-type: none"> <li>• Integrate IB-MHEWS in planning, policy and decision making at all levels</li> <li>• Enhance mechanisms for strengthening capacity at all stages of IB-MHEWS value chain</li> <li>• Community engagement in designing and implementing forecast-based action at all levels</li> <li>• Project pipeline development</li> </ul>	<ul style="list-style-type: none"> <li>• Make fit-for-purpose IB-MHEWS widely available by strengthening capacity</li> <li>• Enhance community-based MHEWS through capacity building of communities, and institutions</li> <li>• Pilot disaster communication systems using digital technologies</li> <li>• Enhance mechanisms for delivering and scaling up FbA</li> </ul>	<ul style="list-style-type: none"> <li>• Innovative financing solutions (including blended finance)</li> <li>• Scale FbA through dedicated funds, insurance and market-based mechanisms, standard resource allocation processes</li> <li>• Embed FbA in financing and delivery systems at scale, working with private sector and informal non-banking institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional collaborative platforms for climate-informed surveillance systems, assessments, and policies</li> <li>• Community knowledge platforms to integrate indigenous knowledge</li> <li>• Knowledge brokering, knowledge management, evaluation and learning, impact evaluation and feedback in IB-MHEWS and FbA</li> <li>• Evidence base for FbA</li> </ul>

Sector	Actions across the drivers of the GCF Strategic Plan			
Climate Information and EWS	Transformational planning and programming	Catalyzing climate innovation	Mobilizing finance at scale	Coalitions and knowledge to scale up success
<p><b>Pathway 3: CIEWS for infrastructure design and resilience financing</b></p>	<ul style="list-style-type: none"> <li>• Strengthen the use of digital technologies for climate investment and financial decisions</li> <li>• Enhance the use of climate analytics for managing financial risks in public sector markets.</li> <li>• Enhancing the use of climate analytics for managing risks in private sector markets</li> <li>• Project pipeline development</li> <li>• Promote CIEWS-based information in climate risk management and decision making under uncertainty for climate proofing projects and adaptation projects, and also for infrastructure services</li> <li>• Support action to address policy and regulatory barriers to use of information (mainstream climate in design standards) including for green infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Promote digital technologies and enabling environment for climate investment and financial decisions</li> <li>• Establish market place for digital technology in climate finance</li> <li>• Enhancing the use of climate analytics for managing financial risks</li> <li>• Promote use of CIEWS information and climate risk management and adaptation design upstream of project cycle (country, sector level)</li> <li>• Promote use of CIEWS information in system-based approaches for infrastructure (network resilience)</li> </ul>	<ul style="list-style-type: none"> <li>• Scale up financing of climate analytics and digital technologies</li> <li>• Digital technology start-up funding through crowd-sourcing</li> <li>• Climate analytics start-up funding for managing investment and financial risks in private sector through crowd-sourcing</li> <li>• Support innovative finance mechanisms for infrastructure resilience, including blended finance, risk financing, etc.</li> <li>• Integration of climate risk management in PPPs</li> <li>• Support private sector and community investment in climate-resilient infrastructure</li> <li>• Extend existing financing arrangements to enable system level and adaptation management / pathway approaches</li> </ul>	<ul style="list-style-type: none"> <li>• Establish knowledge platforms for sharing best practices in CIEWS for infrastructure climate risk management and adaptation, digital technologies and climate analytics for climate finance and investments</li> <li>• Establish Innovation hub for climate analytics</li> <li>• Support community infrastructure resilience</li> <li>• Support knowledge brokering, evaluation and learning for climate resilient infrastructure and digital technologies in climate finance</li> </ul>



# CASE STUDIES

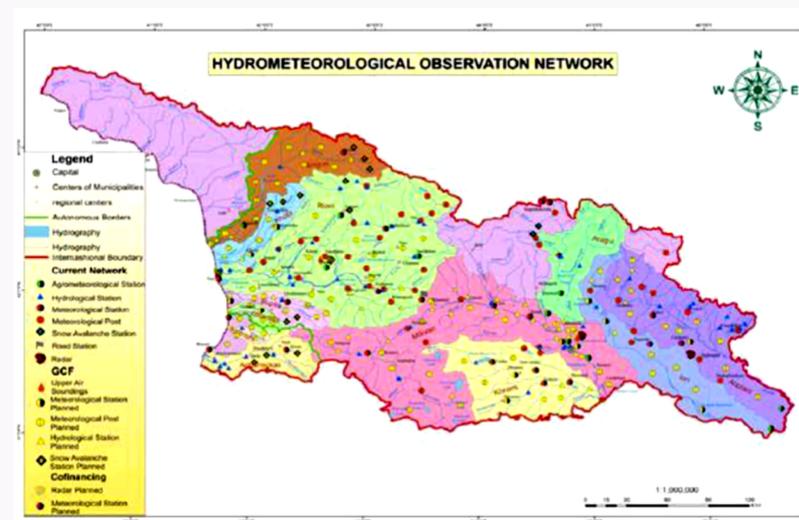
# GEORGIA: SCALING-UP MHEWS AND THE USE OF CLIMATE INFORMATION



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Georgia	USD 27.1 million	UNDP	Grant	2018

Pathway 1: Expansion of hydromet observation network and modelling capacities to provide reliable information on climate-induced hazards, vulnerability and risks:

- Modernising the hydromet agency to deliver robust CIEWS
- Significant co-financing innovations to drive down costs;
- Integrating hydromet infrastructure operations and maintenance costs as part of the government annual budgetary process to ensure sustainability of investments
- Focusing results on the most vulnerable people and communities



# PHILIPPINES: SCALING UP CURRENT INITIATIVES ON DRR AND CLIMATE CHANGE ADAPTATION



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Philippines	USD 10.0 million	Landbank of the Philippines	Grant	2019

Pathway 2: State-of-the art MHEWS linked with forecast-based actions to maximize impacts on the ground

- Adjusting to climate impacts, and implementing long-term climate risk reduction and adaptation measures
- Building on best practice in MHEWS, climate-resilient development planning and investment, and FBA to reduce risk
- High-level political buy-in to demonstrate value of GCF
- Saving lives, livelihoods and assets across multiple Results Areas, including: most vulnerable people and communities; Health and well-being; food and water security; Infrastructure and built environment; Ecosystem and ecosystem services



# LIBERIA: MONROVIA METROPOLITAN CLIMATE RESILIENCE PROJECT



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Liberia	USD 17.3 million	UNDP	Grant	2021

Pathway 3: Building long-term climate resilience of coastal communities by investing in coastal protection, coastal management and diversified climate-resilient livelihoods

- Safeguarding ecosystem services provided by mangroves through community co-management agreements
- Improving community knowledge on climate change impacts and adaptation practices
- Strengthening climate-sensitive livelihoods and supporting the uptake of climate-resilient livelihoods



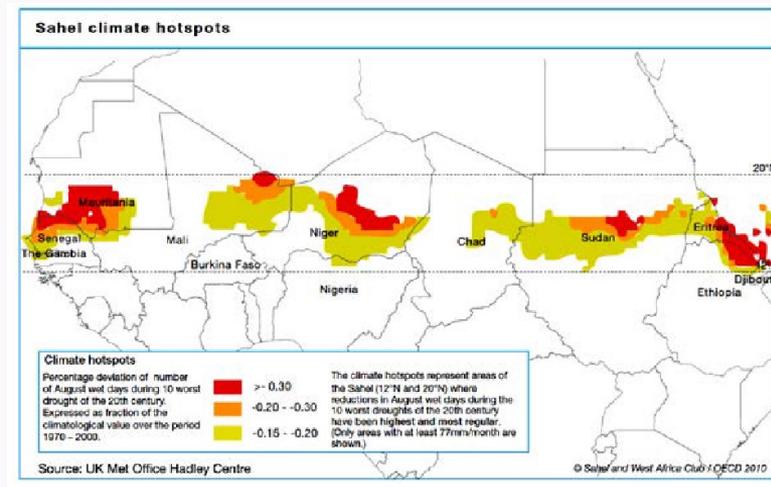
# NIGER BASIN: PROGRAMME FOR INTEGRATED DEVELOPMENT AND ADAPTATION TO CLIMATE CHANGE



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Niger, Nigeria, Cameroon, Chad	USD 57.8 million	African Development Bank	Grant	2018

Integrated and comprehensive actions to reduce the silting of the Niger River, improve natural resources management and enhance the population's ability to adapt to climate change:

- Using robust climate information to secure lives, livelihoods and assets
- Delivering significant avoided costs as well as social, economic and environmental co-benefits
- Leverage well-established high-level political buy-in to demonstrate value of GCF in climate action

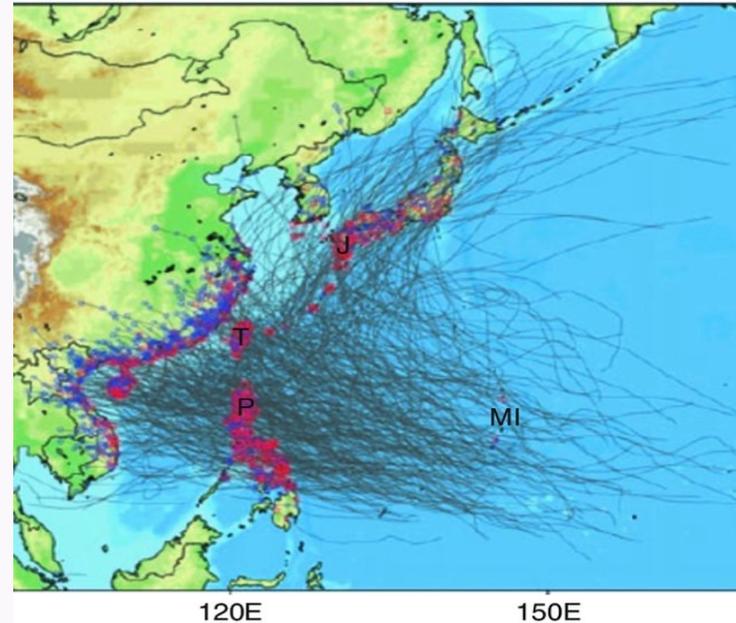


# UNEP PACIFIC CIEWS MULTI-COUNTRY PROGRAMME



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu	USD 47.4 million	UNEP	Grant	2020

- Support increased climate-resilient sustainable development in 5 Pacific countries through targeted CIEWS investments
- CIS strengthening through capacity building and improved policy frameworks
- Investments in climate and marine infrastructure and data management
- Community-based EWS and disaster risk management
- Establishment of regional knowledge and data hub



# SAFEGUARDING RURAL COMMUNITIES AND THEIR PHYSICAL ASSETS FROM CLIMATE INDUCED DISASTERS IN TIMOR LESTE



Country	GCF financing	Accredited entity	Financial instrument	Year approved
Timo-Leste	USD 22.36 million	UNDP	Grant	2018

- **Impact-based Multi-hazard EWS for climate resilient rural infrastructure planning & management**
  - Forecasting, risk modeling, communication & response
- **Climate risk reduction & risk-proofing measures for strengthening resilience of small-scale rural infrastructure**
  - 47 slope stabilization projects (216.94 km)
  - 38 enhanced water supply systems
  - 25 improved irrigation systems (54.18km)
  - 20 flood defenses (14.15 km)
  - 300 ha of agroforestry and reforestation





**GREEN  
CLIMATE  
FUND**