Final Report

2026

Climate information and early warning systems

Independent evaluation of the GCF's approach to and Portfolio of Climate Information and Early Warning System Interventions (CIEWS2025)

GREEN CLIMATE FUND | Independent Evaluation Unit

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Independent Evaluation of the GCF's Approach to and Portfolio of Climate Information and Early Warning System Interventions

FINAL REPORT

02/2026

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First Edition

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ABBREVIATIONS

ADB	Asian Development Bank
AE	Accredited entity
AfDB	African Development Bank
AI	Artificial intelligence
APAC	Asia-Pacific
APR	Annual performance report
B.40	The fortieth meeting of the Board
CCA	Climate change adaptation
CCAG	Climate Change Adaptation Group
CHD	Country hydromet diagnostics
CIEWS	Climate information and early warning systems
CIF	Climate Investment Funds
CIS	Climate information services
CMA5	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session
CONOPS	Concept of operations
COP	Conference of the Parties of the United Nations Framework Convention on Climate Change
CREWS	Climate Risk and Early Warning Systems
DAE	Direct access entity
DRR	Disaster risk reduction
ESS	Environmental and social safeguards
EWS	Early warning systems
EW4All	Early Warning for All initiative
FAA	Funded activity agreement
FAO	Food and Agriculture Organization of the United Nations
FP	Funding proposal
FRLD	Fund for Responding to Loss and Damage
FUNDEA	Fundación para el Desarrollo Empresarial y Agrícola
GAP	Gender Action Plan
GBON	Global Basic Observing Network
GCF	Green Climate Fund
GEF	Global Environment Facility
GFCS	Global Framework for Climate Services

GGA	Global Goal on Adaptation
GI	Governing Instrument
GLOF	Glacial Lake Outburst Flood
IAE	International accredited entity
IDB	Inter-American Development Bank
IEU	Independent Evaluation Unit
IFRC	International Federation of Red Cross and Red Crescent Societies
INSIVUMEH	Institute of Seismology, Volcanology, Meteorology, and Hydrology
IOC	Indian Ocean Commission
IPs	Indigenous Peoples
IRMF	Integrated results management framework
ITU	International Telecommunication Union
KII	Key informant interview
LAC	Latin America and the Caribbean
LDC	Least developed country
LORTA	Learning-Oriented Real-Time Impact Assessment
M&E	Monitoring and evaluation
MDB	Multilateral development bank
MHEWS	Multi-hazard early warning systems
MOU	Memorandum of understanding
NAP	National adaptation plan
NDA	National Designated Authority
NDC	Nationally determined contribution
NDMA	National disaster management authority
NFCS	National Framework for Climate Services
NMHS	National meteorological and hydrological services
PAP	Proposal approval process
PICSA	Participatory Integrated Climate Services for Agriculture
PKSF	Palli Karma-Sahayak Foundation
PMD	Pakistan Meteorological Department
PMF	Performance measurement framework
PPF	Project Preparation Facility
PSAA	Project Specific Assessment Approach
REAP	Risk-informed Early Action Partnership
RMF	Results management framework

RPSP	Readiness and Preparatory Support Programme
SAP	Simplified approval process
SIDS	Small island developing State
SOFF	Systematic Observations Financing Facility
SOP	Standard operating procedure
ToC	Theory of change
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USP	Updated Strategic Plan for the Green Climate Fund
VC	Value chain
WB-GFDRR	World Bank's Global Facility for Disaster Reduction and Recovery
WIGOS	WMO Integrated Global Observing System
WMO	World Meteorological Organization

EXECUTIVE SUMMARY

INTRODUCTION

Climate information and early warning systems (CIEWS) play a critical role in reducing climate risks and building resilience. Evidence shows that well-designed CIEWS can prevent and reduce loss and damage, saving millions of lives. When aligned with the Global Goal on Adaptation's aim to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change, CIEWS are likely to remain a central priority within climate finance.

With its mandate to support developing countries in addressing climate change mitigation and adaptation, the Green Climate Fund (GCF) has made significant investments in CIEWS over the past decade. Despite the large investments, however, there has been no evaluation of GCF's approach to and portfolio of CIEWS projects and programmes. Hence, this evaluation sought to answer the following key questions:

- How can the GCF be strategic in promoting and supporting CIEWS in developing countries with a view to strengthening resilience, preparedness and response while ensuring sustainability of the systems?
- How can the GCF as a global climate finance mechanism build stronger coalitions with other international actors to identify and collectively fill investment gaps in the CIEWS value chain, and/or bring in and blend private sector resources to effect paradigm shifts faster?

To answer these questions, this evaluation examined the GCF's approach to and portfolio of CIEWS. Specifically, the evaluation focused on assessing the GCF's collaboration with other CIEWS actors as well as how the GCF has leveraged its programmatic approaches and funding windows to support CIEWS. These programmatic approaches include working with direct access entities (DAEs) versus international accredited entities (IAEs), engaging with the public versus private sectors, and single-country versus multi-country programming to attain CIEWS results. For funding windows, the evaluation assessed the extent to which and how the GCF has leveraged the Readiness and Preparatory Support Programme (RPSP) and Project Preparation Facility (PPF) for supporting CIEWS interventions. The evaluation also assessed the GCF's portfolio of CIEWS projects and programmes by evaluating the extent to which GCF-funded interventions have made CIEWS available, accessible, and responsive, with the aims of protecting lives and livelihoods and strengthening resilience in developing countries.

By tracing GCF's evolution over the past 10 years, this evaluation presents a story of the GCF emerging as the leading global financier in CIEWS through a process of learning and adaptation. While multilateral banks like the World Bank previously led funding in this area, with the WMO's technical support, the landscape has gradually shifted as the GCF has expanded its commitment to CIEWS. GCF's investments began in 2015 with its first project in Malawi (FP002), which upgraded weather infrastructure and early warning systems (EWS) and benefited over 1.2 million people. The portfolio had grown to 141 CIEWS-tagged projects by the forty-third meeting of the Board (B.43).

CONCLUSIONS AND RECOMMENDATIONS

Conclusion 1: The GCF is highly relevant to CIEWS and holds a privileged position in the space. However, GCF-funded CIEWS projects lack coherence and a systematic approach at portfolio level.

By 2024, the GCF had surpassed the World Bank as the leading financier in EWS, accounting for 34 per cent of the global share and supporting 44 per cent of EWS investments in least developed countries (LDCs) and small island developing States (SIDS). The evaluation team estimates that GCF's cumulative investments in CIEWS reached USD 1.997 billion as of B.43, representing 10 per cent of the total GCF portfolio. Investments in CIEWS include projects that focus primarily on CIEWS and those that integrate CIEWS into broader adaptation efforts.

The release of a sectoral funding approach by the GCF Secretariat in 2022 marked a new phase, introducing three distinct paradigm-shifting pathways for CIEWS investments: (i) strengthening climate information services (CIS), (ii) promoting impact-based multi-hazard early warning systems (MHEWS), and (iii) improving CIEWS for investment and financial decisions. In the same year, the launch of the Early Warning for All (EW4All) initiative by the United Nations Secretary-General António Guterres, which aims at achieving universal early warning coverage by 2027, generated renewed momentum and contributed to the inclusion of CIEWS as a programmatic priority in the Strategic Plan for the Green Climate Fund 2024–2027 (USP-2).

Following the launch of EW4All, CIEWS-related projects increased substantially within the GCF portfolio. However, while the CIEWS project portfolio continues to feature across all eight results areas, investments remain fragmented and are not guided by a unified portfolio-level CIEWS approach. This lack can lead to a fragmented portfolio, where results are provided in isolation and without further consideration of the paradigm shift potential in this sector.

Recommendation 1: The GCF Board and Secretariat should capitalize on the Fund's position as the leading financier in CIEWS and prepare to assume a leadership role beyond 2027. The GCF Board should offer strategic guidance on GCF's intended role and designate CIEWS as a strategic priority under the Strategic Plan for the Green Climate Fund 2028–2031 (USP-3). In turn, the Secretariat should operationalize this guidance aligned with the USP-3.

Conclusion 2: Limited knowledge-sharing and knowledge brokering represent missed opportunities in the CIEWS investments.

The Governing Instrument (GI) states that "the Fund will be scalable and flexible and will be a continuously learning institution guided by processes for monitoring and evaluation. The Fund will strive to maximize the impact of its funding for adaptation and mitigation" (paragraph 3). The GCF is in the early stages of its knowledge management practices, which is broadly consistent with its organizational maturity but not yet sufficient to facilitate a larger knowledge brokering role and leadership. The GCF has a knowledge management strategy and action plan that is not yet fully implemented and institutionalized, but efforts are under way. This shortcoming is also apparent in the portfolio of CIEWS projects.

The discontinuation of the CIEWS sectoral guide in 2025 has heightened uncertainty regarding the GCF's technical and knowledge role in CIEWS projects. At present, the Fund does not provide a comprehensive or visible articulation of its experience or strategic approach in this area, resulting in missed opportunities for broader learning, engagement and influence. Existing GCF documents, including the SAP—CREWS Scaling-up Framework, USP-2, and the WMO–GCF "Developing the

Climate Science Information for Climate Action" offer only limited context. They function primarily as frameworks or toolkits rather than as dedicated CIEWS knowledge resources. Furthermore, the inclusion of a CIEWS target in USP-2, on its own, is insufficient to enable meaningful cross-learning, representing a missed opportunity given GCF's extensive experience in CIEWS investments over the past decade.

Within the organization, respondents expressed differing views on GCF's knowledge-sharing role in CIEWS, likely reflecting the Fund's primary function as a secondary due diligence entity rather than as a dedicated knowledge broker. In practice, GCF largely adopts a passive approach to knowledge dissemination, primarily contributing to resources developed by other CIEWS stakeholders, including WMO, United Nations Office for Disaster Risk Reduction (UNDRR), the Alliance for Hydromet Development, and the Risk-informed Early Action Partnership.

Findings from this evaluation highlight several areas of practice where the GCF approach to CIEWS investments could benefit from greater clarity, knowledge-sharing, mutual learning and strengthening. These include, among others, operationalizing blended finance mechanisms for CIEWS, streamlining regional approaches to managing cross-boundary hazards, and strengthening partnerships with local actors to improve last-mile reach. Sharing these insights in accessible formats would facilitate broader knowledge exchange, promote complementarity and enhance coherence across the diverse CIEWS landscape.

Recommendation 2: As a continuously learning institution, the GCF Secretariat should continue to shift towards a structure and operations that ensure learning and feedback loops across projects, countries and entities clearly and systematically. The Fund should share its CIEWS expertise with relevant CIEWS stakeholders to strengthen the GCF's role as a knowledge broker, besides its position as the leading financier in the CIEWS space.

Conclusion 3: GCF has succeeded in directing CIEWS investments towards countries most in need. Although GCF's CIEWS investments have achieved notable results at the project level, a full paradigm shift of climate information and early warning capabilities has yet to occur across the diverse contexts of participating countries.

The evaluation finds that GCF demonstrates strong alignment with its mandate to serve those developing countries particularly vulnerable to the adverse effects of climate change, as set out in the GI. A comparative analysis of GCF investments by country and disaster risk data from the World Risk Index 2025 shows that the Fund's investments have largely targeted countries experiencing the highest levels of disaster risk, exposure and vulnerability. This highlights GCF's important role in strengthening countries' resilience as they pursue broader adaptation measures, including CIEWS.

However, the evaluation found that while GCF's CIEWS investments have achieved notable results at the project level, persistent challenges remain at the portfolio level, and a full paradigm shift in climate information and early warning capabilities has yet to occur across the diverse contexts of participating countries.

The three pathway assessments show that gaps or weaknesses at any point along the value chain can compromise the overall effectiveness of the CIEWS portfolio, resulting in inconsistent delivery of climate services and warnings.

For example, the assessment of pathway 1, CIS, revealed that although GCF investments have improved meteorological infrastructure, including in fragile settings, persistent gaps exist in advanced climate modelling, user engagement and co-production of climate services, and long-term

institutional capacity-building. Weak user engagement, in particular, highlights the need to build trust and co-develop a timely, reliable and usable climate information service tailored to end user needs and decision contexts.

Pathway 2, MHEWS, has improved the technical sophistication of EWS, but gaps remain between system design and operational delivery. These gaps are most evident in last-mile connectivity and cross-border coordination. The pathway 2 assessment also found a mismatch between stated objectives and actual conditions, as most projects continue to focus on single hazards rather than addressing multiple hazards.

Pathway 3, CIEWS for investments and financial decisions, performed relatively well despite being the youngest portfolio. However, a notable disconnect remains between financial mechanisms and the real-time usability of CIEWS, limiting the full potential of risk-informed finance.

The pathway assessments also revealed limitations in the current framing of the three paradigm-shifting pathways. Because the pathways often overlap and are not sufficiently granular to identify investment gaps by value chain, the evaluation disaggregated each pathway using value chain analysis to better assess portfolio-level performance. Without the ability to review CIEWS by value chain, the Fund cannot assess the maturity of each value chain and prioritize investments accordingly.

Recommendation 3: The Fund should revise how it presents the paradigm-shifting pathways in the CIEWS operational guidance, as outlined in Recommendation 1. A clearer, more structured approach is needed to identify investment gaps across each country's CIEWS value chain. The revised pathways should align with global standards, including the six value chains of the Global Framework for Climate Services and the MHEWS pillars.

Conclusion 4: The long-term sustainability of GCF CIEWS investments remains an ongoing concern. In some cases, project design and review processes do not adequately address long-term outcomes or account for the practical realities encountered during implementation in local contexts.

The evaluation found that GCF funding proposals (FPs) have at times exceeded national capacities, leading to implementation challenges and sustainability risks. Developing countries, especially LDCs and SIDS, often struggle to manage large GCF grants because of limited human and technical resources.

Mismatches between GCF investments and national capacity in national meteorological and hydrological services (NMHS) or related agencies often stem from limited stakeholder consultations, insufficient gap analyses and feasibility studies during project design, and assumptions that newer or more advanced equipment and technology will automatically deliver greater effectiveness.

Many CIEWS proposals emphasize equipment-related investments, including basic observation networks, automated weather stations, weather radars and sea buoys. However, project designs often fail to account for the full cost of ownership, particularly long-term operational and maintenance requirements, leading to recurring sustainability issues. While organizations such as the Systematic Observations Financing Facility (SOFF) provide long-term, results-based financing to support the operation and maintenance of basic observation networks in developing countries, a collaboration framework between SOFF and climate funds, including the GCF, has not been fully utilized, resulting in missed opportunities.

Moreover, projects with a primary focus on CIEWS are often designed at the national level with NMHS and national disaster management agencies. As a result, local end users' needs, which are critical to the success of end-to-end impact-based EWS, are often overlooked. At the same time, evidence indicates that participatory and inclusive approaches introduced from the start of the project design consistently emerge as key success factors in driving sustained institutional and behavioural change at both national and local levels.

The evaluation also highlighted ongoing difficulties in engaging with the private sector and in establishing sustainable, revenue-generating CIEWS service models, exposing a gap between stated goals and practical realities. Although many CIEWS FPs include well-articulated exit strategies – such as securing public funding, generating revenue from commercial weather services, or cutting inefficient operating costs – these ambitions often remain unrealized by the end of project implementation, leading to continued reliance on grant-based financing from development partners.

In response to ongoing sustainability challenges, the evaluation found that CIEWS actors have increasingly applied the concept of operations (CONOPS) in observation-related infrastructure projects. This helps ensure the proposed system is fit for purpose and affordable beyond project lifespan.

Recommendation 4: Across all stages of the project cycle, particularly during project design, the GCF Secretariat should strengthen considerations of the sustainability of CIEWS investments. Such measures should consider including participatory needs assessments that engage both providers and end users of CIS, including women, Indigenous Peoples and other vulnerable groups, as well as comprehensive feasibility studies for revenue-generating activities undertaken by NMHS or related agencies.

In addition, the Secretariat should strengthen its appraisals of CIEWS FPs to ensure that GCF-funded equipment serves its intended use aligns with local institutional and technical capacity, and that post-project operation and maintenance are properly considered in the project design.

Conclusion 5: The Fund faces difficulties in assessing portfolio-wide impacts and accurately identifying and estimating investment volumes for CIEWS projects.

Analysis of reported results against the GCF's mitigation and adaptation performance measurement frameworks (PMFs) and the integrated results management framework (IRMF) reveals systematic measurement challenges across CIEWS investments.

Data reported by accredited entities (AEs) against CIEWS-related indicators of the PMFs, including A1.1 on expected losses, A6.2 on the use of climate information, A7.1 on usage by vulnerable groups, and A7.2 on people reached by warnings, continue to have quality issues. These issues include the reporting of intended (ex-ante) results rather than achieved (ex-post) results, inconsistent units of measurement and calculation, or transcriptions.

While GCF indicators for CIEWS represent a positive step towards tracking and reporting progress, they remain limited in their ability to capture the full breadth and quality of impacts, especially regarding last-mile interventions. For example, the indicators offer limited insight into whether beneficiaries are receiving timely warnings or information, understand the alerts, know appropriate responses, or have the resources to act on them.

The absence of more granular data means that existing indicators do not adequately capture the potential impact of EWS on those receiving alerts. Moreover, the limited and inconsistent application of standard CIEWS indicators across early warning initiatives hinders meaningful

comparisons between projects and prevents the measurement of portfolio-wide impact using these corporate indicators.

The adoption of the Belém Adaptation Indicators at the seventh session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA7), followed by the two-year Belém-Addis Vision on Adaptation process to develop guidance on their operationalization, presents an opportunity for the Fund to engage and contribute to refining these indicators. This timeline also aligns with the scheduled 2026 review of the IRMF.

This evaluation also found that identifying CIEWS projects and estimating CIEWS investment amounts at the portfolio level continue to pose a challenge for CIEWS actors and climate funds, including the GCF. In response, the UNDRR developed the *Early warning systems taxonomy: Guide for tagging and tracking components of early warning systems* to improve the consistency and comparability of EWS data reported by multilateral actors, including the GCF.

With specific reference to GCF tagging practices, the evaluation team identified inconsistencies in the Secretariat's CIEWS-tagging exercise. Some projects were tagged as CIEWS even though they did not meet the criteria. In contrast, other qualifying projects were not tagged, undermining the accuracy and reliability of the GCF CIEWS portfolio.

Furthermore, while the GCF routinely uses the term CIEWS in its documentation, including in USP-2, it lacks a formal definition, leading to inconsistent application across investments and identification of CIEWS projects. While the previous sectoral guide offered some conceptual clarity, its discontinuation has left the Fund without clear guidance on how to apply the term.

Recommendation 5: The GCF Secretariat should leverage the 2026 review of the IRMF to align indicators with global best practices, including the Belém Adaptation Indicators. In doing so, the Secretariat should also consider additional measurement approaches capable of capturing the operational progress of CIEWS interventions and their outcomes at the community level. The primary objective should be to improve the monitoring of progress across CIEWS projects, thereby ensuring that the reported results are both reliable and suitable for comparison and impact measurement.

The GCF Secretariat should formally define CIEWS as part of its operational guidance, as outlined in Recommendation 1, to ensure its consistent application across the portfolio. It should also establish a clear CIEWS taxonomy, aligned with the revised framing of paradigm-shifting pathways set out in Recommendation 3, to address existing challenges in CIEWS-tagging and investment identification.

MAIN REPORT

Chapter 1. INTRODUCTION

A. BACKGROUND

1. The Green Climate Fund (GCF) is a multilateral fund established in 2010 with the purpose of supporting global efforts to mitigate and adapt to climate change by contributing to the goals of the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. The GCF promotes a paradigm shift towards low-emission climate resilience in the context of sustainable development. The Fund provides support to developing countries to reduce their greenhouse gas emissions and to adapt to climate change, while acknowledging the needs of low- and middle-income countries particularly vulnerable to the adverse effects of climate change.
2. The GCF is governed by a Board composed of 24 members, with an equal number of members from developing and developed country Parties, while also ensuring representation from United Nations regional groupings and representatives from small island developing States (SIDS) and least developed countries (LDCs). The work of the GCF is carried out by a Secretariat comprised of more than 300 personnel operating at the Fund's headquarters in Songdo, Republic of Korea. The Secretariat is composed of eight offices and 17 departments, with each office reporting to the Office of the Executive Director.[1] Separate from the Secretariat structure and reporting directly to the GCF Board, there are three independent units of the GCF, including the Independent Evaluation Unit (IEU), Independent Integrity Unit and Independent Redress Mechanism.
3. In accordance with the GCF Governing Instrument (GI) paragraphs 59–62, the IEU conducts independent evaluations of the GCF's activities to ensure its accountability and to synthesize learnings from high-quality and rigorous evaluations to support GCF's effectiveness and efficiency.[2] This dual accountability-learning function is further laid out in the GI and the updated terms of reference of the IEU.[3] The frequency and types of evaluations are specified by the IEU in agreement with the GCF Board and are intended to inform decision-making by the Board. IEU reports are also published and provided to the Conference of the Parties (COP) to enable periodic reviews of the financial mechanism of the UNFCCC.
4. At the fortieth meeting of the Board (B.40) held in Songdo, 21–24 October 2024, the Board approved the IEU workplan, budget and updated rolling objectives which included an evaluation of the GCF's approach to and portfolio of climate information and early warning systems (CIEWS) interventions.[4] Accordingly, the CIEWS evaluation report is submitted to the Board at B.44 in March 2026.

[1] The said structure is in place as of December 2025, as clarified on the Green Climate Fund, About us – Secretariat, Structure.
[2] Green Climate Fund, *Governing Instrument*.
[3] See B.BM-2021/15, annex I.
[4] See GCF/B.40/14, annex VI.

B. PURPOSE

1. RATIONALE FOR CLIMATE INFORMATION AND EARLY WARNING SYSTEMS

5. Increases in extreme weather events associated with climate change cause loss of life and severe socioeconomic impacts, particularly for the most vulnerable populations around the globe who are disproportionately affected. According to the World Meteorological Organization (WMO), weather and climate-related disasters have increased fivefold over the past 50 years.[5] Hydrometeorological hazards, such as floods, storms, cyclones, drought, wildfire and heatwaves are key drivers of disaster impacts, resulting in 56 per cent of deaths and 75 per cent of economic losses (1970–2019).[6] While storms caused the largest economic losses between 2020–2024, heat-related hazards were the leading cause of death during the same period, making up 57 per cent of the total reported weather and climate-related deaths globally.[7] Complex events with multiple hazards are prevalent and produce an outsized proportion of mortality and economic losses.[8]
6. Moreover, long-term changes and shifts in climate trends have the potential to exacerbate existing risks, while also creating new exposures and vulnerabilities that can undermine previously achieved gains and future progress towards sustainable development.[9] For example, rising global temperatures have produced more variable precipitation patterns – with increases in heavy rainfall events in some regions and prolonged drought in others – posing challenges to agricultural production and infrastructure planning.[10] As another example, declines in glaciers and snow cover can affect the availability of fresh water, while also increasing the risk of rapid onset flooding through glacial lake outburst floods.[11] According to the Intergovernmental Panel on Climate Change,[12] the probability of compound events, such as concurrent heatwaves and droughts, is rising and expected to continue in coming decades. Considering the changing climate-related hazards and risks associated with climate change, there is a need to identify, implement and bolster robust approaches for climate adaptation and mitigation to minimize associated losses and damages.[13]
7. Over the past several decades, increasing need coupled with rapid improvements in weather forecasting, climate and prediction capacities have propelled the merging of climate information services (CIS), early warning systems (EWS) and medium- and long-term decision-making across multiple sectors, such as agriculture, food security, health, energy, water security, transport and infrastructure. Improved weather and climate services have the potential to enhance global agricultural productivity by USD 30 billion, while reducing losses by USD 2 billion per year.[14] Additionally, the generation and use of climate information to inform infrastructure investments can improve reliability, reduce maintenance and extend asset lifetimes – with up to a 4-to-1 return on every dollar invested in climate-resilient infrastructure.[15]

[5] World Meteorological Organization, *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)*.
[6] World Meteorological Organization, *2020 State of Climate Services: Risk Information and Early Warning Systems*.
[7] World Meteorological Organization, *2024 State of Climate Services: Five-year Progress Report (2019–2024)*.
[8] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems:2024*.
[9] Intergovernmental Panel on Climate Change, "Weather and Climate Extreme Events in a Changing Climate," in *Climate Change 2021: The Physical Science Basis*.
[10] Intergovernmental Panel on Climate Change, *Climate Change 2021: The Physical Science Basis*.
[11] Intergovernmental Panel on Climate Change, *Special Report on the Ocean and Cryosphere in a Changing Climate*.
[12] Intergovernmental Panel on Climate Change, *Climate Change 2023: Synthesis Report*.
[13] Intergovernmental Panel on Climate Change, *Impacts, Adaptation and Vulnerability*.
[14] World Meteorological Organization, *2019 State of Climate Services: Agriculture and Food Security*.
[15] Organisation for Economic Co-operation and Development, *Infrastructure for a Climate-Resilient Future*.

2. Purpose of the evaluation

8. With its mandate to support developing countries in addressing climate change mitigation and adaptation, the GCF has made significant investments in CIS and EWS interventions over the past decade. As of 31 October 2025, the GCF Secretariat identified 100 projects/programmes that are linked to CIS and/or EWS, encompassing both single- and multiple-country initiatives across 95 countries, including 30 SIDS, 34 LDCs and 39 African States.[16] These projects largely consist of traditional modernization of meteorological and hydrological services (NMHS), CIS and EWS enhancements, sector applications and use of CIEWS in resilience building.[17]
9. Despite the large investments in CIEWS to date and the accumulating knowledge in this sector, there has been no independent assessment of GCF's support to or portfolio of CIEWS projects and programmes. Key questions arise:
    - How can the GCF be strategic in promoting and supporting CIEWS in developing countries with a view to strengthening resilience, preparedness and response while ensuring sustainability of the systems?
    - How can the GCF, as a global climate finance mechanism, build stronger coalitions with other international actors to identify and collectively fill investment gaps in the CIEWS value chain, and/or bring in and blend private sector resources to effect paradigm shifts faster?
10. These questions can only be answered by taking stock of GCF's work over the past decade, reflecting and extracting lessons for the future. Such is the aim of this user-focused evaluation.

C. Road map for this evaluation report

11. Given the rationale for this evaluation, this report endeavours to provide key findings including successes, good practices, challenges and even failures identified in GCF's CIEWS investments in an organized manner. Firstly, Chapter 2 outlines the objectives, methodology and limitations, including laying out the definition of CIEWS applied in the evaluation. Chapter 3 briefly describes CIEWS in the GCF context and provides descriptive statistics of the CIEWS-tagged projects and programmes, including some issues linked to identifying so-called CIEWS-tagged projects and estimating CIEWS investment amounts. Chapter 4 presents key findings on GCF's approach to CIEWS with discussion on the extent to which and how the GCF is collaborating with other CIEWS actors to fill in the CIEWS investment gaps. Chapter 5 continues with an analysis on the extent to which and how the GCF leverages its programmatic approaches and funding windows to support CIEWS. Subsequently, Chapter 6, Chapter 7, Chapter 8 and Chapter 9 assess the overall performance of the GCF portfolio of CIEWS projects and programmes. It does so by highlighting key findings from the analysis of the portfolio through the perspectives of relevance, effectiveness and impact, gender and Indigenous Peoples (IPs), and sustainability. Finally, Chapter 10 provides the conclusions and recommendations.

[16] The data were taken from the Funded Activity General Semantic Model made available by the GCF Secretariat. If a project contained percentage weight linked to the CIEWS sector classification, the project was added into the count of 100 projects/programmes here. More discussion on CIEWS-tagged projects and CIEWS percentage allocations/weights are available in Chapter 2 and Chapter 3 and annexes 3, 4 and 6 of this evaluation report.

[17] Green Climate Fund, *CIEWS Strategic Programming Summary*.

Chapter 2. EVALUATION METHODOLOGY

A. OBJECTIVES, SCOPE AND EVALUATION QUESTIONS

12. To ensure that key findings are examined and identified in a systematic manner, the evaluation team organized its work by two distinct evaluation focus areas: (i) GCF's approach to CIEWS, and (ii) GCF's portfolio of CIEWS projects and programmes. These two focus areas essentially provided an analytical framework for this evaluation. Under each of these focus areas, the evaluation aimed to meet the following objectives (Table 2–1).

Table 2–1. Evaluation objectives

NO.	FOCUS AREA	OBJECTIVES
1	Approach	To assess the complementarity and coherence of GCF support to CIEWS with other CIEWS actors based on an ultimate objective of identifying remaining gaps in the CIEWS space.
2	Approach	To assess the extent to which GCF is leveraging its programmatic approaches and funding windows such as the Readiness and Preparatory Support Programme (RPSP), project preparation facility (PPF), and funded activities including the standard proposal approval process (PAP) and simplified approval process (SAP) for supporting CIEWS interventions.
3	Portfolio	To assess the extent to which the GCF portfolio of CIEWS projects/programmes has been effective in making CIEWS available, accessible and responsive.
4	Portfolio	To assess the evidence of (both realized and potential) CIEWS impacts, sustainability, scalability and replicability.

13. To achieve the evaluation objectives, 10 main evaluation questions were then formulated with innovativeness being a cross-cutting theme across the two evaluation focus areas (Table 2–2). See also the evaluation matrix in annex 1 for further details.

Table 2–2. Evaluation questions by research area and evaluation criterion

FOCUS AREA	GCF EVALUATION CRITERIA	EVALUATION QUESTIONS
Approach	Coherence and complementarity	To what extent has the GCF been able to enhance international cooperation to promote and strengthen CIEWS both within countries and at international forums?
	Efficiency	To what extent is GCF leveraging its programmatic approaches and funding windows (e.g. RPSP; PPF and PAP versus SAP) to support CIEWS?
Portfolio	Relevance	To what extent do CIEWS interventions align to needs and gaps recognized by governments (i.e. National Meteorological and Hydrological Services – NMHS, national disaster management authorities – NDMAs, and subnational governments) within target countries?
	Effectiveness	To what extent has the CIEWS portfolio been successful or unsuccessful

FOCUS AREA	GCF EVALUATION CRITERIA	EVALUATION QUESTIONS
		in terms of: • Enhancing or making CIS available to users? • Making impact-based multi-hazard EWS available, accessible and responsive? • Improving and leveraging CIEWS for investments?
	Impact	What are the key changes in knowledge and behaviours of individuals within target communities following CIEWS interventions?
	Sustainability and country ownership	Are the results achieved from GCF-funded CIEWS projects sustainable without reliance on external support?
	Gender equity	To what extent have CIEWS interventions fostered women's participation and leadership? What key factors have driven gender equality results?
	Replication and scalability	Are there indications that the results achieved from GCF-funded CIEWS projects are, or will be, scalable or replicated beyond intervention locations and stakeholder groups?
	Unexpected results, both positive and negative	What are some unexpected positive and negative results observed in CIEWS interventions?
Cross-cutting	Innovativeness	Have CIEWS interventions supported by the GCF leveraged on innovative approaches, practices and technologies?

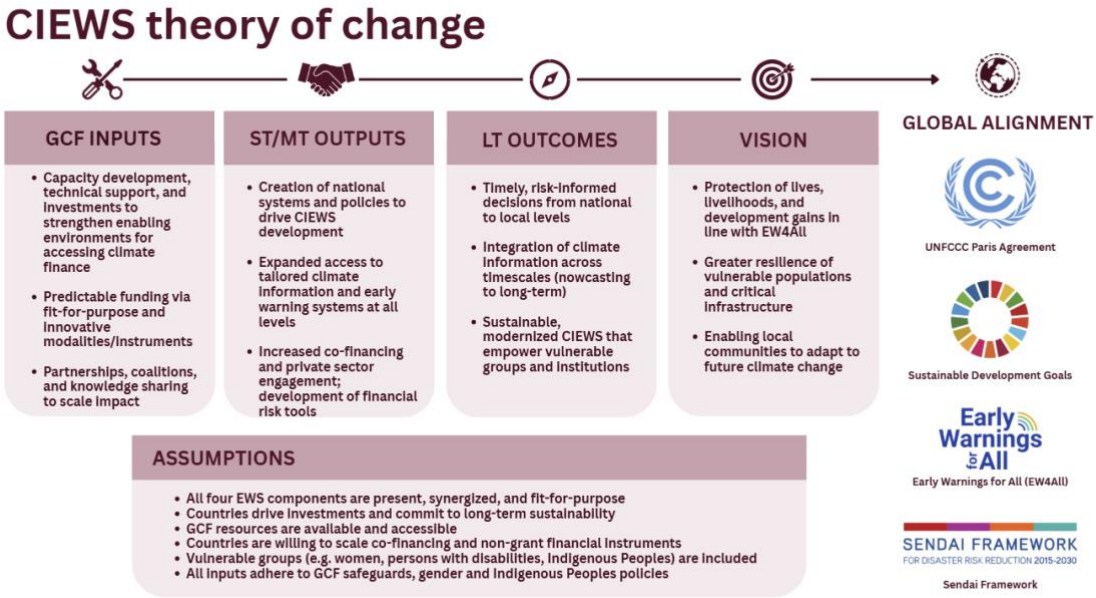
14. With a view to answering these evaluation questions, the scope of evaluation activities included the following:
    - Literature review and online-based research
    - CIEWS data analysis using both external and internal CIEWS-related data sources
    - Key informant interviews (KIIs) with GCF and CIEWS stakeholders
    - Cluster assessments where samples of GCF-funded CIEWS projects and programmes were categorized into three intervention types or so-called clusters, and then scored against a cluster assessment template developed for each cluster
    - Country visits to Bangladesh, Guatemala, Timor-Leste and Uzbekistan as well as a virtual visit to Nigeria via online-based interviews. The country visits included visiting CIEWS-related project sites and meeting GCF stakeholders and beneficiaries on the ground
15. Throughout the evaluation, the team employed mixed methods (both qualitative and quantitative) to build the findings and strengthen their validity.

B. METHODOLOGY

1. THEORY OF CHANGE

16. Before undertaking the assessment activities, the team developed a theory of change (ToC) for GCF's work on CIEWS since the Fund does not have an explicit ToC for its CIEWS work. It was done through the use of secondary data including relevant GCF documents, and validating the draft ToC in a workshop with CIEWS experts from the GCF Secretariat (Figure 2–1).

Figure 2–1. CIEWS theory of change



Note: ST = short-term; MT = medium-term; LT = long-term.

17. The ToC provided the evaluation team with a framework to objectively assess the GCF's performance by "inputs", "outputs", and "outcomes", as shown above. For instance, the "GCF approach", one of the evaluation focus areas, pertains to what the GCF does or delivers and thus represents the "GCF inputs" section of the ToC. Similarly, another focus area, the "GCF's portfolio", corresponds to the short- to medium-term outputs section of the ToC, where countries, with the support of AEs, implement GCF-funded projects and programmes based on GCF inputs and support. These outputs are expected to lead to outcomes, as illustrated in the ToC's "long-term outcomes" section.
18. Since the long-term outcomes and benefits of GCF-funded projects and programmes often materialize after their completion, it was essential for the evaluation team to assess the potential of these outcomes in connection with the observable "outputs". For this reason, findings from the "effectiveness" and "impact" evaluation criteria assessment are presented together in Chapter 7. Additionally, the long-term outcomes section of the ToC was evaluated using criteria such as sustainability, scalability and replicability.

2. Definition: What is CIEWS?

19. While the GCF commonly uses the term CIEWS in its documentation, its use outside the GCF appears to be limited to a few climate funds at present.[18] The Fund has not yet adopted a formal definition of CIEWS. In the simplest terms, CIS are the provision and use of climate data, information and knowledge to assist decision-making, while EWS focus on the provision of warnings linked to all hazards.[19] With growing evidence and awareness of the interconnections between climate change, extreme weather events and disasters, it is understood that the Secretariat combined these terms to capture the broader scope of GCF's investments in both CIS and EWS, as well as the continuum towards resilience building. Accordingly, the evaluation team formulated a definition of CIEWS specifically for the purpose of this evaluation (Box 2–1). More discussion on challenges and issues associated with identifying and estimating CIEWS investments is provided in Chapter 3.

Box 2–1. CIEWS definition for the evaluation

A set of systems designed to understand, anticipate and manage risks related to the effects of climate change with the aim of protecting lives, livelihoods, assets and investment. For populations, communities, governments, and both public and private organizations, CIEWS rely on the collection, monitoring, and analysis of weather and climate data to enable understanding of historical and present trends and prediction of future conditions (i.e. CIS), as well as warning, communication and dissemination networks (i.e. EWS). These systems facilitate the making and sharing of evidence-based decisions that lead to preparedness and timely actions to reduce climate risks and increase adaptive capacity to climate change.

3. Assessing GCF's approach to CIEWS

20. The evaluation of the GCF approach to CIEWS, or the "inputs" section of the ToC, involved examining two key areas: (i) the GCF's collaboration with other CIEWS actors, and (ii) the GCF's use of programmatic approaches and funding windows to support and promote CIEWS. The evaluation took into consideration the evolving context of and discussion on GCF reorganization and regional presence.
21. For the first area, the assessment focused on the GCF's collaboration with other CIEWS actors at both global and national levels, in alignment with GCF Board decision B.17/04 *Matters related to guidance from the COP: Complementarity and coherence*. This decision aims to maximize GCF impact by leveraging the comparative advantages of and collaborating with climate finance institutions across various domains. The evaluation team categorized CIEWS actors into core, climate funds, and delivery/implementing partners and groups and analysed their comparative advantages as well as CIEWS investments to identify remaining complementarity and coherence gaps that the GCF could address. Essentially, this analysis served as a benchmarking or comparators study, where the GCF's work on CIEWS was compared and evaluated against that of other actors.
22. For the second area, the evaluation team assessed how the GCF has leveraged its programmatic approaches and funding windows to support CIEWS. These programmatic approaches include

[18] Global Environmental Facility also uses the term CIEWS. See Global Environment Facility Independent Evaluation Office, *Evaluation of GEF Support to Climate Information and Early Warning Systems (CIEWS)*.
[19] World Meteorological Organization, *2024 State of Climate Services: Five-year Progress Report (2019–2024)*.

working with direct access entities (DAEs) versus international accredited entities (IAEs), engaging with the public versus private sectors, and single-country versus multi-country programming to attain CIEWS results. For funding windows, the team assessed the extent to which and how the GCF has leveraged RPSP and PPF for supporting CIEWS interventions.

23. To identify CIEWS-related grants from the RPSP portfolio, the evaluation team sampled a large number of grant proposals available from the GCF website as of September 2025. Specifically, the team sampled 476 out of 821 readiness grant proposals, representing the standard readiness category and national adaptation plan (NAP) envelopes of the previous GCF Readiness Strategy (decision B.22/11). The team utilized MaxQDA software to identify CIEWS-related readiness grants, which was followed by human verification. In total, 29 readiness grants were identified as being related to CIEWS. The team also conducted a random search by project title and an additional desk review of readiness grants which yielded 13 more readiness grants that were identified as linked to CIEWS. The list of these 42 CIEWS-related grants is provided in annex 9.
24. In addition, for the PPF portfolio, the evaluation team undertook a mapping exercise and identified 27 PPF grants out of 116 approved grants as of January 2026, which later became CIEWS projects approved by the Board. The team conducted an in-depth analysis of these 27 PPF grants to examine the extent to which and how the PPF window has been leveraged to promote CIEWS initiatives. The list of 27 PPF grants that later became CIEWS projects is available in annex 10.

4. Assessing GCF's portfolio of CIEWS interventions

25. The evaluation also assessed the GCF's portfolio of CIEWS projects and programmes, or the "output" section of the ToC. It did so by evaluating the extent to which GCF-funded interventions have made CIEWS available, accessible and responsive, with the aims of protecting lives and livelihoods and strengthening resilience in developing countries.
26. To ensure rigour, the evaluation team employed a mixed-methods approach for the portfolio evaluation, which included:
    - **Establishing the portfolio of CIEWS-tagged projects:** Firstly, the team established a list of projects and programmes for the portfolio analysis by using the projects tagged as CIEWS by the Secretariat as a basis,[20] and modifying the list as necessary. It did so by adding CIEWS-related projects that were identified by the evaluation team via:
        - A review of additional internal documents made available by the Secretariat
        - A review of approved funding proposals (FPs) with an artificial intelligence (AI) application, using the institutional GPT-4o API, followed by human verification
        - After an iterative review process, a total of 141 CIEWS-tagged projects were included in the evaluation out of 335 projects approved by the Board as of B.43.[21] This set of 141 is referred to in this evaluation as "CIEWS-tagged projects" (see annex 3 for details).
    - **Categorizing projects:** Secondly, the team categorized the updated CIEWS-tagged projects from the previous step into three clusters in line with the three paradigm-shifting pathways shown below and as outlined in the *GCF sectoral guide: Climate information and early warning systems*.[22] The classification into the pathways or clusters was initially done through

[20] Projects "tagged as CIEWS by the Secretariat" means those projects that have been assigned CIEWS sectoral percentage allocations in the GCF database, stored in the Funded Activities General semantic model.
[21] These 335 approved projects exclude two cancelled projects, namely FP115 and FP146.
[22] Green Climate Fund, *Sectoral Guide: Climate Information and Early Warning Systems*. This document has been removed from the GCF public website since April 2025.

AI-assisted analyses using the institutional GPT-4o API as the primary processing tool and Claude Opus 4 for quality assurance. Detailed methods are provided in annex 5.

  - Pathway 1: Strengthening CIS and their sectoral application
  - Pathway 2: Promoting impact-based multi-hazard early warning systems (MHEWS)
  - Pathway 3: Improving CIEWS for investments and financial decisions

- **Cluster assessments:** Subsequently, the evaluation team implemented a cluster study by purposively sampling 38 CIEWS-tagged projects for the three cluster/pathways of the sectoral guide, with four projects assessed against all of the three pathways, and five projects assessed against two relevant pathways out of the three. As such, the samples included 16 projects for pathway 1, 26 for pathway 2, and 10 for pathway 3, and were reviewed against an assessment template developed for each cluster (see annex 7). The study involved a detailed review of FPs, annual performance reports (APRs), project completion reports, gender action plans (GAPs), and interim or final evaluations submitted by AEs for those sampled projects. The aim was to examine the CIEWS activities more deeply and to extract successes, challenges, good practices, and lessons. This deep dive exercise enabled the evaluation team to identify projects that should not have been tagged as CIEWS, and to refine the list of CIEWS-tagged projects as the evaluation progressed (see also section C).
- **Triangulation through country visits:** Finally, the team triangulated the findings from the desk review and the cluster assessments with the insights gained from country visits to Bangladesh, Guatemala, Timor-Leste and Uzbekistan, as well as a virtual visit to Nigeria. These countries were purposively selected based on predefined criteria such as geographic balance, the maturity of CIEWS projects, RPSP/PPF linkage, climate hazards, and a mix of DAE versus IAE and single-country versus multi-country projects. For more detail, please refer to the approach paper.[23] The country visits produced primary evaluation data and also helped to validate or refute documentary review.

C. LIMITATIONS

27. The evaluation team encountered several limitations during the assessment, including the following:

- **Definition of CIEWS:** There was no established definition of CIEWS within the GCF or relevant literature, despite some high-level concepts being available within the GCF sectoral guide on CIEWS. This required the team to interpret and develop their own definition of CIEWS for the evaluation. The absence of a clear definition significantly impacted evaluation progress, as the team made several iterations to define CIEWS and apply the evolving definitions to tag or remove projects considered under this evaluation.
- **Project tagging exercise:** As noted in the methodology section above, the team built the portfolio of CIEWS-tagged projects for the evaluation by using the list of projects tagged as CIEWS by the Secretariat as a basis, and modifying the list as necessary. It was done by inserting additional CIEWS-related projects that the evaluation team identified. This approach had limitations due to being a rapid desk exercise. Subsequently, during the cluster study, the evaluation team adjusted and refined the list of CIEWS-tagged projects. While the in-depth cluster study allowed the team to refine the list, the exercise was limited to a subset of the total CIEWS-tagged projects given resource and time constraints. After several iterations, the team

[23] Independent Evaluation Unit, *Independent Evaluation of the GCF's Approach to and Portfolio of Climate Information and Early Warning System Interventions (CIEWS): Approach Paper*.

compiled a total of 141 CIEWS-tagged projects for the scope of this evaluation. The full set has not been validated by the evaluation team.

- **CIEWS funding allocation estimation:** Portfolio analysis by funding amount presented in Chapter 3 is only an estimate due to the unavailability of reliable information on the specific allocation of funds to CIEWS-related interventions within each CIEWS-tagged project. Refer to Chapter 3 for more discussion on challenges associated with identifying CIEWS-tagged projects and estimating their investment amounts. Also see annex 6 for the statistical imputation methods applied to estimate CIEWS investment weights for the CIEWS-tagged projects that were missing weights. The weight used for each CIEWS-tagged project is available in annex 4.
- **Global Observatory data to track global CIEWS investments:** While the team used Global Observatory data made available by the United Nations Office for Disaster Risk Reduction (UNDRR) and WMO to estimate, track and compare global CIEWS investments made by CIEWS actors, there are several notable limitations to the data used. Firstly, there is a challenge in retrospectively identifying and tagging CIEWS projects and estimating investments across multiple actors, as each of them have different methodologies for and interpretations of what constitutes EWS investments. Secondly, some CIEWS actors appear to be selective in their reporting of EWS projects to the Global Observatory, resulting in inconsistent participation by these actors. Thirdly, important data, such as disaggregated investment data by EWS value chain/pillar, is unavailable due to methodological challenges. To overcome this challenge, the evaluation team attempted to estimate disaggregated EWS investments by pillar using available pillar-based tagging information and applying a weighted allocation methodology to distribute the total portfolio funding across these pillars. The methodology is available in annex 8.
- **Data aggregation challenges:** The evaluation team faced challenges in aggregating results data reported against CIEWS-related indicators within the GCF's corporate results frameworks – namely the performance measurement frameworks (PMFs) (decision B.08/07) and the Integrated Results Management Framework (IRMF) (decision B.29/01). This is due to how GCF's corporate indicators are practically interpreted and applied by AEs. The team needed to validate and correct results data from the APRs to ensure minimum quality before aggregating results data at the portfolio level. Annex 11 details the corrections applied to the results data reported for PMF/IRMF indicators. To overcome the limitation of results data aggregation and analysis, deep dive cluster assessments were also conducted, by selecting a sample of 38 projects from the CIEWS-tagged projects. This helped the team gain a greater understanding of the effectiveness and impact of the CIEWS portfolio.
- **Cluster assessment limitations:** Because the assessment was mostly based on desk reviews – except when site visits occurred – the ratings and the issue of insufficient data depended largely on what AEs had included in their documents. In several instances, progress reports and lessons in the APRs could only be accepted at face value due to a lack of other ways to verify them. Additionally, the standard scoring method does not account for country-specific conditions, so projects in less developed countries may struggle to achieve high scores, especially considering institutional challenges. To enhance triangulation, all projects tagged as CIEWS in countries the evaluation team visited were either prioritized or specifically chosen for cluster assessments.
- **Triangulation and bias:** While best efforts were made to triangulate findings with additional information sources via desk reviews and KIIs, the findings are inevitably weighted by country visits undertaken to Bangladesh, Timor-Leste, Uzbekistan and Guatemala (and online

interviews conducted with GCF stakeholders in Nigeria), as well as unconscious biases of evaluation team members. The team attempted to minimize biases through systematic triangulation of data sources and by ensuring the balancing of mission members with appropriate gender and expertise considerations.

Chapter 3. ESTIMATING GCF INVESTMENTS IN CIEWS

KEY FINDINGS

3.1. The term "CIEWS" originated mainly in the GCF and similar actors, rather than being a standard in global disaster risk reduction (DRR) and or climate change adaptation (CCA) frameworks. Not yet universally recognized, the term CIEWS struggles to be clearly defined and measured in all organizations consulted.

3.2. Given the inherent difficulty in applying the interconnected concept of CIEWS, it is challenging to confidently determine how many CIEWS projects are funded by the GCF and what their aggregate investment amount is. As such, the process of tagging CIEWS projects within the GCF Secretariat requires further review.

3.3. The estimation exercise undertaken by the evaluation team suggests that GCF has cumulatively invested USD 1.997 billion in CIEWS-related interventions across the portfolio, constituting 10 per cent of the total GCF portfolio of USD 19.22 billion as of B.43.

3.4. USP-2 set a goal to provide new or improved EWS for 50 to 60 climate-vulnerable developing countries. In USP-2's first year, the Secretariat reported support for 18 countries (36 per cent of the lower target), but the claim is based on intended (ex-ante) results from approved FPs while the actual (ex-post) outcomes of these investments are yet to be realized. Cumulatively up to B.43, GCF's committed CIEWS coverage has reached 106 countries, recording 68.8 per cent of non-Annex 1 countries of the UNFCCC.

A. CIEWS IN GCF HISTORY

28. GCF's commitment to supporting CIEWS is seen throughout its history. In GCF policies and documents, the terms "climate information" and "early warning systems" first appeared in 2014 within the institution's results frameworks, known as the GCF initial results management framework (RMF) and the GCF mitigation and adaptation PMFs (decisions B.07/04 and B.08/07). These Board-approved policy documents noted a CIEWS indicator as requiring "further refinement" for the purpose of the performance tracking of GCF investments.
29. The second results framework of the GCF, known as the IRMF, adopted by the Board in 2021, included a supplementary indicator specific to CIEWS interventions: supplementary indicator 2.4 tracks the number of beneficiaries (female/male) covered by new or improved EWS (decision B.29/01). In addition, the RMF/PMFs and IRMF contain indicators relevant to tracking the progress of GCF's investments in minimizing, averting and addressing loss and damage associated with the adverse effects of climate change. The indicators relevant to CIS and EWS in the RMF/PMFs and the IRMF are summarized in Table 3–1.
30. As initially defined in the RMF, the GCF continues to uphold the results area-based approach, encompassing four mitigation and four adaptation results areas (decision B.07/04). This approach positions CIEWS as a cross-cutting theme relevant to all eight GCF results areas. On its website, the Fund also lists EWS as one of the five other themes that it is supporting.[24]

Table 3–1. List of RMF/PMF and IRMF indicators relevant to CIS and EWS

No.	Results framework	Indicator code	Indicator
1	RMF/PMF	A1.1	Change in expected losses of lives and economic assets (USD) due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention
2	RMF/PMF	A6.2	Use of climate information products/services in decision-making in climate-sensitive sectors
3	RMF/PMF	A7.1	Use by vulnerable households, communities, businesses and public sector services of Fund-supported tools, instruments, strategies and activities to respond to climate change and variability
4	RMF/PMF	A7.2	Number of males and females reached by (or total geographic coverage of) climate-related EWS and other risk reduction measures established/strengthened
5	IRMF	2.4	Beneficiaries (female/male) covered by new or improved EWS (number of individuals)
6	IRMF	2.7	Change in expected losses of lives due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention (number of individuals)
7	IRMF	3.1	Change in expected losses of economic assets due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention (value in USD)

Source: Decisions B.08/07 and B.29/01.

[24] The other themes mentioned are "cooperation for climate action"; "Great Green Wall"; "Amazon"; and "ocean".

31. Alongside the results area-based approach of the GCF, the Secretariat has explored sectoral funding approaches, starting in 2021. The Secretariat has done this by developing 10 sectoral guides in consultation with GCF stakeholders, including one on CIEWS.[25]
32. At least for some time, these guides served as reference documents for AEs in formulating GCF FPs. For example, the CIEWS sectoral guide outlined three paradigm-shifting pathways for achieving CIEWS: (i) strengthening CIS, (ii) promoting impact-based MHEWS and early action, and (iii) leveraging CIEWS for uptake, investment and financial decisions. However, since the sectoral approach lacked a Board-approved policy foundation, the operationalization of the sectoral approach remained somewhat unclear. Following Board members' interventions at B.41, the sectoral guides were removed from the public GCF website in April 2025.
33. The Fund has also participated in key global CIEWS initiatives. Following the launch of the Early Warning for All (EW4All) initiative by United Nations Secretary-General António Guterres in March 2022, GCF joined the Cairo Roundtable on the EW4All in September 2022 to help develop its executive action plan, which was later launched at COP27 in November 2022.[26] The EW4All initiative aims to ensure universal EWS access by the end of 2027. The GCF Executive Director serves on the EW4All Advisory Panel alongside the heads of several CIEWS actors. In October 2025, just before COP30, the EW4All Advisory Panel issued a joint statement, reaffirming their commitment to "scale and sustain early warning systems to save lives and livelihoods".[27] In the statement, the GCF Executive Director noted her commitment to supporting the delivery of the EW4All initiative through the Strategic Plan for the USP-2 and collaboration with the WMO (see Chapter 4.B.2).
34. The USP-2 was adopted at B.36 in 2023, and identified CIEWS as one of the core focus areas of the GCF (decision B.36/13). Of 11 concrete programmatic target results set for the Fund's strategic period, Target 3 is dedicated to protecting 50 to 60 developing countries particularly vulnerable to the adverse effects of climate change with new or improved EWS.
35. For the first year of the USP-2 period in 2024, the Secretariat reported that 18 such countries had been supported, recording 36 per cent of the lower range of the target (GCF/B.41/Inf.13). However, the claim is based on intended (ex-ante) results from approved FPs while the actual (ex-post) outcomes of these investments are yet to be realized. Table 3–2 provides these 18 countries, showing Tonga and Albania as the newly added countries to the GCF CIEWS portfolio as of 2024; the other countries were already covered through GCF projects prior to the USP-2 period. Furthermore, 100 per cent or all 18 counties are supported by public sector projects, and 50 per cent or nine countries are included in the list via multi-country projects, which has its own constraints (see Chapter 5.A.1). Cumulatively, GCF's intended (ex-ante) CIEWS coverage has reached 106 countries as of B.43, recording 68.8 per cent of the non-Annex 1 countries of the UNFCCC.

[25] Green Climate Fund, *Sectoral Guide: Climate Information and Early Warning Systems*.
[26] World Meteorological Organization, "Cairo Roundtable advances on Early Warnings for All."
[27] United Nations Office for Disaster Risk Reduction, "Advisory Panel Joint Statement of the Early Warnings for All Initiative and Priority Actions."

Table 3–2. List of countries reported against USP-2 Target 3 as of the end of 2024

No.	Country	FP number	Public versus private	Multi-country project	Board meeting	LDC/SIDS/African States	Newly supported
1	Albania	SAP041	Public		B.39		Yes
2	Azerbaijan	SAP046	Public		B.40		
3	Burkina Faso	FP247	Public	Yes	B.40	LDC, African State	
4	Cook Islands	SAP034	Public		B.38	SIDS	
5	Cote d'Ivoire	FP247	Public	Yes	B.40	LDC, African State	
6	Djibouti	FP239	Public	Yes	B.39	LDC, African State	
7	Ethiopia	FP239	Public	Yes	B.39	LDC, African State	
8	Kenya	FP239	Public	Yes	B.39	African State	
9	Malawi	FP238	Public		B.39	LDC, African State	
10	Mali	FP247	Public	Yes	B.40	LDC, African State	
11	Mozambique	SAP042	Public		B.39	LDC, African State	
12	Niger	FP247	Public	Yes	B.40	LDC, African State	
13	Pakistan	SAP039	Public		B.39		
14	Sierra Leone	SAP036	Public		B.38	LDC, African State	
15	Somalia	FP239	Public	Yes	B.39	LDC, African State	
16	South Sudan	FP239	Public	Yes	B.39	LDC, African State	
17	Tonga	FP234	Public		B.39	SIDS	Yes
18	Vietnam	SAP040	Public		B.39		

36. In 2023, the GCF and the Climate Risk and Early Warning Systems (CREWS) launched the GCF SAP—CREWS Scaling-up Framework for early warning. This joint framework between the GCF and CREWS aims to fast-track access to GCF finance through its simplified approval process (SAP) for countries with ongoing or recently completed CREWS projects. SAP048 ("Strengthening the resilience of vulnerable communities within high climatic and disaster risk areas in Togo") became the first CREWS-supported CIEWS project approved by the GCF Board in 2025.[28] See Chapter 4.B.1 for further discussion on the framework.
37. As part of the sectoral approaches mentioned earlier, the Secretariat conducted a comprehensive internal exercise to classify and tag existing GCF projects and programmes according to the paradigm-shifting pathways outlined in each sectoral guide. This effort aimed to estimate the GCF investment amounts allocated to each sector. The sectoral tagging work (including CIEWS-tagging) was systematically implemented by the Secretariat for those projects approved up to B.34.
38. The methodology for sectoral tagging and percentage allocations involves tagging each project and programme with predefined keywords per sector and then assigning sectoral percentage allocations based on result area-based percentage allocations available on approved FPs. However, this methodology faces fundamental issues, such as the difficulty of translating the complex concept of CIEWS into actual project activities and a lack of clarity on delineation among the 10 sectors, among others. The tagging work often requires final judgment calls from sector specialists, which can also be subjective. At the time of writing, the evaluation team is unable to confirm the basis of the final judgment calls made by the Secretariat.
39. Currently, the Secretariat tagging work continues, carried out by a dedicated group of Secretariat staff who have maintained this legacy exercise, even as the sector guides themselves have been phased out. This tagging exercise has also served as a basis for the GCF to report to the Global Observatory for Early Warning System Investment, managed by UNDRR and WMO. Initiated by UNDRR and WMO as part of the EW4All initiative, the Observatory platform monitors and tracks self-reported EWS investments made by nine multilateral actors including the GCF. For more discussion on the Observatory data including the global EWS investment amounts, see Chapter 4.A.2.

B. Practical application of the CIEWS concept

40. **The challenge of identifying and tagging CIEWS projects and estimating CIEWS investment amounts is not unique to the GCF; it is a broader issue shared across CIEWS actors and other climate funds globally**, as noted by several informants. For instance, UNDRR highlights that the value chain of EWS is not universally defined, making it difficult to track EWS investments across the entire value chain.[29] Moreover, project interventions are often integrated into a broader project scope, with only a small portion of the total project budget allocated to EWS interventions. This results in challenges in identifying EWS activities and related budgets that are consistent across CIEWS actors.
41. This very issue led the UNDRR to develop the *Early warning systems taxonomy: Guide for tagging and tracking components of early warning systems* in consultation with CIEWS actors globally.[30]

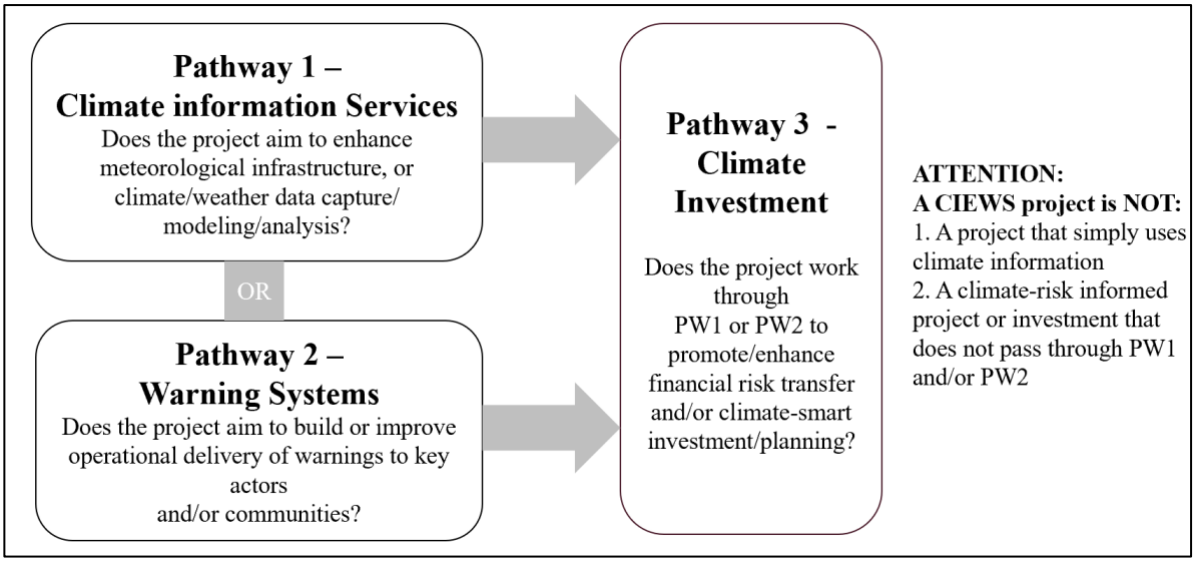
[28] Green Climate Fund, "SAP048: Strengthening the resilience of vulnerable communities within high climatic and disaster risk areas in Togo."
[29] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Early Warning Systems Taxonomy: A guide for tagging and tracking components of early warning systems*.
[30] Ibid.

The taxonomy aims to increase the consistency and comparability of EWS data reported by multilateral actors, including the GCF.

42. The UNDRR taxonomy helps CIEWS actors identify the component parts of a CIEWS and report on their investments in EWS. Nevertheless, the taxonomy poses a potential risk of unintentionally guiding stakeholders to concentrate exclusively on one or two elements, thereby diverging from the foundational principles of CIEWS. Indeed, CIEWS works when multiple components are interconnected and coordinated across sectors and at different levels from local, subnational, and national, to if-relevant (and desirably) regional and/or international levels. In other words, failure in one element or a lack of coordination across the multiple elements of CIEWS could lead to the failure of the whole CIEWS.[31]
43. For example, as a CIEWS effort that addresses cyclones, the minimum package of interconnected functions required to constitute a CIEWS include:
    - Improved precision in climate projections and risk analysis to anticipate cyclone hazards.
    - Strengthened NMHS hazard monitoring and forecasting capacity to detect cyclone formation with sufficient lead time.
    - Refined lines of authority via the national disaster management authority (NDMA) offering clear communication of when and how to seek shelter, using multiple redundant channels so people including those vulnerable know the warning and trust it.
    - Practised community engagement and education to ensure people understand that shelters exist, how to reach them, and why they should move there.
    - Operational shelters and trained personnel are ready to guide and support evacuees who reach the shelter.
44. It means that for a project to qualify as CIEWS-tagged, it must go beyond a single component and foster engagements between data producers and multilevel users, ensuring that the interplay between producers and users is strengthened and sustained.[32]
45. On this basis, the evaluation team applied the CIEWS determination framework (Figure 3–1) for its cluster assessments to determine CIEWS eligibility (see Chapter 7.A for more). The framework is based on the three pathways enshrined in the GCF CIEWS sectoral guide. As illustrated, a true CIEWS project must address either pathway 1 (strengthening CIS and their sectoral application through enhanced meteorological infrastructure, data capture, modelling, or analysis) or pathway 2 (promoting impact-based MHEWS by delivering actionable warnings). Projects merely preferencing climate data and information or risks (as all GCF investments should) were not considered CIEWS.
46. The framework also clarifies that pathway 3 (improving CIEWS for investments and financial decisions) counts as genuine CIEWS investments only when they flow from meaningful advances in the core service and system functions described in pathways 1 and/or 2. In other words, to be considered as a CIEWS pathway 3 project, it must be a CIEWS project with clear pathways 1 (CIS) or 2 (EWS), feeding into climate investments and including financial risk transfer or climate-smart investment actions where financial elements are triggered by CIEWS.

[31] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global status of multi-hazard early warning systems: Target G*; United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems 2023*.
[32] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Target G*.

Figure 3–1. CIEWS determination framework



47. When this framework is applied, the evaluation team found some gaps in the CIEWS-tagging exercise undertaken by the Secretariat. For example, some projects tagged as CIEWS, like FP004 ("Climate-Resilient Infrastructure Mainstreaming"), FP109 ("Safeguarding rural communities and their physical and economic assets from climate-induced disasters in Timor-Leste"), and FP112 ("Addressing Climate Vulnerability in the Water Sector in the Marshall Islands") were not considered CIEWS projects by the evaluation team. Conversely, some projects, such as FP048 ("Low Emissions and Climate-Resilient Agriculture Risk Sharing Facility"), FP179 ("Tanzania Agriculture Climate Adaptation Technology Deployment Programme"), FP244 ("Climate-Resilient Health and Well-Being for Rural Communities in southern Malawi"), and SAP011 ("Climate-resilient food security for women and men smallholders in Mozambique through integrated risk management") were not tagged by the Secretariat despite these projects qualifying as CIEWS according to the framework.

48. **The practical challenges of applying the CIEWS concept, coupled with insufficient data in GCF FPs and APRs, make it difficult to confidently determine how many CIEWS projects have been funded by the GCF and what their aggregate CIEWS-related investment amount is.** This complexity arises from the multifaceted nature of CIEWS, where projects often integrate various components, making clear identification and financial estimation difficult.

49. Additionally, some CIEWS projects approved after the Secretariat's systematic tagging exercise seem to have missed being tagged as CIEWS. These include FP258 ("Multi-country Project Advancing Early Warnings for All"), FP279 ("Enhancing Climate Resilience in Flood-Prone Areas in Northwestern South Sudan"), FP283 ("Glaciers to Farms (G2F) Regional Program: Advancing Climate Resilience & Sustainable Development in Central and West Asia"), SAP063 ("Scaling up of Caribbean Hydrometeorological and Multi-hazard Early Warning Services (CREWS) in Belize and Trinidad and Tobago"), and SAP065 ("Harnessing Insurance for Climate Resilience in Indian Agriculture").

50. The evaluation team analysed the GCF portfolio of CIEWS-tagged projects and estimated the total CIEWS investment amount. As noted in Chapter 2, a total of 141 CIEWS-tagged projects were

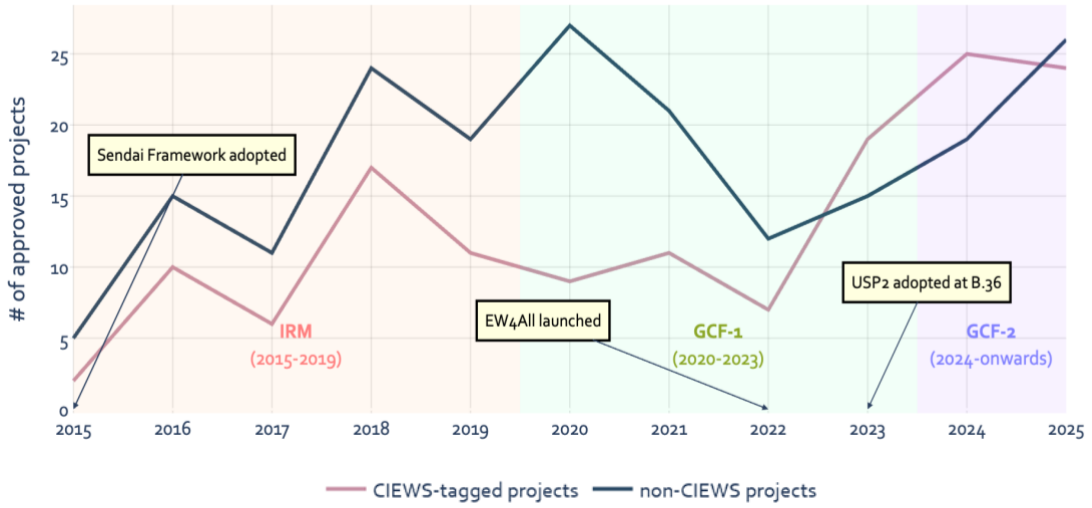
included in the evaluation out of 335 projects approved by the GCF Board as of B.43.[33] Of 141 CIEWS-tagged projects, 100 projects were tagged by the Secretariat with pre-assigned CIEWS percentage allocations or weights, while an additional 41 projects were tagged by the evaluation team (using an AI-assisted desk exercise) which did not have predefined allocations. To address missing data for these 41 projects, the team performed statistical imputation using variables correlated with assigned CIEWS weights, such as adaptation-related areas, semantic tags from FPs, and project keywords.

51. This approach enabled conservative estimates for CIEWS investments rather than applying full approved amounts. Details on the imputation method are available in annex 6, though further clarification is needed regarding the Secretariat's original allocation methodology which at the time of writing was not available. Projects tagged by the Secretariat but found ineligible by the evaluation team were still included to present a complete portfolio analysis. The analyses aim to encourage a re-evaluation of the ongoing tagging exercise that could lead to improvements in how CIEWS projects are identified, tagged and given CIEWS weights.

C. DESCRIPTIVE STATISTICS OF CIEWS-TAGGED PROJECTS

52. Figure 3–2 shows the number of approved CIEWS-tagged projects versus non-CIEWS projects over the past 10 years by approval year. As shown, when projects are simply counted, there is a considerable increase in the number of approved CIEWS-tagged projects post 2022 surpassing the number of non-CIEWS projects in 2023 and reaching the highest in 2024.

Figure 3–2. Number of approved CIEWS-tagged projects versus non-CIEWS projects by approval year



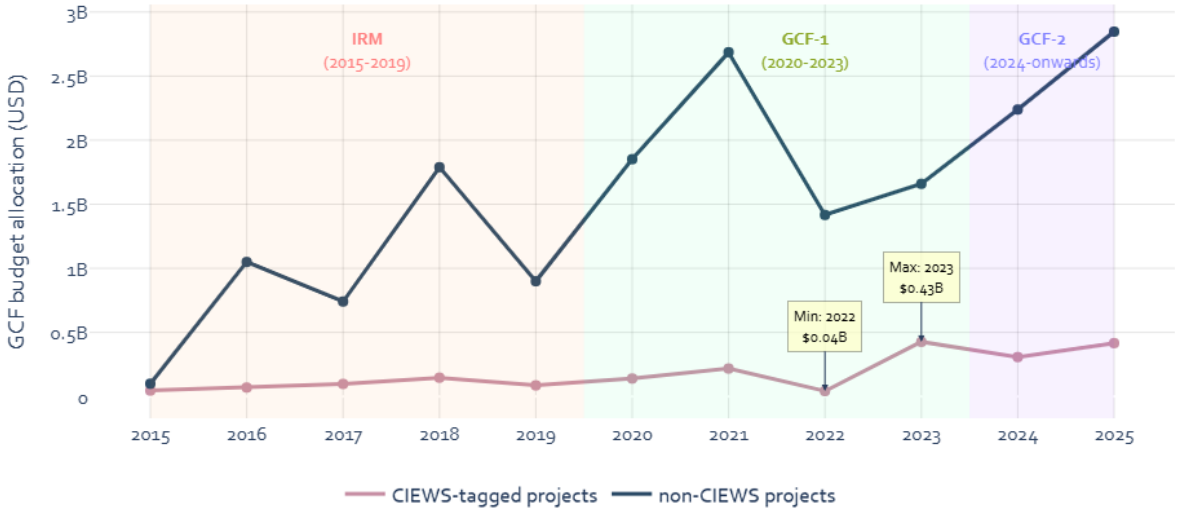
Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

53. Figure 3–3 shows the weighted funding amounts of approved CIEWS-tagged projects in USD versus the funding amounts of non-CIEWS projects by approval year. As CIEWS investment

[33] These 335 approved projects exclude FP115, which was cancelled after project implementation started.

amounts are weighted now by a CIEWS percentage allocation given to each project, the figure gives more granular information on estimated CIEWS investment amounts by each approval year. Cumulatively, the GCF is estimated to have invested USD 1.997 billion in CIEWS-related interventions across the portfolio, constituting 10 per cent of the total GCF portfolio of USD 19.22 billion as of B.43. In 2023, CIEWS recorded its highest annual estimated investment at USD 0.43 billion, followed by USD 0.41 billion in 2025.

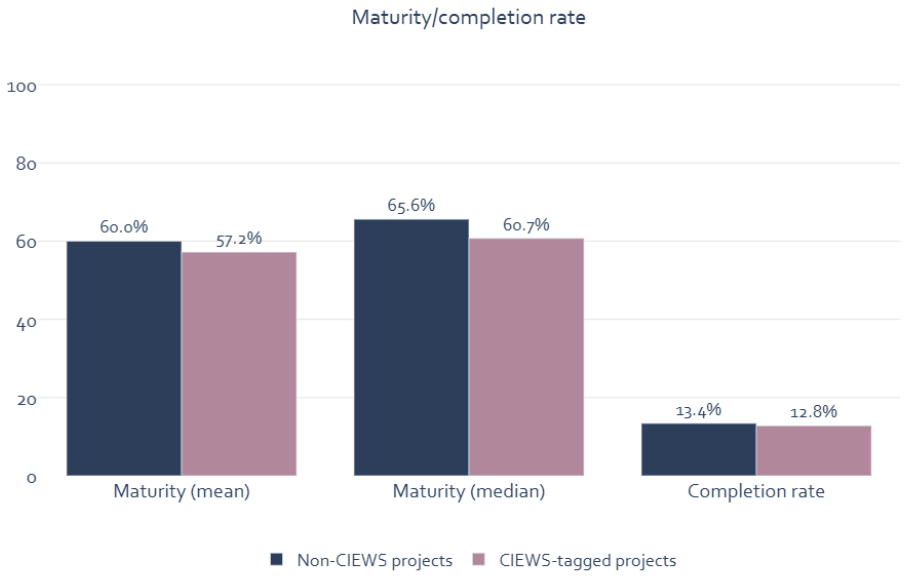
Figure 3–3. Estimated GCF investments in USD (weighted) versus non-CIEWS investments by approval year



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

54. Figure 3–4 shows the average (both mean and median) maturity rates of CIEWS-tagged projects compared to non-CIEWS projects for those projects under implementation as of December 2025. The maturity rate is calculated by taking the total number of days elapsed from the start of project implementation (marked by the funded activity agreement (FAA) effectiveness date) to December 2025, and dividing it by the total project duration (in days) for those projects. This gives an indication of how far along projects are in their implementation timeline relative to their planned duration. The completion rate, on the other hand, is the percentage of projects that have reached completion, as recorded in the GCF Secretariat database, compared to the entire portfolio of each type of project. As shown, both the maturity rate (mean and median) and the completion rate of CIEWS-tagged projects and non-CIEWS projects are similar, exhibiting no distinct variation across these categories.

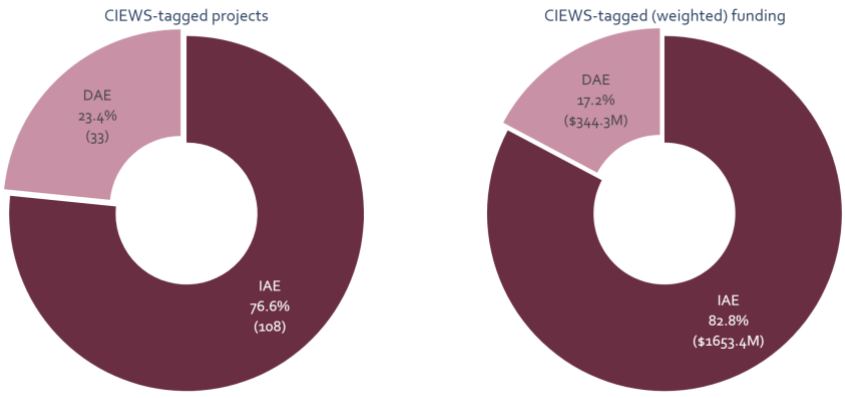
Figure 3–4. CIEWS portfolio maturity



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Maturity rate is calculated by taking the total number of days elapsed from the start of project implementation (marked by the FAA effectiveness date) to December 2025 and dividing it by the total project duration (in days) for those projects. The completion rate is the percentage of projects that have reached completion, as recorded in the GCF Secretariat database, compared to the entire portfolio of each type of project.

55. Figure 3–5 illustrates CIEWS-tagged projects by entity type, with the left side showing the number of projects and the right side displaying the weighted CIEWS investments. As depicted, the majority of CIEWS-tagged projects are managed by IAEs. The share of IAEs is even more pronounced when considering the estimated CIEWS investments, indicating that larger funds are channelled to IAEs. This suggests a significant role for IAEs in managing and implementing CIEWS projects, in line with the assumption that they have the necessary capacity to handle large-scale investments.

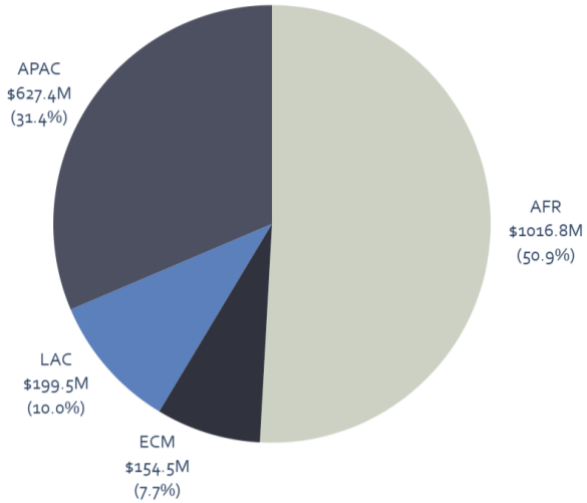
Figure 3–5. CIEWS-tagged projects by entity



Source: GCF project database, including all projects approved through B.42 (accessed July 16, 2025).
Note: 2025 data include projects approved up to December 2025 (B.43). Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

56. Figure 3–6 presents the estimated CIEWS investments (weighted) by region. The largest amount of CIEWS investments is directed towards Africa, followed by the Asia–Pacific region. Latin America and the Caribbean (LAC) comes next, with the Eastern Europe, Central Asia, and Middle East region receiving the least investment.

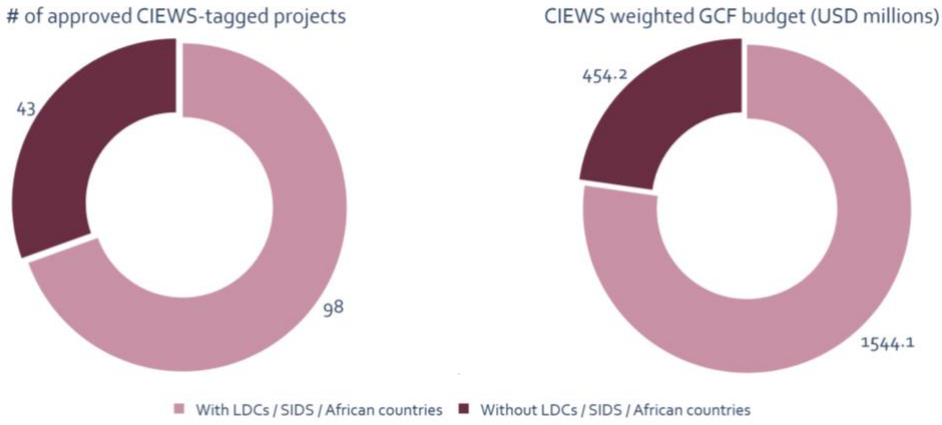
Figure 3–6. Estimated CIEWS investment amount by region



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: AFR = Africa, APAC = Asia–Pacific, LAC = Latin America and the Caribbean, ECM = Eastern Europe, Central Asia, and Middle East. Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

57. Figure 3–7 shows CIEWS-tagged projects by GCF priority countries – LDCs, SIDS, and African States – with project numbers on the left and weighted investments on the right. Of 141 projects, 98 (70 per cent) support these priority countries with an estimated USD 1.54 billion invested, reflecting GCF's commitment to supporting these countries.

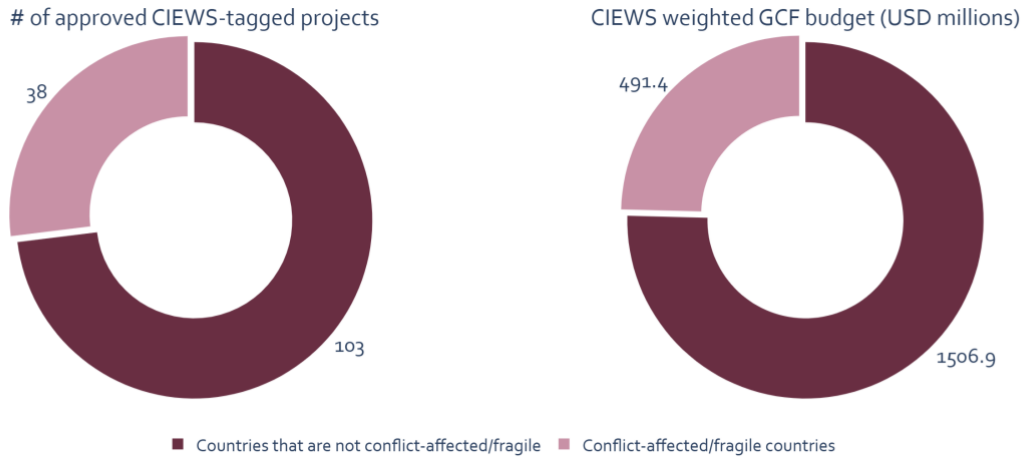
Figure 3–7. CIEWS-tagged projects by LDCs, SIDS and African States



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

58. Figure 3–8 displays CIEWS-tagged projects in fragile and conflict-affected states, showing project counts on the left and weighted investments on the right. Of 141 projects, 38 (27 per cent) support these countries with approximately USD 491 million invested, indicating a gradual increase in investments in these countries.

Figure 3–8. CIEWS-tagged projects by fragile and conflict-affected countries



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Fragile and conflict-affected countries were classified using the World Bank Group's 2025 list. Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

59. Figure 3–9 illustrates the portfolio of CIEWS-tagged projects, categorized by private versus public sector. The left side of the figure represents the number of projects, while the right side shows the weighted CIEWS investment amounts by sector. As depicted, the majority of CIEWS projects are public sector projects, indicating a significant emphasis on CIEWS delivery by public entities.

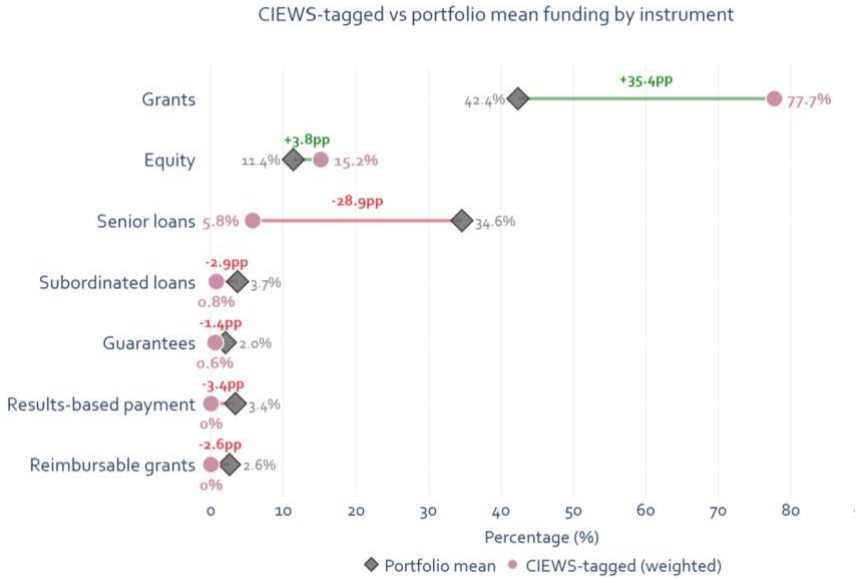
Figure 3–9. CIEWS-tagged projects (left – number of projects; right – weighted CIEWS investment amounts) by private versus public sector

Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

60. Figure 3–10 displays the estimated CIEWS investments (weighted) by financial instrument, compared to the funded activity portfolio mean. As shown, the majority of CIEWS investments

(77.7 per cent) are made in the form of grants, which is higher than the average percentage of grant investments for the entire portfolio of funded activities. Additionally, it is notable that CIEWS equity investments are 3.8 per cent higher than the portfolio average. This suggests that some CIEWS investments made by the private sector in the form of equity, involving comparatively large investment amounts, are contributing to this increase in equity investments.

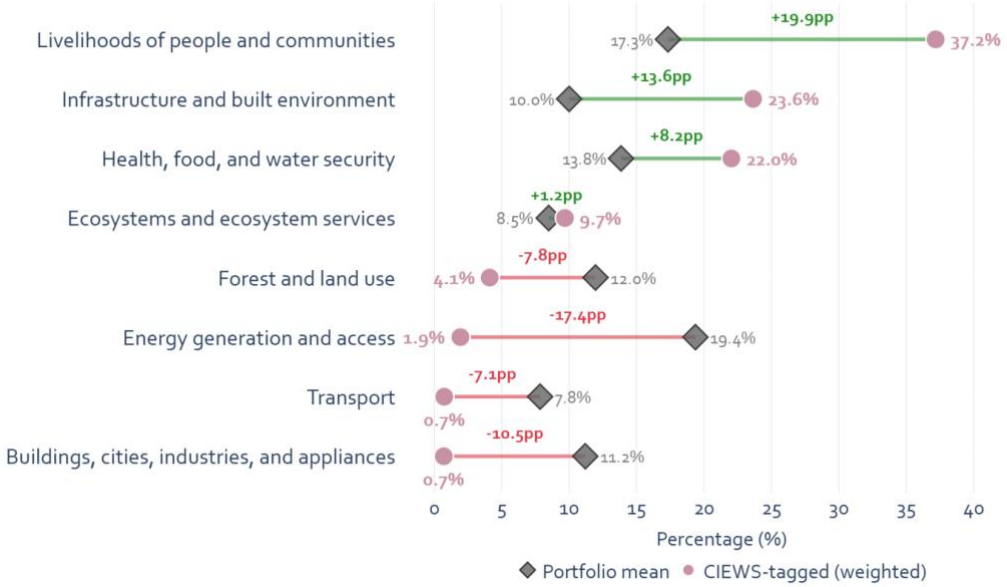
Figure 3–10. Estimated CIEWS investments by financial instrument



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

61. Figure 3–11 displays the estimated CIEWS investments (weighted) by results area, compared to the funded activity portfolio mean. As shown, the majority of CIEWS investments are concentrated in the three adaptation results areas, namely, “livelihood of people and communities”, “infrastructure and built environment”, and “health, food, and water security”.

Figure 3–11. Estimated CIEWS investments by results area



Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Estimated investment amounts exclude co-financing. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

Chapter 4. GCF'S APPROACH: COLLABORATION WITH CIEWS ACTORS

KEY FINDINGS

4.1. According to Global Observatory data of the EW4All initiative, GCF is the top funder of EWS, providing 34 per cent of global CIEWS investments and 44 per cent in LDCs/SIDS.

4.2. The GCF's comparative advantage is its significant financial capacity to invest in large-scale projects with large scope. Large-scale funding from a single source can potentially streamline the process for countries by reducing the need to navigate the complex, multi-layered processes required to access funds from multiple actors. However, this approach is only effective if the country has the human and technical capacity to absorb and effectively utilize the large-scale funding.

4.3. The successful materialization of the global EW4All programme (FP258) allowed the GCF to enhance the visibility of its contributions to EW4All, as intended. Through this programme, the GCF effectively brought together core CIEWS actors and demonstrated its ability to improve coordination among them.

4.4. However, the GCF's collaboration with climate funds such as Global Environment Facility (GEF), Climate Investment Funds (CIF) and Adaptation Fund on CIEWS programming has been limited, to date. Since each fund has different levels of accessibility – for instance, the GEF and Adaptation Fund are procedurally easier to access but offer less funding than the GCF – coordinated country-level efforts can promote a more streamlined approach, enabling GCF to support countries to efficiently expand projects tested under other funds.

4.5. The SAP—CREWS Scaling-up Framework facilitated mutual benefits for both the GCF and CREWS. It allowed the GCF to differentiate the SAP modality from the (standard) PAP by highlighting its fast and simplified approval process. Meanwhile, CREWS benefited from partnering with a larger financing mechanism like the GCF to continue its mandate and ensure that the results achieved in their investments are scaled. However, the success so far within the framework may need to be nuanced when considering wider actors and frameworks including the Systematic Observations Financing Facility (SOFF) framework for collaboration.

4.6. While the GCF funding role in CIEWS is clear and well-recognized, its technical and knowledge-sharing role appears unclear. There is some ambiguity within the Fund regarding whether it should concentrate on strengthening its own technical focus on CIEWS or rely primarily on the technical expertise and capabilities of AEs given the institutional arrangement of the GCF as the second due diligence organization.

4.7. While it is evident that addressing fragmentation of key CIEWS actors globally requires intentional efforts, there is a risk that these efforts could miss the mark in reaching the last mile – the original purpose of the efforts – if countries and communities are not actively involved and driving the efforts. The ongoing challenges in achieving effective coordination suggest the need for a balanced approach that involves all stakeholders at the national, regional and global levels.

A. GLOBAL CONTEXT

1. EVOLUTION OF CIEWS-RELATED FRAMEWORKS

62. Conceptually, there is a growing trend towards the complementarity and coherence of policies and frameworks, and disciplines across CIS, disaster risk reduction (DRR) with MHEWS as a key component, and climate change adaptation (CCA) including resilience building.

63. Historically, these disciplines have gone through separate evolutions over the years. The summary of key global milestones in DRR, CIS, and CCA as well as other interdisciplinary milestones linked to CIEWS is provided in Table 4–1. For example, DRR discussion started as early as the 1970s, culminating in the adoption of the Sendai Framework in 2015, which established a clear DRR implementation framework with seven global targets. Specifically, Target G aims to ensure the availability and accessibility of MHEWS globally (Table 4–2). The Sendai Framework also marked major progress in coherence efforts with other policies and frameworks by clearly recognizing climate change as one of the drivers of disaster risk and articulating the opportunity to reduce disaster risk in a coherent manner throughout the interrelated intergovernmental processes, including the UNFCCC.[34]

Table 4–1. CIEWS-related milestones and frameworks by (sub) discipline

YEAR	(SUB) DISCIPLINE/ SECTOR	GLOBAL DEVELOPMENT	MAIN ORGANIZATIONS/ PARTNERSHIPS
1989	DRR	International Framework of Action for the International Decade for Natural Disaster Reduction adopted at the United Nations General Assembly	International Decade for Natural Disaster Reduction (former UNDRR)
1994	DRR	Yokohama Strategy adopted	UNDRR
2005	DRR	Hyogo Framework for Action (2005–2015) adopted	UNDRR
2012	CIS	Global Framework for Climate Services (GFCS) established	WMO
2015	Interdisciplinary	Sustainable Development Goals including Goal 13 on climate action	United Nations
2015	DRR	Sendai Framework for DRR adopted which includes Target G on MHEWS	UNDRR
2015	Climate negotiation and finance including CCA	Paris Agreement adopted at COP21, including Article 7.1 on Global Goal on Adaptation (GGA), and Article 8 that mentions EWS as part of action and support to avert, minimize and address loss and damage associated with the adverse effects of climate change	UNFCCC COP
2016	CIS and EWS	CREWS established at COP21	COP, WMO, 12 member States
2019	CIS and EWS	The Alliance for Hydromet Development launched at COP25	12 organizations such as WMO, climate funds including GCF, multilateral banks and United

[34] United Nations Office for Disaster Risk Reduction, *Sendai Framework for Disaster Risk Reduction 2015–2030* (2015).

YEAR	(SUB) DISCIPLINE/ SECTOR	GLOBAL DEVELOPMENT	MAIN ORGANIZATIONS/ PARTNERSHIPS
			Nations agencies
2019	DRR and humanitarian sector	Risk-informed Early Action Partnership (REAP) launched at the United Nations Climate Action Summit	International Federation of Red Cross and Red Crescent Societies (IFRC), United Nations agencies, governments and private sector
2022	CIS and EWS	Systematic Observations Financing Facility (SOFF) established	WMO, United Nations Development Programme (UNDP), and United Nations Environment Programme (UNEP) at the request of WMO member States in 2021
2022	CIS, EWS and humanitarian sector	Early Warnings for All (EW4All) initiative launched at COP27	United Nations, COP, WMO, IFRC, International Telecommunication Union (ITU), UNDRR supported by United Nations agencies, CREWS, SOFF, climate funds including GCF and humanitarian actors such as REAP, and United Nations Office for the Coordination of Humanitarian Affairs.
2023	Climate negotiation and finance	Fund for Responding to Loss and Damage (FRLD) operationalized at COP28 following decision in 2022	UNFCCC, GCF, UNDP, FRLD
2023	CCA	UAE Framework for Global Climate Resilience adopted including Article 10(a) on CIEWS	UNFCCC COP
2025	CCA	Belém Adaptation Indicators adopted at COP30/CMA7	UNFCCC COP

Source: Publicly available documentation from relevant organizations.

Table 4–2. Sendai Framework Target G indicators

SENDAI FRAMEWORK TARGET G INDICATORS	
G1 (compound G2–G5)	Number of countries that have MHEWS.
G2	Number of countries that have multi-hazard monitoring and forecasting systems.
G3	Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms.
G4	Percentage of local governments having a plan to act on early warnings.
G5	Number of countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels.
G6	Percentage of population exposed to or at risk from disasters protected through pre-emptive evacuation following early warning.

Source: United Nations Office for Disaster Risk Reduction, *Sendai Framework*.

64. In a similar manner, the CIS space has progressed over the past 15 years starting from 2009, where the need for enhanced and coordinated climate services was formally recognized at the third World

Climate Conference. This resulted in the establishment of the GFCS in 2012 – a United Nations-led initiative spearheaded by WMO to enable society to better manage the risks and opportunities arising from climate variability and change.[35] The GFCS scope includes five priority sectors, namely agriculture and food security, DRR, energy, health, and water.

65. The GFCS is comprised of six components of the climate services value chain, including: (i) basic systems and observations, to ensure the continuous and reliable collection of climate data as may be crucial for climate monitoring and prediction, (ii) research, modelling and prediction, which enables climate services to be based on the latest scientific data, information and knowledge, (iii) a climate services information system through which climate data and information are collected, processed and disseminated, (iv) user engagement, also known as user interface platforms, to facilitate exchanges between climate service providers and users thereby ensuring that the services are tailored to the needs of various sectors for greater benefits, (v) capacity development such as training and education programmes to strengthen the understanding and use of climate information, and (vi) governance for effective coordination with NMHS playing the key coordination role.[36]

66. The National Framework for Climate Services (NFCS) provides country-level implementations of the GFCS concept, focusing on developing and delivering climate services tailored to national needs and circumstances.[37] Essentially, the NFCS means to function as the key institutional mechanism in a country to coordinate and facilitate collaboration among national institutions and other key stakeholders, including international or regional agencies where relevant, to enhance the co-production, tailoring, delivery, and use of climate services.

67. In the early action and early warning space, a global multi-stakeholder partnership initiative known as the REAP was launched in 2019 at the United Nations Climate Action Summit.[38] REAP is a global coordination platform hosted at the IFRC to unify diverse stakeholders to achieve the safety of 1 billion people from disasters by 2025, which is now extended to 2030.[39] As a REAP partner, GCF plays a financial role in supporting REAP's objectives and regularly appears on REAP's flagship annual reports known as "the State of Play".[40]

68. Meanwhile, under CCA action and support, a growing number of policies and frameworks have embraced the development and implementation of CIS and EWS. For example, the Paris Agreement under Article 7.1 established "the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change" as a collective vision and direction for the international community to engage in required adaptation and resilience building efforts. Building on this and following the conclusion of a two-year Glasgow–Sharm el-Sheikh work programme, the CMA5 adopted the UAE Framework for Global Climate Resilience in December 2023.[41] This framework defines seven thematic and four cross-cutting dimensions as global targets for adaptation through paragraphs 9–10, offering a more structured approach to assessing collective adaptation progress. Specifically, Article 10(a) of the framework mentions CIEWS by targeting that:

[35] World Meteorological Organization, "Climate Services for Supporting Climate Change Adaptation: Supplement to the Technical Guidelines for The National Adaptation Plan Process."
[36] World Meteorological Organization, *Five-year Progress Report (2019–2024)*.
[37] World Meteorological Organization, "Current Status of the Implementation of National Frameworks for Climate Services (NFCS)".
[38] Risk-informed Early Action Partnership, Partners.
[39] United Nations Framework Convention on Climate Change, Risk-informed Early Action Partnership (REAP); Risk-informed Early Action Partnership, *Strategy 2030: Uniting for Risk-informed Early Action at Scale*.
[40] Risk-informed Early Action Partnership, Partners; Wagner, Marie, *Early Action: The State of Play 2023*.
[41] United Nations Framework Convention on Climate Change, "Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation referred to in decision 7/CMA.3."

> By 2030 all Parties have conducted up-to-date assessments of climate hazards, climate change impacts and exposure to risks and vulnerabilities and have used the outcomes of these assessments to inform their formulation of national adaptation plans, policy instruments, and planning processes and/or strategies, and by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services.

69. CMA5 also launched the UAE-Belém two-year work programme on indicators, tasked with identifying and/or developing robust indicators to measure progress towards the framework.[42] In November 2025, the CMA7 adopted "voluntary" Belém Adaptation Indicators that include seven CIEWS indicators for assessing Article 10(a) of the framework (see Table 4–3) and initiated a two-year process – the Belém-Addis Vision on Adaptation – to develop guidance on how to operationalize these indicators.[43] Moreover, the CMA7 invited the GCF to use its readiness programme to assist developing countries to implement the UAE Framework for Global Climate Resilience. These milestones reflect consistent advancement in enhancing the implementation, measurability, and comparability of adaptation initiatives across countries and sectors, including the CIEWS. Within the Fund, preparatory work is currently ongoing to develop and implement a harmonized RMF that takes into account the Belém Adaptation Indicators.

Table 4–3. List of indicators for assessing Article 10(a) of the UAE Framework of Global Climate Resilience

UAE Framework for Global Climate Resilience Target 10(a) indicators		Linkage to Target G indicators
(a)	Level of establishment of MHEWS	G1
(b)	Level of conduct of assessments of climate hazards, climate change impacts, and exposure to risks and vulnerabilities based on different global warming scenarios, as appropriate for regions and contexts	G5
(c)	Level of establishment of multi-hazard monitoring and impact-based forecasting systems, including monitoring stations	G2
(d)	Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms	G3
(e)	Percentage of the population in a country exposed to or at risk from climate-related disasters protected through pre-emptive evacuation measures following early warning	G6
(f)	Level of establishment of CIS for risk reduction and systematic observation to support improved climate-related data, information and services	-
(g)	Extent of usage of climate risk information and comprehensive risk assessment based on different global warming scenarios, as appropriate for regions and contexts, to inform formulation of NAPs, policy instruments, and planning processes and/or strategies.	-

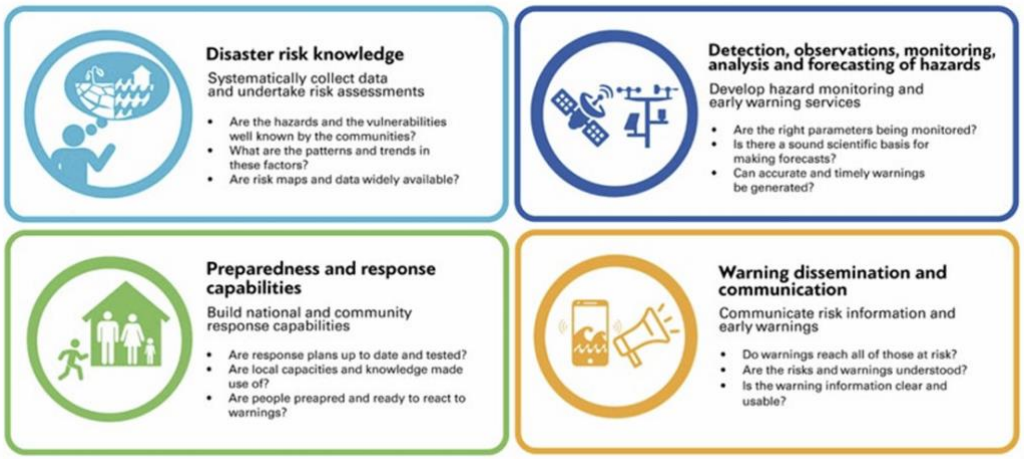
Source: United Nations Framework Convention on Climate Change, "Matters relating to adaptation."
Note: Linkage to Sendai Framework Target G indicators was done by the authors.

[42] United Nations Framework Convention on Climate Change, "Adaptation Knowledge Portal."
[43] United Nations Framework Convention on Climate Change, "Matters relating to adaptation."

70. Moreover, Article 8 of the Paris Agreement mentions EWS as part of the actions and support that should be enhanced to avert, minimize and address loss and damage associated with the adverse effects of climate change – both extreme weather and slow onset events. Loss and damage remain a key issue in the UNFCCC negotiations, with ongoing discussions on how to effectively address it. One of the key recent developments is the operationalization of a FRLD, following a decision at COP27 in 2022[44], with a mandate to assist developing countries that are particularly vulnerable to the adverse effects of climate change in responding to economic and non-economic loss and damage. The FRLD was initially served by an interim Secretariat using seconded staff from the UNFCCC, the GCF and the United Nations Development Programme (UNDP) while presently it has transitioned to a dedicated and independent Secretariat. Amid funding challenges, a total of USD 789 million has been pledged to the FRLD as of June 2025, representing 6 per cent of the pledges confirmed by the GCF for its second replenishment period (2024–2027).[45] This is far less than the estimated USD 300 billion per year needed to address annual loss and damage globally,[46] as well as the New Collective Quantified Goal, adopted at COP29, that set a floor of USD 300 billion annually by 2035 for developed nations to provide to developing countries for climate action.
71. Despite the challenge, the operationalization of FRLD has begun, including facilitating coordination and complementarity with other existing support mechanisms such as the Warsaw International Mechanism for Loss and Damage Executive Committee (WIMExCom) and Santiago Network. More recently at COP30, the FRLD launched a call for funding requests from developing countries under its initial phase of Barbados Implementation Modalities – USD 250 million funding window – to strengthen countries' responses to climate disasters including slow onset and extreme climate-induced events.[47]
72. Among all these developments, however, the most significant one in the CIEWS space, is the EW4All initiative launched by the United Nations Secretary-General at COP27 in 2022, as noted in Chapter 3. **This initiative has essentially consolidated multiple efforts from DRR, CIS, and CCA in one space and has also brought in humanitarian actors and partnerships such as IFRC and REAP to increase coherence and complementarity across CIEWS actors**.
73. The EW4All initiative aims to achieve universal access to EWS by 2027 and prioritizes the initial 30 countries for its rollout across Africa, LAC, Central Asia, and Asia and the Pacific. Importantly, the plan emphasizes the need to address the below four pillars from scientific and technical, policy, and financial perspectives and clarifies that national-level implementation should involve both the NMHS and NDMA of relevant countries (Figure 4–1). To track its progress, the initiative combines data from official reporting mechanisms, such as the Sendai Framework Monitor, the Global Observatory and WMO's monitoring system.

[44] Decision 2/CP.27.
[45] United Nations Framework Convention on Climate Change, "Pledges to the Fund for Responding to Loss and Damage"; Green Climate Fund, "Resource mobilisation, GCF-2."
[46] Independent High-Level Expert Group, *Accelerating Sustainable Finance for Emerging Markets and Developing Economies: Independent High-Level Expert Group Review of the Vertical Climate and Environmental Funds*.
[47] Fund for Responding to Loss and Damage, "The Fund for responding to Loss and Damage Launches Call for Funding Requests at COP30, Marking Historic Milestone from Promise to Action."

Figure 4–1. Four pillars of multi-hazard early warning systems



Source: World Meteorological Organization, *Early Warnings for All: Executive Action Plan 2023–2027*.

74. The EW4All Executive Action Plan (2023–2027) launched at COP27 highlights the need for the targeted investment of an estimated USD 3.1 billion into the four pillars of EWS. These are Pillar 1 – disaster risk knowledge (USD 374 million), Pillar 2 – detection observations, monitoring, analysis and forecasting of hazards (USD 1.18 billion), Pillar 3 – warning dissemination and communication (USD 550 million), and Pillar 4 – preparedness and response capabilities (USD 1 billion).[48] These pillars are led by the UNDRR, WMO, ITU and IFRC respectively, and supported by numerous organizations and agencies that include the GCF and other climate funds.

2. Global CIEWS investments

75. As part of the EW4All initiative, UNDRR and WMO, with funding support from CREWS, launched the Global Observatory for Early Warning System Investments in December 2024.[49] This initiative tags and tracks EWS investments across multilateral development banks (MDBs) and climate funds, including the GCF.

76. As shown in Table 4–4, according to the Observatory data as of the end of 2024, the **GCF emerges as the leading funder of EWS in terms of both the number of projects and the investment amounts, taking the CIEWS investment share of 34 per cent globally.**[50] It is followed by the World Bank, the Asian Development Bank (ADB), and the Global Environmental Facility (GEF). The aggregate EWS investment amount reported by eight institutions is USD 6.5 billion, comprising 379 projects for the period 2012–2024.

[48] World Meteorological Organization, *Early Warnings for All: Executive Action Plan 2023–2027*.
[49] World Meteorological Organization, "Tracking funding for life-saving early warning systems," February 12, 2025; United Nations Disaster Risk Reduction and World Meteorological Organization, "Global Observatory for EWS Investments."
[50] The Observatory data includes co-financing amounts in addition to the GCF funding amounts, both weighted by estimated CIEWS percentage allocations reported in line with the EWS Taxonomy (see United Nations Disaster Risk Reduction, "Advisory Panel Joint Statement of the Early Warnings for All Initiative and Priority Actions.") As a result, the total aggregated amount of EWS investment by the GCF here is higher, amounting to USD 2.2 billion, compared to the estimated CIEWS investments amount provided in chapter 3 (USD 1.997 billion as of B.43), which accounts for GCF funding only. In addition, the portfolio analyses presented in chapter 3 include an additional 41 CIEWS projects added by the evaluation team. See Chapter 2.C regarding the limitation of this data.

Table 4–4. Total reported EWS investments by institution (2012–2024)

INSTITUTION	NO. OF EWS PROJECTS	EWS FUNDING (USD MIL.)	% OF FUNDING
GCF	85	2,210	34 %
World Bank	50	1,820	27.9%
ADB	62	1,464.3	22.4%
GEF	40	602.4	9.2%
Adaptation Fund	59	203.9	3.1%
CREWS	29	121.6	1.9%
SOFF	48	90.1	1.4%
IDB	8	14.8	0.2%
Total	**381**	**6,527.1**	**100%**

Source: Global Observatory for Early Warning System Investments.[51]
Note: IDB = Inter-American Development Bank. GCF investments start from 2015.

77. Table 4–5 highlights the number and amounts of investments directed to LDCs and SIDS, combined, by various institutions. **Once again, the GCF stands out as the top contributor, with EWS investments amounting to USD 1.6 billion (including co-financing). This accounts for 44 per cent of the global share**.

Table 4–5. Number and amounts of investments made to LDCs and SIDS (2012–2024)

INSTITUTION	NO. OF EWS PROJECTS	EWS FUNDING (USD MIL.)	% OF FUNDING
GCF	46	1,662.10	44.4%
World Bank	29	861	23.0%
GEF	40	602.4	16.1%
ADB	30	294.4	7.9%
CREWS	29	121.6	3.2%
Adaptation Fund	31	111.7	3.0%
SOFF	42	89.2	2.4%
IDB	1	0.2	0%
Total	**248**	**3,742.6**	**100%**

Source: Global Observatory for Early Warning System Investments.[52]
Note: GCF investments start from 2015.

78. As shown, GCF is by far the largest funder in the current CIEWS sector. This finding aligns with the information gathered from KIIs where **GCF value addition is noted as being its significant financial capacity to invest in large-scale projects with large scope, which is considered an advantage within the rather fragmentated CIEWS space.** For instance, large-scale funding from a single source can potentially streamline the process for countries by reducing the need to navigate the complex, multi-layered processes required to access funds from multiple actors. This approach

[51] United Nations Disaster Risk Reduction and World Meteorological Organization, "Global Observatory for EWS Investments."
[52] Ibid.

could simplify bureaucratic processes and minimizes the additional coordination and process requirements typically involved with multiple funding sources, and countries can focus more on delivery and implementation. However, **this approach is only effective if the country has the human and technical capacity to absorb and effectively utilize the large-scale funding**.

79. The evaluation team also attempted to estimate GCF's EWS investments by EW4All pillar using the Observatory data, which includes tagging of EW4All pillars. Given the challenge that most projects contribute to multiple pillars simultaneously without the availability of pillar-specific budget breakdowns, a weighted allocation methodology was employed to distribute the total portfolio funding across the four EW4All pillars plus the cross-pillar "Foundational elements for effective early warning systems".[53] See annex 8 for more details.

80. While this analysis should be considered with several caveats – including the simplified allocation weights and the assumption that comprehensive projects distribute funding equally across pillars – the results reveal important patterns in EWS investment priorities. As shown in Figure 4–2, **the global portfolio demonstrates notable upstream investments, with pillars 1 (disaster risk knowledge) and 2 (detection, observations, monitoring, analysis, and forecasting) receiving 55.8 per cent of total funding compared to 29.6 per cent for the downstream pillars 3 (warning dissemination) and 4 (preparedness and response).** The analysis reveals some gap in downstream pillars: only five projects exclusively target Pillar 3 or Pillar 4, compared to 87 projects exclusively addressing upstream pillars. **There are similar trends in the GCF portfolio where investments are more focused on pillars 1 and 2**.

[53] This methodology accounts for three categories of project complexity: exclusive projects that address only one pillar (97 projects, 25.5 per cent of portfolio), comprehensive projects that address all five pillars (62 projects, 16.3 per cent), and multi-pillar projects that address 2 to 4 pillars (222 projects, 58.3 per cent). It uses differentiated allocation weights based on these complexity categories, with exclusive projects allocating 100 per cent to their single pillar, comprehensive projects distributing 20 per cent to each pillar equally, and multi-pillar projects allocating an estimated 33 per cent average per pillar addressed.

Figure 4–2. Estimated investments by pillar for the total EW4All portfolio versus GCF investments[54]

Source: EW4All initiative.[55]
Note: Pillar 1 = disaster risk knowledge; Pillar 2 = detection, observations, monitoring, analysis, and forecasting of hazards; Pillar 3 = warning dissemination and communication; Pillar 4 = preparedness and response capabilities; CP (cross-pillar) = foundational elements for effective EWS.[56] See annex 8 for methodology.

3. Trackability of GCF investments in CIEWS by Sendai Framework

81. While the Global Observatory tracks investment flows into EWS, the Sendai Framework Monitor provides the primary international mechanism for tracking EWS outcome indicators at the country level. As covered above, countries report progress against six target G indicators (G1–G6) through the Sendai Framework Monitor, with the G1 composite indicator serving as the primary measure of national MHEWS capacity on a scale of 0 (no capacity) to 1 (full capacity).
82. To assess the extent to which GCF CIEWS investments can be tracked against international outcome benchmarks, the evaluation team cross-referenced the CIEWS portfolio against Sendai Framework Monitor data for GCF-eligible countries.
83. Of the 106 countries receiving GCF CIEWS investments as of B.43,[57] 60 (56.6 per cent) report to at least one Sendai Framework target G indicator, while 46 countries (43.4 per cent) do not report to any relevant indicator.[58]

[54] United Nations Disaster Risk Reduction and World Meteorological Organization, "Global Observatory for EWS Investments."
[55] Early Warnings for All, "The Early Warnings for All (EW4All) initiative."
[56] United Nations Office for Disaster Risk Reduction. *Sendai Framework for Disaster Risk Reduction 2015–2030*.
[57] This refers to 141 projects tagged as CIEWS that span 106 countries, as identified by the evaluation team.
[58] When measured by investment volume, approximately USD 1,141 million (57.1 per cent) of CIEWS investment is in countries with some Sendai data availability, while USD 857 million (42.9 per cent) cannot be tracked against any Sendai Framework indicator.

Table 4–6. CIEWS investment trackability by Sendai Framework indicator

INDICATOR	EW4ALL PILLAR	COUNTRIES WITH DATA	TRACKABLE CIEWS (USD MIL.)	% TRACKABLE
G1 (composite)	All pillars	46	970.8	48.6%
G2	2 (detection and monitoring)	58	1,127.0	56.4%
G3	3 (warning dissemination)	58	1,128.8	56.5%
G4	4 (preparedness)	40	758.6	38.0%
G5	1 (risk knowledge)	45	927.5	46.4%
G6	4 (preparedness)	40	807.2	40.4%

Source: United Nations Office for Disaster Risk Reduction, Sendai Framework Monitor, updated April 1, 2025;[59] GCF project database, including all projects approved through B.43, accessed December 11, 2025.
Note: G1 = composite MHEWS indicator; G2 = detection, observations, monitoring, analysis, and forecasting; G3 = warning dissemination and communication; G4 = preparedness to respond; G5 = risk knowledge; G6 = preparedness (international cooperation). CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 3). Trackable investment refers to CIEWS funding in countries reporting to the respective Sendai indicator. Rows are not mutually exclusive: countries may report to multiple indicators, and the same CIEWS investment may be counted under several indicators; figures should not be summed across rows.

84. The trackability gap is particularly pronounced among GCF's priority countries. While LDCs demonstrate high CIEWS coverage within the GCF portfolio (38 of 44 eligible LDCs, or 86.4 per cent, receiving USD 1,011 million), only 52.8 per cent of this investment is trackable against Sendai indicators. Of the 38 LDCs with CIEWS investment by the GCF, 21 do not report to the Sendai Framework Monitor. SIDS present a similar pattern: 28 of 35 eligible SIDS (80.0 per cent) receive GCF funding in CIEWS totalling USD 357 million, but only 41.1 per cent is trackable.

Table 4–7. CIEWS coverage and trackability by country category

CATEGORY	COUNTRIES WITH CIEWS	COVERAGE RATE	CIEWS INVESTMENT (USD MIL.)	TRACKABLE (%)
LDCs	38 of 44	86.4%	1,011.1	52.8%
SIDS	28 of 35	80.0%	357.3	41.1%

Source: United Nations Office for Disaster Risk Reduction, Sendai Framework Monitor, updated April 1, 2025;[60] GCF project database, including all projects approved through B.43, accessed December 11, 2025.
Note: LDC and SIDS classifications based on United Nations official lists. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 3). Trackability calculated as percentage of CIEWS investment in countries reporting to at least one Sendai target G indicator. Categories are not mutually exclusive: some countries qualify as both LDC and SIDS; figures should not be summed across rows.

85. For the 46 countries with G1 data, the evaluation examined whether GCF CIEWS investments align with demonstrated EWS capacity gaps. Nineteen countries with high needs (G1<0.3) have received approximately USD 479 million in CIEWS investment. Notable examples include Bangladesh (USD

[59] World Bank, "Sendai Framework Monitor (SFM)."
[60] Ibid.

92 million, G1=0.13), Kenya (USD 44 million, G1=0.25), Togo (USD 39 million, G1=0.20), and Somalia (USD 29 million, G1=0.05). Three countries with GCF CIEWS investment, Kazakhstan, Georgia, and Guatemala, report G1 values of zero, indicating minimal baseline MHEWS capacity. Conversely, Haiti, classified as both an LDC and SIDS and highly vulnerable to climate and disaster risks, has not received GCF CIEWS investment as of B.43 and does not report on Sendai Framework G indicators, suggesting a need for support.

86. These findings do not reflect on GCF's performance, as Sendai Framework reporting is a country-driven process beyond GCF's operational control. Rather, they highlight a broader ecosystem challenge: the countries most in need of EWS investment often have the least capacity to report against international monitoring frameworks, creating an evidence gap for assessing collective progress towards EW4All and Sendai Framework targets.

87. These data availability patterns provide important context for interpreting the effectiveness findings presented in Chapter 7.A, and may inform considerations for future CIEWS programming and coordination.

4. Global CIEWS progress and gaps

88. Although significant progress in CIEWS has been documented in the literature, notable gaps persist, especially in nations that are particularly susceptible to the negative impacts of climate change. In terms of progress, the capacity of NMHS to deliver CIS has increased notably. Over the past five years, the number of NMHS providing "advanced" climate services rose from 8 to 15 countries.[61] Additionally, the number of countries covered by EWS doubled in 2023 compared to 2015, although this still represents only half of the world, covering 52 per cent or 101 countries.

89. However, only 46 per cent of LDCs and 39 per cent of SIDS report having MHEWS in place.[62] Similarly, as of 2022, countries in Africa and the Americas and Caribbean reported MHEWS coverage of 45 per cent and 37 per cent, respectively, lagging behind the global average.[63]

90. Moreover, according to the midterm review of the Sendai Framework, reported economic losses of 1 per cent of global gross domestic product are likely an underestimate, and damage to and destruction of critical infrastructure remains unacceptably high.[64] Indeed, the Global Natural Disaster Assessment Report 2024 noted that total direct economic losses caused by natural disasters in 2024 alone came to USD 252 billion worldwide, of which storms accounted for approximately 71 per cent.[65] Moreover, the cost of direct economic losses is steadily increasing over decades; the losses increased by 81 per cent in 2021 when compared to the average over the last 30 years (1991–2020).[66] A lack of reliable information and data related to natural disaster impacts led UNDRR with UNDP and WMO to develop DELTA Resilience – an enhanced disaster tracking system for hazardous events and associated losses and damages – which is considered more comprehensive and

[61] World Meteorological Organization, *2024 State of Climate Services: Five-year Progress Report (2019–2024)*.
[62] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems 2023*.
[63] Ibid.
[64] United Nations Office for Disaster Risk Reduction, *The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030*.
[65] Academy of Disaster Reduction and Emergency Management, Ministry of Emergency Management – Ministry of Education et al., *2024 Global Natural Disaster Assessment Report*.
[66] Academy of Disaster Reduction and Emergency Management, Ministry of Emergency Management – Ministry of Education et al., *2021 Global Natural Disaster Assessment Report*.

interoperable than the existing Sendai monitoring system.[67] Its rollout, however, demands significant investment, awareness efforts, national commitment, and capacity-building.

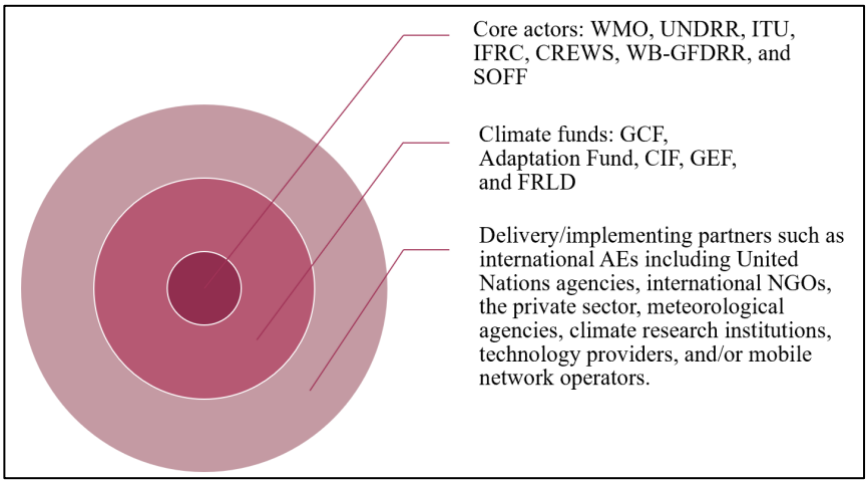
91. There are similar trends in CIS, where of the available data from 179 WMO member States, 33 per cent of NMHS produce climate services at only an "essential" level, and in Africa 15 per cent of countries have "less than basic" climate services capacities.[68]

92. Numerous actors are working to address these remaining CIEWS gaps. Past investments in CIEWS have provided many lessons, particularly regarding sustainability, local capacity, and coordination, as noted by multiple sources.[69] Given the current global funding conditions and previous experiences, it is important to assess the current situation, clarify roles, and identify the comparative advantages of different actors in the CIEWS space including the GCF.

B. GCF'S COLLABORATION WITH CIEWS ACTORS

93. GCF Board decision B.17/04 "Matters related to guidance from the Conference of the Parties: complementarity and coherence" aims to maximize GCF impact by leveraging the comparative advantages of and collaborating with climate finance institutions across various domains. In the CIEWS space specifically, core actors include the WMO, UNDRR, ITU, IFRC, CREWS, SOFF and World Bank's Global Facility for Disaster Reduction and Recovery (WB-GFDRR). Surrounding, there are climate funds such as the GCF, GEF, Climate Investment Funds (CIF), and Adaptation Fund, whose investments reach other CIEWS actors like United Nations agencies, international non-governmental organizations (NGOs), private sector, meteorological agencies, climate research institutions, technology providers, and mobile network operators (Figure 4–3).

Figure 4–3. CIEWS actors at the global level



[67] United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems 2025*.
[68] World Meteorological Organization, *2024 State of Climate Services: Five-year Progress Report (2019–2024)*.
[69] Adaptation Fund, *Strengthening Resilience through Disaster Risk Reduction and Early Warning Systems Interventions: Experiences and Lessons Learned from the Adaptation Fund Portfolio*; United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems 2024*; United Nations Office for Disaster Risk Reduction and World Meteorological Organization, *Global Status of Multi-Hazard Early Warning Systems: 2025*; Budimir et al., "Opportunities and Challenges for People-Centered Multi-Hazard Early Warning Systems: Perspectives from the Global South."

94. Table 4–8 presents an overview of the comparative advantages between the GCF and core CIEWS actors as well as climate funds, drawing on desk research and KIIs conducted during the evaluation. The principle of comparative advantage entails each actor focusing on their areas of highest expertise and exchanging products or services to enhance overall effectiveness within the sector.

Table 4–8. Comparative advantage for GCF and core CIEWS actors

ACTOR	COMPARATIVE ADVANTAGE
GCF	• Scale of funding • A wide range of implementing partners (AEs) • The ability to raise the profile of other smaller actors • Convening power to bring in private sector actors with innovative financing instruments
CREWS	• Explicit focus on CIEWS in LDCs/SIDS • CIEWS experience in fragile and conflict-affected states
IFRC	• Network of NGOs and civil society organizations (CSOs) in countries • Linkage with humanitarian actions
ITU	• Advocacy and know-how on digital technology, cell broadcast, and other connectivity technology • Strong connection with private sector mobile operators
SOFF	• Focus on niche area – operation and maintenance of basic observation network based on open-ended long partnership approach to support NMHS
UNDRR	• DRR leadership and advocacy including tracking Sendai Framework targets • Knowledge-sharing through the Global Status of MHEWS issued annually • Expertise in disaster risk financing
WB-GFDRR	• Global advisory and knowledge services on CIEWS and DRR including human-made disasters (conflicts) • Close linkage with large-scale investments by World Bank • Knowledge-sharing through a series of publications and data analytics
WMO	• Technical authority on CIEWS • Tracking WIGOS and GFCS • Knowledge generation and sharing (e.g. state of climate services) • Global network of NMHS
Adaptation Fund	• 100 per cent grant-based financing • Accessible application procedures • Tailored support available through a smaller yet more responsive team • Low reliance on co-financing
CIF	• Application of programmatic approach to fund governments (as opposed to project-based approach) and mobilization of private sector engagement and co-financing • Channelling its funding exclusively through six AAA-rated MDBs (ADB, AfDB, EBRD, IDB, IFC, and World Bank)
GEF	• Strong co-financing leverage • Dedicated funding windows for LDCs • Support beyond climate change to cover other thematic areas such as biodiversity, land degradation, international waters, and chemicals and waste

Notes: AfDB =African Development Bank; EBRD = European Bank for Reconstruction and Development; IFC = International Finance Cooperation; WIGOS = WMO Integrated Global Observing System.

95. **Thus far, the GCF's collaboration with these CIEWS actors, based on their respective comparative advantages, has varied across partners.** For instance, cooperation with CREWS is notably robust, particularly due to the SAP—CREWS Scaling-up Framework as discussed in section 1 below. While coalition building with organizations such as the WMO, UNDRR and IFRC may not have been strong, these partnerships have existed since 2019 and emerged more prominently in the past few years through the EW4All initiative. Collaboration with ITU and SOFF is relatively new. Conversely, engagement with WB-GFDRR – a specific partnership and grant-funding mechanism focused on disaster reduction and climate change – appeared most limited. Their mandate may clarify this limitation. While the World Bank, as an MDB, is an AE of the GCF and has received significant funding from the Fund including for CIEWS investments, the WB-GFDRR separately manages grants provided by bilateral donor countries and allocates them through World Bank operations to support disaster risk management projects in developing countries. The WB-GFDRR is also one of the few entities accredited by CREWS to implement CREWS-funded CIEWS investments.

96. **In terms of the GCF collaboration with climate funds such as GEF, CIF and Adaptation Fund, there has been some advancement at the institutional level while coordination specific to CIEWS programming and pipeline development has been limited.** At the institutional level, the "Action plan on complementarity and coherence" was jointly developed by four climate funds (GCF, GEF, CIF and Adaptation Fund) and approved at their respective governing bodies, including the GCF Board at B.39 (decision B.39/15). This was in response to the conclusion of the global stocktake exercise at COP28 which noted that both mitigation and adaptation progress was too slow and that accelerated complementarity and coherence was needed towards streamlining access to climate finance and to increase impact in developing countries (decision B.39/15). Since then, progress made includes knowledge exchange through the launch of the Climate Project Explorer platform[70] at COP29, a joint pavilion at COP30 as well as the launch of the Multilateral Climate Funds Joint Results Report.[71] In addition, the four funds have increased engagement from an annual dialogue to more frequent engagements four times annually at the heads-level (GCF/B.43/Inf.07/Add.01).

97. However, CIEWS programming lacks complementarity and coherence, resulting in a missed opportunity. A few examples include FP018 ("Glacial Lake Outburst Flood (GLOF) risk reduction in Pakistan") and FP068 ("Multi-Hazard Early Warning in Georgia"), both initially supported by the Adaptation Fund and later scaled up with GCF funding.[72] Similarly, FP035 ("Climate Information Services for Resilient Development Planning in Vanuatu") and FP202 ("Upscaling Ecosystem-based Climate Resilience of Vulnerable Rural Communities in the Valles Macroregion of the Plurinational State of Bolivia") were first supported through the CIF and subsequently expanded by the GCF.[73] Several informants noted that the lengthy and unpredictable procedures for obtaining GCF funds make it extremely challenging to schedule a GCF project immediately after another climate fund project. **Since climate funds differ in accessibility – for instance, GEF and Adaptation Fund are known as procedurally easier to access but offer smaller-scale support than GCF – coordinated country-level efforts initiated by the GCF can promote a more streamlined approach, enabling the Fund to support countries to efficiently expand projects tested under other funds.** Country or regional platform approaches to be supported through the GCF readiness

[70] Climate Fund Explorer, Climate Fund Search.
[71] Green Climate Fund, *Multilateral Climate Funds Joint Results Report*.
[72] Adaptation Fund, *Strengthening Resilience through Disaster Risk Reduction and Early Warning Systems Interventions: Experiences and Lessons Learned from the Adaptation Fund Portfolio*.
[73] Climate Investment Funds, *Independent Evaluation of the Pilot Program for Climate Resilience of the Climate Investment Funds*.

programme have the potential to further enhance such complementarity and coherence, as discussed in Chapter 5.B.1.[74]

98. According to available sources, interaction and collaboration between the GCF and other CIEWS actors go back to 2019 when GCF convened an expert meeting on CIEWS strategies in Geneva, Switzerland attended by 36 CIEWS experts/actors from across the world.[75] The meeting included representation from various organizations including the UNFCCC, WMO, World Bank, IFRC, UNDP, United Nations Environment Programme (UNEP), and World Food Programme. Additionally, bilateral donors like the Swiss Agency for Development and Cooperation, as well as a series of NMHS from both developed and developing countries, participated in the meeting.
99. The GCF utilized the meeting to socialize elements of the conceptual framework for its CIEWS strategy and guide.[76] This framework was later assumed to have evolved into the sectoral guide on CIEWS. The timing of the meeting was crucial as it coincided with the ongoing work for the first replenishment of the GCF.
100. The report produced after the meeting highlighted the consensus to ensure complementarity and coherence in the fragmented CIEWS space. The report noted:

> …different partners will have different comparative advantage to offer specific components of a project, and this should be taken into [account] in designing the project and approaching the donor. This is an equal responsibility between countries, agencies and funding donors.

101. The GCF also attended similar events organized by other core CIEWS actors. In July 2023 it joined a Caribbean regional workshop on integrated DRR and CCA planning organized by the UNDRR where the GCF presented on the concept of its EW4All Global Support Programme.[77] The participants included the UNDRR, WMO, IFRC and UNFCCC among many other regional-based CIEWS actors.
102. The concept for the GCF's EW4All Global Support Programme was subsequently presented at the United Nations Climate Ambition Summit in September 2023. At this event, the proposal for a multi-country EW4All programme was introduced, alongside the announcement that GCF's PPF would be used to develop this initiative in partnership with the UNDP and in collaboration with other key CIEWS actors, including the WMO, IFRC, UNDRR, ITU, CREWS, SOFF and UNEP. This concept ultimately culminated in the approval of FP258 ("Multi-country Project Advancing Early Warnings for All (EW4All)") at B.41 in 2025.
103. Behind the public announcement, the CIEWS actors met for a three-day workshop in Bangkok where EW4All pillar leads (i.e. UNDRR, WMO, ITU and IFRC) along with SOFF and CREWS were tasked to jointly formulate EWS project activities across multiple countries, as facilitated by the GCF.
104. The collaboration among the EW4All pillar leads was described as excellent by some informants although several challenges had to be addressed to bring the programme to approval. One major challenge that was shared was the GCF's slow, rigid and bureaucratic processes, where "things

[74] Independent High-Level Expert Group, *Accelerating Sustainable Finance for Emerging Markets and Developing Economies: Independent High-Level Expert Group Review of the Vertical Climate and Environmental Funds*.
[75] Green Climate Fund, "GCF Technical Expert Meeting on Climate Information, Early Warning and Disaster Risk Reduction Services." May 16, 2019.
[76] Ibid.
[77] United Nations Office for Disaster Risk Reduction, *The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030*.

needed to fit into GCF box". Yet the other key informants noted that the project was warmly received by the Board and enabled the GCF to contribute significantly to the EW4All initiative.

105. **The successful materialization of the global EW4All programme with UNDP (FP258) allowed the GCF to enhance the visibility of its contributions to EW4All, as intended. Through this programme, the GCF effectively brought together core CIEWS actors and demonstrated its ability to improve coordination among them.**

106. The following subsections will examine in detail how the GCF works with certain CIEWS actors, focusing on a select group for deeper analysis.

1. Collaboration with CREWS under the SAP—CREWS Scaling-up Framework

107. Among the core CIEWS actors noted above, GCF has worked most closely with CREWS, a specialized financing mechanism for CIEWS with a mandate to support LDCs and SIDS in providing weather and climate services and effective impact-based, multi-hazard, gender-informed EWS.[78] In 2023, the GCF and CREWS signed the GCF SAP—CREWS scaling-up framework for early warning, allowing LDC and SIDS countries with ongoing or recently completed CREWS projects to receive fast-track access to GCF finance through the SAP modality.[79] As CREWS is a specialized financing mechanism for EWS, it positions itself as a delivery vehicle for the EW4All initiative and provides support across all four pillars.

108. SAP048 ("Strengthening the resilience of vulnerable communities within high climatic and disaster risk areas in Togo") was the first project approved by the GCF Board under this framework.[80] The inaugural project was able to demonstrate the scaling-up framework's potential by getting the FP approved within 10 months at a low cost. However, other projects being developed under the framework including the second project approved – SAP063 ("Scaling up of Caribbean Hydrometeorological and Multi-hazard Early Warning Services (CREWS) in Belize and Trinidad and Tobago") – were delayed and have missed the original differentiation of "fast-tracking".

109. **This framework initially emerged from discussions on complementarity and coherence, where both the GCF and CREWS identified mutual benefits. From the GCF's perspective, the SAP needed to differentiate itself from the standard PAP by emphasizing its fast and simplified approval process, which was its intended purpose**. From the perspective of CREWS, which since its establishment has received just over 1 per cent of the second replenishment pledges received by the GCF,[81] partnering with a larger financing mechanism like the Fund was essential to continue its mandate and ensure the results gained in their investments are scaled.

110. The collaborative process typically starts with CREWS reviewing its entire portfolio to identify projects with elements of success and scalability potential. These projects can then be brought to the attention of GCF SAP for FP development and fast-tracking.

111. From the GCF side, the SAP desk provides initial support by connecting GCF stakeholders in the country, such as the national designated authority (NDA) and AE, ideally a DAE, with CREWS counterparts for potential scale-up discussions. The SAP desk then arranges necessary support from

[78] Climate Risk and Early Warning Systems, "Governance Document."
[79] Green Climate Fund and Climate Risk and Early Warning Systems, *GCF SAP—CREWS Scaling-up Framework for Early Warning* (2023); Green Climate Fund, "Simplified Approval Process."
[80] Green Climate Fund, "SAP048: Strengthening the resilience of vulnerable communities within high climatic and disaster risk areas in Togo."
[81] As of 2024, USD 137.87 million in pledges and contributions have been made into the CREWS since CREWS was established in 2016. See Climate Risk and Early Warning Systems, "Financials."

in-house GCF CIEWS experts to help co-develop the CIEWS FP, such as having the expert attend an FP development workshop in the country. Furthermore, the SAP team asks the identified AE to submit as part of FP annexes the scope of detailed activities undertaken in CREWS projects, and to explain how the new SAP proposal can address the remaining CIEWS gaps in the country to improve complementarity and coherence.

112. CREWS' support includes hiring a consultant to aid in CIEWS FP development for the GCF, organizing an FP development workshop attended by all stakeholders, including local NMHS and/or NDMA stakeholders, and conducting FP validation and review work. The cost of developing a pipeline FP is managed under CREWS investments, which is noted to be significantly less than developing an FP via the GCF PPF window. Therefore, this collaborative approach seems to help achieve cost-efficiency on the side of GCF.

113. Additionally, the framework has facilitated collaboration and interactions between key CREWS actors, such as NMHS, NDMA and CREWS' implementing partners and GCF stakeholders in countries including NDAs and AEs. CREWS' implementing partners de facto provide technical assistance to NMHS and/or NDMA in CREWS-supported investments. They are analogous to AEs and had been limited to three entities, namely the WMO, UNDRR and WB-GFDRR. More recently, ITU and IFRC are in the process of being accredited by the CREWS Board in line with their technical expertise under the EW4All initiative.[82]

114. A few challenges are identified impacting the fast-track timelines of the framework. For example, some informants noted that procuring a consultant can be time-consuming and may delay project formulation. **Since the framework is meant to serve as GCF's rapid special CIEWS window for LDCs and SIDS, such delays could undermine its original purpose.** This suggests a need for revisions of the framework's structure, including fast-track procurement of the CREWS consultant and/or a possibility of assigning dedicated staff at CREWS to support scaling-up formulation. Other informants noted that GCF's earlier and more integrated support on monitoring and evaluation (M&E) coupled with technical support from the CIEWS experts could avoid further delays.

115. Another notable aspect of the GCF—CREWS partnership is **CREWS' expertise and experience in supporting CIEWS in fragile and conflict-affected States.** To date, CREWS has supported 27 countries affected by conflict or fragility,[83] providing them with a unique positioning against the GCF to share their knowledge and experience on how fragile conflicted-affected countries can advance CIEWS, as detailed in their operational procedures on CREWS Programming in fragility, conflict and violence settings.[84] Given the GCF new focus on fragile- and conflict-affected States with the Special Initiatives housed in the Front Office of the Chief Strategy and Impact Officer, there could be further opportunities for collaboration with CREWS within the existing framework.

116. Overall, the collaboration between the GCF SAP and CREWS has been more positive than negative, although the framework may not achieve its "fast-track" goal due to pipeline challenges, as seen with its parent SAP. Still, it offers LDCs/SIDS a smaller, more accessible funding window compared to the standard PAP, suiting these countries' capacities.

2. Collaboration with WMO

117. Beyond CREWS, **GCF has also worked closely with the WMO despite the collaboration being mostly limited to the project level.** As a technical United Nations agency in the design and

[82] World Meteorological Organization, "CREWS Launches 2030 Strategy at COP30 to Scale Early Warnings for All."
[83] Climate Risk and Early Warning Systems, "In numbers."
[84] Climate Risk and Early Warning Systems, "Financials"; Climate Risk and Early Warning Systems, "Analytical Paper to guide the development of Operational Procedures on CREWS Programming in FCV settings."

delivery of meteorological services, WMO's value addition is to support countries to create and utilize public weather and climate information that serve as a basis for wider users. For example, one of the core WMO businesses is to establish standards and regulations for the generation, sharing and use of weather and climate data across multiple actors and countries.

118. Originally accredited by the GCF in 2016, WMO has attempted a few project formulations which did not succeed. For example, in 2017 it used the GCF PPF window with PPF002 ("Enhancing Early Warning Systems to Build Greater Resilience to Hydro and Meteorological Hazards in Pacific Small Island Developing States (SIDS)") to formulate a CIEWS investment. Although the PPF was initially intended for the development of a regional proposal, this did not materialize, and WMO's accreditation expired before the completion of its FP development. However, facilitated by the NDA in Timor-Leste, UNEP seemingly used the assessments conducted by WMO through the PPF grant to develop a new FP for Timor-Leste. This proposal became an approved FP in 2021, known as FP171 ("Enhancing Early Warning Systems to build greater resilience to hydrometeorological hazards in Timor-Leste" (2022–2027)). The original concept note submitted by the WMO in 2018, titled "Towards Risk-Aware and Climate-resilienT communities (TRACT)" was again picked up by UNEP under its PPF proposal (PPF081) and became an approved SAP project (SAP050) at B.42. Under PPF081, UNEP involved WMO as an implementing entity to undertake a site-specific hazard assessment and develop a scientifically evidenced climate rationale. These instances can be noted as examples where WMO's original technical inputs on CIEWS concepts and assessment were utilized by other GCF stakeholders to advance CIEWS investments.

119. In 2018, the GCF and WMO signed a memorandum of understanding (MOU) which was upgraded in 2024 to maximize the benefits of GCF CIEWS investments through the partnership.[85] The MOU provided the WMO with pragmatic ways to get involved and provide CIEWS technical expertise in GCF investments when and where requested. To date, it has provided technical assistance in at least six GCF-funded projects – FP012, FP074, FP161, FP258, SAP048, and SAP050. As the implementing partner of CREWS initiatives, WMO also assists LDCs/SIDS to access GCF funding via the SAP—CREWS scaling-up framework. Moreover, WMO plays the role of technical oversight and guidance to SOFF (discussed in the section below).

120. While the WMO's accreditation by the GCF expired after its initial accreditation, efforts seem underway again for the WMO to be accredited under the revised accreditation framework (decision B.42/13). If indeed accredited, it will enable the WMO, a key technical actor without country presence, to directly access funding from the GCF and cover the remote technical assistance costs necessary to provide countries with CIEWS-integrated advisory services. In turn, the GCF could leverage WMO's network of NMHS, technical expertise and know-how, for example to support countries with the implementation of NFCS,[86] and enhance the provision of tailored climate services.

121. Additionally, the WMO has recently become one of the 54 delivery partners (DPs) that will support countries under the revised GCF Readiness Strategy for 2024–2027 (decision B.37/21). This role further strategically positions the WMO as a core GCF collaborator on CIEWS-related capacity-building and pipeline formulation.

[85] World Meteorological Organization, "WMO and Green Climate Fund join to support low carbon, climate resilient development"; World Meteorological Organization, *2024 State of Climate Services: Five-year Progress Report (2019–2024)*; Green Climate Fund, "GCF and WMO agree to strengthen science in climate response."
[86] World Meteorological Organization, "Current Status of the Implementation of National Frameworks for Climate Services (NFCS)." The WMO tracks the implementation of NFCS through steps 0 to 6, with 0 being a planned phase and 6 being where countries with NFCS provide advanced services.

3. Collaboration with the Systematic Observations Financing Facility

122. The SOFF is a newly established specialized United Nations climate fund, created in 2022 by the WMO, UNDP and UNEP in response to a request from the 193 countries and territories of the World Meteorological Congress in 2021. As a delivery vehicle for Pillar 2 of the EW4All initiative, SOFF provides grant-only funding to target countries, prioritizing assistance to LDCs and SIDS.[87]

123. While the SOFF is a smaller actor in terms of size, having received contributions of less than 1 per cent of the second replenishment pledges received by the GCF,[88] it operates with a clear mandate and value proposition. Its focus is on addressing the remaining gaps in basic weather and climate data and supporting the implementation of the Global Basic Observing Network (GBON) to ensure that the data generated becomes a global public good and enhances forecast accuracy worldwide.

124. GBON is a fundamental element of the WMO Integrated Global Observing System (WIGOS) that establishes global standards for surface-based weather observations. It was created to ensure that essential meteorological data is collected and shared internationally for enhancement of weather forecasts and climate predictions.[89] SOFF is not only hosted physically at the WMO but also receives necessary technical and operational oversight from the WMO on GBON compliance and other related technical matters. While compliance is mandatory among the 193 WMO member countries, major data and capacity gaps exist in most developing countries, with LDCs and SIDS generating and exchanging less than 10 per cent of mandated GBON data.[90]

125. SOFF has a readiness phase where GBON gap analyses and/or country hydromet diagnostics (CHD) are undertaken in target countries to identify their technical and investment gaps. The CHD, developed by the Alliance for Hydromet Development (with GCF as one of the 12 founding members), is a standardized hydromet assessment tool applied by SOFF, WMO and their partners. It was also applied as a methodological basis for the EW4All Pillar 2 Rapid Assessment.[91] After the gap analysis in the readiness phase, countries supported by SOFF move to the investment phase, analogous to the GCF's projects/programme phase, where identified gaps are addressed by SOFF's implementing partners such as UNDP and UNEP to enhance weather and climate observation systems.[92]

126. Currently, the GCF and all other climate funds are represented on SOFF's Advisory Board and are signatories to a collaborative framework with SOFF. This framework is titled "Framework for collaboration between the SOFF, Adaptation Fund, Climate Investment Fund, CREWS, GEF and GCF for enhancing systematic observation and improving the use of basic weather and climate data for effective climate action."[93] While the framework aims to promote complementarity and coherence between the SOFF and climate funds, its uptake has been limited, as noted by several informants.

127. The framework specifies that:

[87] Systematic Observations Financing Facility, "SOFF Brochure."
[88] According to the SOFF dashboard, SOFF has received contributions of USD 101 million to its United Nations trust fund to date. See Systematic Observations Financing Facility, "Dashboard."
[89] World Meteorological Organization, "GBON – Global Basic Observing Network."
[90] Heureux, "Global Basic Observing Network (GBON) Systematic Observations Financing Facility (SOFF) Workshop."
[91] Alliance for Hydromet Development, *Hydromet Gap Report 2024*.
[92] Heureux, "Global Basic Observing Network (GBON) Systematic Observations Financing Facility (SOFF) Workshop."
[93] Systematic Observations Financing Facility, "Signed Framework for Collaboration for enhancing Systematic Observation."

> The climate funds will make efforts to ensure their support for upstream investments does not duplicate SOFF support, and in addition will focus on latter parts of the meteorological value chain, leveraging SOFF enhanced observations for better hydromet services, including early warnings.

128. However, in practice, climate funds including the GCF seem to continue to invest in equipment with limited consideration of the framework arrangement noted above, indicating that the framework is not fully embraced and operationalized. A recent example is SAP048 in Togo, where a GCF project was developed by a DAE through the SAP—CREWS Scaling-up Framework. As per the approved FP, this project includes a component on basic weather observation data with GBON compliance that could be better handled by SOFF according to the SOFF framework. **While the project was a success case for the SAP—CREWS Scaling-up Framework by enabling fast-track access to GCF funds for an LDC, the success may need to be nuanced when complementarity and coherence is considered.**

129. Despite the missed opportunity above, there are also good cases where complementarity and coherence with SOFF was achieved. For example, these include SAP050 in the Maldives managed by UNEP, and FP258 managed by UNDP. Given that both UNEP and UNDP are the implementing partners of both the SOFF and GCF, they are seemingly well aware of the comparative advantages of both the SOFF and GCF. This awareness by the AEs has facilitated effective complementarity for these two projects. **These instances suggest that while the SOFF framework provides a strategic direction between the SOFF and climate funds on complementarity and coherence in CIEWS, its practical application requires consistent efforts in coordination and sensitization among wider stakeholders including the GCF Secretariat, CREWS and AEs, especially DAEs who may not be aware of such corporate-level arrangements between/among CIEWS core actors.**

130. From SOFF perspective, it sees itself as a complement to the GCF, known for the scale of its investments. While SOFF's funding is minimal compared to that of the GCF, SOFF's value addition is to address narrower but essential technical and capacity gaps related to the operation and maintenance of weather and climate observations, which does not require large-scale funding.

131. The SOFF refers to this approach as "compliance-based", which involves long-term, open-end results-based financing to developing countries for the operation and maintenance of basic observation networks, ensuring their compliance with GBON requirements after weather stations are installed. To operationalize this business model, the SOFF engages with 28 peer advisers, primarily from NMHS in developed WMO member countries, to arrange open-ended long-term technical support for matched NMHS in developing countries.[94] The long-term support provided by peer advisers begins during the SOFF's readiness phase, where they conduct GBON gap analysis and CHD. This support remains open-ended throughout the compliance phase, during which NMHS undertakes the operation and maintenance of observation networks. **This model essentially transitions from the traditional equipment-focused business model to an operational, and peer-to-peer partnership-based approach to address sustainability.**

132. The compliance model, supported by the concept of country drivenness and long-term collaborations among developed and developing NMHS holds large potential. **However, the idea of an open-ended "compliance phase" or results-based financing to countries is still untested, with its effectiveness yet to be demonstrated. Even if GBON compliance succeeds, it will address only a small portion of the overall challenge.** Currently, discussions are ongoing regarding the detailed aspects of the "compliance" modality, including determining the modality of

[94] Heureux, "Global Basic Observing Network (GBON) Systematic Observations Financing Facility (SOFF) Workshop."

a results-based payment approach and the appropriate level of monetary contributions to countries for complying with GBON requirements.

133. In the next section, the evaluation will highlight outstanding gaps the GCF should address to strengthen collaboration, ultimately to improve the effectiveness and impact of CIEWS initiatives.

C. GCF'S TECHNICAL AND KNOWLEDGE CONTRIBUTION TO CIEWS

134. **While the GCF funding role in CIEWS is clear and well-recognized, its technical and knowledge-sharing role, as outlined in the CIEWS ToC (**Figure 2–1**), appears somewhat unclear.** According to its business model, the GCF relies on NDAs to identify and promote countries' priorities, and on AEs to originate FPs. In other words, both the AE and the NDA are responsible for conducting the initial due diligence of an FP package.

135. The GCF Secretariat conducts a second level of due diligence and appraisal, which theoretically focuses on ensuring consistency with the GCF's mandate, policies and procedures, as well as identifying relevant risks.[95] This operational model positions the GCF as a second level due diligence organization, leveraging the expertise of the AE, which serves as an intermediary between the GCF Secretariat and the executing entities. This setup allows the GCF to capitalize on the specialized knowledge, expertise and capabilities of AEs, including on CIEWS.

136. **In contrast to this institutional approach, the CIEWS ToC – developed with inputs from Secretariat experts – emphasizes the GCF's role in building partnerships, forming coalitions, and exchanging technical knowledge with other actors to boost CIEWS impact (**Figure 2–1**).** The GCF's CIEWS sectoral guide, though now discontinued, reinforced this perspective in the past by noting that:[96]

> GCF creates and shares knowledge to harmonize valuation methods and incorporate climate risks into financial decisions to align finance with sustainable development. […] By sharing lessons, methods (traditional and scientific) and standards, global finance flows can contribute to projects and programmes that follow transformational pathways towards low emissions and climate-resilient development.

137. **This dual focus suggests some ambiguity within the Fund regarding whether it should concentrate on strengthening its own technical focus on CIEWS or rely primarily on the technical expertise and capabilities of AEs.**

138. **Indeed, while individual contributions by CIEWS experts of the Secretariat have been visible in various platforms and knowledge products, there is a noted absence of a cohesive institutional vision and clear direction for CIEWS at the organizational level.** CIEWS experts frequently participate in technical activities, such as developing knowledge resources, in collaboration with key partners including the WMO and UNDRR, and they are active in the CIEWS space and platforms such as the Alliance for Hydromet Development – a forum initially established by 12 CIEWS actors, including the GCF, to better coordinate CIEWS efforts within a fragmented landscape.[97] GCF experts are consistently cited as contributors to "Hydromet Gap Reports" prepared by the Alliance for Hydromet Development, the "State of Climate Services Reports" published by

[95] Green Climate Fund, *GCF Appraisal Guidance: A comprehensive guide to the tools and due diligence processes used to review and assess concept notes and funding proposals*.
[96] Green Climate Fund, *Sectoral Guide: Climate Information and Early Warning Systems*.
[97] Repnik and Tsirkunov, "The Alliance for Hydromet Development."

the WMO, and the "Global Status of Multi-hazard Early Warning Systems Reports" issued by UNDRR. However, these documents are official publications originating from other organizations.

139. **With regard to GCF's official documents and publications on CIEWS, the visibility is notably absent.** "Developing the Climate Science Information for Climate Action," co-authored by the GCF and WMO in 2022,[98] offers GCF's AEs a helpful guide but serves only as a toolkit, not a strategic document. The GCF SAP—CREWS scaling-up framework for early warning document is limited to the framework application. The USP-2 includes a CIEWS target but this alone does not provide the comprehensive guidance needed for strategic investment and development in this area. With relegation of the CIEWS sectoral guide, and if the GCF aims to play a significant role in CIEWS by leveraging its identified comparative advantages, it will require moving beyond merely including a CIEWS target in the USP-2.

140. Moreover, while the annual reports of the GCF to the COPs (in 2022, 2023 and 2024) are successful in showcasing many streams of activities that the GCF is involved in, fulfilling its accountability as the main operating entity under the financial mechanism of the UNFCCC, the reported activities seem broad and lacking the necessary focus on lessons and good practices from the technical aspects of the GCF's work, and its investments including on CIEWS. Some informants noted that actors including the GCF have not seriously considered the value of knowledge-sharing across CIEWS projects and that as a result, information remains at project level leading to further fragmentation in the sector. **Considering that the GCF is "a continuously learning institution guided by processes for M&E" as the GI guides the Fund, this suggests a missed opportunity for the GCF, which currently stands as the largest funder in the CIEWS sector.**

141. CIEWS-related knowledge contributions through the GCF support for the establishment and operationalization of the FRLD, as well as discussions at the Warsaw International Mechanism Executive Committee (WIM ExCom) and implementation of the UAE Framework for Global Climate Resilience, present significant opportunities for the GCF to enhance its role and visibility in the CIEWS sector. If successfully leveraged, these opportunities could allow the GCF to build support and contribute its knowledge and experience in CIEWS.

D. REMAINING COLLABORATION GAPS

142. Despite a few positive efforts such as the EW4All and the Global Observatory initiatives, many CIEWS actors acknowledged that fragmentation continues to exist in the space. Some informants emphasized the necessity of establishing initiatives to clearly define and formalize the roles and responsibilities of each CIEWS stakeholder. Yet other informants noted that, unlike other donors and funders, it is challenging for the GCF to engage in global coordination because it operates on a country-driven model, which differs from other funding models. This country-driven approach emphasizes the importance of aligning investments with national priorities and needs, which can complicate broader global coordination efforts, especially if the country priorities are not aligned with global priorities such as the EW4All.

143. **While it is evident that addressing the fragmentation of key CIEWS actors globally requires intentional efforts, there is a risk that these efforts could miss the mark in reaching the last mile – the original purpose of the efforts – if countries' priorities are different, and communities are not actively involved.** To mitigate this risk, the GCF should align its CIEWS investments with the specific needs and capacities of target countries or regions, while also sharing

[98] World Meteorological Organization and Green Climate Fund, *Developing the Climate Science Information for Climate Action*.

relevant information with global CIEWS stakeholders for better coordination. Investments must match local priorities and financial and technical abilities, requiring early engagement with stakeholders and a solid grasp of their current capabilities. The approved operationalization of a regional presence by the GCF Board (decision B.42/14) presents opportunities to address these coordination challenges across global, regional, and country levels – provided it is implemented effectively. For example, co-investment platforms established at the country or regional level through the GCF readiness programme could facilitate improved alignment with other CIEWS funders and actors, thereby helping avoid duplication or mismatches in investment (see also Chapter 5.B.1).

144. **The ongoing challenges in achieving effective coordination underscore the need for a balanced approach that involves all stakeholders at the national, regional and global levels.** At the country level, some informants noted that the issue of fragmentation is often oversimplified, and the presence of multiple projects within a single country is frequently perceived as less effective even if it is not always the case. Effective coordination and complementarity can occur when projects are well aligned and focused on different sectors. For example, one project might concentrate on the agriculture sector, while another targets urban development and flood risk management, with NMHS taking on the responsibility of coordination. Conceptually, this scenario demonstrates the ideal envisioned by the GFCS in its framework. An important lesson noted by the informants is that effective coordination does not happen automatically and requires significant time and efforts from all actors involved.

145. Looking forward, some informants cautioned that maintaining coordination beyond 2027, when the EW4All initiative is set to expire, would be challenging. **However, this presents an opportunity for the GCF to get involved and potentially steer the space. Overall, the GCF is known as the largest funder in CIEWS, and its participation in EW4All was seen as strong politically, by bringing attention and relevance to the EW4All initiative across global actors**.

Chapter 5. GCF'S APPROACH: PROGRAMMATIC APPROACHES AND FUNDING WINDOWS

KEY FINDINGS

5.1. Using a multi-country, global approach, GCF expanded its CIEWS investments worldwide and allowed IAEs to secure substantial funding for CIEWS with a single proposal, avoiding multiple approval processes.

5.2. Although a multi-country approach is generally viewed positively and applied numerous times by the GCF, an examination of current CIEWS initiatives reveals practical issues including difficulties in coordination, obstacles to data-sharing, and frequent delays in project execution. The lack of a defined policy for the multi-country approach introduces uncertainty regarding the implementation of such projects and programmes.

5.3. For a CIEWS regional approach, clear guidance on what should be covered by regional approaches versus what is best addressed nationally or locally will help ensure that these efforts complement and reinforce each other, maximizing their overall impact on climate resilience and early warning capacity.

5.4. As the current CIEWS portfolio predominantly constitutes IAE-managed projects, the GCF's strategic direction towards supporting DAEs necessitates a re-evaluation of the CIEWS portfolio. Given that one of the GCF's comparative advantages is its engagement with a wide array of implementing partners, both DAEs and IAEs, this diverse network of AEs can be more effectively leveraged to achieve the desired outcomes in CIEWS as well as climate resilience and adaptation more broadly.

5.5. GCF private sector approach in CIEWS is still emerging, revealing a gap between intentions and actual engagement. Despite the challenge, a case in Guatemala demonstrates a successful private sector engagement in tailored services, highlighting sustainable commercial CIEWS initiatives.

5.6. While the readiness programme has indirectly created an enabling environment in CIEWS programming via its NAP envelope, direct support through CIEWS-specific grants has been very limited. The revised Readiness Strategy now offers an opportunity for more targeted CIEWS support.

5.7. GCF leveraged PPF support strategically to formulate CIEWS projects by meeting applicants' practical requirements, such as financial and marketing needs. However, ongoing CIEWS projects with design issues suggest that the PPF window could be used more effectively (e.g. incorporating CIEWS-specific tools in feasibility assessments).

5.8. Both PPF and readiness windows could be more effectively utilized to clarify not only the needs of services providers (e.g. NMHS and other national agencies) but also those of end users (e.g. women/men, local communities, Indigenous groups, and other vulnerable groups).

A. PROGRAMMATIC APPROACHES TO CIEWS

146. Having discussed the GCF's role in the wider CIEWS space, this chapter delves deeper into the GCF strategy to leverage various programmatic approaches and funding windows to support CIEWS. These programmatic approaches include single-country versus multi-country programming, working with DAEs versus IAEs, and engaging with the public versus private sectors.

1. SINGLE-COUNTRY VERSUS MULTI-COUNTRY PROJECTS/PROGRAMMES

147. The CIEWS-tagged project portfolio includes both projects and programmes that focus on one country or several countries. Because climate hazards often cross borders, the multi-country approach is thought to be especially useful in the CIEWS interventions. A multi-country approach can be effective for promoting CIEWS by achieving economies of scale and improving efficiency, especially when a single AE manages projects in challenging contexts, such as in SIDS. In addition, this approach can enhance regional collaboration and capacity-building on climate issues. Conversely, disadvantages are that it may prioritize AEs' interests over national needs and require greater coordination across countries. Indeed, developing countries are often hesitant in adopting the multi-country approach due to perceived and/or actual challenges in securing a consistent inflow of financial resources to individual countries. The experience led to the past COP guidance to the GCF to improve the monitoring and reporting of disbursements and impacts on a per-country basis for multi-country programmes (GCF/B.39/10).

148. As depicted in Figure 5–1, of the 141 CIEWS-tagged projects, 25 are multi-country initiatives, accounting for 17.7 per cent of the CIEWS portfolio. However, when analysing the estimated funding amounts, the share of multi-country projects/programmes rises to 41 per cent. This increase is largely due to the significant budgets of multi-country initiatives; the average GCF allocation for single-country CIEWS projects (not weighted, 100 per cent approved GCF funding) is USD 28 million, whereas multi-country projects or programmes receive an average of USD 105 million (not weighted, 100 per cent approved GCF funding).

Figure 5–1. CIEWS-tagged projects by single-country versus multi-country

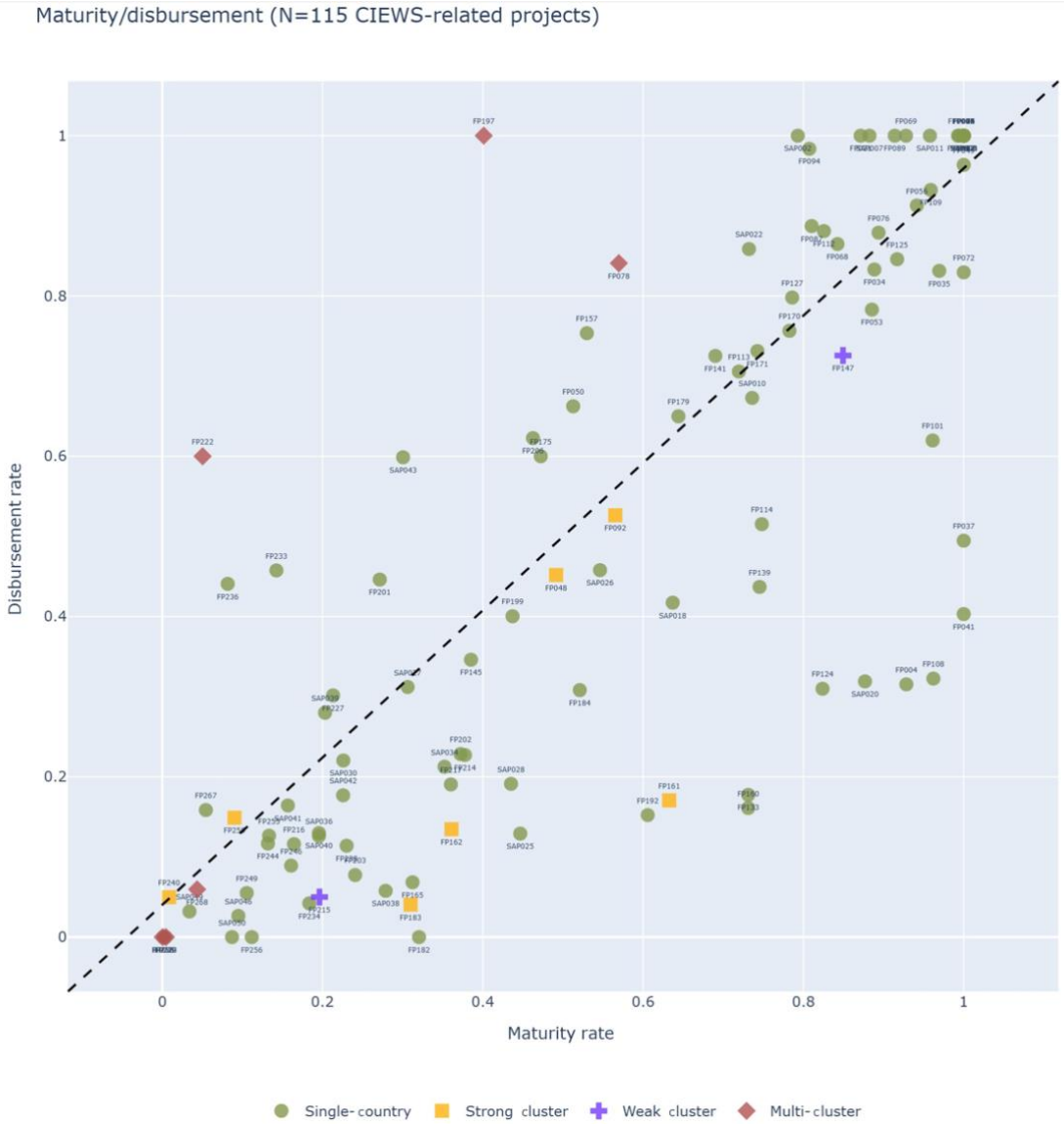
Source: GCF project database, including all projects approved through B.43 (accessed December 12, 2025).
Note: Weighted funding refers to GCF funding allocated proportionally across countries in multi-country projects/programmes. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

149. **Although a multi-country approach is generally viewed positively within the GCF and applied numerous times, an examination of current CIEWS initiatives including KIIs reveals practical issues including difficulties in coordination, obstacles to data-sharing, frequent delays in project execution due to procurement processes, and difficulty in tracking progress.** FP092 ("Programme for Integrated Development and Adaptation to Climate Change in the Niger Basin") can demonstrate this point. This programme covering nine Niger basin countries (Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Guinea, Mali, Niger, and Nigeria) has strong CIEWS components such as strengthening climate and weather information services through training staff of the NMHS on data modelling and forecasting, and equipping them with software and hardware tools and technical assistance for certification in line with WMO standards. The programme also has a component to establish community-based EWS to manage climate extremes through Basin country involvement (Benin, Cameroun, Guinea, Mali, Niger, Chad) and the Niger Basin Authority – a regional entity aimed at promoting cooperation among member countries and ensuring the integrated development of the basin. However, a (virtual) country mission to Nigeria revealed a series of implementation challenges. The large number of participating countries with differing government structures, levels of decentralization and varying capacities and needs related to CIEWS has constrained the timely operationalization of EWS and effective regional cooperation. In addition, national procurement systems were not adequately assessed at the design stage, and country-level programme arrangements have not been revisited regularly to keep pace with evolving national contexts. As a result, CIEWS equipment had to be procured individually by countries, undermining potential economies of scale and extending procurement timelines, which in turn has delayed their delivery and installation, including automatic tele-transmission recorders. While regional structures such as the Niger Basin Authority and the Regional Programme Coordination Unit attempted to address some of these challenges, particularly those related to procurement, installation and training, and promoting more standardized approaches across countries, overall effectiveness remains limited. Consequently, potential CIEWS synergies across the neighbouring countries remain largely untapped. Moreover, the lack of country ownership was evident with limited engagement from the local-level stakeholders in Nigeria whom the programme was supposed to strengthen.

150. Similar challenges exist within FP161 ("Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries")[99] and FP162 ("The Africa Integrated Climate Risk Management Programme: Building the resilience of smallholder farmers to climate change impacts in seven Sahelian Countries of the Great Green Wall (GGW)").[100] These both projects faced implementation delays with low disbursement rates despite their being well underway. According to the APRs submitted for these projects, reasons for the delay included the time taken to set up a programme management unit, coordination involving multiple executing entities, and procurement processes, among others. It is notable that the evaluation team often struggled to assess the progress or status of multi-country CIEWS initiatives due to incomplete or insufficient country-specific information in submitted APRs, as well as limited understanding among AE headquarters staff regarding the current state of ongoing programmes.

[99] FP161 covers Comoros, Madagascar, Mauritius, and Seychelles.
[100] FP162 covers Burkina Faso, Chad, Gambia, Mali, Mauritania, Niger, and Senegal.

Figure 5–2. Efficiency of multi-country versus single-country CIEWS projects



Source: GCF project database, including all projects approved through B.43 (accessed December 9, 2025).
Notes: N = 115 CIEWS-related projects under implementation. Maturity rate is calculated by dividing the total number of days elapsed from the start of project implementation (FAA effectiveness date) to the date of analysis (October 20, 2025) by the total project duration (in days). This indicates how far along projects are in their implementation timeline relative to their planned duration. CIEWS-tagging combines Secretariat classifications with additional projects identified by the evaluation team (see annex 4).

151. Figure 5–2 shows an efficiency analysis of CIEWS projects/programmes by single versus multi-country projects/programmes, where multi-country projects/programmes are classified into three subcategories, namely “strong cluster”, “weak cluster” and “multi-regional” projects/programmes. “Strong cluster” projects refer to those that involve neighbouring countries sharing national borders

such as FP048,[101] FP092,[102] FP161,[103] and FP162.[104] "Weak cluster" projects/programmes comprise participating countries situated within the same region and in close proximity but not necessarily sharing borders, such as FP147,[105] and FP215.[106] Finally, "multi-regional" projects/programmes include those involving countries dispersed within the same region such as FP078,[107] as well as global programmes spanning multiple regions such as FP258.[108] According to the scatter plot that shows the relations between the maturity of projects (X-axis) and disbursement rate of those projects (Y-axis), **there is a tendency for those "strong cluster" projects to be slower in their disbursement rates when compared to single-country projects.** While the samples are too small to draw any conclusion, this analysis supports the point that **regional projects can be slower or less efficient than the single-country projects.**[109] The analysis also shows an interesting result where a few multi-regional or global projects/programmes show high disbursement rates. These projects are mostly private sector projects with small CIEWS components, where upfront GCF investments/disbursements are common as seed capital into the financial mechanisms established, such as equity funds.

152. **Another issue common with regional projects/programmes is data-sharing and ownership.** Cross-country data-sharing is generally a challenge from both the technological and policy perspective. Technology challenges include data integration issues due to unique data formats, incompatible storage and exchange standards, and difficulty in making data publicly accessible.[110] The policy challenges include siloed institutions involved in the regional programmes, policy gaps on data exchange, and reluctance to share data due to perceived loss of power.[111] Indeed, climate/weather and hydrological information such as precipitation and water flow can be highly sensitive,[112] and the sharing of data across borders often requires careful management. Informants noted that cross-boundary data-sharing frequently necessitates the involvement of a regional agency with a mandate to facilitate data and information exchange, such as the Regional Integrated Multi-Hazard Early Warning System (RIMES),[113] to help depoliticize the information. Other informants pointed out that when a country with limited capacity relies on another country's capacity to manage climate or weather data, it can lead to data sovereignty issues where the country with greater capacity restricts access to raw data, thereby limiting the other country's ability to make independent

[101] "Low Emissions and Climate Resilient Agriculture Risk Sharing Facility." The programme covers Mexico and Guatemala.
[102] "Programme for integrated development and adaptation to climate change in the Niger Basin (PIDACC/NB)." The programme covers Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Guinea, Mali, Niger, and Nigeria.
[103] "Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries." The project covers Comoros, Madagascar, Mauritius, and Seychelles.
[104] "The Africa Integrated Climate Risk Management Programme: Building the resilience of smallholder farmers to climate change impacts in 7 Sahelian Countries of the Great Green Wall (GGW)." The programme covers Burkina Faso, Chad, Gambia, Mali, Mauritania, Niger, and Senegal.
[105] "Enhancing Climate Information and Knowledge Services for resilience in five island countries of the Pacific Ocean." The project covers Cook Islands, Marshall Islands, Niue, Palau, and Tuvalu.
[106] "Community Resilience Partnership Program." The programme covers Cambodia, Indonesia, Lao People's Democratic Republic, Pakistan, Papua New Guinea, Timor-Leste, and Vanuatu.
[107] "Acumen Resilient Agriculture Fund (ARAF)." The programme covers Ghana, Kenya, Nigeria, and Uganda.
[108] "Multi-country Project Advancing Early Warnings for All (EW4All)." The programme covers Antigua and Barbuda, Cambodia, Chad, Ecuador, Ethiopia, Fiji, and Somalia.
[109] While it is beyond the scope of this evaluation to assess the performance of every CIEWS-tagged project, further examination is warranted for those with low disbursement rates, particularly as they near the end of their implementation periods. Notable examples include FP004, FP041, FP108, FP124, FP133, FP160, and SAP020.
[110] Argent et al. "Hydrological Data Exchange," (2021).
[111] Ibid.
[112] Ibid.
[113] RIMES is an intergovernmental institution registered with the United Nations under Article 102 of the United Nations Charter. It assists its member countries in establishing and maintaining climate information and EWS through a multi-hazard framework that covers all four pillars, according to each country's unique needs.

decisions and manage its own risks effectively. **These concerns highlight the need to establish and implement clear principles for regional CIEWS projects/programmes, including fair access to data and removal of barriers caused by existing institutional arrangements.**

153. Another example provides additional insights regarding why GCF stakeholders continue to choose a multi-country approach despite the associated challenges. For global CIEWS initiatives such as FP258, the multi-country approach was used to secure large funding in one review process rather than to address cross-border CIEWS issues. GCF viewed FP258 as a chance to demonstrate its ability to provide over USD 100 million to a single AE and increase its CIEWS coverage, and to support EW4All. On the other hand, UNDP, as the AE, utilized its established networks to organize subprojects in seven countries across three regions and obtain funding collectively. Put simply, the **application of a multi-country approach, particularly global initiatives, enabled the GCF to increase coverage of its CIEWS investments globally while allowing IAEs to obtain significant GCF funding for CIEWS through a single FP, eliminating the need for multiple separate FP approval processes.**

154. **However, the absence of a clear policy for a multi-country approach creates uncertainty in their implementation.** Currently, there is no GCF policy on programmatic approach, although the GCF Board discussed the matter at B.14, and there was some attempt by the Secretariat to table the item again in 2022. As a result, many multi-country programmes have been approved with recurring issues that led to the COP guidance noted above (paragraph 147). Some informants noted that the GCF expectations for these projects/programmes are often unclear, leading to delays and stakeholder confusion during formulation, implementation, and reporting. Moreover, experience seems to indicate that regional and global programmes yield additional benefits over single-country projects only if they clearly define their climate rationale and subproject selection criteria; otherwise, they may undermine country ownership, reduce impact estimation accuracy, and diminish GCF investment efficiency.

155. **Programmatic policy, if developed, can offer a framework for programmatic proposals by establishing guiding principles and requirements for their preparation, submission, and review.** For instance, the proposed policy may stipulate that all programme submissions involving future subprojects must contain comprehensive information regarding relevant factors including detailed criteria for selecting and approving subprojects, processes designed to ensure country ownership as well as conformity with all GCF policies – such as restructuring and cancellation, environmental and social safeguards (ESS) and information disclosure requirements, and any other sectoral-specific requirements and conditions (including for CIEWS) such as data exchange. Moreover, **clear principles on what should be covered by regional CIEWS approaches versus what is best addressed nationally or locally will help ensure that the multi-country and national/local efforts complement and reinforce each other, maximizing their overall impact on climate resilience and early warning capacity.**

2. DAE VERSUS IAE

156. As highlighted in Chapter 3, the majority (77 per cent) of the 141 CIEWS-tagged projects and programmes have been executed in collaboration with IAEs, while the remaining 23 per cent are implemented by DAEs. GCF has various policies and strategies that advocate for programming with DAEs, emphasizing the importance of country drivenness and ownership. These policies and strategies include the investment framework, previous and revised readiness strategies (decisions

B.08/11 and B.22/08), PPF guidance, and the USP-2 (decision B.36/13).[114] Notably, USP-2 includes two out of 11 programming targets that are highly relevant to promoting country drivenness and ownership, as outlined below:

> 1. More than 100 developing countries directly supported by GCF to advance the implementation of their NDCs [nationally determined contributions], NAPs or LTS [long-term strategies] through integrated climate investment planning and/or developing high-quality climate project pipelines for GCF funding.
> 2. Doubling the number of DAEs with approved GCF funding proposals through strengthened climate programming capacity and increasing the allocation of GCF resources through DAEs.

157. When programming interventions, including CIEWS, the choice between IAEs and DAEs ultimately seems to come down to the availability of capacity. As explored in the previous section on a single versus muti-country approach, the comparative advantages of programming a CIEWS project with an IAE are understood as being global or regional expertise and/or resources, opportunities for cross-border or regional collaboration, capacity to handle large-scale funding, and existing relationships with other CIEWS actors including multilateral organizations (e.g. WMO and ITU), among others. On the other hand, the comparative advantages of programming a CIEWS project with a DAE are understood to be, inter alia: country drivenness and ownership including ensuring alignment to national priorities; utilizing local knowledge and networks for project design and implementation; and strong opportunities to strengthen national systems which in turn lead to sustainability.

158. In other words, there is an underlying assumption that DAEs may be less equipped to manage large-scale GCF funding, despite having distinct comparative advantages that IAEs may lack. This means that if we consider the scenario where DAEs possess the necessary capacity to handle substantial funding, alongside their noted strengths, the option of programming with DAEs becomes more attractive. This aligns with the GCF's priorities of promoting country drivenness and ownership, which are crucial for ensuring the sustainability of interventions.

159. Bangladesh provided a valuable case for evaluating the choice between IAEs and DAEs, as among those countries visited by the evaluation team, it is the only country with ongoing CIEWS projects managed by both types of entities. In Bangladesh, the national DAE, Palli Karma-Sahayak Foundation (PKSF), manages three GCF-funded projects that are linked to CIEWS. These projects are FP206 ("Resilient Homestead and Livelihood support to the vulnerable coastal people of Bangladesh", SAP008 ("Extended Community Climate Change Project-Flood (ECCCP-Flood)"), and SAP026 ("Extended Community Climate Change Project-Drought (ECCCP-Drought)").

160. In addition, there is a CIEWS project managed by an IAE, UNDP Bangladesh – FP069 ("Enhancing Adaptive Capacities of Coastal Communities, Especially Women, to Cope with Climate Change Induced Salinity").

161. The evaluation team observed through a site visit that the PKSF projects had much closer engagement and outreach to local communities, especially those who are considered the most vulnerable or at the "last mile". In addition, their extensive network of local volunteer groups and CSOs as well as ability to mobilize these networks to deliver results were notably strong, including ensuring monitoring of results post-project implementation. During the visit, it was clarified that PKSF possesses the capacity to develop GCF FPs independently, without relying on external

[114] Green Climate Fund, "Project Preparation Facility."

support. This capability is evidenced by their successful approval of three FPs, one of which (SAP008) has reached completion. Furthermore, PKSF has managed a USD 77 million portfolio of GCF-funded projects, in addition to other international funding sources from MDBs and United Nations agencies.

162. While the UNDP project demonstrated strong results by embedding an early warning system for cyclones in the vulnerable communities of Southwest Bangladesh, the presumed comparative advantage of UNDP's strong capacity did not particularly stand out, as PKSF exhibited equally robust capacity. Both entities effectively aided the most vulnerable communities in Bangladesh in reducing the risks of asset and life loss due to extreme weather events like cyclones and flooding.

163. This context highlighted PKSF's comparative advantages more prominently, such as its adept use of local knowledge and networks and its ability to support community-rooted climate actions across the country, particularly in vulnerable areas. Additionally, PKSF maintained a strong linkage with the NDA office, which exercises extensive oversight over the country's climate actions and activities through the International Climate Finance Cell located within the Economic Relations Division of the Ministry of Finance.

164. The ability of a DAE in Bangladesh, such as PKSF, to manage and absorb large funding while delivering impactful results relevant to CIEWS renders the discussion of DAE versus IAE somewhat irrelevant in this context. Although this example may not be typical, it underscores the notion that the distinction between DAEs and IAEs can be nominal. Instead, capacity is the critical variable that should be assessed across the diverse range of AEs with which the GCF collaborates.

165. As noted in Chapter 4, one of the GCF's comparative advantages is its engagement with a wide array of implementing partners, both DAEs and IAEs including national-level governments and line department or ministries, local NGOs, or CSOs, private sector entities, and regional and international organizations. This diverse network of AEs can be effectively leveraged to achieve the desired outcomes in CIEWS as envisaged in the three paradigm-shifting pathways.

166. Within the Fund, there is a strong emphasis on supporting and collaborating with DAEs to "promote a systemic shift in funding practices and ensure investments are context-specific".[115] **As the current CIEWS portfolio predominantly constitutes IAE-managed projects, the GCF's current strategic direction necessitates a re-evaluation of the CIEWS portfolio. If the GCF decides to expand CIEWS programming with a focus on supporting DAEs, it can leverage existing mechanisms, such as the readiness programme to build a DAE base by partnering with a wide array of actors – both public and private – to help build the necessary CIEWS infrastructural and institutional capacity in these countries** (see also section B.1 below). The WMO – now a registered delivery partner under the readiness programme – could facilitate the provision of such technical support (see also Chapter 4.B.2).

3. PUBLIC VERSUS PRIVATE SECTOR

167. The evaluation also examined the extent to which the GCF has catalysed and/or leveraged private sector engagement to promote or strengthen CIEWS. Engagement with the private sector is defined by WMO as:[116]

> Any type of interaction with private/business entities, with different objectives, ranging from informal talks and discussions, to knowledge-exchange platforms, to full-fledged

[115] Green Climate Fund, "GCF in Brief: Locally Led Climate Action."
[116] World Meteorological Organization, "Guidelines for Public-Private Engagement."

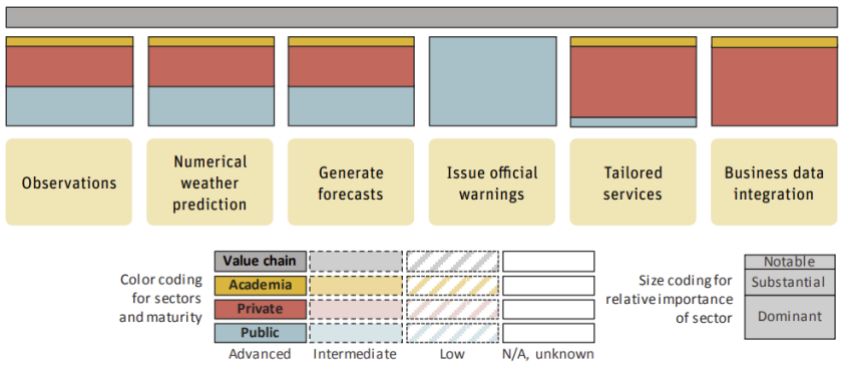
> partnerships entailing funding or brand asset exchanges. These engagements may be implemented through different modalities, including, but not limited to, partnering, and may entail different levels of public exposure.

168. The definition covers both private sector collaboration and private sector partnerships. Private sector collaboration refers to cases where there is no contractual agreement between the NMHS (or other government agencies) and the private sector. In contrast, private sector partnerships typically involve a formal arrangement, such as a contract or MOU.[117]

169. In simple terms, CIEWS services can be split into public and non-public services. Non-public services can be further divided into those provided by private and academic sectors.[118] For example, public services can include national weather networks and general forecasts while private services may include tailored products for clients or risk indices for insurers.[119] While public services often require oversight, they do not always need to be delivered by government agencies; private or academic entities can provide them under regulatory supervision.[120]

170. To effectively utilize private sector engagement in a country, it is important to understand enabling factors. These include the maturity level of each part of the CIEWS value chain (e.g. observations, numerical weather prediction, generating forecasts, issuing official warnings, tailored services and business data integration); the existing balance of contributions from public, private, and academic sectors; activities of other development partners supporting CIEWS; and the policy framework shaping the value chain in the country.[121] Figure 5–3 provides a hypothetical example of a CIEWS value chain in a country with an advanced level of maturity across the value chain, with public and non-public (private and academia) sector balance. In this hypothetical country situation, public, private and academic sectors have clear roles and responsibilities to ensure effective CIEWS to all segments of users (e.g. citizens, businesses, and individual clients).

Figure 5–3. CIEWS sector balance and maturity diagram



Source: World Bank, *The Power of Partnership: Public and Private Engagement in Hydromet Services*.
Note: The original diagram uses the term "hydromet" value chain. The terminology adoption of "CIEWS" was done by the author.

[117] Climate Risk and Early Warning Systems, "CREWS Operational Procedures Note 6: Private Sector Engagement."
[118] World Bank, *The Power of Partnership: Public and Private Engagement in Hydromet Services*.
[119] Ibid.
[120] Ibid.
[121] World Meteorological Organization, "Guidelines for Public-Private Engagement"; World Bank, *The Power of Partnership: Public and Private Engagement in Hydromet Services*; Rogers et al., "Affordability of National Meteorological and Hydrological Services."

171. While the GCF's CIEWS sectoral guide emphasized the importance of private sector engagement in all three paradigm-shifting pathways,[122] it did not outline operational approaches for engagement. However, the CIEWS ToC developed with CIEWS experts as part of this evaluation provides further insights, where increasing co-financing and private sector engagement through the development of financial risk tools are seen as ways to attain CIEWS results (Figure 2–1). Therefore, the evaluation team classified private sector engagement within the GCF's CIEWS portfolio into the following two operational models for the purpose of analysis:

- **Blended finance structures to mobilize private capital and de-risk investments:** These GCF projects/programmes partner with private sector entities or MDBs as AEs to attract private investment for climate adaptation, such as CIEWS. They use GCF funding to create innovative financial mechanisms – like adaptation equity funds, sustainability-linked bonds, catastrophe bonds, or parametric insurance – to attract private capital into adaptation efforts and reduce or transfer disaster risks. Examples include FP048,[123] FP078,[124] FP179,[125] and FP283.[126]
- **Public-private engagement across CIEWS value chain:** These CIEWS projects/programmes are grant-based projects, managed by a public sector AE and executing entity, which collaborate with private sector partners to provide CIEWS services and products. Examples include FP002,[127] FP075,[128] FP161,[129] FP258,[130] SAP022,[131] and SAP041.[132]

172. **In both of these models, it was found that private sector involvement in the CIEWS portfolio is still limited and emerging, revealing a gap between intentions and actual engagement.** With a few exceptions, GCF projects operating under these models are either in their initial phases with few measurable results, or the evaluation team was unable to obtain further information from AEs. The limitation is common across CIEWS initiatives throughout developing countries due to a few reasons listed below.

173. In LDCs, SIDS and African States where the majority of GCF's CIEWS investments are located (Figure 3–7), the CIEWS value chain exists generally at a low maturity level and has limited private sector engagement due to financial, socioeconomic, and technical barriers. Even in the context of low-medium income countries, a lack of willingness by users to pay for CIEWS services is common, as EWS are public goods, resulting in lack of incentive for private companies to participate.[133] In addition, government agencies often hesitate to outsource CIEWS services to the private sector due to concerns over data accuracy, control and accountability. Furthermore, the authority to permit private commercial CIEWS activities lies within the jurisdiction of individual sovereign States, over which the GCF exercises limited influence.[134]

[122] Green Climate Fund, *Sectoral Guide: Climate Information and Early Warning Systems*.
[123] "Low Emissions and Climate Resilient Agriculture Risk Sharing Facility."
[124] "Acumen Resilient Agriculture Fund."
[125] "Tanzania Agriculture Climate Adaptation Technology Deployment Programme."
[126] "Glaciers to Farms (G2F) Regional Program: Advancing Climate Resilience & Sustainable Development in Central and West Asia."
[127] "Scaling up the use of Modernized Climate Information and Early Warning Systems in Malawi."
[128] "Institutional Development of the State Agency for Hydrometeorology of Tajikistan."
[129] "Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries."
[130] "Multi-country Project Advancing Early Warnings for All."
[131] "Enhancing Multi-Hazard Early Warning System to increase resilience of Uzbekistan communities to climate change induced hazards."
[132] "ALBAdapt – Climate Services for a Resilient Albania."
[133] Rogers et al., "Affordability of National Meteorological and Hydrological Services"; United Nations Development Programme, "Private Sector Engagement in Climate Information Services and Early Warning System in Cambodia: Feasibility study."
[134] World Meteorological Organization, "Guidelines for Public-Private Engagement."

174. Albeit limited, some GCF projects have achieved early successes in operationalizing blended finance structures to mobilize private capital and de-risk investments in commercial CIEWS services. Guatemala provides a useful example of how a country-level CIEWS portfolio could be formulated with a mix of private and public sector projects to target different segments of users. FP048 aims to promote climate-smart investments in Guatemala and Mexico through a risk-sharing facility established by the IDB. The facility blends GCF funding with large-scale private and public co-financing to support rural cooperatives and micro, small and medium enterprises in these countries via the provision of loans and guarantees. The Fundación para el Desarrollo Empresarial y Agrícola (FUNDEA) – one of the local financial intermediaries in Guatemala – used the funds from the facility (USD 2,050,000 – 93 per cent loan, 7 per cent grant) to develop tailored CIS for businesses/farmers. The funds were invested in designing and piloting a sensor network that gathers climate data for analysis, helping develop climate knowledge products like a subscription-based, impact-driven early warning system for farmers. By the end of the subproject, FUNDEA and its subsidiary SIUCOM operated a commercial CIEWS with over 2,300 meteorological sensors collecting climate data at a much higher resolution than the public meteorological network offered by NMHS in the country. FUNDEA used this data to offer advanced climate dashboards, subscription-based tailored climate analytics and integrated climate data for investment decisions, and other tailored client products. The data also enhanced risk analysis for microfinancing and supported planning for a parametric microinsurance pilot in 2026. **This case demonstrates a successful private sector engagement in the provision of tailored services (**Figure 5–3**), highlighting sustainable commercial CIEWS initiatives in the country.** The success has prompted FUNDEA to continue investing, expanding sensor coverage, and developing new climate-related products across sectors.

175. While FP048 targets tailored services for narrower clients and businesses, GCF projects such as FP087[135] and FP145[136] are filling the CIEWS needs of wider segments of the population in Guatemala, especially vulnerable Indigenous communities. These projects support government agencies such as the NMHS – namely the National Institute of Seismology, Volcanology, Meteorology, and Hydrology (INSIVUMEH) – to collect and analyse climate information by providing additional meteorological stations (FP087) and supporting the maintenance of existing meteorological stations and climate analysis tools (FP145). For example, FP087 has supported 19 installed and operational stations and invested in INSIVUMEH's data-processing equipment and data centre. On the other hand, FP145 has deployed the Agricultural Stress Index System which monitors vegetation health using remote sensing and then compares it with 40 years of satellite data to identify drought-stressed crops before they are visible to human eyes. Furthermore, FP087 contributes to last-mile dissemination by translating climate information into local Indigenous languages, supporting multiple communication channels (e.g. community radio stations, bulletins, and a mobile app) and strengthening the capacity of local organizations to understand climate information. **To sum up, CIEWS investments, by public and private sectors in Guatemala, are meeting the needs of diverse user groups – including vulnerable communities, business entities, and individual clients – by addressing both public goods and commercial objectives**.

176. Similarly, under the second operational model of public-private engagement, several GCF projects/programmes attempted private sector engagement with limited success. For example, while SAP022 in Uzbekistan noted in its approved FP that it would work with various public and private

[135] "Building livelihood resilience to climate change in the upper basins of Guatemala's highlands," managed by International Union for Conservation of Nature.
[136] "RELIVE – REsilient LIVElihoods of vulnerable smallholder farmers in the Mayan landscapes and the Dry Corridor of Guatemala," managed by the Food and Agriculture Organization of the United Nations (FAO).

stakeholders to make CIS more cost-efficient and sustainable in the long-term, the only private sector engagement confirmed thus far by the evaluation team was private contractors to install equipment. Meanwhile, the project-level interim evaluation for SAP022 undertaken in 2024 noted that several revenue generation options are being explored based on delivery of disaster risk information products/services.[137] Similarly, in Timor-Leste, while the project set out to help businesses take advantage of better climate services, the interim evaluation carried out for the project in 2025 identified major challenges facing the private sector. Indeed, a country visit to Timor-Leste by the evaluation team revealed a significant difference between the project's initial goals and realities in the country, with very low CIEWS capacity. Yet in Malawi, FP002 designed activity 2.4 for establishing a "demand-based model for climate information and services stimulating private sector engagement". The model incorporated partnerships with private telecom operators for platforms including 3-2-1, Esoko, and Frontline SMS, proposing free basic weather warnings while developing revenue-generating agricultural advisory services. However, APRs and interim evaluation documented limited actual implementation, with private sector assessments experiencing repeated delays. Likewise in the IOC project (FP161), while the approved FP states that "the NMHSs of the target countries in the Southwest Indian Ocean region are not agencies; and therefore a mechanism needs to be sought to ensure that they are able to manage revenues and incomes from their commercial services and cost-recovery that would support operations and maintenance, to date, the existing project management unit staff of the IOC has solely engaged in dialogue, rather than developing financial sustainability models in CIEWS. These examples demonstrate persistent challenges in engaging with private sector entities and creating sustainable CIEWS services across the value chain under the grant-based CIEWS projects/programmes.

177. Despite the operational realities, there are high expectations for the GCF to boost private sector engagement in CIEWS. Several informants emphasized the GCF's unique ability to mobilize private sector investments by piloting innovative blended finance structures. As done by other CIEWS actors such as WMO, CREWS and WB-GFDRR, the development and implementation of operational guidelines in CIEWS on private sector engagement may be able to facilitate the definition of GCF's clear paths towards more concrete outcomes in private sector engagement, and enable a transition from the prevailing grant-based support model towards more sustainable, revenue-generating investments. **The integration of GCF's Private Sector Facility into regional departments as part of the ongoing GCF restructuring process presents an opportunity for cross-fertilization of private sector and CIEWS expertise. CIEWS stakeholders expect GCF to go beyond grants to improve financial sustainability, attract private sector involvement, and increase the impact of CIEWS initiatives.**

B. Application of funding windows to promote CIEWS

178. This section explores the extent to which the RPSP and the PPF have supported the creation of an enabling environment for CIEWS programming.

[137] United Nations Development Programme. *Interim evaluation of SAP022: Enhancing Multi-hazard Early Warning System to Increase Resilience of Uzbekistan Communities to Climate Change Induced Hazards Project*.

1. Readiness and Preparatory Support Programme

179. The RPSP was established as a dedicated funding window to support developing countries in building the necessary capacities to effectively plan and programme climate actions with the GCF. The foundation for this support is articulated in paragraph 40 of the GCF GI, which states that:

> The Fund will provide resources for readiness and preparatory activities and technical assistance, such as the preparation or strengthening of low-emission development strategies or plans, NAMAs [Nationally Appropriate Mitigation Actions], NAPs [National Adaptation Plan], NAPAs [National Adaptation Programmes of Action] and for in-country institutional strengthening, including the strengthening of capacities for country coordination and to meet fiduciary principles and standards and environmental and social safeguards, in order to enable countries to directly access the Fund.

180. Following the mandate of the GI, and Board decision B.08/11, the RPSP was officially launched in 2014, with the first readiness grant approved in May 2015. Since its inception, the programme has undergone three distinct phases:

- Phase I: 2015 to 2018
- Phase II: 2019 to 2021, extended to 2023 by Board decision B.33/04
- Phase III: Operational from January 2024 to 2027, as per Board decision B.37/21

181. Including the transitional period between phases II and III, which continued until 2025, the readiness window has, as of November 2025, approved a total of 875 grants amounting to USD 745.7 million, supporting 143 countries. Each phase of the programme has sought to build upon the lessons and experiences of its predecessor. Notably, the Readiness Programme Strategy for 2019–2021, endorsed at B.22 (decision B.22/11), marked a shift away from input-based approaches – previously defined as "indicative activities" in Board decisions B.08/11 and B.13/32 – towards longer-term, outcome-based objectives for readiness support (GCF/B.22/08).

182. The strategy for phase II was particularly ambitious, setting out the vision that:

> by 2025 all GCF recipient countries have developed the necessary enabling environment, including increased institutional capacity and robust country strategies, to implement transformational projects and programmes in line with national climate change priorities and GCF result areas, including as elaborated in updated NDCs and NAPs.

183. However, as the readiness portfolio expanded, the realization of this vision became increasingly challenging. A relatively limited proportion of readiness support actually translated into follow-on GCF investments within these countries.[138] By the end of 2023, the programme had invested over USD 631 million (GCF/B.40/Inf.05.), prompting stakeholders to question its overall impact and results.

184. In response to these concerns, the revised Readiness Strategy (phase III), approved at B.37, seeks to address this very issue. The strategy notes that:

[138] According to GCF/B.43/Inf.11 ("Readiness and Preparatory Support Programme and Project Preparation Facility – annual report on implementation 2024"), the readiness support resulted in the development of 497 project ideas and concept notes and 14 full FPs as at the end of 2024. However, it is unclear how many of these concept notes have moved to FPs and how many of the FPs developed under the readiness portfolio were approved by the GCF Board.

> It is now time to build on the results of the Readiness Programme that have been delivered in the eight years of operation so that it can become not only the largest, but also the most impactful capacity-building programme that enables countries to directly access climate finance and successfully design programmes and projects that help them address climate change challenges.

185. Phase III is designed to provide more strategic support for climate programming, aligning with the priorities set out in the USP-2. While earlier phases concentrated on supporting countries to develop strategic frameworks such as NDCs, NAPs, and long-term strategies, the current phase places greater emphasis on assisting countries in the implementation of these strategies. Furthermore, the revised strategy targets capacity-building with a clear focus on developing pipelines for climate action – an area that was identified as lacking in previous phases.

186. By December 2025, phase III had moved forward slowly, with just a handful of projects receiving approval under the updated strategy in countries like the Dominican Republic. Nevertheless, these approvals represent an important achievement for the Secretariat, which put a new readiness concept into practice, as discussed in more detail below.

187. Given the current status of phase III, the identification and review of CIEWS-related readiness grants was only feasible under readiness phases I and II. Specifically, the evaluation team sampled 476 out of 821 readiness grant proposals available on the GCF website as of September 2025, and utilized MaxQDA software to identify CIEWS-related readiness grants, which was followed by human verification. Of 476 sampled readiness grants, 29 readiness grants were identified as related to either CIS or EWS. In addition, a random search by project title and additional desk review of readiness grants yielded 13 more readiness grants that were identified as linked to CIEWS. The list of these 42 CIEWS-related grants is provided in annex 9.

188. Of these 42 grants identified as CIEWS-related, 71 per cent or 30 grants fall under the standard readiness category of capacity-building while 29 per cent or 12 grants were related to NAP formulation or implementation. For example, under the standard readiness category, AGO-RS-002 titled “Strengthening Institutional Information Services to support decision-making for Climate Change in the AFOLU sector in Angola” (approved in 2020) focused on addressing gaps in agricultural drought monitoring, such as building a medium- and long-term vision for an early warning information system for extreme climate events. Similarly, LAC-RS-006 titled “CDEMA Early Warning Systems Readiness Proposal” in Antigua and Barbuda (2019) focused on improving regional- and national-level mechanisms and capacity for achieving climate resilience through advancing MHEWS, and provided capacity-building for national-level EWS actors such as the NMHS and NDMA. Under the NAP support category, KAZ-RS-003 titled “Institutionalization of adaptation planning and integration of climate risks into Kazakhstan’s development planning processes to enable implementation of adaptation measures as part of coherent NAP policies” (2023) included an output to identify gaps and needs in climate services for climate-resilient development planning. Activities under this grant for example included increasing availability and access to climate risk and vulnerability assessments, climate damage data, and downscaled climate projections as well as assessing the capacity development needs of existing and potential climate service providers and climate service users at national and subnational levels.

189. The review of the sampled CIEWS readiness grants along with additional desk review and observations and data-collection from country visits generated the following findings.

190. **Firstly, while the readiness programme has indirectly created an enabling environment in CIEWS programming via its NAP support envelope,[139] direct support through CIEWS-specific grants has been very limited.** Only a small proportion of grants were allocated specifically to address identified gaps and needs within the CIEWS sector although the CIEWS sectoral guide acknowledged the readiness programme as a means to enhance institutional capacity for CIEWS.[140] Analysis of the sampled CIEWS grants reveals a distinct pattern in the management of these initiatives. Specifically, 33 per cent (14 grants) were overseen by national or regional entities, whereas the majority – 67 per cent (28 grants) – were managed by international organizations such as UNDP, UNEP, and the Global Green Growth Institute. This inclination towards international management aligns with the entire readiness portfolio as well as the GCF portfolio of funded activities, where international entities typically play a leading role. However, given the GCF core emphasis on country ownership and driven approaches, there is a need to reassess how CIEWS grants within the readiness programme are allocated and managed to ensure greater national or local involvement, which will in turn contribute to addressing sustainability within the sector. Recognizing this requirement, the revised Readiness Programme 2024–2027 has introduced new operational modalities specifically designed to address the prevailing imbalance.[141] These updated modalities aim to promote more active participation of national entities in the management of readiness grants including CIEWS-related grants, thereby supporting the GCF's commitment to country-driven solutions and increased local ownership.

191. **Secondly, the extent to which CIEWS are addressed through the GCF readiness grants is shaped not only by the stated priorities of individual countries, but also by factors such as the existing capacities and interests of NDAs, relevant line ministries, and the presence of alternative funding sources to support CIEWS initiatives.** These elements seem to have collectively influenced how countries engaged with the GCF readiness programme in relation to CIEWS. Bangladesh serves as a notable example in this regard. Despite not receiving specific CIEWS grants through the readiness programme, this absence should not be interpreted as a lack of prioritization of CIEWS within the country. In fact, CIEWS remains a key priority in Bangladesh, as outlined in the country's Delta Plan 2100 and NAP. However, the country did not require GCF readiness funding to bolster its CIEWS capacity or to develop a project pipeline in this sector. This is partially attributable to Bangladesh's established CIEWS networks and the availability of alternative assistance and financial resources within the country, which have enabled continued progress independently of GCF readiness support. Indeed, Bangladesh is among the first 30 countries selected for coordinated support under the EW4All initiative, underscoring the international commitment on CIEWS in the country.

192. **Thirdly, although these challenges are not exclusive to the CIEWS sector, limited capacities and understanding within NDAs regarding the GCF readiness funding window, coupled with frequent staff turnover within the NDA offices, have hindered some countries from effectively utilizing GCF readiness funding to address their priority needs.** For instance, in Guatemala, despite a relatively high number of readiness grants awarded between 2016 and 2024 (15 in total), the evaluation team identified persistent institutional gaps, including a lack of comprehensive knowledge and understanding of GCF readiness grants. Similarly, in Timor-Leste, frequent changes within the Government adversely affected continuity, resulting in limited GCF readiness knowledge among current NDA staff and challenges in adhering to related GCF procedures. Comparable issues

[139] For example, the Secretariat reported that of the 64 countries that have submitted NAPs to UNFCCC, 53 (82.8 per cent) have received GCF readiness support for the formulation of their NAPs (GCF/B.43/Inf.11).
[140] Green Climate Fund, *Sectoral Guide: Climate Information and Early Warning Systems*.
[141] Green Climate Fund, *Strategic Planning of Readiness Support: Guide for Countries*.

were observed in other countries visited including virtually, such as Uzbekistan and Nigeria, where the NDA repeatedly transitioned from one office to another. This ongoing turnover raised concerns about the continuity and effectiveness of readiness support as well as the intended purpose of the NDA to fulfil strategic oversight of GCF investments in the country.

193. **Drawing on these findings, the evaluation team concluded that, under readiness programme phases I and II, the creation of an enabling environment for CIEWS programming was highly limited.**

194. Despite the above, phase III seems to offer countries opportunities to intentionally utilize readiness to address their national priorities and pipeline development, including CIEWS. One notable feature is support for country platforms – initiated by the G20 in 2020 and revitalized under Brazil's 2024 presidency – which aim to enhance national coordination mechanisms and investment frameworks to drive their climate actions.[142]

195. These platforms facilitate strategic planning and cooperation between governments, the private sector and international actors, providing a stronger foundation for investment and coordination including addressing complementarity and coherence among climate funds, as envisaged in the idea of vertical climate and environmental funds.[143] Indeed, under this platform arrangement, the GCF revised Readiness Programme 2024–2027 is intended to assist countries to access climate finance beyond GCF funding – which is a major shift from the previous phases where country programmes and pipeline development activities under the readiness programme were limited within the scope of programming with the GCF.

196. At COP30, a significant development was the announcement by 14 developing countries and regions of their intention to establish country or regional platforms utilizing the GCF's readiness support.[144] The countries and regions identified include the Africa Island States Climate Commission, Cambodia, Colombia, India, Kazakhstan, Lesotho, Mongolia, Nigeria, Oman, Panama, Rwanda, the Dominican Republic, Togo, and South Africa. These new platforms will be supported through the readiness programme and will build upon the precedent set by the first two country and regional platforms previously facilitated by the GCF for Brazil and the Caribbean region.[145]

197. **Should these country platforms become standard practice, they are expected to play a crucial role in enhancing the coordination and coherence of climate finance and action at the national level. If the GCF, as the facilitator and funder of these platforms, opts to use them as a means to advance the EW4All initiative, the readiness programme stands poised to become more purposeful in promoting and supporting CIEWS. In this scenario, the readiness programme could shift towards a more deliberate approach, strengthening its contribution to CIEWS through the strategic use of country and regional platforms.**

198. Moreover, phase III of the readiness programme aims to introduce a novel shift in the approach to supporting DAEs, with a strong focus on enhancing efficiency in multi-stakeholder collaboration at the national level. The concept aims to ensure that resources are managed and allocated in a manner that maximizes impact, particularly for sector-based initiatives such as CIEWS.

199. A key lesson drawn from previous phases is that simply increasing the number of accredited DAEs did not necessarily lead to a greater volume of projects managed by these entities. Indeed, only 24 out of 84 DAEs currently have approved GCF projects. In response, phase III aims to test a more

[142] Garnak, "The Supply Side of Country Platforms."
[143] Independent High-Level Expert Group, *Accelerating Sustainable Finance for Emerging Markets and Developing Economies: Independent High-Level Expert Group Review of the Vertical Climate and Environmental Funds*.
[144] Green Climate Fund, "Fourteen new Country Platforms announced in collaboration with GCF to drive country-led climate solutions."
[145] Green Climate Fund, "Country platforms: Green Climate Fund Approach, Available Support and Impact."

strategic and targeted approach, prioritizing the empowerment of national entities with the potential to function effectively as DAEs and distribute funds across various sectors and agencies within their countries, thereby improving the overall efficiency of fund management – provided they have the requisite capacity.

200. For example, ministries of finance in some country contexts are identified as potential DAEs within the current pipeline. Positioned to provide national leadership, these ministries can channel funding to a wide range of other ministries, departments, and entities. This includes institutions such as NMHS and NDMA, both of which are well-placed to implement sector-specific projects that contribute to strengthening CIEWS.

201. In addition to public sector engagement, phase III aims to strengthen the involvement of private sector entities as DAEs. These entities, noted for their extensive partnership networks within countries, are positioned to foster multi-stakeholder collaboration. In summary, phase III presents significant potential for DAEs to be more adequately prepared to support the implementation and delivery of critical climate actions, including CIEWS. This is expected to be achieved through a more deliberate and coordinated approach, with mechanisms such as a dedicated DAE funding window established under phase III serving to test and refine this concept.

202. Although the revised Readiness Strategy approved by the Board in 2023 has prompted the development of these new concepts and approaches, it is important to recognize that these ideas have primarily arisen from the Secretariat's evolving perspective. Notable features discussed are the use of readiness funds beyond GCF programming, the creation of country platforms, and the introduction of a new approach to DAEs. However, these features are not yet comprehensively documented or clearly articulated within official materials released under the current phase of the readiness programme.[146] The absence of clear and detailed documentation may hinder stakeholders' understanding and uptake of these new initiatives under the readiness window and their linkage with initiatives under other funding windows. For example, several informants indicated confusion regarding the boundaries of support provided by the readiness programme and the PPF, underscoring the need for improved guidance and communication. **Stakeholders – including regional Secretariat staff and external audiences – require clarity to ensure these windows are leveraged optimally for programming climate actions including CIEWS initiatives.**

2. Project Preparation Facility

203. One of the main distinctions between the readiness programme and the PPF is whether their funding is dedicated exclusively to GCF programming or not. The PPF window is exclusively for the GCF while the revised readiness programme is more flexible, letting developing countries formulate pipelines of climate actions beyond GCF (see section 1 above). Specifically, the PPF is designed to assist AEs in preparing FPs for submission to the GCF by facilitating the development of relevant FP annexes and supplementary information. This ensures that submitted FPs meet the minimum information requirements necessary for GCF's thorough review and approval process. The complementary information produced under the PPF can, for example, include (pre)feasibility studies, ESS and gender studies, stakeholder engagement plans, risk assessments, assessments of climate impact potential, identification of programme/project indicators, pre-contract services such as preparation of tender documents, and advisory services on legal, financial, tax, regulatory and governance matters. As another distinction, the PPF is specifically tied to AEs and Project Specific

[146] These official documents include the revised Readiness Strategy 2024–2027, Guide for Countries on Strategic Planning of Readiness Support, and revised Readiness Results Management Framework Handbook.

Assessment Approach (PSAA) applicants, while the readiness programme is tied only to countries and DAEs (hence not all AEs or PSAA applicants).[147]

204. **PPF support is intended to be sector-agnostic, without deliberate focus on CIEWS or other sectors. However, the evaluation showed that GCF strategically used the PPF window for developing CIEWS projects to address applicants' practical needs like finance and marketing.** For example, of 55 FPs approved with PPF support by B.43, 27 (49 per cent) included CIEWS components, indicating strong utilization of the PPF for projects with CIEWS elements (annex 10).[148] Although the PPF mainly aims to support DAEs, many IAEs also used it for FP formulation, especially in CIEWS projects. Of 27 approved CIEWS FPs with PPF support, 13 (48 per cent) came from IAEs – including MDBs and United Nations agencies. Informants noted that a lack of funding to formulate a complete FP package without approval certainty is a common issue across all AEs and that this trend is expected to increase given the current geopolitical climate and worldwide financial constraints. In addition, for IAEs, developing complex FPs – especially multi-country ones – requires a significant upfront investment, and this is where PPF funding becomes attractive. Moreover, informants noted that the PPF window is often used to attract co-financing and to publicly announce project pipelines, for instance, in support of the EW4All initiative (see also Chapter 4.B– paragraph 102). These points indicate that PPF support was utilized efficiently to meet applicants' practical requirements.

205. A desk review of these PPF proposals indicates that CIEWS-tagged projects used PPF to complete multiple GCF FP requirements, in particular, feasibility studies, vulnerability assessments, capacity gap assessments, and cost-benefit analyses/financial and economic assessments in addition to meeting other standard FP requirements such as ESS and gender studies and M&E-related needs. However, as covered in Chapter 6.B and Chapter 7.D, notable gaps were observed between planned CIEWS interventions and real conditions (e.g. limited local capacity) in some ongoing CIEWS projects, leading to implementation issues. This underscores the need for thorough needs assessments as well as feasibility studies when developing FPs for CIEWS projects. **The PPF window could be leveraged more effectively to better determine project feasibility and sustainability by considering comprehensive financial, human and technical resources available in-country as well as future equipment maintenance needs at NMHS and/or other government agencies.** Applying a CIEWS-specific assessment method in PPF-funded feasibility studies could help prevent problems with implementation or sustainability in the future. For example, concept of operations (CONOPS),[149] which serves as a feasibility tool to describe the scope and characteristics of the proposed system over its entire life cycle,[150] could be applied through the PPF where possible. By strategically incorporating CIEWS-specific feasibility techniques early on, AEs could more accurately estimate CIEWS service costs required, refine intervention priorities, and help ensure GCF investments are more effective and sustainable.

206. Moreover, while many CIEWS proposals focus on NMHS requirements such as CIEWS-related equipment (e.g. basic observation system, automated weather stations, and weather radars etc.), it is

[147] PSAA applicants under the pilot PSAA scheme essentially go through accreditation assessment and proposal appraisal in parallel, thereby reducing the overall time to access GCF funding. See Green Climate Fund, "Project-specific assessment approach."
[148] These 55 approved FPs with PPF support include one cancelled PPF application (PPF061) which later became FP276. See annex 10 for the list of approved CIEWS projects with PPF support.
[149] The CONOPS accounts for the expenses associated with all necessary equipment, facilities, materials, software, hardware, policy and technical documentation, services, training, and personnel required for the operation and support of the NMHS or any other relevant system. This comprehensive approach is commonly referred to as the total cost of ownership. See Rogers et al., "Affordability of National Meteorological and Hydrological Services"; World Bank, "Charting a Course for Sustainable Hydrological and Meteorological Networks in Developing Countries.".
[150] Rogers et al., "Affordability of National Meteorological and Hydrological Services."

equally important to consider end users' needs from the design stage so that climate information and early warnings services are relevant and inclusive – addressing the differentiated needs of men/women, local communities, IPs and other vulnerable groups. This approach of addressing local needs and knowledge from the start is also enshrined in GCF's Locally Led Climate Action framework and guidance launched at COP30.[151] **The PPF and readiness windows could be more strategically utilized to clarify these essential needs of end users, especially vulnerable groups.**

207. The expansion of the PPF services from the original eight to 32 service firms in 2025, in addition to the list of 54 DPs under the readiness window,[152] presents an opportunity to reconsider the use of PPF and readiness windows to develop CIEWS pipelines. These additional firms, primarily chosen for their experience in countries with existing GCF programmes/projects, also come with the expertise necessary to provide sector-specific support across nearly all sectors, including CIEWS.

[151] Green Climate Fund, "GCF's Locally Led Climate Action framework and guidance"; Green Climate Fund, "GCF leaves COP30 ready to ramp up climate finance."
[152] Green Climate Fund, "Project Preparation Facility"; see also Chapter 4.B.2.

Chapter 6. GCF PORTFOLIO OF CIEWS – RELEVANCE

KEY FINDINGS

6.1. GCF CIEWS investments are well aligned with various global CIEWS priority initiatives and frameworks, including EW4All initiative and GFCS.

6.2. GCF CIEWS investments mainly target those developing countries with high risk, high exposure and high vulnerability, demonstrating GCF's relevance for addressing CIEWS in countries of greatest need.

6.3. However, GCF investments are not fully aligned with national capacity in some country contexts. The funding provided needs to match each country's human and technical capacity to absorb it.

6.4. There seems to be a strategic tension in the GCF model where the Fund pursues high-volume, at-scale results suitable for global visibility, while urging its AEs and partners to reach and prove impact among "last mile" communities, objectives that can conflict in both practice and measurement.

6.5. While significant hurdles persist in rigorously measuring the extent to which GCF CIEWS investments genuinely address the priorities of the communities they aim to serve, there are numerous cases where "community" is a key focus in the GCF CIEWS portfolio. Adopting a trans-sectoral, integrated approach to CIEWS investments can enhance the additionality and sustained effectiveness of GCF funding, ensuring that investments in CIEWS are both contextually relevant and capable of delivering meaningful CIEWS benefits in settings where multiple risks and fundamental needs converge.

6.6. There are a handful of cases showing good intentions and/or practices of CIEWS funded by the GCF, and targeting underserved communities (last mile, disabled and vulnerable groups/minorities).

6.7. While there are instances of good practice and emerging models for inclusion, persistent gaps signal the need for more systematic and actionable strategies to ensure that CIEWS investments equitably reach and benefit all vulnerable, displaced, and minority populations.

208. CIEWS interventions are becoming increasingly more relevant due to rising number and intensity of extreme climate hazards taking place globally. This section evaluates how well GCF investments in CIEWS match the priorities, policy frameworks, and identified needs or gaps at global, national, and local levels.

A. GLOBAL-LEVEL ALIGNMENT

209. Firstly**, it is clear that GCF CIEWS investments are well aligned with various global CIEWS priority initiatives and frameworks. These include EW4All, Sendai Framework, GFCS, GGA, Alliance for Hydromet Development, and REAP.** As covered in Chapter 3 and Chapter 4, GCF successfully positioned itself as a critical contributor to the EW4All initiative through the formulation of the global EW4All programme with UNDP and the pillar leads (FP258). In addition, many GCF investments align with the GFCS as they support the implementation of NFCS; examples of projects with NFCS scope are: FP012 in Mali; FP147 in the Pacific Islands; FP161 in Comoros, Madagascar, Mauritius and Seychelles; FP171 in Timo-Leste; SAP007 in Zimbabwe; SAP022 in Uzbekistan; SAP033 in Sierra Leone; SAP041 in Albania; SAP046 in Azerbaijan; SAP048 in Togo; and SAP050 in Maldives. Moreover, of 141 CIEWS-tagged projects, 98 (70 per cent) benefit LDCs, SIDS, and African States, with a total estimated investment of USD 1.54 billion, indicating the alignment of GCF CIEWS investments with CIEWS priority countries, as discussed in Chapter 4.A.4.

210. Secondly, **GCF CIEWS investments are largely directed towards the developing countries with the highest disaster risk, indicating the GCF's relevance and efforts so far to address CIEWS in countries of greater need.** Table 6–1 shows the top 20 non-Annex I countries of the UNFCCC,[153] with the highest risk where the risk data is sourced from the World Risk Index 2025,[154] and compared against the number of existing GCF CIEWS-tagged projects in those countries. The World Risk Index 2025 is a statistical assessment of latent disaster risk for 193 countries caused by extreme natural events and the negative impacts of climate change.[155] As shown, most countries with the highest disaster risk already receive multiple GCF CIEWS investments, although the project count includes multi-country initiatives which present specific constraints, as discussed in Chapter 5.A.1. While five countries (Myanmar, China, Yemen, Nicaragua and Venezuela) in the top 20 list are currently without GCF investments, three (Yemen, Nicaragua, and Venezuela) of these five have early CIEWS pipelines with the GCF,[156] indicating a possibility of future support. Similarly, Table 6–1 and Table 6–2 show the top 20 non-Annex I countries with highest exposure to natural disasters,[157] and highest vulnerability,[158] respectively, compared against the number of existing GCF CIEWS-tagged projects in those countries. The lists show that GCF investments have targeted most of those countries facing the greatest exposure and/or vulnerability. Two countries

[153] Non-Annex I countries are mainly developing nations that have joined the UNFCCC but are not listed in Annex I of the Kyoto Protocol. See United Nations Framework Convention on Climate Change, "Parties to the United Nations Framework Convention on Climate Change."
[154] Humanitarian Data Exchange. "World Risk Index."
[155] Ibid.
[156] The information was collected internally through the Green Climate Fund Partner Portal database.
[157] The World Risk Index calculates exposure as a geometric mean of earthquakes, tsunamis, coastal floodings, riverine floodings, cyclones, droughts and sea level rise. See Humanitarian Data Exchange. "World Risk Index."
[158] The vulnerability index is calculated as a geometric mean of the susceptibility index, the lack of coping capacity index, and the lack of adaptive capacity index. For methodology and metadata for the index, see Humanitarian Data Exchange. "World Risk Index."

with the highest vulnerability (Central African Republic, and Burundi) have not yet received GCF investments in CIEWS but have a CIEWS FP and concept note under their pipelines respectively.[159]

Table 6–1. Top 20 high-risk non-Annex I countries with number of GCF CIEWS-tagged projects

RANK	COUNTRY	# OF APPROVED GCF CIEWS PROJECTS	RISK
1	Philippines	5	46.56
2	India	3	40.73
3	Indonesia	4	39.8
4	Colombia	4	39.26
5	Mexico	3	38.96
6	Myanmar	0	36.91
7	Mozambique	2	34.39
8	China	0	30.62
9	Pakistan	6	26.82
10	Bangladesh	6	26.71
11	Papua New Guinea	2	26.51
12	Vietnam	5	25.92
13	Peru	2	25.81
14	Somalia	3	24.89
15	Yemen	0	24.83
16	Ecuador	3	24.14
17	Madagascar	4	23.68
18	Nicaragua	0	23.6
19	Venezuela	0	22.12
20	Thailand	2	20.03

Source: Humanitarian Data Exchange, "World Risk Index."
Note: The World Risk Index is a statistical model that provides an assessment of the latent disasters occurring in 193 countries as of September 2025, caused by extreme natural events and the negative impacts of climate change. The risk index is calculated as the square root of the exposure index times the vulnerability index. The exposure index is calculated as the geometric mean of earthquakes, tsunamis, coastal floodings, riverine floodings, cyclones, droughts and sea level rise. The vulnerability index is calculated as the geometric mean of the susceptibility index, lack of coping capacity index, and lack of adaptive capacity index. The number of GCF CIEWS-tagged projects by country is produced by the evaluation team. Multi-country projects are double-counted among those participating countries. The count includes those identified by the evaluation team as "non-CIEWS" but classified as "CIEWS" by the Secretariat.

[159] The information was collected internally through the Green Climate Fund Partner Portal database.

Table 6–2. Top 20 non-Annex I countries with highest exposure and number of GCF CIEWS-tagged projects

RANK	COUNTRY	# OF APPROVED GCF CIEWS PROJECTS	EXPOSURE
1	China	0	64.59
2	Mexico	3	50.08
3	Philippines	5	39.99
4	Indonesia	4	39.89
5	India	3	35.99
6	Colombia	4	31.54
7	Vietnam	5	26.73
8	Myanmar	0	22.43
9	Venezuela	0	19.52
10	Papua New Guinea	2	18.84
11	Nicaragua	0	18.71
12	Madagascar	4	18.38
13	Mozambique	2	18.1
14	Peru	2	16.65
15	Bangladesh	6	16.57
16	Panama	1	15.89
17	Ecuador	3	14.57
18	Thailand	2	14.32
19	Pakistan	6	13.11
20	Chile	0	12.86

Source: Humanitarian Data Exchange, "World Risk Index."
Note: The World Risk Index is a statistical model that provides an assessment of the latent disasters occurring in 193 countries as of September 2025, caused by extreme natural events and the negative impacts of climate change. The number of GCF CIEWS-tagged projects by country is produced by the evaluation team. Multi-country projects are double-counted among those participating countries. The count includes those identified by the evaluation team as "non-CIEWS" but classified as "CIEWS" by the Secretariat.

Table 6–3. Top 20 non-Annex I countries with highest vulnerability and number of GCF CIEWS-tagged projects

RANK	COUNTRY	# GCF CIEWS PROJECTS	VULNERABILITY
1	Central African Republic	0	72.71
2	Somalia	3	72.45
3	Chad	6	70.7
4	South Sudan	2	69.62
5	Democratic Republic of Congo	2	68.41
6	Yemen	0	67.59
7	Niger	6	67.28

RANK	COUNTRY	# GCF CIEWS PROJECTS	VULNERABILITY
8	Ethiopia	3	66.01
9	Sudan	2	65.69
10	Mozambique	2	65.33
11	Nigeria	7	63.99
12	Syria	0	63.24
13	Mali	8	62.53
14	Myanmar	0	60.74
15	Cameroon	4	60.2
16	Burkina Faso	8	59.22
17	Burundi	0	57.76
18	Kenya	8	57.53
19	Pakistan	6	54.85
20	Afghanistan	0	54.81

Source: Humanitarian Data Exchange, "World Risk Index."
Note: The vulnerability index is calculated as a geometric mean of the susceptibility index, the lack of coping capacity index, and the lack of adaptive capacity index. The number of GCF CIEWS-tagged projects by country is produced by the evaluation team. Multi-country projects are double counted among those participating countries. The count includes those identified by the evaluation team as "non-CIEWS" but classified as "CIEWS" by the Secretariat.

B. COUNTRY-LEVEL RELEVANCE

211. **Alignment at the national level has generally been achieved, although certain challenges remain.** In theory, every GCF investment, including a CIEWS project, must be relevant and aligned with identified national needs and gaps, as required by two key GCF investment criteria – "*needs of recipient"* and *"country ownership"* of the GCF investment framework (decisions B.07/06 (a) and B.37/20). These two investment criteria assess inter alia country-level gaps and needs, as well as alignment with priorities articulated in national climate policy frameworks such as NDCs and NAPs. The evaluation team used desk reviews and country visits to assess the relevance of CIEWS investments at the country level. In all five countries visited, including a virtual visit to Nigeria, CIEWS investments were found to be relevant or highly relevant to identified needs and gaps. For example, in Nigeria, there was overwhelming agreement among respondents that CIEWS interventions are needed and consistent with country priorities. Nigeria has a weak observation network that does not cover a large part of the country, negatively affecting the accuracy of forecasts. In addition, the increased frequency and intensity of droughts and floods make the improvement and/or strengthening of forecasts and early warning and preparedness key priorities for the country. FP092 aims to address these gaps through the regional approach and has faced implementation challenges, as discussed in Chapter 5.A.1.

212. Similarly in Timor-Leste there is a strong consensus that CIEWS interventions are highly relevant and necessary. For example, FP171 addresses a key priority of Timor-Leste's NAP (2021) that highlights the need to **improve EWS to mitigate climate hazards and disaster risks**. In Guatemala, the NDC (2022) emphasizes adaptation and commits to installing national hydrometeorological, geological, and seismic stations to improve EWS. In addition, the National

Action Plan on Climate Change of Guatemala calls for EWS to be strengthened for extreme weather events to protect food security and water resources. This commitment is further illustrated by Guatemala's participation in the EW4All initiative as launched in 2024, aiming to cover 100 per cent of the population with multi-hazard EWS by 2027. In light of these national-level priorities, GCF investments in the country (FP087 and FP145) are filling identified CIEWS gaps such as increasing the number and operability of the national weather stations network and last-mile dissemination of climate knowledge through working with the country's NMHS – the INSIVUMEH – alongside other agencies. In Uzbekistan, CIEWS investment relevance was also confirmed through a series of decrees and resolutions enacted to support CIEWS in the country, including Resolution No. 4896 outlining the Government's commitment to modernize and strengthen hydrometeorological service delivery, as well as Resolution No. 361 adopted in August 2023 related to an automated warning system.[160] In addition, a visit to Uzbekistan by the evaluation team confirmed that GCF SAP022 supports these country priorities through the installation of automated weather stations and specialized water measurement devices, among other actions, significantly improving data-collection capabilities for flood and drought forecasting.

213. **While the relevance to country needs and their national policies are confirmed, the evaluation also found that investments were not fully aligned with national-level institutional capacities in some country contexts.** Developing nations, especially LDCs and SIDS, often face significant obstacles in managing large GCF funds due to limited human and technical resources, fragmented government structures, and limited technological capabilities like inadequate internet access. For example, Timor-Leste's existing CIEWS capacity is low with very limited human, technical and equipment availability, including having a very weak observation network. In this context, the National Directorate for Meteorology and Geophysics (Timor-Leste's NMHS) struggles to keep pace with demanding project implementation, experiencing shortages in personnel and equipment coupled with a policy environment that is underdeveloped for supporting CIEWS. Desk reviews revealed similar situations in Pacific Islands (FP147) and Niger Basin countries (FP092). These instances suggest that the funding and the scope of a project should be practical and match each country's human and technical capacity to absorb it. As highlighted in Chapter 5.B.2, ensuring good design work (e.g. feasibility assessments) during the pipeline development process becomes crucial for ensuring that goals set align with what can realistically be achieved and maintained in practice.

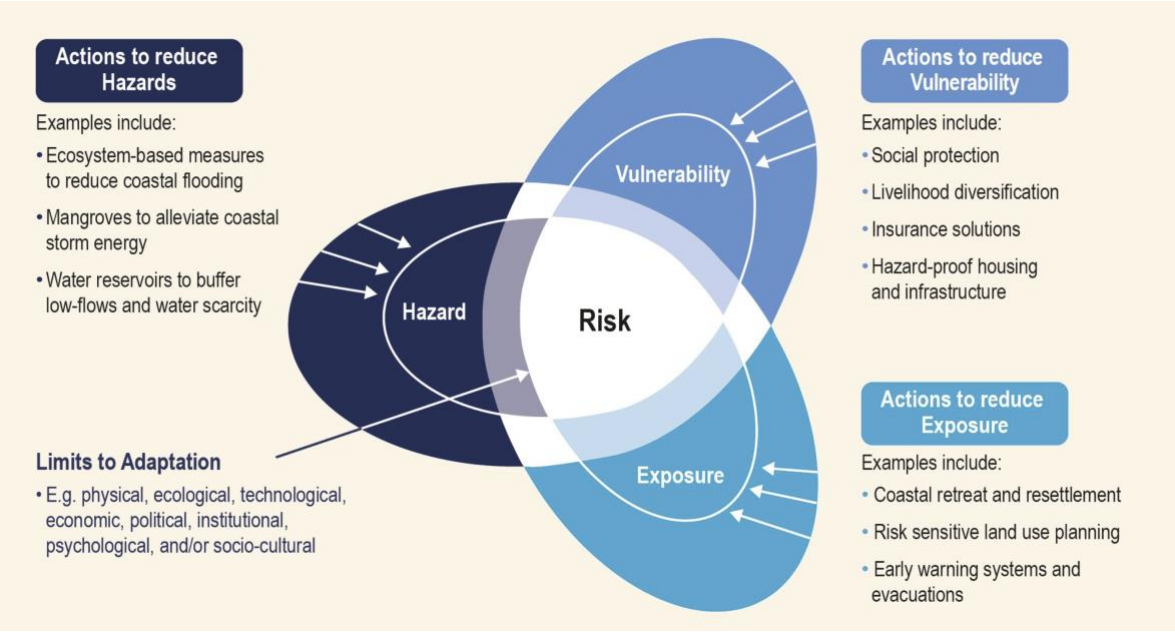
C. ALIGNMENT WITH NEEDS OF COMMUNITIES

214. **Measuring the degree to which GCF's CIEWS investments truly respond to the priorities of the communities they are intended to support remains a complex challenge.** Evidence indicates that communities targeted for CIEWS investments often prioritize immediate survival needs, such as food security, livelihoods and shelters above longer-term resilience objectives including CIEWS. For GCF investments in CIEWS, this underscores the importance of designing community-level interventions that holistically address the three dimensions of risk – hazard, exposure, and vulnerability (see Figure 6–1). Where a community's vulnerability (i.e. poverty) outweighs its exposure to frequent, severe, or cascading hazards, a stand-alone CIEWS initiative is unlikely to achieve lasting impact.[161] In such cases, forging partnerships with other fields (agriculture, water or health) becomes critical, as done in projects such as SAP008 and FP206 in Bangladesh. These

[160] United Nations Development Programme, *Interim evaluation of SAP022*.
[161] Intergovernmental Panel on Climate Change, "Determinants of Risk: Exposure and Vulnerability"; Moriniere et al., *Context Counts: Cultivating Community Disaster Preparedness Amid Complexity*; United Nations Office for Disaster Risk Reduction, *Linking Disaster Risk Reduction and Poverty Reduction*.

projects well understood that stand-alone CIEWS initiatives would not address the immediate and highest priorities of target communities (e.g. livelihoods and shelters) and hence combined multiple interventions to address all three dimensions of risk. For example, for SAP008 in the Northern Char (sandbars) land of Bangladesh where target communities face frequent river flooding, women volunteer groups known as Climate Change Adaptation Groups (CCAGs) were mobilized to boost their risk awareness and share flood warnings with the rest of the communities, while vulnerability interventions included goat rearing for livelihood, installing latrines and water pumps for sanitation, and planting banana trees as combined agriculture and hazard reduction activities, since banana trees help stabilize soil and absorb excess water thereby reducing the impact of hazards. Furthermore, homestead plinths were raised across the target communities to lessen the effects of floods, thereby directly mitigating hazards. As this example tells us, **adopting a trans-sectoral, integrated approach can enhance the additionality and sustained effectiveness of GCF funding, ensuring that investments in CIEWS are both contextually relevant and capable of delivering meaningful CIEWS benefits in settings where multiple risks and fundamental needs converge**.

Figure 6–1. Determinants of risk with actions to reduce hazards, vulnerability and exposure



Source: Intergovernmental Panel on Climate Change, *Special Report on the Ocean and Cryosphere in a Changing Climate*, 88.

215. At the organizational level, however, there is an inherent strategic tension within the GCF business model where on the one hand, the Fund seeks to deliver high-volume, large-scale results that lend themselves to robust global visibility and reporting while on the other, it encourages AEs and partners to demonstrate tangible impact at the last mile – among the most vulnerable and hardest-to-reach communities. These dual ambitions can, at times, appear to be at odds in both their practical application and the ways in which they are measured and communicated. The drive for scale and efficiency – tenets of the GCF's current reform programme,[162] can inadvertently steer projects towards more accessible or populated regions, potentially at the expense of tailored, resource-intensive interventions required for transformative change at the community level, especially for vulnerable groups. This dynamic prompts a critical reflection: Does the pursuit of both objectives

[162] Green Climate Fund, "Executive Director unveils "50 by 30" blueprint for reform, targeting USD 50 billion by 2030."

genuinely advance the interests of vulnerable communities, or does it risk prioritizing institutional imperatives such as global-level reporting and visibility over the delivery of lasting, meaningful impact on the ground? As the Fund is yet to adopt an official CIEWS approach including clear investment allocations between these two conflicting ambitions, developing such an approach could potentially help GCF balance and achieve dual goals in future sectoral investments.

216. **While significant hurdles persist in rigorously assessing the extent to which GCF CIEWS investments genuinely address the priorities of the communities they aim to serve, there are numerous cases where "community" is a key focus in the GCF CIEWS portfolio.** The commitment is evidenced not only by the explicit inclusion of "community" in the titles of many FPs but also by a variety of targeted efforts that have been substantiated through rigorous document review, country visits and interviews with key informants. For instance, FP002 in Malawi stands out for its scale, with over 250,000 farmers trained using the Participatory Integrated Climate Services for Agriculture (PICSA) methodology and an estimated reach of around 1 million individuals. Similarly, FP024 in Namibia has sought to empower local decision-making by enhancing the generation and utilization of climate information within community-based natural resource management frameworks. In Kenya, FP175 aims to bolster hydrological and meteorological information services to ensure communities receive climate information that is both timely and relevant. FP184 in Vanuatu, building upon the foundations laid by FP035, has expanded community access to actionable climate data while fostering adaptive governance structures. Further examples include FP206 and FP069 in Bangladesh, which extended community-focused cyclone warning services, and SAP010 in the Philippines, where participatory workshops have reportedly transformed community trust in meteorological warnings. In the Cook Islands, SAP034 has successfully integrated health information with EWS for communities. While some highlights on their relevance to communities are noted here as examples, their successes or effectiveness are reserved for the section on effectiveness and impact, below (see Chapter 7).

217. The GCF's Locally Led Climate Action framework and guidance launched in November 2025 promotes local-level climate actions within GCF investments. It features a few local CIEWS initiatives as examples to highlight that a robust understanding of local knowledge and contexts is essential for effective CIS and early warnings. However, it is also important to clarify that the majority of CIEWS interventions are typically reliant on higher-level mandates from national institutions such as NMHS and NDMA. These entities, supported by frameworks like NFCS and National Early Warning Systems, are specifically designed to ensure that warnings and services reach and protect those most at risk. The global emphasis on last-mile communities reflects an ongoing effort to ensuring that these national-level mandates are fulfilled, particularly for populations who are otherwise excluded from timely alerts, as discussed previously.

218. On rare occasions, isolated or off-grid communities may take the initiative to design, implement, and manage their own EWS, particularly where national systems fall short in providing adequate warnings. Such grass roots initiatives are well-articulated in the IFRC's Community EWS Guiding Principles (2012).[163] Nevertheless, it is a clear indication of a gap in national coverage when communities are compelled to independently gather, analyse, and act on risk information.

219. What can be locally led in CIEWS involves organized community engagement in the reception, dissemination, comprehension, and practical application of early warning messages. This aspect of locally led action – often linked to EWS pillars 3 and 4 – has been the focus of various global initiatives, and some GCF-funded projects such as SAP022 in Uzbekistan, and SAP008, FP069 and

[163] International Federation of Red Cross and Red Crescent Societies, "Community early warning systems: guiding principles."

FP206 in Bangladesh, which have made contributions in this area. For more information see Chapter 7.A and Chapter 7.C.

220. Although some projects reveal strong links to locally led CCA and DRR efforts, only a small number establish clear, direct ties to locally led CIEWS activities. For instance, the APRs of FP056 Colombia highlight the role of "545 rural promoters (50 per cent women)" in facilitating "three times faster community adoption", while the APR of FP016 Sri Lanka 2023 notes that "7,000 women farmers" contributed to measurable improvements in "resource distribution during crises". The effectiveness of these projects is explored further below in Chapter 7.A.

D. ALIGNMENT WITH UNDERSERVED POPULATIONS

221. The EW4All initiative frequently uses the term "last-mile" to describe the challenge of ensuring early warning messages reach the most at risk, remote, or marginalized communities. For EW4All, "last mile" emphasizes the need to move beyond issuing alerts and instead focuses on making warnings actionable and accessible, especially for people who are not digitally connected or who face language, cultural, or geographic barriers.

222. The IFRC and UNDRR, as EW4All pillar leads, highlight the importance of tailored communication and the translation of technical alerts into locally relevant actions – the true test of an effective early warning system.

223. However, despite its popularity, **"last mile" lacks a common, operational definition across the climate, DRR, and humanitarian sectors.**[164] For some, it refers to the physical endpoint of a technical system; for others, it signifies meaningful behavioural change, or the moment at-risk individuals receive, understand, and act on warnings. This definitional ambiguity is noted in both peer-reviewed literature and GCF's own reviews,[165] and presents a profound challenge when attempting to measure the impact of GCF investments in CIEWS for these populations. Without a standardized notion of "last mile", indicators and results measurements become fragmented, leading to inconsistent and often incomparable metrics for "reach" and "effectiveness" at community level.

224. **A select number of cases demonstrate good intent and practice by GCF in advancing CIEWS for underserved communities, including last-mile populations, persons with disabilities, and vulnerable groups or minorities** (see also section C). Notably, several GCF-funded initiatives have explicitly prioritized last-mile communities. For instance, SAP022 in Uzbekistan – supported by documentation and corroborated through field visits – reflects an explicit commitment to reaching these communities. FP068 in Georgia is distinguished by participatory last-mile communication solutions tailored to local needs, encompassing community-based EWS. Similarly, FP147 in the Pacific reports progress against targets 3 and 4 of the REAP, highlighting early action in "last/first mile" communities and the expansion of improved early warning system coverage. In Bosnia and Herzegovina, FP216 incorporates provisions for effective "last-mile" communication and community-based EWS targeting the highest-risk communities (activity 1.3). Moreover, other projects, such as SAP018 in Liberia and SAP033 in Sierra Leone, leverage the IFRC movement to facilitate last-mile outreach. SAP010 in the Philippines noted clear, active participation and sustained engagement of last-mile stakeholders as a critical enabler of project success.

[164] International Federation of Red Cross and Red Crescent Societies, "Early Warnings for All"; Global Disaster Preparedness Center and Integrated Risk Management Associates LLC, *Inclusive Early Warning Early Action for the 'Last Mile: A Meta-Synthesis of 15 National Research Reports* (forthcoming).
[165] Krüger and Puri, "Going the Last Mile: Behavioural Science and Investments in Climate Change Mitigation and Adaptation."

225. **The assessment identified four notable instances where GCF-funded CIEWS initiatives have addressed the needs of persons with disabilities, reflecting emerging efforts towards inclusive practice.** For example, for FP171 in Timor-Leste, the APR documents the integration of disability inclusion in community-level preparedness activities, facilitated through the Timor-Leste Red Cross's inclusive approach. Similarly, FP184 in Vanuatu acknowledges the necessity of providing warnings to people with disabilities in a range of accessible formats – including written, graphic, audio, SMS, social media, and radio – to enhance reach and usability. SAP030 in Lao People's Democratic Republic demonstrates a commitment to preparing messages specifically tailored for disabled communities, signalling growing recognition of differentiated communication needs. Furthermore, under the readiness portfolio, the 2023 readiness grant (PSE-RS-006) in Palestine incorporates the tracking of disability status within CIEWS-related data-collection processes. These examples indicate promising progress; nonetheless, further systematic integration and evaluation of disability inclusion within CIEWS efforts would be instrumental in ensuring equitable access and impact for all vulnerable populations.

226. **The engagement of vulnerable, displaced, and minority populations within GCF-funded CIEWS initiatives reflects both commendable intent and notable challenges.** For instance, the SAP040 programme in Vietnam demonstrates an inclusive approach by instituting quotas ensuring that at least 10 per cent of participants in each activity are drawn from vulnerable groups, including within its CIEWS interventions. Similarly, FP244 in Malawi underscores the ambition to enhance community preparedness for diverse climate-related health impacts, with particular attention to marginalized cohorts such as pregnant women and households with young children. However, progress in targeting such groups has not been uniformly realized; the APR of FP171 in Timor-Leste, despite a design commitment to inclusion, reports limited advancement in addressing the needs of marginalized populations.

227. These mixed outcomes are further echoed in other projects. While some initiatives, such as FP074 in Burkina Faso, identify the last mile challenge, they fall short of articulating concrete measures to address it within their CIEWS frameworks. In Bosnia and Herzegovina, FP216 recognizes the necessity of including Roma and persons with disabilities, yet the implementation phase has met practical obstacles that hinder full realization of these objectives. Likewise, SAP030 in Lao People's Democratic Republic acknowledges that access to the most current risk and EWS information – particularly for speakers of marginalized languages or those residing in remote locations – remains an area for enhancement. **Overall, while there are instances of good practice and emerging models for inclusion, persistent gaps signal the need for more systematic and actionable strategies to ensure that CIEWS investments equitably reach and benefit all vulnerable, displaced, and minority populations**.

Chapter 7. GCF PORTFOLIO OF CIEWS – EFFECTIVENESS AND IMPACT

KEY FINDINGS

7.1. The effectiveness of GCF CIEWS portfolio reveals a complex landscape where meaningful project-level achievements coexist with systemic challenges in demonstrating the portfolio-wide impact of expanding access to tailored CIEWS.

7.2. Under the Pathway 1 portfolio, GCF investments have improved meteorological infrastructure, even in fragile settings. However, a full paradigm shift has yet to occur because of ongoing gaps in advanced climate modelling, user engagement, and long-term institutional capacity-building, including governance for coordination.

7.3. The Pathway 2 portfolio (MHEWS) has also advanced the technical sophistication of EWS, but a gap remains between design and operational delivery, particularly in last-mile connectivity and border region coordination. The experiences reveal that successful EWS require more than technical infrastructure or sophisticated forecasting capabilities.

7.4. Pathway 3 (CIEWS for investments and financial decisions), though the youngest and comprising a smaller share of the portfolio, effectively leverages micro- and macrolevel financial mechanisms to support climate resilience. Projects that tailor financial tools to user capacity and integrate multiple risk management strategies yielded the strongest outcomes.

7.5. While the GCF indicators for CIEWS represent a positive step towards monitoring and capturing CIEWS progress, they remain limited in their ability to capture the full breadth and quality of impacts, especially regarding “last mile” interventions.

7.6. Understanding systematic measurement challenges in the application of GCF’s results management frameworks helps to explain why demonstrating portfolio-wide impact remains difficult despite evidence of project-level achievements. The current relatively weak data reporting characteristics indicate opportunities for strengthening M&E frameworks specifically tailored to CIEWS.

7.7. CIEWS interventions have largely supported greater adaptive capacity at community level, and knowledge on climate change impacts has improved.

228. This section assesses GCF's progress and likelihood of achieving its intended CIEWS objectives in accordance with the ToC (Figure 2–1). The main intended CIEWS output is to expand access to tailored CIEWS in those countries in which the GCF invests. Achieving this should result in timely, risk-informed decisions at all levels, and sustainable CIEWS that support vulnerable groups, ultimately saving lives and enhancing their capacity to adapt to climate change.

229. Throughout the assessment of effectiveness and impact, the evaluation team examined key evaluation questions that cut across the GCF portfolio of CIEWS:

- What factors facilitate or hinder CIEWS progress?
- How effectively does the CIEWS portfolio address climate hazards and vulnerabilities?
- What measurable or observable results have CIEWS interventions achieved?
- What are the key changes in knowledge and behaviours of individuals within target communities after GCF CIEWS interventions?

230. To answer the above questions, the evaluation team undertook three actions: qualitative assessments of selected CIEWS projects by CIEWS pathways (cluster assessments); analysis of CIEWS results data from AEs; and synthesis of these findings with insights from country visits and context-specific household survey data.

231. **Taken together, findings from these analyses indicate that while GCF CIEWS investments have achieved notable results at the project level, broader systemic issues remain that make it difficult to show clear impact across the entire portfolio.** While individual CIEWS projects deliver valuable infrastructure, capacity-building, and localized benefits through capable implementing partners, the broader effectiveness picture is complicated by several structural factors: a disconnect between GCF actual role as a catalytic financier working through AEs versus theoretical assumptions about direct technical implementation; temporal mismatches between the 10–15 year timeframes needed to assess CIEWS transformation and the current early-stage implementation of many key projects assessed; and attribution complexities inherent in multi-stakeholder interventions where GCF's specific contributions often blend with those of implementing partners, national institutions, and co-financing sources. As such, individual project successes within the portfolio should be viewed as the result of collaborative efforts involving a range of stakeholders. These achievements, while valuable, do not yet amount to a systematic transformation of climate information and early warning capabilities across the diverse contexts of participating countries. Instead, they reflect incremental advances that contribute to the broader aims of the GCF mandate.

232. Under the pathway 1 (CIS) portfolio, GCF investments have improved meteorological infrastructure, even in fragile settings. However, a full paradigm shift has yet to occur because of ongoing gaps in advanced climate modelling, user engagement/co-production of climate services, and long-term institutional capacity-building, such as governance for coordination across multiple sectors (e.g. agriculture, health, water and DRR). The underperformance of user engagement mechanisms highlights the need to build fundamental trust among stakeholders – local communities, government ministries, departments, agencies and the private sector – through continuous engagement to develop timely, reliable and usable CIS and products that are tailored to the needs and decision contexts of the end users.[166] Under pathway 2 (MHEWS), projects have advanced the technical sophistication of EWS, but a gap remains between design and operational delivery, particularly in last-mile connectivity and border region coordination. Notable successes are found where community-based approaches and integration with existing social structures are prioritized,

[166] Jacob et al., "Co-production of climate services: challenges and enablers."

leading to high notification rates and tangible reductions in disaster losses. Persistent challenges include limited multi-hazard coverage and inconsistent reach to the most vulnerable populations. Although pathway 3 (CIEWS for investments and financial decisions) comprises the youngest and smaller share of the portfolio, it effectively leverages micro- and macrolevel financial mechanisms to support climate resilience. Projects that tailor financial tools to user capacity and integrate multiple risk management strategies yield the strongest outcomes. However, there is a notable disconnect between financial mechanisms and real-time CIEWS, limiting the full potential of risk-informed finance.

233. The below section presents detailed findings from these assessments followed by a synthesis of observable and measurable results and factors affecting the achievements.

A. CLUSTER ASSESSMENTS

234. To assess progress towards making CIEWS available, accessible and responsive, cluster assessments were conducted by purposely sampling 38 CIEWS projects and grouping them into three clusters based on the below paradigm-shifting pathways from the CIEWS sectoral guide:

- Pathway 1: Strengthening CIS and their sectoral application
- Pathway 2: Promoting impact-based MHEWS
- Pathway 3: Improving CIEWS for investments and financial decisions

235. The 38 projects were assigned to pathways based on their main objectives and assessed with tailored templates. Pathway 1 used six value chains of the GFCS to assess the effective creation, management and use of climate services. Pathway 2 applied four MHEWS pillars, plus a cross-cutting governance pillar to assess the operational delivery of actionable warnings. Pathway 3 used a risk layering approach to evaluate the use of climate information to develop financial analytics and or mechanisms and reduce climate risk impact. Refer to annex 7 for each pathway's template including assessment criteria.

236. The assessments were conducted using scorecards, where each value chain or pillar within a pathway received a rating of low, moderate, or high according to specific assessment criteria. These scores were primarily determined based on project-related documents reviewed with adjustments made as needed after project site visits or interviews with relevant stakeholders. If there was insufficient data – meaning a value chain component was either not mentioned or lacked enough detail – no score was assigned to that component (see also Chapter 2.B.4 and Chapter 2.C). Table 7–1, Table 7–2 and Table 7–3 present the cluster assessment results for each pathway, followed by a detailed analysis of each pathway.

Table 7–1. Cluster assessment scores for Pathway 1 (CIS)

#	FP ID	Site visit	VC1: Basic systems and observations	VC2: Research, modelling, and prediction	VC3: Climate services information system	VC4: User engagement	VC5: Capacity development	VC6: Governance for effective coordination
1	FP012		M	M	M	M	M	M
2	FP016		L	L	M	L	L	L
3	FP035		M	M	M	L	M	M
4	FP048	Yes	H	H	H	M	M	L
5	FP074		M	M	M	M	M	M
6	FP075			L	L	L	L	L
7	FP087	Yes	M	M	H	M	H	M
8	FP092	Yes (virtual)		M	M			
9	FP101		L		L			
10	FP145	Yes	M	M	M	L	M	M
11	FP147		M	M	L	L	M	L
12	FP162							
13	FP171	Yes	M	L	M	M	L	M
14	FP179		L					
15	FP215							
16	SAP026		M	M	M	M	H	M

Source: GCF sampled project documentation.
Note: VC = value chain. Vertical (y) axis represents sampled projects by project ID. Scoring: grey = insufficient data; L = low; M = moderate; H = high. Insufficient data represents either no mention of a value chain component or insufficient narrative to allow evaluators to score the component (including its design).

Table 7–2. Cluster assessment scores for Pathway 2 (impact-based MHEWS)

#	FP ID	Site visit	P1: Disaster risk knowledge	P2: Detection observations, monitoring, analysis and forecasting of hazards	P3: Warning dissemination and communication	P4: Preparedness and response capabilities	Cross-pillar: Foundational elements for effective EWS
1	FP002		H	H	H	H	M
2	FP012		M	M	M	L	L
3	FP018		H	H	H	H	H
4	FP021		M	M	M	L	L
5	FP037		H	M	H	M	M
6	FP048	Yes	M	M	M	M	L
7	FP056		H	M	M	H	H
8	FP068		H	H	M	M	M
9	FP069	Yes	H	L	H	H	L
10	FP133		H	M	M	M	M
11	FP161		H	M	M	M	H
12	FP162		M	M	M	M	M
13	FP171		L	M	L	M	L
14	FP179		M	L	L	M	M
15	FP184		M	L	M	H	H
16	FP206	Yes	M	L	M	H	M
17	FP207		H	M	L	M	M
18	FP215		M	M	M	M	M
19	FP216		M	M	H	M	M

#	FP ID	Site visit	P1: Disaster risk knowledge	P2: Detection observations, monitoring, analysis and forecasting of hazards	P3: Warning dissemination and communication	P4: Preparedness and response capabilities	Cross-pillar: Foundational elements for effective EWS
20	SAP008	Yes	H	L	M	M	M
21	SAP010		M	H	H	H	H
22	SAP011		M	M	M	H	H
23	SAP022	Yes	M	M	H	M	M
24	SAP030		M	L	L	M	H
25	SAP041		M	M	M	L	M
26	SAP042		M	L	L	H	H

Source: GCF sampled project documentation.
Note: P = pillar. Vertical (y) axis represents sampled projects by project ID. Scoring: L = low; M = moderate; H = high.

Table 7–3. Cluster assessment scores for Pathway 3 (CIEWS for investment and financial decisions)

#	FP ID	Site visit	C1. Climate analytics integration	C2. Decision support tools	C3. Risk-informed strategy	C4. Ensure long-term financing	C5. Impact measurement
1	FP037		L	M	H	L	M
2	FP048	Yes	M	M	H	H	M
3	FP133		L	L	H	M	L
4	FP162		H	H	H	L	M
5	FP179		L	L	H	M	H
6	FP206	Yes	L	L	M	H	H
7	FP215				M	H	H
8	FP216		H	H	H	H	M
9	SAP011		M	L	H	H	M
10	SAP030		M	M	L	L	M

Source: GCF sampled project documentation and site visits.
Note: C = criterion. Vertical (y) axis represents sampled projects by project ID. Scoring: grey = insufficient data; L = low; M = moderate; H = high. Insufficient data represents either no mention of a criteria component or insufficient narrative to allow evaluators to score the component (including its design).

1. Pathway 1: Strengthening climate information services and their sectoral application

237. Pathway 1 forms the foundation for all climate and weather-related services, with its six value chains (VCs) playing complementary and critical roles to deliver reliable climate and weather information, tools, and products that are useful for various sectors and specific user groups.

238. For VC1 (basic systems and observations), high scores reflect a comprehensive, reliable, and well-maintained observation network with up-to-date equipment and protocols for maintenance. Low scores result from fragmented systems, frequent equipment failures, and poor maintenance, leading to unavailable or unreliable data. For VC2 (research modelling and prediction), high marks go to projects using advanced, locally relevant modelling with reduced uncertainty and interdisciplinary approaches, while low scores indicate reliance on outdated models, little innovation, and limited accuracy. For VC3 (climate services and information systems), top scores are for systems producing timely, accurate, user-focused climate information products with strong dissemination and feedback whereas low scores are linked to poor data transformation and unreliable and limited delivery of climate information products. For VC4 (user engagement/user interface platform), high scores mean intuitive platforms that enable active, ongoing engagement and incorporate user feedback, while low scores reflect hard-to-use platforms, little user input, and minimal collaboration among producers, researchers and users. Similarly, high scores for VC5 (capacity development) are given where there is ongoing, well supported training and strong institutional leadership at NMHS and related agencies, leading to improved staff capability, while low scores come from sporadic training, limited resources, and high staff turnover. Lastly, for VC6 (governance for effective coordination), high scores require strong governance, clear roles across sectors and active stakeholder involvement under the strong coordination role of NMHS, while low scores reflect weak governance, unclear responsibilities, and poor coordination.

239. **Based on the criteria above, the Pathway 1 portfolio consistently showed low to medium scores across value chains, with six projects lacking data in all or some of the value chains. Of these, three were multi-country projects (FP092, FP162 and FP215). Overall, the assessment highlights that gaps or weaknesses in any value chain can compromise the overall effectiveness of CIS interventions, resulting in inconsistent delivery of climate services.** Among the six value chains assessed, VC4 (user engagement) was found to be underperforming relative to the others. This underperformance emphasizes the critical need to ensure the co-production of climate services that directly reflect and meet the needs of end users. Without active user engagement, services risk missing the mark in terms of relevance and practical utility. For instance, projects such as FP012 in Mali and FP074 in Burkina Faso encountered difficulties in balancing delivery between VC1/VC2 and VC3/VC4, highlighting the importance of not only investing in physical infrastructure but also in mechanisms that connect services to those who rely on them most.

240. **The assessment further identified that, while substantial investments were channelled into VC1 (basic systems and observations) and VC5 (capacity-building), projects focusing on long-term priorities such as institutional capacity-building of NMHS were limited across the portfolio.** Instead, the scope of training under VC5 tended to focus on short-term gains, such as digitalization, short-term forecasting, and equipment maintenance rather than strengthening advanced climate modelling and research at NMHS, indicating missed opportunities to build national forecasting capacity. In addition, VC6 – governance for effective coordination – remained a work in progress across sampled projects. It underscored the extensive and long-term investment required to establish effective governance and coordination mechanisms across various sectoral

actors under the leadership of NMHS – commitment that cannot realistically be achieved within typical five-to-six-year project timeframes.

241. Despite the overall state, pathway 1 also witnessed good project-level progress. Mali's FP012 and Burkina Faso's FP074 were the first fragile and conflict-affected countries to receive GCF CIEWS investments, starting with the baseline of limited NMHS capacity and few functioning operational weather stations. Despite political and security challenges, FP012 modernized data-collection by installing or upgrading 46 meteorological and air quality stations, and 24 hydrometric and water quality stations, supported by WMO, enabling regular data-sharing via GBON. The project also established a communication mechanism to deliver timely and tailored agrometeorological services to local farmers through 36 local groups for agrometeorological assistance, enhancing the effectiveness of alerts and community response to emergencies. FP074 established flood forecasting systems at NMHS with WMO's technical support and addressed infrastructure and equipment gaps by adding 56 meteorological/hydrological stations and one atmospheric monitoring station, alongside significant capacity-building. Notably, the Fada N'Gourma atmospheric station now provides critical input for global climate models. In Sri Lanka, FP016 has worked to improve the dissemination of weather information and empower farming communities through the co-production of weather and agromet advisories. In Guatemala, FP087 has fostered valuable connections between community weather stations and the NMHS, with Agroclimatic Technical Roundtables (*Mesas Técnicas Agroclimáticas*) consultation groups playing a key role in validating forecasts and early warning recommendations and promoting climate-resilient practices. FP147 in the Pacific Islands illustrates how enhanced prediction capabilities can help reduce community exposure and vulnerability, while SAP026 in Bangladesh has demonstrated tangible progress by establishing 600 women-led CCAGs with trained leadership. Moreover, projects such as FP171, FP145, and FP035 have managed to integrate CIS governance interventions (VC6), with the NMHS taking a leading role in project implementation. This approach adopted by these projects serves as a valuable model for others, as an emphasis on governance can significantly enhance the long-term sustainability of intervention outcomes and foster greater institutional ownership and commitment to newly introduced initiatives under those projects.

2. Pathway 2: Promoting impact-based multi-hazard early warning systems

242. Pathway 2 projects sit at the heart of the GCF's ambition to turn climate and hydrometeorological information into timely, people-centred action. Under pathway 2, a high score for Pillar 1 (disaster risk knowledge) requires regular comprehensive multi-hazard risk assessments, strong integration with national strategies, and open-access risk data platforms, while lower scores reflected partial coverage, data gaps, or minimal systematic assessment. For Pillar 2 (detection, observations, monitoring, analysis and forecasting), scores depended on the presence and quality of real-time, interoperable multi-hazard monitoring and forecasting infrastructure, with basic or outdated systems and large coverage gaps scoring low. Pillar 3 (warning dissemination and communication) was scored on whether warnings are delivered through multiple, inclusive channels in impact-based formats that reliably reach marginalized groups and collect feedback, with limited channels or persistent last-mile connectivity issues receiving medium or low scores. Pillar 4 (preparedness and response) scores reflected the degree to which communities and institutions conduct regular drills, have pre-arranged financing, and operate community-led, tested standard operating procedures (SOPs) for anticipatory action, as opposed to ad hoc, reactive responses with little or no formal planning or training.

243. While pathway 2 experiences more uniform and moderate performance across the portfolio, the cluster assessment also reveals some implementation gap between design and delivery. By tracing performance across the four EWS pillars, the assessment finds that investments are still focused on plans, equipment, or frameworks rather than fully functioning end-to-end multi-hazard systems that reliably reach at-risk communities. The fundamental challenge across the sample of projects appears to lie in the gap between procurement and operational use, where persistent challenges in technical capacity and last-mile delivery undermine even well-designed systems, highlighting that implementation often falls short of design ambition. Under Pillar 1, some projects require comprehensive multi-hazard assessment although others have scored high by combining hazard and vulnerability assessments. Within the sampled projects, EWS Pillar 4 on preparedness and response emerges as a relatively stronger area of performance than Pillar 2 on forecasting, reflecting more consistent emphasis on community capacity-building, drills, and institutional readiness across the cluster with high-scoring projects demonstrating "annual drills, pre-arranged financing, and community-led, tested SOPs" embedded within existing structures rather than creating parallel systems. Under Pillar 2, while there is clear progression from basic stations to technically sophisticated systems, technical sophistication can often exceed ground-level implementation capacity. Pillar 3 demonstrates the greatest evolution from traditional channels to innovative approaches including gendered SMS networks (FP002 and FP069), but achieving last-mile connectivity is the persistent challenge with many projects achieving only limited channels with inconsistent reach, especially to remote or vulnerable populations. The assessment also found that many projects that claim multi-hazard approaches in reality focus on a single hazard (particularly floods) except a few projects like SAP010 and SAP022. Moreover, it remains unclear whether these MHEWS address only individual hazards or also take into account their interrelatedness and their impacts on the EWS chain.

244. Within this mixed picture, a few projects demonstrate how locally grounded design, multi-stakeholder governance, and iterative learning can translate technical upgrades into real behavioural change and risk reduction outcomes, underscoring both the potential of the pathway and challenge of this approach. Bangladesh's SAP008 and the Philippines' SAP010 stand out for embedding EWS directly into existing social structures. SAP008 integrated warning systems into microfinance structures, creating dual incentives where a thousand CCAGs serve both financial and resilience purposes. This approach recognized that social capital represents more reliable infrastructure than technology in remote areas, particularly where over 80 per cent of direct beneficiaries and CCAG members are women. Through face-to-face delivery via trusted community groups holding regular meetings, the project achieved 95 per cent household notification rates, proving that leveraging existing social networks outperforms stand-alone technical solutions. Similarly transformative, the Philippines' SAP010 shows how people-centred communication can turn forecasts into decisive action. SAP010 is one of the few fully confirmed MHEWS in the sample, shifting from technical bulletins to impact-based messages that raised evacuation compliance from 41 per cent to 73 per cent through hyper-local guidance and house-to-house coverage. Moreover, FP056 in Colombia features communities across all four EWS pillars, with 291 communities participating in Community Monitoring Early Warnings through messages, email and social networks.

245. **Operational EWS in the GCF portfolio exhibit critical coverage gaps in border regions where populations depend on coordinated warning protocols across political boundaries.** Rivers flood downstream regardless of sovereignty; cyclones track across borders; and droughts span entire regions – yet Pathway 2 projects operate within national boundaries with minimal coordination of warning dissemination, emergency response protocols, or community preparedness across borders. The "border blindness" can create dangerous false security where a downstream population receives

warnings from their national meteorological service while remaining unaware of upstream conditions, upstream early action decisions, or coordinated evacuation protocols with neighbours. The Georgia Shovi tragedy – where 33 people died in rural border areas in 2023 despite system capability to provide two-hour warnings – exemplifies how resource allocation was concentrated in visible urban centres while leaving border populations fatally exposed. Future Pathway 2 proposals should require joint early warning protocols for transboundary hazards, including formal cross-border communication channels, harmonized impact-based messaging, and coordinated last-mile delivery mechanisms to vulnerable populations in border regions and downstream communities.

246. **Taken together, the pathway 2 portfolio highlights how EWS succeed or fail as complete chains, not just as collections of technical components. Where projects align risk knowledge, forecasting, communication, and preparedness with real community needs and decision contexts, they generate measurable reductions in loss and damage; where any link in this chain is weak, system performance quickly unravels. These contrasting experiences reveal that successful EWS require more than technical infrastructure or sophisticated forecasting capabilities.**

3. Pathway 3: Improving CIEWS for investments and financial decisions

247. Pathway 3 centres on enhancing climate resilience by strategically directing finance to help communities and economies adapt to climate risks. Unlike pathway 1, which concentrates on meteorological work, and pathway 2, which focuses on EWS, pathway 3 is distinct in its approach to using financial mechanisms informed by climate information as tools for adaptation. Within the CIEWS portfolio, pathway 3 makes up the smallest share of projects, as its support – often involving private sector financial products and services – is limited (see Chapter 5.A.3).

248. Effective climate-resilient finance in pathway 3 depends on the integration of five interconnected elements, each playing a crucial role:

- Climate analytics integration (Criterion/C1): This involves using climate risk data to inform financial decisions, ensuring that investment is guided by up-to-date and relevant climate information.
- Decision support tools (C2): These tools translate climate data into usable formats for investors and planners, making complex information accessible and actionable.
- Risk-informed strategy (C3): A combination of financial mechanisms – such as insurance, savings, and buffers – are employed to manage various layers of climate risk.
- Long-term financing (C4): Sustainability is ensured by designing financial systems that can operate well beyond the initial project funding phase.
- Impact measurement (C5): This element tracks whether investments are genuinely reducing losses and yielding social and economic benefits.

249. For climate analytics integration (C1), projects earn high marks when they actively use climate risk data and real-time information to guide decisions – particularly when projections have a direct impact on financing choices. Simply acknowledging climate risks without integrating them into decision-making results in low scores.

250. For decision support tools (C2), the evaluation considers how climate analytics are delivered. Top scores go to interactive tools that enable users to explore different scenarios, whereas static reports or reliance on historical data receive lower ratings. Crucially, these tools must match users' needs

and abilities; an advanced tool that is not adopted is less valuable than a simpler one that is well used.

251. For risk-informed strategy (C3), high scores are given to strategies that address multiple climate risks through a mix of solutions, such as insurance, savings, financial buffers, and investments in adaptation. High-performing projects feature clear triggers for financial responses to emerging risks.

252. For long-term financing (C4), sustainability is crucial: Investments should be designed to last at least 10 years beyond initial funding, often by blending resources from government, private sector, and donors. Projects funded only through grants score lower unless they provide a clear plan towards sustainable financing.

253. For impact measurement (C5), emphasis is placed on rigorous tracking of both financial and resilience outcomes. High-scoring projects show concrete results such as reduced losses, economic benefits (like safeguarding livelihoods or boosting income), and social improvements (such as greater inclusion or community cohesion). Merely monitoring financial flows or insurance payouts results in lower scores.

254. **A review of pathway 3 projects revealed a notable pattern: technological sophistication was not the key determinant of success in pathway 3, with C3 (risk-informed strategy) scoring the highest while C1 (climate analytics integration) and C2 (decision support tools) scored lowest.** Only 20 per cent of projects achieved high scores for climate analytics and decision tools. Although this might be perceived as a limitation at first glance, it actually suggests that greater sophistication does not always correspond to increased effectiveness, as also demonstrated in pathway 2.

255. Projects often scored low on climate analytics not due to failure, but because their success did not hinge on advanced analysis. For instance, a farmer-led savings group does not require interactive dashboards, nor does a community insurance pool need complex climate models. The most successful components were those that matched the complexity of financial mechanisms to the management capacity of countries or people in those countries and the understanding of beneficiaries. **Simpler mechanisms, implemented effectively and well understood by users, fostered stronger ownership and more promising long-term outcomes.**

256. **The effectiveness of pathway 3 projects also lies in their strategic management of climate and financial risks.** Most projects utilized multiple financial mechanisms in complementary ways – combining risk transfer (such as index or parametric insurance), risk retention (such as savings), and risk reduction (such as climate-smart agriculture or infrastructure). This diversity is significant: when one mechanism fails or is insufficient, others can compensate. This layered approach ensures that communities are not reliant on a single solution and has proven to be a key factor in the success of these projects. For example, FP037 in Samoa integrated three financial mechanisms – Payment for Ecosystem Services Programme, Ecosystem-based Adaptation Enterprise Development Programme, and Cash-for-Work Programme – to enhance the flood resilience of local villagers by offering multiple layers of financial support to hedge against climate risks.

257. Another good example is FP048 in Guatemala, which scored high on C3 (risk-informed strategy) and C4 (securing long-term financing). The risk-informed strategy combines resources from the GCF, IDB and local partners, utilizing various financial instruments to provide partial credit guarantees that effectively reduce the risk of lending to micro, small, and medium-sized enterprises in the agricultural sector. **This approach enables the project to leverage significant funds from the private sector for beneficiaries who would normally be considered too risky. To ensure long-term financing, the risk-sharing facility created through FP048 aligns its debt conditions with the long maturity cycles of agroforestry investments and maintains a revolving structure**

by reinvesting payments from previous loans and investments. Both mechanisms help sustain the Facility over the long-term, as demonstrated by its 15-year lifespan in this project.

258. Despite the strengths of pathway 3, a critical disconnect exists between finance initiatives and the broader CIEWS framework. Only 20 per cent of pathway 3 projects showed a direct connection to CIEWS. Although the logic for climate-risk-informed finance is compelling – where insurance payouts are triggered by verified climate data and investment decisions incorporate climate projections – most projects only engage with climate risks at a general level. They do not fully utilize the real-time, detailed climate information produced by pathway 1 or the operational EWS of pathway 2.

259. This lack of integration represents a missed opportunity. For example, a farmer with access to seasonal forecasts could make more informed insurance and investment decisions, and governments could more effectively trigger pre-arranged finance using reliable early warnings. **In practice, however, climate-informed finance often remains disconnected from the very climate information it should be based on.**

260. The underlying reason can be traced to project design. Many financial mechanisms in pathway 3 do not require advanced climate analytics; a simple savings scheme does not benefit from complex projections, and a parametric insurance product may only need a straightforward trigger. However, this pragmatic approach comes at a cost, as stronger integration with CIS could make these investments even more effective. Currently, financial systems and CIS generally operate in parallel, rather than as integrated systems.

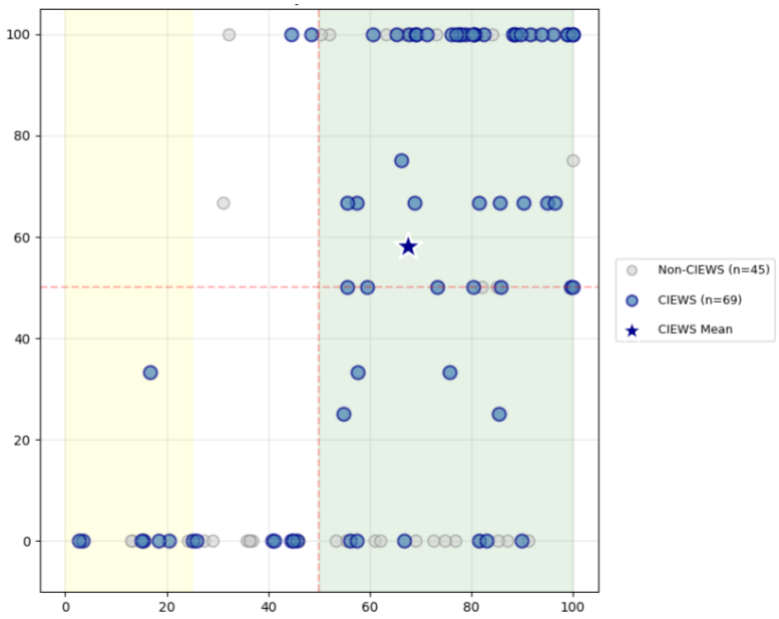
B. CIEWS IMPACT MEASUREMENT CHALLENGES AND OPPORTUNITIES

261. To supplement the above qualitative analysis, the evaluation gathered and analysed quantitative CIEWS results data reported by AEs via APRs submitted to the Fund. As discussed in Chapter 3.A, PMFs offered four indicators relevant to CIEWS: A1.1 (expected losses), A6.2 (use of climate information), A7.1 (use by vulnerable groups), and A7.2 (people reached by warnings). In 2021, the GCF Board adopted the IRMF, introducing a supplementary indicator (2.4) specific to CIEWS interventions, which tracks the number of beneficiaries (female and male) covered by new or improved EWS.

262. Firstly, the evaluation team analysed whether CIEWS projects are reporting results against these CIEWS-relevant indicators within the PMFs and IRMF. Based on LogFrame commitments noted in the APRs, 69 CIEWS-tagged projects are expected to report on at least one of these indicators, while it was found that 70 projects actually reported data against one or more of these indicators, indicating good coverage with one additional project voluntarily reporting. Additionally, 45 non-CIEWS projects also report on these indicators, reflecting indicator relevance beyond CIEWS.

263. Among the 69 CIEWS-tagged projects with reporting commitments, the analysis uncovered a “zero cliff pattern” where 83 per cent of early-stage projects (less than 25 per cent maturity/completion rate) report no results (zero values) while the reporting rate increases considerably for mature projects (defined here as over 50 per cent maturity) where the maturity/completion rate is measured by the proportion of time elapsed in each project’s planned duration. This tendency reflects **project lifecycle rather than performance issues** (Figure 7–1).

Figure 7–1. Relationship between project maturity and indicator compliance for CIEWS projects[167]



Source: GCF-funded activity general semantic model.
Notes: Both ex-ante and ex-post data were extracted from APR 2024 via the funded activity general semantic model. Where 2024 data were unavailable, APR 2023 and/or APR 2022 were also reviewed. Project maturity, or completion rate, refers to the percentage of planned project time that has passed. Standard compliance rate is the ratio of indicators reported in the previous APR to those initially planned for the project.

264. The transition from PMF to IRMF after B.31 has added additional complexity. As of APR 2024, none of the six CIEWS projects approved under the IRMF have reported results for IRMF indicator 2.4. This limits the assessment of whether the new supplementary indicator 2.4 better captures CIEWS investment progress.

265. Secondly, cumulative results data from relevant CIEWS indicators were analysed and aggregated respectively. Table 7–4 presents headline results derived from APR2024 data, supplemented by earlier reporting years for projects that concluded prior to 2024.

[167] Standard indicator compliance for CIEWS projects. The horizontal axis shows "Project maturity (completion rate %)" based on time elapsed since the project's start relative to planned duration. The vertical axis shows "Standard compliance rate (%)", the percentage of expected indicators reporting any value, calculated without adjustments for project maturity. Background shading indicates project stages: yellow zone (0–25 per cent) for early-stage projects, white zone (25–50 per cent) for mid-stage projects, and green zone (50–100 per cent) for mature projects where measurable impacts should be evident. Blue circles represent CIEWS projects, with clustering near zero compliance for early-stage projects (left side) illustrating the "zero cliff pattern" where projects in initial implementation phases have not yet generated measurable impacts. The concentration of projects with zero or low compliance in the early-stage zone (yellow) is expected while projects in the mature zone (green) with very low to zero compliance rates warrant further investigation.

Table 7–4. CIEWS portfolio impact metrics (cumulative values)

INDICATOR	DESCRIPTION	VALUE	# PROJECTS REPORTING
A7.2	People reached by climate-related EWS	10,865,783 individuals	18
A1.1 (lives)	Lives protected from climate disasters	574,471	5
A1.1 (economic)	Economic losses avoided	USD 15,471,776	4
A7.1 (households)	Households using Fund-supported tools	147,274	11
A7.1 (individuals)	Individuals using Fund-supported tools	2,346,320	12
IRMF 3.1	Economic loss reduction (IRMF)	USD 815,045	1

Source: APR data extraction and analysis, 2016–2024. See annex 11 for data quality documentation.

266. The aggregated results are notably dominated by a few projects that reported large achievements. For people reached by EWS (A7.2), three projects account for over two-thirds of the total: FP034 (3.76 million) in Uganda, FP012 (2.27 million) in Mali, and FP002 (1.20 million) in Malawi. Similarly, for lives protected (A1.1), FP012 alone accounts for 85 per cent of the reported total (488,555 lives), followed by FP026 (85,300 lives) in Madagascar. This concentration can be due to various reasons, including but not limited to the scale of certain flagship interventions; the limited number of projects that selected the given indicator for reporting; limited guidance on and enforcement of reporting by the Secretariat; and/or no project progress.

267. Indeed, the evaluation team found significant issues with the quality of data reported by AEs. The data quality assurance process documented in annex 11 identified 27 corrections across 11 projects. These corrections include the removal of ex-ante projections reported as achievements, unit reclassifications between households, businesses, and individuals, and calculation or transcription errors. For example, the reported value of 1.75 million lives and USD 1.3 billion in economic protection under FP074 in Burkina Faso were removed from the aggregation since these values represent model-based projections. Second, only a fraction of the CIEWS portfolio contributes to these totals; only 18 projects report on A7.2 (people reached by EWS), and only 4–5 projects report on A1.1. (lives or economic assets protected). Moreover, results reported to these indicators offer limited insight into whether beneficiaries are receiving timely information, understand the alerts, possess the knowledge of appropriate responses, or have the necessary resources to act upon warnings. **These systematic measurement challenges help explain why demonstrating portfolio-wide impact remains difficult despite evidence of project-level achievements.**

268. **While the GCF indicators for CIEWS represent a positive step towards monitoring and capturing CIEWS progress, they remain limited in their ability to capture the full breadth and quality of impacts, especially regarding last-mile interventions**. The absence of more granular data means that the indicator does not adequately convey the potential impact of EWS on those receiving alerts. Moreover, the lack of systematic application of standard indicators across EWS initiatives precludes meaningful comparison among projects.

269. Some CIEWS projects are designed with implementation lifespans extending decades, meaning that current impact figures represent early-stage achievements from a portfolio where many projects remain under implementation. This means that measurable impacts documented above will likely

increase as projects mature and their investments generate benefits beyond the current reporting period.

270. This temporal dynamic also presents a monitoring challenge: GCF's current reporting requirement does not systematically allow impact capture after project closure, potentially understating the full return on CIEWS investments. Future evaluations should consider mechanisms for post-completion impact tracking to provide a more complete picture of CIEWS effectiveness.

271. An evaluability study that examined the extent to which the CIEWS portfolio is designed to credibly measure and report on its results (annex 12), also suggests a need for more sophisticated measurement approaches that can capture systemic changes in early warning capabilities over time.

272. **The current relatively weak data reporting characteristics indicate opportunities for strengthening M&E frameworks tailored to CIEWS interventions, particularly for capturing outcomes at the community level.** As discussed in Chapter 4.A.1, the Belém Adaptation Indicators – where four of seven CIEWS-relevant indicators are qualitative – offer opportunities for GCF to pilot new measurement methods. The IRMF review in 2026 as per the policy requirement allows the Secretariat to revisit and refine CIEWS indicators through the ongoing development of the harmonized RMF.

C. MEASURABLE AND OBSERVABLE CIEWS RESULTS

273. This section summarizes the measurable and visible outcomes of CIEWS, organized by theme. The results were compiled by analysing cluster assessments, reported data, and field insights from country visits, alongside household survey information specific to selected CIEWS projects.

274. **Economic returns provide compelling evidence for the effectiveness of investments in CIEWS with notable multiplier effects observed across several projects.** For instance, FP002 in Malawi demonstrates significant agricultural gains, with annual benefits estimated at USD 3.8 million and yield increases of 25 per cent among farmers trained under the PICSA approach. Similarly, SAP011 in Mozambique reports that the adoption of climate-informed conservation agriculture has led to yield doubling compared to traditional practices, underscoring the value of integrating climate considerations into agricultural planning. In Guatemala, FP087 has facilitated access to index-based insurance for 5,000 smallholder farmers in the highlands, while Agroclimatic Technical Roundtables have successfully combined traditional knowledge – such as bird migration and lunar phases – with scientific data, and embedded these mechanisms within government structures. FP056 in Colombia has contributed to enhancing food security and ensuring reliable water access during disasters, thereby safeguarding agricultural livelihoods and investments. Reports highlighted that countries have achieved returns on investment of four to five times when EWS have successfully mitigated crop losses. Collectively, these examples underscore the tangible economic and social value generated through targeted interventions, while also illustrating the importance of context-sensitive and locally embedded approaches for maximizing impact.

275. **Traditional knowledge integration emerges as a success factor enhancing trust and adoption. In particular, projects that marry traditional ecological knowledge with contemporary scientific methods see improved community buy-in and warning compliance.** For instance, FP035 in Vanuatu found that hybridizing traditional knowledge with modern CIS enthusiastically received and enhanced trust. FP056 in Colombia developed messages co-designed with local knowledge holders including Indigenous bioindicators. It also blends *Zenú* "flood star" observations based on Indigenous knowledge with satellite rainfall measurements to adjust river-height thresholds, boosting alert accuracy for 28,000 farmers while revitalizing cultural heritage. FP037 in

Samoa overlays participatory community mapping with technical hydrologic modelling. FP184 in Vanuatu demonstrates intent to bridge traditional knowledge with modern climate science through participatory design, though cyclone impacts derailed implementation despite being an anticipated hazard. FP087 in Guatemala demonstrates strong Indigenous engagement by broadcasting climate information through community radios in Maya *K'iche'*, *Kaqchikel*, and *Mam* languages, with Radio Comunitaria San Juan broadcasting 80 per cent content in Indigenous languages. In addition, the project integrates traditional knowledge, including lunar phases and ancestral weather indicators, into scientific bulletins. FP018 in Pakistan incorporates Indigenous innovations such as ice stupas. This offers far-reaching benefits, not only strengthening early warning capacity but also alleviating persistent challenges like water scarcity and social cohesion within vulnerable communities. In Malawi's FP002, Indigenous knowledge and local context are integrated through participatory co-development of advisories and community-based EWS, ensuring that traditional practices inform both risk assessments and disaster preparedness activities.

276. **Projects with a primary focus on CIS tend to be more effective (than the projects with a CIS component in broader adaptation initiatives) in fostering coordination and enabling informed decision-making across various sectors through established national-level mechanisms.** For example, FP021 in Senegal facilitated unprecedented collaboration within the National Flood Management Committee, bringing together the National Agency for Civil Aviation and Meteorology, the Directorate for Water Resource Planning and Management, the Investment Promotion and Large Projects Agency, and the Senegal National Office for Sanitation. FP068's Climate Coordination Council successfully advanced policy integration, including the revision of building codes in Georgia. FP002 in Malawi institutionalized multi-agency collaboration through the Department of Climate Change and Meteorological Services and the Department of Disaster Management Affairs via policy updates in 2020, though some resource constraints at the district level remain. SAP010 in the Philippines strengthened inter-agency cooperation through memorandums of agreement involving the Department of Science and Technology - Philippine Atmospheric Geophysical and Astronomical Services Administration, the Department of Environment and Natural Resources – Mines and Geosciences Bureau, the Department of the Interior and Local Government, and four pilot local government units, with decision support systems now embedded in national operations. SAP042 in Mozambique achieved further integration by incorporating climate adaptation into existing social protection frameworks through decentralized planning.

277. **Technological innovation demonstrates variable implementation success with potential for scaling.** Technology applications across the portfolio feature automated sensors, high-performance computing platforms, probabilistic risk assessment tools, mobile applications for warning delivery, and integration with global data networks. While implementation challenges persist with delays in procurement, technical capacity constraints, and difficulties maintaining sophisticated equipment, successful implementations balance high-tech solutions with robust community engagement and local capacity-building. In some cases, satellite technology enabled cost-effective, high-resolution climate modelling without expensive ground infrastructure. For example, the Vanuatu project (FP035) leverages Himawari Cast satellite imagery, Global Precipitation Measurement and Multisensor Precipitation Estimate precipitation estimates through the Commonwealth Scientific and Industrial Research Organisation's conceptual modelling approach, using Coastal Ocean Marine Prediction Across Scales unstructured grid modelling. The system is operational with the VaCSA database accessing the Vanuatu Meteorology and Geo-Hazards Department database for eight automatic weather stations using state-of-the-art agrometeorological data assimilation techniques. In other cases, unmanned aerial vehicle technology demonstrates potential for scaling hazard

monitoring to protect large populations. For example, Georgia's FP068 project procures three drones equipped with thermal cameras and visual computing appliances for processing aerial photos, establishing a MHEWS serving 1.7 million people (40 per cent of the population). Guatemala's FP087 project employs drone-based light detection and ranging technology for hazard and risk mapping, targeting 132,000 direct beneficiaries. FP161 employs AI for downscaling and calibration by leveraging existing global model products from advanced centres at very high resolution, including the Copernicus programme. Moreover, Georgia's FP068 Delft-FEWS Platform has successfully established forecasting platforms for Western Georgia basins with flood maps updated every 12 hours.

278. **Nature-based approaches demonstrate dual functionality: generating climate data through biological indicators and community-based hydrological tracking while creating protective buffers for technical monitoring infrastructure.** Colombia's *La Mojana* project (FP056) utilizes 6,100 hectares of restored wetlands with 45.8 km of improved wetland channels as natural water flow monitoring systems. These ecosystems provide calibration data for hydrological models, with community-based wetland monitoring through 54 community restoration plans feeding real-time water level data into the Regional Forecast and Alert Centre. The centre has issued 494 daily forecast bulletins and 92 special hydrometeorological reports. Vietnam's project (SAP040) includes replanting 150 hectares of mangroves and dune vegetation, with tide gauges and smart flood towers providing real-time water-level data. Wetland restoration also acts as flood protection, enabling low-cost rain gauges managed by local boards to trigger alerts and cash-for-work responses when thresholds are reached.

279. **National coordination mechanisms have shown strong potential to enhance cross-sectoral collaboration between CIS producers and users of information.** In Timor-Leste (FP171), the Monsoon Forums have become an effective platform for sharing seasonal forecasts and potential impacts for the different sectors. This has started to change the way people work together, moving from a siloed approach where they would receive and share the forecasts within their line ministries (DRR, health, agriculture, energy) to jointly discuss and develop a sectoral action plan during the Forums. This greater engagement has enhanced understanding of forecasts and climate-related impacts across sectors, strengthening trust in the National Directorate for Meteorology and Geophysics forecasts and supporting the development of sectoral climate information tools such as Automated Decision Support Systems. Similarly, National Climate Outlook Forums (FP147, FP035) have been considered helpful for sharing and discussing with relevant stakeholders the seasonal cyclone outlook to inform planning and preparedness. The establishment of NFCS in countries such as Timor-Leste and Vanuatu, (FP171, FP147) clarified institutional roles, reduced duplication, and streamlined information production.

280. **Evidence at the community level shows that participatory and co-production approaches yield the strongest results.** When climate information is tailored to local needs and disseminated through accessible channels, it leads to higher trust, uptake, and adaptive behaviour. Linkages to individual-level changes are stronger in proposals with a well-developed last mile component and practical, local-level applications, but this is found to be lacking in projects that have a strong focus on strengthening CIS infrastructure and systems at national level. Tailored weather-informed advisories to help decision-making before and during the season (depending on the frequency of forecasts) for agriculture and fisheries have supported the adoption of adaptive practices (crops switch, timing of planting/harvesting crops, etc.) and strengthened livelihoods resilience (FP002 and FP087). Participatory co-development and localized dissemination of climate information products consistently increased uptake and demonstrated benefits, including improved preparedness and

resilience among women and smallholder farmers in Malawi (FP002) as well as in Bangladesh (FP069, FP206 and SAP008).

281. **At the individual level, the most visible changes are in knowledge, decision-making, and adaptive behaviours.** In Guatemala (FP087 and FP048), farmers are beginning to combine scientific forecasts with traditional knowledge to adjust planting schedules and adopt nature-based practices such as rainwater harvesting, mulching, and diversified cropping systems (e.g. *milpa* with fruit trees). These behavioural shifts reflect a growing openness to new information and a more forward-looking perspective among Indigenous farmers. Participatory training sessions, many led by women, have also played an important role in improving understanding of weather and climate concepts and in building confidence to act on forecast information. Household survey baseline data collected for FP087 via IEU's Learning-Oriented Real-Time Impact Assessment (LORTA) indicates, however, that overall perception of climate risks and familiarity with EWS were initially limited, with few households reporting strong knowledge of climate change impacts or systematic use of community-level EWS (see Box 7–1). This suggests that CIEWS interventions in Guatemala are operating from a relatively low baseline, where the potential for additionality is high.

Box 7–1. LORTA baseline evidence from Guatemala (FP087)

Responsiveness to climate risks and EWS

The LORTA programme is supporting an impact evaluation of FP087 ("Building livelihood resilience to climate change in the upper basins of Guatemala's highlands"), implemented by International Union for Conservation of Nature with national and local partners. The project aims to enhance ecosystem-based watershed management and introduce an early warning system to reduce communities' vulnerability to climate risks. The baseline survey, conducted in 2021 across 1,486 households in 21 treatment and 13 control microwatersheds, provides important insights into resilience and responsiveness before interventions.

Key findings

- Exposure to climate shocks: 17 per cent of households reported facing climate-related shocks in the previous 12 months.
- Perceptions and knowledge: Despite exposure, most households exhibited low perception and knowledge of climate change events and consequences.
- Community-level EWS: At baseline, the presence and use of community-level EWS was limited, providing scope for the project's planned investments.

Implications

The baseline highlights that while households in Guatemala's highlands face significant exposure to climate risks, knowledge and use of CIEWS remain limited.

282. In contrast, Bangladesh, presents a very different starting point. Women engaged through FP069 and FP206 have acquired skills in vulnerability mapping and the preparation of hazard-crop calendars, which has increased their agency in household and farming decisions. The participatory, gender-responsive, and institutionally integrated approaches adopted under these projects have fostered strong community ownership, reduced vulnerability to floods, and promoted sustainable adaptation practices. The LORTA impact evaluation baseline survey for FP069 shows that households already had high levels of awareness and responsiveness to EWS, with nearly all respondents reporting that they understood warning signals and knew what actions to take during disasters (see Box 7–2).

Thus, while Guatemala's interventions are focused on building foundational awareness and introducing new tools, Bangladesh's efforts have emphasized deepening gender-responsive approaches and the institutionalizing of preparedness practices – building upon an already strong base of awareness at baseline. The strong base is assumed to be resulting from the decades of preparedness activities implemented through the Bangladesh's Cyclone Preparedness Programme – a joint disaster management initiative by the Government and the Bangladesh Red Crescent Society.

Box 7–2. LORTA baseline evidence from Bangladesh (FP069)

High awareness of EWS in coastal communities of Bangladesh

The LORTA programme conducted baseline data-collection for the impact evaluation of FP069 ("Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity"), implemented by UNDP with the Ministry of Women and Children Affairs and the Department of Public Health Engineering in Bangladesh. The project seeks to strengthen adaptive capacities through climate-resilient livelihoods, improved drinking water solutions, and enhanced dissemination of EWS. The baseline survey, conducted in 2021 across 3,120 households in Khulna and Satkhira, provides insights into community preparedness prior to project interventions.

Key findings

- High awareness of EWS: 98 per cent of households reported understanding early warning signals, and 97 per cent stated they knew the steps to be taken after receiving a warning.
- Access to shelters: Over 80 per cent of households had access to safe shelters in case of natural disasters.
- Preparedness gaps in financial coping strategies: Only 7.5 per cent of households reported saving to cope with disaster-related costs, while about one-third relied on loans.
- Social safety nets: Half of the surveyed households reported support from relatives as their primary coping mechanism.
- Food security strategies: Only 2–3 per cent of households reported reducing food intake as a coping strategy, suggesting that food-based coping was not the primary response.

Implications

These findings suggest that households in coastal Bangladesh entered the project with a relatively high level of awareness and use of EWS, reflecting decades of national investment in cyclone preparedness. However, significant gaps remain in household financial resilience, with limited formal savings or insurance mechanisms and heavy reliance on informal support networks. This baseline highlights the importance of FP069's focus on gender-responsive disaster preparedness and resilient livelihood support, which can help shift households from awareness towards deeper adaptive capacity and sustainable coping strategies.

283. Similar positive patterns were observed in the Philippines (SAP010), where participatory engagement and the integration of local and scientific knowledge increased community trust and led to more nuanced, actionable early warnings. In Malawi (FP002), using the PICSA approach enhanced farmers' use of seasonal forecasts and improved adaptive decisions at the farm level. The findings from the GCF LORTA evaluation carried out for FP002 found significant impacts on both intermediate and long-term outcomes. PICSA lead farmers were more likely to use seasonal forecasts to plan farm decisions and are more likely to make crop variety decisions. **LORTA results suggest that PICSA had a statistically significant and positive impact on building the**

adaptation capacity of lead farmers who attended the PICSA trainings. Positive evidence was reported on the use of seasonal forecasts, changes to crop activities, yields and income (Box 7–3).

Box 7–3. Rigorous impact evidence from Malawi (FP002)

Empowering smallholders through CIS

The LORTA programme conducted a rigorous impact evaluation of the PICSA intervention in Malawi, implemented under the "Scaling up the use of Modernized Climate information and Early Warning Systems in Malawi (M-CLIMES)" project. PICSA is a training-based intervention that uses historical climate data and participatory tools to help farmers plan agricultural activities suited to local climates. Using a clustered sampling approach with baseline (2018) and endline (2020) surveys, the evaluation applied propensity score matching to estimate causal effects.

Key findings

- High participation: 92 per cent of lead farmers in treatment areas attended at least one PICSA training.
- Use of forecasts: PICSA increased the use of seasonal forecasts for planning by 4.5–6 percentage points and for crop variety choices by 14–17 percentage points.
- Behavioural change: The likelihood of changing crop activities rose by 25–36 percentage points, with diversification into an average of three crops.
- Productivity gains: Maize yields increased by 434–505 kg/ha – equivalent to a 60 per cent gain, a remarkably large effect compared to other smallholder interventions.
- Livelihood effects: PICSA reduced reliance on casual labour by 9–16 percentage points. No significant impacts were found on livestock practices or food security indicators.

Implications

The Malawi study demonstrates that when climate services are designed to be participatory and farmer-oriented, they can drive meaningful behavioural changes and productivity gains. It also illustrates the added value of rigorous impact evaluations, which provide credible evidence that complements the qualitative insights from cluster assessments.

284. Across these diverse contexts, participatory and inclusive approaches consistently emerge as key drivers of behavioural and institutional change. Integrating local and scientific knowledge, involving women as agents of change, and tailoring information products to community needs have proven essential for strengthening trust, ownership, and the sustained use of CIEWS.

D. Barriers to effectiveness

285. This section provides factors that hinder portfolio effectiveness.

286. **A lack of or limited CIEWS need assessments during the design stage can hinder project effectiveness. Several projects were found to have insufficient or missing CIEWS needs assessments, in particular at the local level.** Incorporating a comprehensive assessment including end users' needs as a core element of project design would help ensure that key services and tools are well aligned with on-the-ground realities, support the development of effective capacity-building strategies, and contribute to robust last-mile delivery. Where project designs do not fully capture or address differentiated needs at the local level, implementation challenges may arise. For instance, a multi-country project in the Niger Basin (FP092) presents an overview of CIEWS capacities and

structures at a regional level but offers limited detail on national capacities or specific local contexts, resulting in a generalized understanding of key issues. Similarly, FP101 in Belize does not provide an in-depth analysis of the differentiated needs of agricultural users at the community level, the mechanisms through which information is shared and accessed, or preferred dissemination channels. FP016 in Sri Lanka could also be enhanced by a more thorough assessment of users' needs at the local level, including considerations of differentiated needs among men, women, youth, and the elderly, and how information is accessed, as current approaches rely substantially on extension services. The Timor-Leste project (FP171) illustrates a broader pattern; while CIS interventions tend to be robustly designed at the national level, their articulation and effectiveness in supporting last-mile activities could be further developed. As a result, these interventions are currently viewed as proofs of concept or pilot initiatives, rather than fully operational systems. Greater attention to these aspects could help facilitate the provision of locally tailored forecasts and actionable adaptation measures.

287. **At national level, limited capacities for implementation can lead to some difficulties across the portfolio, which may affect long-term sustainability.** For instance, under FP035 in Vanuatu, a shortage of in-country expertise and a relatively modest emphasis on training and capacity-building contributed to some implementation delays. Sourcing appropriate expertise for various CIS technical areas is also not straightforward in Timor-Leste and other SIDS, including finding IT specialists, meteorologists, and technicians for maintenance (FP171, FP147).

288. **Project management can encounter difficulties due to staff who may not have extensive experience, highlighting the need for a clearer understanding of the technical skills and capacities required to manage GCF projects.** Identifying suitable expertise for these roles is not always straightforward. In the case of FP147, regional technical partners and national stakeholders are often involved in several ongoing initiatives simultaneously, which may result in limited time and resources being available. NMHSs also experience significant demands on their time, which can affect their ability to engage consistently and effectively with project partners. SAP041 in Albania illustrates some of the institutional challenges involved, as shifting from an academic research institution to a round-the-clock operational weather service is a complex process that may require adjustments beyond the original project scope.

289. **Rigid GCF procedures and guidance can influence project effectiveness.** Some interviewees noted that while the GCF provides technical guidance during the development of CIEWS projects, these recommendations are not always aligned with local realities. For instance, sophisticated observation equipment and infrastructure often demand technical expertise and accessible maintenance services – resources that may be scarce or unavailable in developing countries, particularly in SIDS and LDCs. This can make regular upkeep of such equipment within these countries unfeasible, leading to implementation and sustainability challenges. Engaging local stakeholders in creating project recommendations could increase their relevance and help sustain results beyond the project's completion. Additionally, informants pointed out that delays in GCF approval processes contribute to on-the-ground setbacks. Such delays may lead to initial budget allocations becoming outdated due to changing market conditions, cause trained personnel to pursue alternative employment, or result in a loss of community engagement momentum.

290. **Several additional challenges have been identified that may impede the extent to which GCF's CIEWS investments effectively address community needs.** Notably, feedback from informants suggests that FPs often prioritize national-level systems over local engagement, with limited integration into local decision-making processes. It was observed that the emphasis frequently rests on technological solutions and modelling, which may not always align with the practical realities or

immediate concerns of communities. Informants noted that the focus should not just be on climate observations but rather on climate services, which is what users actually need. Indeed, there appears to be a recurring tendency towards a “technical fixation”, where investment in hardware may not sufficiently be complemented by robust social systems. These findings underscore the importance of adopting a more balanced and user-oriented approach, ensuring that technological advancements are meaningfully integrated with community-driven needs and capacities.

Chapter 8. GENDER AND INDIGENOUS PEOPLES IN CIEWS

KEY FINDINGS

8.1. GCF's Gender Policy framework facilitates gender integration in CIEWS interventions, with recent restructuring aimed at strengthening policy impact for more consistent implementation of gender and IPs considerations.

8.2. While there are regular mentions and the compliance of gender mainstreaming across the CIEWS portfolio through a strong focus on women's participation and engagement in CIEWS interventions, national-level CIS are predominantly gender-responsive where traditional gender roles permit.

8.3. There is evident, robust engagement of women at the local level in supporting implementation of EWS, but true participation of women in decision-making is not always clear and, in many countries, it might be limited by cultural norms and values.

8.4. The GCF's approach to IPs' inclusion is grounded in its Indigenous Peoples' Policy and shows an increasing recognition of the value of traditional knowledge. However, systematic integration of Indigenous perspectives into CIEWS projects remains limited, often relying on external partners rather than internal processes.

A. GENDER CONSIDERATIONS IN CIEWS

291. The first GCF Gender Policy and Gender Action Plan, adopted in 2015, established key guiding principles and promoted a gender-sensitive approach aimed at avoiding harm while ensuring equitable inclusion and benefit for both women and men in GCF-financed activities. The 2019 updated Gender Policy and Gender Action Plan (GAP) for 2020–2023,[168] marked a transition to a gender-responsive strategy, introducing mandatory gender assessments and project-specific GAPs to systematically integrate gender considerations at the project level. Following the Secretariat's restructuring in 2024, the responsibilities previously held by the Office of Sustainability and Inclusion have been divided between the Strategy and Impact Office and the Investment Office. The Strategy and Impact Office is now tasked with developing policy standards, providing guidance, offering upstream advice on inclusion – including for gender and IPs – and enhancing results frameworks and indicators, including those specific to gender. The Investment Office is responsible for operationalizing gender inclusion from project origination, through FP approval, and into project implementation.

292. The new structure aims to enable earlier country engagement, addressing a recurring gap in which safeguards reviews began too late in FP appraisal to shape how women contribute to and are affected by projects, especially in adaptation and CIEWS initiatives. Informants noted that while earlier engagement is a positive step, the Investment Office still lacks sufficient gender staffing and CIEWS-specific gender expertise, which could limit the intended shift from late-stage compliance to upfront, meaningful gender-responsive design. Additionally, the majority of CIEWS projects are classified as Category C,[169] in terms of risk level and assessment, which generally means that social and environmental requirements are minimal unless GCF deliberately prioritizes inclusion – such as last-mile user needs or consultations with IPs – which are otherwise not mandatory for AEs. Therefore, strengthening last-mile engagement will require an active commitment from GCF that goes beyond the second due diligence compliance model.

293. At the project level, there is regular mention of gender mainstreaming across the CIEWS sample of projects that were reviewed, and every project includes a gender assessment and GAP. These projects have identified specific quotas and targets at different levels (impact, outcomes and outputs) to be achieved related to women's participation. Many proposals have a strong focus on gender targeting (beneficiary selection, meetings and trainings, etc.) and emphasize representation and inclusivity, providing opportunities for women to share their knowledge and opinions. This is not necessarily linked to CIEWS interventions, particularly in sectoral programmes where CIEWS activities are part of a wider basket of resilience building interventions. In projects that focus on the national level,[170] CIEWS interventions seem to focus on capacity-building initiatives promoting the professional development of hydromet employees, including women. This depends on the national CIEWS context given that in many countries, especially LDCs and SIDS, the sector tends to be male-dominated. There is stronger engagement of women in interventions focusing on the last mile, although evidence of the effective integration of a gender lens in all CIEWS-related decisions is considerably weaker.

294. **Pathway reviews highlight both successes and persistent challenges.** SAP026 in Bangladesh achieved 50 per cent women's participation and created meaningful roles in water management. However, deep patriarchal structures, limited decision-making power and perpetuated wage

[168] Green Climate Fund, "Sustainability guidance note: screening and categorizing GCF-financed activities."
[169] Ibid. Category C activities, or low-risk activities, include those that have minimal to no adverse environmental and social risks and impacts. Category C activities are typically those that have no physical elements or defined footprints.
[170] FP012, FP074 and FP147.

discrimination for women in the country means that notwithstanding their "inclusion", individual empowerment will likely remain constrained by traditional norms. Traditional and cultural norms also were a challenge for FP075 in Tajikistan in the recruitment of women in field offices, many of which are remote, and as such limiting wider women's representation across the project. Under FP087 instead, the local context played an important role in increasing engagement from women and youth given the high levels of male migration and work requirements. The project focused on enhancing the resilience of at least 15,000 women in the project area, including improving their abilities to utilize EWS for agricultural and agroforestry practices, as well as water management, climate-smart agriculture, and agroforestry practices. Secondary evidence suggests that the project has been successful in ensuring gender inclusion, and during focus group discussions, women have expressed feeling empowered by the project, citing increased learning opportunities and reduced dependency on male income.

295. **Other projects, particularly where CIEWS is one of the components inside a sectoral intervention, highlight the role of women in supporting the implementation of local-level activities, including CIEWS.** Under SAP002 in Kyrgyzstan, gender was systematically prioritized, with women representing more than half of direct beneficiaries while there was specific outreach to women's groups and female-led households for climate information and early warning services. Under SAP008 in Bangladesh, over 80 per cent of direct beneficiaries and CCAG members are women. Under FP018 in Pakistan, there is a high level of women's participation and active monitoring of quotas for women and persons with disabilities in all DRR activities. In the same project in 2022, local disaster management committees – led by women and youth – played an active role in successfully supporting the evacuation of at-risk residents. Under FP021 in Senegal, gender is a core cross-cutting objective with a dedicated GAP detailing targets for women's participation in every training, working group, or leadership structure and the specific engagement of women's organizations. In Malawi, FP002 has a strong outreach to women's groups and female-headed households through the co-development of advisories and community-based early warnings, with the engagement of women in co-production processes where women represent 58 per cent of the trained climate information intermediaries. Findings under FP056 in Colombia highlighted women representing more than 50 per cent of rural promoters in the community.

296. **Gender considerations are less prominent in regional projects.** For instance, FP147 for the Pacific Islands does not clearly demonstrate how gender perspectives are integrated into technical work. Although a gender analysis was conducted in 2023 for Rarotonga Island in the Cook Islands (with plans to conduct similar analyses for Niue, the Marshall Islands, Tuvalu, and Palau), it remains unclear what these assessments will cover or how their findings will connect with national or local activities. The Palau Red Cross Society appears to encourage active local participation – including from women, youth, people with disabilities, and other marginalized groups – in EWS and disaster risk management. In the FP092 regional programme across Niger basin countries, gender provisions remain broad and include strategies such as creating mixed-gender field teams, scheduling events at accessible times and locations for women, and ensuring women actively participate in and benefit from climate information and EWS. While further gender analysis is planned through the project's gender assessment and action plan,[171] it is uncertain whether this work will inform EWS activities or how it will be implemented in each specific country.

[171] The gender assessment notes that further analysis will be conducted to identify: (i) gender disparities that may affect the success of the project; (ii) opportunities within the project to improve women's access to basic services, economic opportunities or decision making; and (iii) specific components or other mechanisms to ensure that both women and men participate in and benefit from the project. See Green Climate Fund, "FP092: Gender Assessment."

297. **There has been limited evidence across the CIEWS projects of men and women benefiting equally from CIEWS interventions,** with many proposals lacking a thorough assessment of the needs of users at local level with very little understanding of differentiated needs at community level or of how individuals access information based on their gender, age, or ethnicity.[172] For example, FP145 in Guatemala refers to gender-sensitive agricultural adaptation packages and activities but lacks detail on gender-specific CIEWS or measures to ensure women have equal access to information. In community-based early warnings, there is evidence of the higher participation of women in decision-making and in preparedness activities – this could potentially strengthen their role within the community and should ensure equal benefits from CIEWS as seen in a number of projects.[173]

298. **Projects that adopt strong participatory approaches also have a stronger focus on women, marginalized groups and IPs.** For example, in Guatemala, under FP087, different activities have been implemented to better understand beneficiaries' needs and adjust the delivery of information, including the Knowledge Dialogues to incorporate local knowledge and make the EWS more effective. Specific attention has been paid to understanding how men and women access climate information to identify what are the most appropriate communication channels for women and men. Differentiated livelihood practices by gender were considered when providing guidance/advice on adaptation practices based on the forecasts. In the Philippines, gender and IPs inclusion in project design and practice under SAP010 supported increased trust in meteorological warnings. Community understanding, belief, and action increased thanks to tailored, tested warning messages and protocols developed together with local leaders (including women and Indigenous representatives). Secondary evidence suggests that, where these participatory processes are in place, EWS have greater credibility in the community.

299. All CIEWS projects submitted GAPs and gender assessments, showing high compliance, though quality varies. Some AEs lack sufficient capacity, requiring extra support from the Secretariat Gender Team. Increased dialogue between the gender team and CIEWS experts, along with better use of readiness support, the PPF, and clearer guidance, should be considered to address these gaps and further strengthen gender mainstreaming in CIEWS projects.

B. Indigenous Peoples in CIEWS

300. The GCF IPs-relevant policy architecture is anchored in the Indigenous Peoples Policy (decision B.19/11), adopted by the Board in 2018. This Policy aims to ensure that GCF activities are developed and implemented in a manner that fully respects, promotes, and safeguards IPs' rights and interests. The objectives are twofold: firstly, to ensure that IPs benefit from GCF-financed activities and projects in ways that are culturally appropriate; and secondly, to prevent any harm or adverse effects resulting from the design and implementation of such activities.

301. There has also been a growing commitment to leveraging traditional, local, and Indigenous knowledge within climate investment. The GCF Board, through decision B.33/12 paragraph (h), affirmed that the best available information and data – including that from the Intergovernmental Panel on Climate Change as well as traditional, local and Indigenous knowledge and practices – are sufficient to demonstrate impact potential for GCF-supported activities. This approach is mindful of the proposal's context, the varying capacities of AEs, and specific country and regional circumstances.

[172] This was particularly evident for FP016, FP171, FP145, and FP101.
[173] FP161, FP018, FP184, and FP069.

302. As covered in Chapter 7.C, there are numerous examples of the successful integration of Indigenous knowledge and practices into CIEWS initiatives at the project level. Projects documented in FPs, APRs, and through country mission interviews, show that integrating Indigenous knowledge and fostering local leadership can significantly enhance outcomes.

303. **However, the majority of these successful efforts are primarily driven by GCF partners who respond to the differentiated needs of CIEWS in specific country or local contexts, rather than by a clear and systematic intention from the Fund itself.** Informants noted that "no one has managed to really bring to light and scale" Indigenous and traditional knowledge approaches in a systematic way. Another observation was that most CIEWS projects focus on national systems, with limited integration into local decision-making processes. Overall, there is an understanding that GCF CIEWS projects often lack genuine integration of traditional knowledge, as they are frequently constrained by technical silos and late-stage due diligence on the matter. This challenge is exacerbated by the limited in-house expertise on traditional knowledge within the Secretariat, leading to a heavy reliance on AEs and external partners for the inclusion of an IP lens.

304. Externally, partners provide valuable lessons and methods for integrating and blending traditional knowledge with scientific knowledge to enhance climate resilience. For instance, the United Nations Educational, Scientific and Cultural Organization's Local and Indigenous Knowledge System supports EWS/DRR activities,[174] and the WMO task team focuses on Indigenous and local knowledge. GCF project development could benefit further from strengthening these partnerships. Internally, the Advisory Group on Indigenous Peoples, which is currently under-utilized, should be leveraged more effectively as a mechanism to incorporate Indigenous perspectives into project design, including for CIEWS projects.

305. The GCF accreditation of the Tenure Facility, an organization that works directly with IPs and local communities, presents opportunities for meaningful community-centred interventions and may be relevant for future CIEWS initiatives. The Secretariat is developing culturally sensitive outcome-level indicators for IPs, aiming to institutionalize stronger IPs inclusion. Despite concerns regarding cost and time implications, these initiatives have the potential to foster a more systematic approach to integrating IPs' knowledge into CIEWS programming, and addressing existing gaps. Furthermore, as covered in Chapter 5.B.2 and Chapter 7.D, ensuring early and meaningful engagement with end users of CIEWS, including IPs, would be essential with a view to strengthening the effectiveness of CIEWS interventions.

[174] United Nations Framework Convention on Climate Change, "Introduction."

Chapter 9. SUSTAINABILITY

KEY FINDINGS

9.1. Most projects currently show limited sustainability indicators, though some demonstrate stronger potential; these challenges are not unique to GCF but are widespread across the sector.

9.2. Major barriers to sustainability at the country level include limited institutional and financial resources, and insufficient human capacity, often exacerbated by the short project cycles which pressure rapid results.

9.3. Operation and maintenance costs for observation infrastructure funded by the GCF remain a persistent challenge, as seen in many similar projects elsewhere.

9.4. Mismatches between GCF investments and national capacity in NMHS or related agencies often result from insufficient stakeholder consultations, gap assessments and feasibility studies during project design stage, and assumptions that the latest equipment and technology bring more effectiveness.

9.5. Greater opportunities for uptake and scalability of CIEWS interventions can be seen in projects with a strong participatory approach and a focus on the institutional integration of CIEWS-related processes and products.

306. This chapter assesses the sustainability of GCF investments in CIEWS. The GCF IRMF defines sustainability as the "degree to which the outcomes and results of GCF investments are sustained beyond completion through the creation of a structural and financial base as well as climate-resilient practices". Hence to achieve sustainability, investments must first generate outcomes that can be sustained. The definition also emphasizes the need for institutional structures – such as NMHS or relevant agencies – to support long-term outcomes, and that these outcomes should persist without relying on external funding. Additionally, individuals supported by GCF investments should continue to apply new systems or practices as part of climate resilience efforts.

307. Based on this definition, it is too soon to evaluate sustainability within GCF CIEWS portfolio, as comprehensive transformation among countries is still underway, as noted in Chapter 7. **At the individual project level, most initiatives show few indicators of sustainability, with some exhibiting strong potential. However, these sustainability issues are not unique to the GCF; they are widespread across the CIEWS sector**. For example, the Hydromet Gap Report 2024 revealed that none of the evaluated NMHSs have stable financial resources, and 75 per cent depend on development or climate funding.[175]

308. Noting the bigger context, the below provides the list of key sustainability issues found in the GCF portfolio of CIEWS.

309. **At the country level, limited institutional and financial resources, along with human capacity, present significant obstacles to sustainability. Because building sustainability is a long-term effort that extends well beyond the typical five- or six-year project cycle, there seems to be pressure to show rapid results and paradigm shifts within a short project period.** This has led some CIEWS projects to focus on quick outcomes or pursue activities that do not reflect actual conditions. For example, the evaluation identified instances where GCF investments did not align with national NMHS capacity, which was often lower than anticipated in FPs. Moreover, while most CIEWS FPs include clear exit strategies – like obtaining public funding, generating revenue, or reducing costs – these are often not fully achieved by project end. For these countries, a stronger focus on NMHS capacity-building is needed from project inception through to implementation. The needed capacity-building, though depending on contexts, includes forecasting skills, maintenance of equipment, data analysis skills, know-how on procurement of technical equipment, and IT systems maintenance, among others. Although GCF investments typically include capacity-building components or training sessions, in some instances these have been brief, not programmed throughout the project period, and/or have involved only a limited number of participants.

310. Institutional capacity challenges observed within those countries/projects reviewed include: a high turnover of NMHS staff; limited information, technology, and communication capacity; manual observation practices as opposed to automated processing of climate and weather data; and unclear roles and responsibilities across related departments and ministries, especially the lack of legal and governance arrangements for the NMHS which prevents them from receiving regular budget allocations and/or seeking additional commercial revenues for their operations.

311. For instance, in Vanuatu's FP035 project, staff turnover and information, technology, and communication capability at the NMHS were identified as institutional challenges in addition to issues related to data-sharing and access among government organizations. Similarly, in Uzbekistan (SAP022), turnover of NMHS staff was noted as high, and fragmentation exists in mandates among NMHS, NDMA and other line ministries and departments. In Guatemala (FP087), the existing national network of meteorological stations includes manual stations, where an observer must

[175] Alliance for Hydromet Development, *Hydromet Gap Report 2024*; United Nations Framework Convention on Climate Change, "Local and Indigenous Knowledge Systems (LINKS)."

physically visit them to read the instruments and record the data, affecting interoperability. In Timor-Leste (FP171), connectivity was highlighted as one of the key issues with unreliable internet and cell phone connectivity at both *suko* (village) and municipal level, impacting the accessibility of digital platforms and mobile applications where health and agriculture-related alerts and advisories will be shared. An additional challenge noted was the strengthening and retaining of a skilled workforce within the NMHS.

312. **Notably, a major challenge for long-term sustainability in many CIEWS investments is obtaining and sustaining technical equipment, since the lack of a local market for observation-related equipment means both equipment and expertise must be procured from outside the country.** This raises costs for maintenance, replacements and training, straining already limited resources of the NMHS in these countries. For example, in Timor-Leste, the evaluation team noted limited local skills for maintaining marine and land observation networks and in-country IT expertise to sustain systems currently being set up by the project. In Vanuatu (FP035), the procurement of various pieces of weather and ocean monitoring equipment, including a Doppler Radar, presented a challenge for long-term sustainability given maintenance of the technology is costly and the expertise does not exist in the country. This in turn creates new requirements for the NMHS to secure the budget and capacity to sustain the equipment over its lifetime.

313. **Operation and maintenance costs for observation infrastructure funded by the GCF remain a persistent challenge, as seen in many similar projects elsewhere.** CIEWS investments typically do not cover staff salaries or ongoing equipment operation and maintenance beyond the project's lifespan. This reality creates issues, as upgraded infrastructure often raises operation and maintenance costs because of increased complexity, higher technical skill requirements and additional costs like electricity and connectivity.[176] For optimal results, equipment procurement in CIEWS projects should be supported by a comprehensive operations and maintenance plan. This includes identifying and training NMHS staff and DPs, as well as clearly outlining budget lines and anticipated costs over time.

314. **The persistent sustainability challenges with observation infrastructure have led organizations such as SOFF to focus on specific yet crucial technical and capacity shortcomings in operating and maintaining weather and climate observation systems,** as detailed in Chapter 4.B.3. To date, at least a few GCF projects are exploring or have confirmed parallel financing or post-project financing from SOFF. For instance, the NMHS in Timor-Leste (FP171) secured the continuous maintenance and calibration of automated weather stations from SOFF for 5 years after the end of the GCF project. FP074 in Burkina Faso is seeking support from SOFF to keep weather stations operational and ensure data transmission to global networks post-project completion, while also ensuring technical assistance from CREWS to sustain and accelerate the institutional capacity-building of the NMHS. Moreover, as discussed in Chapter 4.B.3, FP258 (global EW4All programme) and SAP050 (Maldives) have secured SOFF's parallel financing. However, a collaboration framework between SOFF and climate funds, including the GCF, has not been fully leveraged, resulting in missed opportunities for ensuring the sustainability of observation-related investments.

315. **To tackle ongoing sustainability challenges and address their underlying causes, CIEWS stakeholders are proactively seeking and applying new solutions – such as CONOPS – in projects related to observation infrastructure.**[177] CONOPS serves as a feasibility tool to ensure

[176] Rogers et al., "Affordability of National Meteorological and Hydrological Services."
[177] Ibid; World Bank, "Charting a Course for Sustainable Hydrological and Meteorological Networks in Developing Countries."

that the operational requirements of a proposed system are clearly understood and agreed upon by users during the design phase. This helps ensure the proposed system is fit for purpose and affordable beyond project lifespan. CONOPS allows a careful examination of the system during the project design phase through a combination of financial and operational feasibility checks. For example, financial feasibility includes a review of the expenses associated with all necessary equipment, facilities, materials, software, hardware, policy and technical documentation, services, training, and personnel required for the operation and support of the relevant system.[178] CONOPS essentially determines what it takes for NMHS to fully own the new system beyond project lifespan. Using these tools helps NMHS avoid unsustainable infrastructure investments and choose realistic, cost-effective solutions suited to local capacity while meeting WMO standards. As covered in Chapter 5.B.2, PPF could be effectively leveraged to pilot these novel approaches to ensure sustainability of CIEWS infrastructure investments.

316. **The evaluation also found that mismatches between GCF investments and national capacity in NMHS or related agencies often result from insufficient stakeholder consultations, gap assessments and feasibility studies during the project design stage, and assumptions that the latest equipment and technology bring more effectiveness.** Key informants highlighted that with appropriate participatory gap/needs assessments from the outset involving all relevant stakeholders, these design issues found in some projects could be reduced or minimized.[179] While time-consuming, participatory and inclusive approaches introduced from the start of the project design consistently emerged as key success factors in driving sustained institutional and behavioural change at both national and local levels, resulting in lasting change beyond the project's completion.

317. **Conversely, the evaluation did find some initiatives that effectively improved the likelihood of sustainability.** FP012 in Mali successfully reduced the operational costs of the NMHS by replacing diesel generators with solar photovoltaic electricity, thereby freeing up resources to be allocated to other operational expenses. In a similar vein, FP018 in Pakistan notes: "For the local-level early warning system's financial sustainability strategy, the Pakistan Meteorological Department (PMD) will include all relevant costs for its involvement in the EWS within its general operational budget after project completion," as agreed between the ongoing GLOF project and the PMD. This includes adding automated weather stations and river discharge sensors to PMD's monitoring network, which will supply data for the local EWS (activities 2.1 and 2.2). Therefore, collecting, analysing, and sharing all climate-related information generated by this project will become part of the PMD's regular duties both during and after project completion. This approach is an important step towards true national ownership, pending confirmation in future GCF APRs and similar documents.

318. **Furthermore, evidence shows that national coordination mechanisms, such as Monsoon Forums, NFCS, and Climate Outlook Forums, have the potential to improve sustainability by clarifying stakeholder roles and promoting data-sharing among ministries.** In Timor-Leste, the NFCS process – supported by the Regional Integrated Multi-Hazard Early Warning System (RIMES) – has enhanced understanding of climate services, strengthened coordination, and streamlined climate information production across sectors like agriculture, health, and energy. Once approved, the NFCS outcome document will guide line ministries in using NMHS's climate data and clarify stakeholder responsibilities, aiming to reduce fragmentation among agencies. The other projects that effectively leveraged coordination mechanisms include FP087 in Guatemala and FP147 in the Pacific Islands.

[178] Ibid.
[179] For example, FP092 (Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria) and FP215 (Cambodia, Indonesia, Lao People's Democratic Republic, Pakistan, Papua New Guinea, Timor-Leste, Vanuatu).

319. **There are also examples of improved institutional coordination at subnational level.** For example, under FP016 in Sri Lanka, a series of seasonal workshops for co-developing the agromet advisories have strengthened collaboration of district and local stakeholders. The project also established agromet units in the Department of Provincial Agriculture and Agrarian Development in project districts to institutionalize the provision of advisory services. In Guatemala, FP087 established clear coordination mechanisms at local level between different actors implementing the EWS, with INSIVUMEH (Guatemala's NMHS) providing the forecasts/data and other line ministries coordinating response, sharing of alerts and preparedness. These collaborations have informed the development of several practical tools used to inform local adaptation practices.

320. **Many projects have demonstrated that working together with national NGOs and CSOs is crucial for fostering community involvement, supporting local ownership, and ensuring that interventions have a lasting effect.** Local ownership and sustainability are strengthened when activities and funds are channelled through local NGOs and community-led groups, including by engaging them in peer-to-peer trainings, anchoring capacities with NGOs and local communities and creating robust ownership at local level (FP056, FP206, SAP008, and SAP026). In Bangladesh (SAP026), 600 CCAGs were created through a community-based ownership model with trained leadership, integration of climate change units in government structures and self-sustaining financial mechanisms at local levels to maintain key infrastructures.

321. **Greater opportunities for uptake and scalability of CIEWS interventions can be seen in projects with a strong participatory approach and a focus on the institutional integration of CIEWS-related processes and products.** One of the approaches that has demonstrated its potential for replicability is the PICSA, which is already being rolled out in different countries and can be tailored to different local contexts. With its focus on co-production of weather agricultural advisories, the empowerment of knowledge intermediaries and local communities, and institutional integration, it also shows great potential for longer-term sustainability (FP002, FP087). In Guatemala, lessons emerging from FP087 are being shared with FP145 – led by the Food and Agriculture Organization of the United Nations (FAO) – to promote replication of the approach. The pilot application of a mobile app is showing promising results for scalability (FP087).

322. Upon consideration, fostering the sustainability of CIEWS is fundamentally a long-term undertaking. It requires a shift in perspective from prioritizing investments that yield immediate outcomes to emphasizing long-term objectives, which may take longer to manifest but deliver enduring benefits.

Chapter 10. CONCLUSIONS AND RECOMMENDATIONS

323. This evaluation examined to what extent and how GCF has strengthened the accessibility and availability of CIEWS through a range of programming approaches and its investments. This evaluation is critical as it brings together insights about GCF CIEWS investments from the past decade, and highlights what changes are needed now given the current situation at GCF and global efforts such as the EW4All initiative. This chapter presents conclusions and recommendations derived from this evaluation.

324. CIEWS play a critical role in reducing climate risks and building resilience. Evidence shows that well-designed CIEWS can prevent and reduce loss and damage, saving millions of lives. When aligned with the GGA's aim to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change, CIEWS are likely to remain a central priority within climate finance.

325. By tracing GCF's evolution over the past 10 years, this evaluation presents a story of the GCF emerging as the leading global financier in CIEWS through a process of learning and adaptation. While multilateral banks like the World Bank previously led funding in this area, with the WMO's technical support, the landscape has gradually shifted as the GCF has expanded its commitment to CIEWS. GCF investments began in 2015 with its first project in Malawi (FP002), which upgraded weather infrastructure and EWS and benefited over 1.2 million people. The portfolio had grown to 141 CIEWS-tagged projects by B.43.

326. **Conclusion 1: The GCF is highly relevant to CIEWS and holds a privileged position in the space. However, GCF-funded CIEWS projects lack coherence and a systematic approach at portfolio level.**

327. By 2024, the GCF had surpassed the World Bank as the lead financier in EWS, accounting for 34 per cent of the global share and supporting 44 per cent of EWS investments in LDCs and SIDS. The evaluation team estimates that GCF's cumulative investments in CIEWS had reached USD 1.997 billion as of B.43, representing 10 per cent of the total GCF portfolio. Investments in CIEWS include projects that focus primarily on CIEWS and those that integrate CIEWS into broader adaptation efforts.

328. The release of a sectoral funding approach by the GCF Secretariat in 2022 marked a new phase, introducing three distinct paradigm-shifting pathways for CIEWS investments: (i) strengthening CIS; (ii) promoting impact-based MHEWS; and (iii) improving CIEWS for investment and financial decisions. In the same year, the launch of the EW4All initiative by the United Nations Secretary-General, which aims at achieving universal early warning coverage by 2027, generated renewed momentum and contributed to the inclusion of CIEWS as a programmatic priority in the GCF's USP-2.

329. Following the launch of EW4All, CIEWS-related projects increased substantially within the GCF portfolio. However, while the CIEWS project portfolio continues to feature across all eight results areas, investments remain fragmented and are not guided by a unified portfolio-level CIEWS approach. This lack can lead to a fragmented portfolio, where results are provided in isolation and without further consideration of the paradigm shift potential in this sector.

330. **Recommendation 1: The GCF Board and Secretariat should capitalize on the Fund's position as the leading financier in CIEWS and prepare to assume a leadership role beyond 2027. The**

GCF Board should offer strategic guidance on GCF's intended role and designate CIEWS as a strategic priority under the USP-3. In turn, the Secretariat should operationalize this guidance aligned with the USP-3.

331. **Conclusion 2: Limited knowledge-sharing and knowledge brokering represent missed opportunities in the CIEWS investments.**

332. The GI states that "the Fund will be scalable and flexible and will be a continuously learning institution guided by processes for M&E. The Fund will strive to maximize the impact of its funding for adaptation and mitigation". The GCF is in the early stages of its knowledge management practices, which is broadly consistent with its organizational maturity but not yet sufficient to facilitate a larger knowledge brokering role and leadership. The GCF has a knowledge management strategy and action plan that is not yet fully implemented and institutionalized, but efforts are under way. This shortcoming is also apparent in the portfolio of CIEWS projects.

333. The discontinuation of the CIEWS sectoral guide in 2025 has heightened uncertainty regarding the GCF's technical and knowledge role in CIEWS projects. At present, the Fund does not provide a comprehensive or visible articulation of its experience or strategic approach in this area, resulting in missed opportunities for broader learning, engagement and influence. Existing GCF documents, including the SAP–CREW Scaling-up Framework, USP-2, and the WMO–GCF Developing the Climate Science Information for Climate Action, offer only limited context. They function primarily as frameworks or toolkits rather than as dedicated CIEWS knowledge resources. Furthermore, the inclusion of a CIEWS target in USP-2, on its own, is insufficient to enable meaningful cross-learning, representing a missed opportunity given GCF's extensive experience in CIEWS investments over the past decade.

334. Within the organization, respondents expressed differing views on GCF's knowledge-sharing role in CIEWS, likely reflecting the Fund's primary function as a secondary due diligence entity rather than as a dedicated knowledge broker. In practice, GCF largely adopts a passive approach to knowledge dissemination, primarily contributing to resources developed by other CIEWS stakeholders, including WMO, UNDRR, the Alliance for Hydromet Development, and the REAP.

335. Findings from this evaluation highlight several areas of practice where the GCF approach to CIEWS investments could benefit from greater clarity, knowledge-sharing, mutual learning and strengthening. These include, among others, operationalizing blended finance mechanisms for CIEWS, streamlining regional approaches to managing cross-boundary hazards, and strengthening partnerships with local actors to improve last-mile reach. Sharing these insights in accessible formats would facilitate broader knowledge exchange, promote complementarity and enhance coherence across the diverse CIEWS landscape.

336. **Recommendation 2: As a continuously learning institution, the GCF Secretariat should continue to shift towards a structure and operations that ensure learning and feedback loops across projects, countries and entities clearly and systematically. The Fund should share its CIEWS expertise with relevant CIEWS stakeholders to strengthen the GCF's role as a knowledge broker, besides its position as the leading financier in the CIEWS space.**

337. **Conclusion 3: GCF has succeeded in directing CIEWS investments towards countries most in need. Although GCF's CIEWS investments have achieved notable results at the project level, a full paradigm shift of climate information and early warning capabilities has yet to occur across the diverse contexts of participating countries.**

338. The evaluation finds that GCF demonstrates strong alignment with its mandate to serve those developing countries particularly vulnerable to the adverse effects of climate change, as set out in the GI. A comparative analysis of GCF investments by country and disaster risk data from the World Risk Index 2025 shows that the Fund's investments have largely targeted countries experiencing the highest levels of disaster risk, exposure and vulnerability. This highlights GCF's important role in strengthening countries' resilience as they pursue broader adaptation measures, including CIEWS.

339. However, the evaluation found that while GCF CIEWS investments have achieved notable results at the project level, persistent challenges remain at the portfolio level, and a full paradigm shift in climate information and early warning capabilities has yet to occur across the diverse contexts of participating countries.

340. The three pathway assessments show that gaps or weaknesses at any point along the value chain can compromise the overall effectiveness of the CIEWS portfolio, resulting in inconsistent delivery of climate services and warnings.

341. For example, the assessment of pathway 1, CIS, revealed that although GCF investments have improved meteorological infrastructure, including in fragile settings, persistent gaps exist in advanced climate modelling, user engagement and co-production of climate services, and long-term institutional capacity-building. Weak user engagement, in particular, highlights the need to build trust and co-develop a timely, reliable and usable climate information service tailored to end user needs and decision contexts.

342. Pathway 2, MHEWS, has improved the technical sophistication of EWS, but gaps remain between system design and operational delivery. These gaps are most evident in last-mile connectivity and cross-border coordination. The pathway 2 assessment also found a mismatch between stated objectives and actual conditions, as most projects continue to focus on single hazards rather than addressing multiple hazards.

343. Pathway 3, CIEWS for investments and financial decisions, performed relatively well despite being the youngest portfolio. However, a notable disconnect remains between financial mechanisms and the real-time usability of CIEWS, limiting the full potential of risk-informed finance.

344. The pathway assessments also revealed limitations in the current framing of the three paradigm-shifting pathways. Because the pathways often overlap and are not sufficiently granular to identify investment gaps by value chain, the evaluation disaggregated each pathway using value chain analysis to better assess portfolio-level performance. Without the ability to review CIEWS by value chain, the Fund cannot assess the maturity of each value chain and prioritize investments accordingly.

345. **Recommendation 3: The Fund should revise how it presents the paradigm-shifting pathways in the CIEWS operational guidance, as outlined in Recommendation 1. A clearer, more structured approach is needed to identify investment gaps across each country's CIEWS value chain. The revised pathways should align with global standards, including the six value chains of the GFCS and the MHEWS pillars.**

346. **Conclusion 4: The long-term sustainability of GCF CIEWS investments remains an ongoing concern. In some cases, project design and review processes do not adequately address long-term outcomes or account for the practical realities encountered during implementation in local contexts.**

347. The evaluation found that GCF FPs have at times exceeded national capacities, leading to implementation challenges and sustainability risks. Developing countries, especially LDCs and SIDS, often struggle to manage large GCF grants because of limited human and technical resources.

348. Mismatches between GCF investments and national capacity in NMHS or related agencies often stem from limited stakeholder consultations, insufficient gap analyses and feasibility studies during project design, and assumptions that newer or more advanced equipment and technology will automatically deliver greater effectiveness.

349. Many CIEWS proposals emphasize equipment-related investments, including basic observation networks, automated weather stations, weather radars and sea buoys. However, project designs often fail to account for the full cost of ownership, particularly long-term operational and maintenance requirements, leading to recurring sustainability issues. While organizations such as SOFF provide long-term, results-based financing to support the operation and maintenance of basic observation networks in developing countries, a collaboration framework between SOFF and climate funds, including the GCF, has not been fully utilized, resulting in missed opportunities.

350. Moreover, projects with a primary focus on CIEWS are often designed at the national level with NMHS and national disaster management agencies. As a result, local end users' needs, which are critical to the success of end-to-end impact-based EWS, are often overlooked. At the same time, evidence indicates that participatory and inclusive approaches introduced from the start of the project design consistently emerge as key success factors in driving sustained institutional and behavioural change at both national and local levels.

351. The evaluation also highlighted ongoing difficulties in engaging with the private sector and in establishing sustainable, revenue-generating CIEWS service models, exposing a gap between stated goals and practical realities. Although many CIEWS FPs include well-articulated exit strategies – such as securing public funding, generating revenue from commercial weather services, or cutting inefficient operating costs – these ambitions often remain unrealized by the end of project implementation, leading to continued reliance on grant-based financing from development partners.

352. In response to ongoing sustainability challenges, the evaluation found that CIEWS actors have increasingly applied CONOPS in observation-related infrastructure projects. This helps ensure the proposed system is fit for purpose and affordable beyond project lifespan.

353. **Recommendation 4: Across all stages of the project cycle, and particularly during project design, the GCF Secretariat should strengthen considerations of the sustainability of CIEWS investments. Such measures should consider including participatory needs assessments that engage both providers and end users of CIS, including women, IPs and other vulnerable groups, as well as comprehensive feasibility studies for revenue-generating activities undertaken by NMHS or related agencies.**

In addition, the Secretariat should strengthen its appraisals of CIEWS FPs to ensure that GCF-funded equipment serves its intended use, aligns with local institutional and technical capacity, and that post-project operation and maintenance are properly considered in the project design.

354. **Conclusion 5: The Fund faces difficulties in assessing portfolio-wide impacts and accurately identifying and estimating investment volumes for CIEWS projects.**

355. Analysis of reported results against the GCF PMFs and the IRMF reveals systematic measurement challenges across CIEWS investments.

356. Data reported by AEs against CIEWS-related PMF indicators – including A1.1 on expected losses, A6.2 on the use of climate information, A7.1 on usage by vulnerable groups, and A7.2 on people reached by warnings – continue to have quality issues. These issues include reporting intended (ex-ante) results rather than achieved (ex-post) results, inconsistent units of measurement and calculation, or transcription errors.

357. While GCF indicators for CIEWS represent a positive step towards tracking and reporting progress, they remain limited in their ability to capture the full breadth and quality of impacts, especially regarding last-mile interventions. For example, the indicators offer limited insight into whether beneficiaries are receiving timely warnings or information, understand the alerts, know appropriate responses, or have the resources to act on them.

358. The absence of more granular data means that existing indicators do not adequately capture the potential impact of EWS on those receiving alerts. Moreover, the limited and inconsistent application of standard CIEWS indicators across early warning initiatives hinders meaningful comparisons between projects and prevents the measurement of portfolio-wide impact using these corporate indicators.

359. The adoption of the Belém Adaptation Indicators at CMA7, followed by the two-year Belém-Addis Vision on Adaptation process to develop guidance on their operationalization, presents an opportunity for the Fund to engage and contribute to refining these indicators. This timeline also aligns with the scheduled 2026 review of the IRMF.

360. This evaluation also found that identifying CIEWS projects and estimating CIEWS investment amounts at the portfolio level continue to pose a challenge for CIEWS actors and climate funds, including the GCF. In response, the UNDRR developed the “Early warning systems taxonomy: Guide for tagging and tracking components of early warning systems” to improve the consistency and comparability of EWS data reported by multilateral actors, including the GCF.

361. With specific reference to GCF tagging practices, the evaluation team identified inconsistencies in the Secretariat’s CIEWS-tagging exercise. Some projects were tagged as CIEWS even though they did not meet the criteria. In contrast, other qualifying projects were not tagged, undermining the accuracy and reliability of the GCF CIEWS portfolio.

362. Furthermore, while the GCF routinely uses the term CIEWS in its documentation, including in USP-2, it lacks a formal definition, leading to inconsistent application across investments and identification of CIEWS projects. While the previous sectoral guide offered some conceptual clarity, its discontinuation has left the Fund without clear guidance on how to apply the term.

363. **Recommendation 5: The GCF Secretariat should leverage the 2026 review of the IRMF to align indicators with global best practices, including the Belém Adaptation Indicators. In doing so, the Secretariat should also consider additional measurement approaches capable of capturing the operational progress of CIEWS interventions and their outcomes at the community level. The primary objective should be to improve the monitoring of progress across CIEWS projects, thereby ensuring that the reported results are both reliable and suitable for comparison and impact measurement.**

The GCF Secretariat should formally define CIEWS as part of its operational guidance, as outlined in Recommendation 1, to ensure its consistent application across the portfolio. It

should also establish a clear CIEWS taxonomy, aligned with the revised framing of paradigm-shifting pathways set out in Recommendation 3, to address existing challenges in CIEWS-tagging and investment identification.

REFERENCES

GCF Board decisions

Decision B.07/04: Initial results management framework of the Fund.

Decision B.07/06 (a): Initial investment framework of the Fund.

Decision B.08/07: Mitigation and adaptation performance measurement frameworks.

Decision B.08/11: Revised programme of work on readiness and preparatory support.

Decision B.13/32: Country programming, readiness and preparatory support: Readiness and preparatory support.

Decision B.17/04: Matters related to guidance from the Conference of the Parties: complementarity and coherence.

Decision B.19/11: Indigenous Peoples Policy.

Decision B.22/11: Readiness and country programming: Readiness and Preparatory Support Programme: revised work programme and forward budget.

Decision B.22/08: Consideration of funding proposals.

Decision B.24/12: Updated Gender Policy and Action Plan 2020–2023.

Decision B.27/06: Updated Strategic Plan for the GCF for 2020–2023.

Decision B.BM-2021/15: Decision of the Board on the amendment to the Evaluation Policy for the GCF: Updated Terms of Reference of the Independent Evaluation Unit.

Decision B.29/01: Integrated results management framework and results tracking tool.

Decision B.32/06: Review of the initial private sector facility modalities and the private sector strategy.

Decision B.33/04: Readiness and Preparatory Support Programme: work programme and budget for 2022–2023.

Decision B.33/12: Steps to enhance climate rationale.

Decision B.36/13: Update of Strategic Plan for the GCF 2024–2027.

Decision B.37/20: Allocation parameters and portfolio targets under the GCF initial investment framework.

Decision B.37/21: Readiness and Preparatory Support Programme.

Decision B.39/15: Action plan on complementarity and coherence.

Decision B.42/13: Accreditation matters.

Decision B.42/14: Regional presence.

GCF Board documents

GCF/B.07/06: Investment Framework, May 9, 2014.

GCF/B.09/07: Further Development of the Initial Investment Framework: Subcriteria and Methodology, February 23, 2015.

GCF/B.22/08: Readiness and Preparatory Support Programme: Strategy for 2019-2021 and Work Programme 2019, February 1, 2019.

GCF/B.33/05: Steps to enhance the climate rationale of GCF-supported activities, June 24, 2022.

GCF/B.39/10: Guidance from the twenty-eighth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change: Co-Chairs' proposal, June 24, 2024.

GCF/B.40/14: Independent Evaluation Unit 2025 workplan and budget and update of its three-year rolling objectives, October 4, 2024.

GCF/B.40/Inf.05: Readiness and Preparatory Support Programme – annual report on implementation 2023, September 30, 2024.

GCF/B.41/Inf.13: Status of the GCF resources, pipeline and portfolio, February 4, 2025.

GCF/B.42/04/Add.03: Updated monitoring and accountability framework for accredited entities, June 11, 2025.

GCF/B.43/Inf.07/Add.01: Annual update on complementarity and coherence, October 8, 2025.

GCF/B.43/Inf.11: Readiness and Preparatory Support Programme and Project Preparation Facility – annual report on implementation 2024, October 10, 2025.

Other sources

Academy of Disaster Reduction and Emergency Management, Ministry of Emergency Management – Ministry of Education, School of National Safety and Emergency Management, Beijing Normal University, National Disaster Reduction Center of China, Ministry of Emergency Management, and International Federation of Red Cross and Red Crescent Societies. *2021 Global Natural Disaster Assessment Report*. 2022. https://reliefweb.int/report/world/2021-global-natural-disaster-assessment-report#:~:text=The%20natural%20disasters%20mainly%20included,collaborative%20research%20toward%20that%20end.

Academy of Disaster Reduction and Emergency Management, Ministry of Emergency Management – Ministry of Education, School of National Safety and Emergency Management, Beijing Normal University, National Disaster Reduction Center of China – Ministry of Emergency Management, China Association for Disaster Prevention, and Integrated Research on Disaster Risk. *2024 Global Natural Disaster Assessment Report*. October 2025. https://www.preventionweb.net/publication/documents-and-publications/2024-global-natural-disaster-assessment-report.

Adaptation Fund. *Strengthening Resilience through Disaster Risk Reduction and Early Warning Systems Interventions: Experiences and Lessons Learned from the Adaptation Fund Portfolio*. Adaptation Fund, 2023. https://www.adaptation-fund.org/wp-content/uploads/2023/10/Disaster-Risk-Report-10.18.pdf.

Alliance for Hydromet Development. *Hydromet Gap Report 2024*. Alliance for Hydromet Development, 2024. https://alliancehydromet.org/wp-content/uploads/2025/03/Hydromet-Alliance-Gap-Report-2024.pdf.

Argent, Robert, Jan Daňhelka, Marcelo Medeiros and Dominique Berod. "Hydrological Data Exchange." World Meteorological Organization, October 7, 2021. https://wmo.int/media/magazine-article/hydrological-data-exchange.

Baek, Hanna, Soledad Barone, Martín Dellavedova, Alejandro González-Caro, Eric Müller, Andreas Reumann et al. "The Fourth Evaluability Assessment." Independent Evaluation Unit, Green Climate Fund, 2026. https://ieu.greenclimate.fund/document/fourth-evaluability-assessment.

Budimir, Mirianna, Robert Šakić Trogrlić, Cinthia Almeida, Miguel Arestegui, Orlando Chuquisengo Vásquez, Abel Cisneros et al. "Opportunities and Challenges for People-Centered Multi-Hazard Early Warning Systems: Perspectives from the Global South." *iScience*28, issue 5, 112353 (2025). https://doi.org/10.1016/j.isci.2025.112353.

Climate Fund Explorer. Climate Fund Search. Accessed October 2025. https://climateprojectexplorer.org/.

Climate Investment Funds. *Independent Evaluation of the Pilot Program for Climate Resilience of the Climate Investment Funds.* Climate Investment Funds, 2025. https://www.cif.org/sites/cif_enc/files/meeting-documents/ppcr-final-evaluation-report_april-2025.pdf.

Climate Risk and Early Warning Systems. "Analytical Paper to guide the development of Operational Procedures on CREWS Programming in FCV settings." Climate Risk and Early Warning Systems, 2024. https://crews-initiative.org/wp-content/uploads/2024/11/CREWS-Operational-Procedures-FCV-Final-Oct-2024.pdf.

Climate Risk and Early Warning Systems. "CREWS Operational Procedures Note 6: Private Sector Engagement." Climate Risk and Early Warning Systems, 2023. https://crews-initiative.org/wp-content/uploads/2024/12/20231130_CREWS_Operational-Procedures-Note-6_webpages.pdf.

Climate Risk and Early Warning Systems. "Financials." Last updated December 31, 2024. https://crews-initiative.org/reports/annual-report-2024/financials/.

Climate Risk and Early Warning Systems. "*Governance Document.*" Climate Risk and Early Warning Systems, 2019. https://public.wmo.int/sites/default/files/2023-07/CREWS_Governance_Document_Revised_November_2019.pdf.

Climate Risk and Early Warning Systems. "In numbers." Climate Risk and Early Warning Systems, 2025. https://crews-initiative.org/in-numbers/#:~:text=SHARE,0.

Early Warnings for All. "The Early Warnings for All (EW4All) initiative." Accessed October 2025. https://earlywarningsforall.org/site/early-warnings-all.

Fund for Responding to Loss and Damage. "The Fund for responding to Loss and Damage Launches Call for Funding Requests at COP30, Marking Historic Milestone from Promise to Action." Press release, November 10, 2025. https://www.frld.org/sites/default/files/Press%20Release_Call%20for%20Funding%20Requests%20at%20COP30%20%282%29_0.pdf.

Garnak, Asger. "The Supply Side of Country Platforms." Discussion Paper. Concito, 2025. https://concito.dk/files/media/document/Discussion%20paper%20-%20The%20supply%20side%20of%20country%20platforms.pdf.

Global Disaster Preparedness Center and Integrated Risk Management Associates LLC. *Inclusive Early Warning Early Action for the 'Last Mile: A Meta-Synthesis of 15 National Research Reports*. Global Disaster Preparedness Center and Integrated Risk Management Associates LLC, forthcoming.

Global Environment Facility Independent Evaluation Office. *Evaluation of GEF Support to Climate Information and Early Warning Systems (CIEWS)*. Global Environment Facility, January 8, 2024. https://www.gefieo.org/en/types/evaluations/ciews-2024.

Global Shield. "A toolbox of tailored CDRFI instruments for the Global Shield." Accessed May 30, 2025. https://www.globalshield.org/instruments-offer-financial-tools/.

Green Climate Fund and Climate Risk and Early Warning Systems. *GCF SAP—CREWS Scaling-up Framework for Early Warning*. Green Climate Fund, June 2025. https://www.greenclimate.fund/document/gcf-sap-crews-scaling-framework-early-warning.

Green Climate Fund. "Country platforms: Green Climate Fund Approach, Available Support and Impact." GCF Readiness Information session #9, June 2025. gcf-readiness-information-session-country-platforms-june-2025.pdf.

Green Climate Fund. "Executive Director unveils "50 by 30" blueprint for reform, targeting USD 50 billion by 2030." News update, September 22, 2023. https://www.greenclimate.fund/news/executive-director-unveils-50by30-blueprint-reform-targeting-usd-50-billion-2030.

Green Climate Fund. "Fourteen new Country Platforms announced in collaboration with GCF to drive country-led climate solutions." Press release, November 11, 2025. https://www.greenclimate.fund/news/fourteen-new-country-platforms-announced-collaboration-gcf-drive-country-led-climate-solutions.

Green Climate Fund. "FP092: Gender Assessment." Green Climate Fund, 2019. https://www.greenclimate.fund/sites/default/files/document/gender-assessment-fp092-afdb-multiple-countries.pdf.

Green Climate Fund. "GCF and WMO agree to strengthen science in climate response." Press release, December 11, 2018. https://www.greenclimate.fund/news/gcf-and-wmo-agree-to-strengthen-science-in-climate-response.

Green Climate Fund. "GCF Appraisal Guidance: A comprehensive guide to the tools and due diligence processes used to review and assess concept notes and funding proposals." Green Climate Fund, 2022.

Green Climate Fund. "GCF in Brief: Locally Led Climate Action." Green Climate Fund, 2025. https://www.greenclimate.fund/document/locally-led-climate-action.

Green Climate Fund. "GCF leaves COP30 ready to ramp up climate finance." News, November 27, 2025. https://www.greenclimate.fund/news/gcf-leaves-cop30-ready-ramp-climate-finance.

Green Climate Fund. "GCF Technical Expert Meeting on Climate Information, Early Warning and Disaster Risk Reduction Services." May 16, 2019. https://www.greenclimate.fund/event/gcf-technical-expert-meeting-climate-information-early-warning-and-disaster-risk-reduction.

Green Climate Fund. "GCF's Locally Led Climate Action framework and guidance." Green Climate Fund, 2025. https://www.greenclimate.fund/document/gcf-s-locally-led-climate-action-framework-and-guidance.

Green Climate Fund. "Project Preparation Facility." Accessed October 2025. https://www.greenclimate.fund/projects/ppf.

Green Climate Fund. "Project specific assessment approach." Last updated February 1, 2026. https://www.greenclimate.fund/projects/psaa.

Green Climate Fund. "Resource mobilisation, GCF-2." Accessed May 2025. https://www.greenclimate.fund/about/resource-mobilisation/gcf-2.

Green Climate Fund. "SAP048: Strengthening the resilience of vulnerable communities within high climatic and disaster risk areas in Togo." Funding proposal. Green Climate Fund, March 12, 2025.

https://www.greenclimate.fund/document/strengthening-resilience-vulnerable-communities-within-high-climatic-and-disaster-risk-0.

Green Climate Fund. "Simplified Approval Process." Accessed October 2025. https://www.greenclimate.fund/projects/sap.

Green Climate Fund. "Strategic Planning of Readiness Support: Guide for Countries." Green Climate Fund, 2025. https://www.greenclimate.fund/sites/default/files/document/3-guide-countries-strategic-planning-readiness-support_0.pdf.

Green Climate Fund. "Sustainability guidance note: screening and categorizing GCF-financed activities." Green Climate Fund, 2019. https://www.greenclimate.fund/sites/default/files/document/sustainability-guidance-note-screening-and-categorizing-gcf-financed-activities.pdf.

Green Climate Fund. About us – Secretariat, Structure. Accessed October 2025. https://www.greenclimate.fund/about/secretariat#structure.

Green Climate Fund. *CIEWS Strategic Programming Summary*. Green Climate Fund (2024).

Green Climate Fund. *Governing Instrument*. Green Climate Fund, 2011. https://www.greenclimate.fund/document/governing-instrument.

Green Climate Fund. *Multilateral Climate Funds Joint Results Report*. November 2025. https://www.greenclimate.fund/document/multilateral-climate-funds-joint-results-report.

Green Climate Fund. *Sectoral Guide: Climate Information and Early Warning Systems*. Green Climate Fund, 2022.

Heureux, Ana. "Global Basic Observing Network (GBON) Systematic Observations Financing Facility Workshop." Presentation at Meteorological Technology World Expo 2024, September 24, 2024. https://wmo.int/sites/default/files/2025-07/Global%20Basic%20Observing%20Network%20%28GBON%29%20Systematic%20Observations%20Financing%20Facility%20%28SOFF%29%20Workshop.pdf.

Hochrainer-Stigler, S., and K. Reiter. "Risk-Layering for Indirect Effects." *International Journal of Disaster Risk Science* 12 (2021): 770–778. https://pure.iiasa.ac.at/id/eprint/17403/1/Hochrainer-Stigler-Reiter2021_Article_Risk-LayeringForIndirectEffect.pdf.

Humanitarian Data Exchange. "World Risk Index." Last update September 24, 2025. https://data.humdata.org/dataset/worldriskindex.

Independent Evaluation Unit. *Independent Evaluation of the GCF's Approach to and Portfolio of Climate Information and Early Warning System Interventions (CIEWS): Approach Paper*. Independent Evaluation Unit, Green Climate Fund, June 2025. https://ieu.greenclimate.fund/document/ciews2025-approachpaper.

Independent High-Level Expert Group. *Accelerating Sustainable Finance for Emerging Markets and Developing Economies: Independent High-Level Expert Group Review of the Vertical Climate and Environmental Funds*. Independent High-Level Expert Group, October 2024. https://g20sfwg.org/wp-content/uploads/2024/10/G20-IHLEG-VCEF-Review.pdf.

Inter-American Development Bank. "Disaster Risk Reduction Investment Profile Cost-Benefit Analysis of Public Investment for Vulnerability Reduction in Terms of Future GDP Growth: Technical Framework and Methodology Report." Inter-American Development Bank, 2022. https://publications.iadb.org/en/disaster-risk-reduction-investment-profile-cost-benefit-analysis-public-investment-vulnerability.

Interagency Gender Working Group. "The Gender Integration Continuum." Population Reference Bureau, 2017.

Intergovernmental Panel on Climate Change. "Determinants of Risk: Exposure and Vulnerability." In *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, edited by C.B. Field, V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi et al., Cambridge University Press, 2012. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap2_FINAL-1.pdf.

Intergovernmental Panel on Climate Change. "Weather and Climate Extreme Events in a Changing Climate." In *Climate Change 2021: The Physical Science Basis*. Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, 2023. https://doi.org/10.1017/9781009157896.013.

Intergovernmental Panel on Climate Change. *Climate Change 2021: The Physical Science Basis*. Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. 2021. https://www.ipcc.ch/report/ar6/wg1/.

Intergovernmental Panel on Climate Change. *Climate Change 2023: Synthesis Report*. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, 2023. https://www.ipcc.ch/report/ar6/syr/.

Intergovernmental Panel on Climate Change. *Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, 2022. https://www.ipcc.ch/report/ar6/wg2/.

Intergovernmental Panel on Climate Change. *Special Report on the Ocean and Cryosphere in a Changing Climate.* Cambridge University Press, 2019. https://www.ipcc.ch/srocc/.

International Federation of Red Cross and Red Crescent Societies. "Community early warning systems: guiding principles." International Federation of Red Cross and Red Crescent Societies, 2012. https://www.ifrc.org/sites/default/files/CEWS-Guiding-Principles-EN.pdf.

International Federation of Red Cross and Red Crescent Societies. "Early Warnings for All." Accessed October 2025. https://www.ifrc.org/our-work/disasters-climate-and-crises/climate-smart-disaster-risk-reduction/early-warnings-all.

Jacob, Daniela, Asun Lera St. Clair, Roché Mahon, Simon Marsland, Mzime Ndebele, Carlo Buontempo et al. "Co-production of climate services: challenges and enablers." *Frontiers in Climate* 7:1507759. https://doi.org/10.3389/fclim.2025.1507759.

Krüger, Cornelius, and Jyotsna Puri. "Going the Last Mile: Behavioural Science and Investments in Climate Change Mitigation and Adaptation." Independent Evaluation Unit, Green Climate Fund, 2020. https://ieu.greenclimate.fund/document/going-last-mile-behavioural-science-and-investments-climate-change-mitigation-and.

Moriniere, Lezlie, Marilise Turnbull, Randi Rumbold and Michael Moses. *Context Counts: Cultivating Community Disaster Preparedness Amid Complexity*. Margaret A. Cargill Philanthropies, 2025. https://www.macphilanthropies.org/highlights/context-counts-cultivating-community-disaster-preparedness-amid-complexity/.

Organisation for Economic Co-operation and Development. *Infrastructure for a Climate-Resilient Future*. OECD Publishing, 2024. https://doi.org/10.1787/a74a45b0-en.

Repnik, Markus, and Vladimir Tsirkunov. "The Alliance for Hydromet Development." *World Meteorological Organization*, April 23, 2019. https://wmo.int/media/magazine-article/alliance-hydromet-development.

Risk-informed Early Action Partnership. "Partners." Accessed October 2025. https://www.early-action-reap.org/reap-partners.

Risk-informed Early Action Partnership. *Strategy 2030: Uniting for Risk-informed Early Action at Scale*. Risk-informed Early Action Partnership, 2025. https://www.early-action-reap.org/reap-2030-strategy.

Rogers, David P., Michael Staudinger, Vladimir Tsirkunov, Makoto Suwa and Haleh Kootval. "Affordability of National Meteorological and Hydrological Services." World Bank Group, 2022. http://documents.worldbank.org/curated/en/099834505052213398.

Systematic Observations Financing Facility. "Dashboard." Accessed October 2025. https://un-soff.org/dashboard/.

Systematic Observations Financing Facility. "Signed Framework for Collaboration for enhancing Systematic Observation." Systematic Observations Financing Facility, 2023. https://www.un-soff.org/document/signed-framework-for-collaboration-for-enhancing-systematic-observation/.

Systematic Observations Financing Facility. "SOFF Brochure." Systematic Observations Financing Facility, 2025. https://un-soff.org/document/soff-brochure/.

Systematic Observations Financing Facility. *SOFF Impact Bond: Catalyzing Innovative Finance for Global Resilience—Scaling Access to Climate and Weather Data through the SOFF Impact Bond*. Systematic Observations Financing Facility, 2025. https://www.un-soff.org/document/soff-impact-bond/.

United Nations Development Programme. "Private Sector Engagement in Climate Information Services and Early Warning System in Cambodia: Feasibility study." United Nations Development Programme, 2020. https://www.adaptation-undp.org/sites/default/files/resources/cis_private_sector_engagement_cambodia_-_june_30_-_final_draft.pdf.

United Nations Development Programme. *Interim evaluation of SAP022: Enhancing Multi-hazard Early Warning System to Increase Resilience of Uzbekistan Communities to Climate Change Induced Hazards Project*. United Nations Development Programme, 2024. https://www.greenclimate.fund/sites/default/files/document/sap022-interim-evaluation-report-pub.pdf.

United Nations Framework Convention on Climate Change. “Adaptation knowledge portal.” Accessed October 2025. https://www4.unfccc.int/sites/NWPStaging/pages/home.aspx.

United Nations Framework Convention on Climate Change. “Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation referred to in decision 7/CMA.3.” Sessional proceedings. United Nations Framework Convention on Climate Change, December 13, 2023. https://unfccc.int/documents/636595.

United Nations Framework Convention on Climate Change. “Global Goal on Adaptation.” Accessed October 2025. https://unfccc.int/topics/adaptation-and-resilience/workstreams/gga.

United Nations Framework Convention on Climate Change. “Introduction.” Accessed October 2025. https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction.

United Nations Framework Convention on Climate Change. “Matters relating to adaptation.” CMA7, November 10–21, 2025. https://unfccc.int/sites/default/files/resource/cma2025_L25_adv.pdf.

United Nations Framework Convention on Climate Change. "Parties to the United Nations Framework Convention on Climate Change." Accessed February 25, 2026. https://unfccc.int/process/parties-non-party-stakeholders/parties-convention-and-observer-states?fi…

United Nations Framework Convention on Climate Change. Local and Indigenous Knowledge Systems (LINKS). Accessed October 2025. https://lcipp.unfccc.int/node/283.

United Nations Framework Convention on Climate Change. Pledges to the Fund for Responding to Loss and Damage. Accessed October 2025. https://unfccc.int/topics/climate-finance/funds-entities-bodies/fund-for-responding-to-loss-and-damage/pledges-to-the-fund-for-responding-to-loss-and-damage.

United Nations Framework Convention on Climate Change. Risk-informed Early Action Partnership (REAP). Updated 2024. https://climateaction.unfccc.int/Initiatives?id=Risk_informed_Early_Action_Partnership#:~:text=REAP%20was%20launched%20at%20the,progress%20against%20the%20targets;%20g.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. *Global status of multi-hazard early warning systems: Target G*. United Nations Office for Disaster Risk Reduction, 2022. https://www.undrr.org/media/84088/download?startDownload=20260113.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. *Global Status of Multi-Hazard Early Warning Systems 2023*. United Nations Office for Disaster Risk Reduction, 2023. https://www.undrr.org/reports/global-status-MHEWS-2023.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. *Global Status of Multi-Hazard Early Warning Systems 2024*. United Nations Office for Disaster Risk Reduction, 2024. https://www.undrr.org/reports/global-status-MHEWS-2024.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. *Global Status of Multi-Hazard Early Warning Systems 2025*. United Nations Office for Disaster Risk Reduction, 2025. https://library.wmo.int/records/item/69684-global-status-of-multi-hazard-early-warning-systems-2025.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. *Early Warning Systems Taxonomy: A guide for tagging and tracking components of early warning systems*. United Nations Office for Disaster Risk Reduction, 2025. https://www.preventionweb.net/media/101624/download?startDownload=20250128.

United Nations Office for Disaster Risk Reduction and World Meteorological Organization. “Global Observatory for EWS Investments.” Early Warning for All, Dashboards. Accessed October 25, 2025. https://earlywarningsforall.org/site/early-warnings-all/dashboards/global-observatory-ews-investments.

United Nations Office for Disaster Risk Reduction, *The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030*. United Nations Office for Disaster Risk Reduction, 2023. https://www.undrr.org/publication/report-midterm-review-implementation-sendai-framework-disaster-risk-reduction-2015-2030.

United Nations Office for Disaster Risk Reduction. “Advisory Panel Joint Statement of the Early Warnings for All Initiative and Priority Actions.” Accessed December 15, 2025. https://www.undrr.org/publication/documents-and-publications/advisory-panel-joint-statement-early-warnings-all-initiative.

United Nations Office for Disaster Risk Reduction. “Early Warnings for All.” Accessed October 2025. https://www.undrr.org/implementing-sendai-framework/sendai-framework-action/early-warnings-for-all.

United Nations Office for Disaster Risk Reduction. *Linking Disaster Risk Reduction and Poverty Reduction*. United Nations Office for Disaster Risk Reduction, 2008. https://www.preventionweb.net/files/3293_LinkingDisasterRiskReductionPovertyReduction.pdf.

United Nations Office for Disaster Risk Reduction. *Sendai Framework for Disaster Risk Reduction 2015–2030*. United Nations Office for Disaster Risk Reduction, 2015. https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030.

United Nations Office for Disaster Risk Reduction. Sendai Framework Monitor. Updated April 1, 2025. https://sendaimonitor.undrr.org/.

United Nations Office for Disaster Risk Reduction. *The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030*. United Nations Office for Disaster Risk Reduction, 2023. https://www.undrr.org/publication/report-midterm-review-implementation-sendai-framework-disaster-risk-reduction-2015-2030.

Wagner, Marie. *Early Action: The State of Play 2023*. Risk-informed Early Action Partnership, 2024. https://www.early-action-reap.org/early-action-state-play-2023.

World Bank. "Charting a Course for Sustainable Hydrological and Meteorological Networks in Developing Countries." Feature story, October 11, 2022. https://www.worldbank.org/en/news/feature/2022/10/11/charting-a-course-for-sustainable-hydrological-and-meteorological-networks.

World Bank. "Sendai Framework Monitor (SFM)." Data 360. Accessed December 11, 2025. https://data360.worldbank.org/en/dataset/UNDRR_SFM.

World Bank. *The Power of Partnership: Public and Private Engagement in Hydromet Services*. World Bank, 2019. https://www.gfdrr.org/sites/default/files/publication/The%20Power%20of%20Partnership_WEB.pdf.

World Meteorological Organization and Green Climate Fund. "Developing the Climate Science Information for Climate Action." WMO-No. 1287. World Meteorological Organization, 2022. https://unfccc.int/sites/default/files/resource/WMO_Developing_the_Climate_Science_Information_For_Climate_Action.pdf.

World Meteorological Organization. *"*Cairo Roundtable advances on Early Warnings for All*."* News, September 12, 2022. https://wmo.int/media/news/cairo-roundtable-advances-early-warnings-all#:~:text=Participants%20included%20representatives%20of%20the,gave%20the%20Egyptian%20NMHS%20perspective.

World Meteorological Organization. "Climate Services for Supporting Climate Change Adaptation: Supplement to the Technical Guidelines for The National Adaptation Plan Process*."* WMO-No. 1170. World Meteorological Organization, 2016. https://unfccc.int/sites/default/files/resource/WMO_Climate_Services_for_Supporting_CCA.pdf.

World Meteorological Organization. "CREWS Launches 2030 Strategy at COP30 to Scale Early Warnings for All." News, November 10, 2025. https://wmo.int/media/news/crews-launches-2030-strategy-cop30-scale-early-warnings-all.

World Meteorological Organization. "Current Status of the Implementation of National Frameworks for Climate Services (NFCS)." Updated October 13, 2023. https://gfcs.wmo.int/site/global-framework-climate-services-gfcs/components-of-gfcs/current-status-of-implementation-of-national-frameworks-climate-services-nfcs.

World Meteorological Organization. "GBON – Global Basic Observing Network." Accessed October 2025. https://community.wmo.int/en/activity-areas/wigos/gbon.

World Meteorological Organization. "Guidelines for Public-Private Engagement." WMO-No. 1258. World Meteorological Organization, 2024. https://wmo.int/media/announcement/guidelines-public-private-engagement-wmo-no-1258-have-been-updated-and-available-all-six-official.

World Meteorological Organization. "Seamless prediction of the Earth system: From minutes to months." WMO-No. 1156. World Meteorological Organization, 2015. https://library.wmo.int/viewer/54696?medianame=wmo_1156_en_#page=1&viewer=picture&o=bookmark&n=0&q=.

World Meteorological Organization. "Strengthening Climate Resilience: Progress on the Global Observatory for EWS Finance Tracking." Project update, January 24, 2025. https://wmo.int/media/project-update/strengthening-climate-resilience-progress-global-observatory-ews-finance-tracking.

World Meteorological Organization. "Tracking funding for life-saving early warning systems." News, February 12, 2025. https://wmo.int/media/news/tracking-funding-life-saving-early-warning-systems-0.

World Meteorological Organization. "WMO and Green Climate Fund join to support low carbon, climate resilient development." News, December 10, 2018. https://wmo.int/media/wmo-and-green-climate-fund-join-support-low-carbon-climate-resilient-development.

World Meteorological Organization. *2019 State of Climate Services: Agriculture and Food Security*. World Meteorological Organization, 2019. https://wmo.int/publication-series/2019-state-of-climate-services-agriculture-and-food-security.

World Meteorological Organization. *2020 State of Climate Services: Risk Information and Early Warning Systems*. World Meteorological Organization, 2020. https://wmo.int/publication-series/2020-state-of-climate-services-risk-information-and-early-warning-systems.

World Meteorological Organization. *2024 State of Climate Services: Five-year Progress Report (2019–2024)*. World Meteorological Organization, 2024. https://library.wmo.int/idurl/4/69061.

World Meteorological Organization. *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)*. World Meteorological Organization, 2021. https://library.wmo.int/index.php?lvl=notice_display&id=21930.

World Meteorological Organization. *Early Warnings for All: Executive Action Plan 2023–2027*. World Meteorological Organization, 2022. https://www.un.org/en/climatechange/early-warnings-for-all.