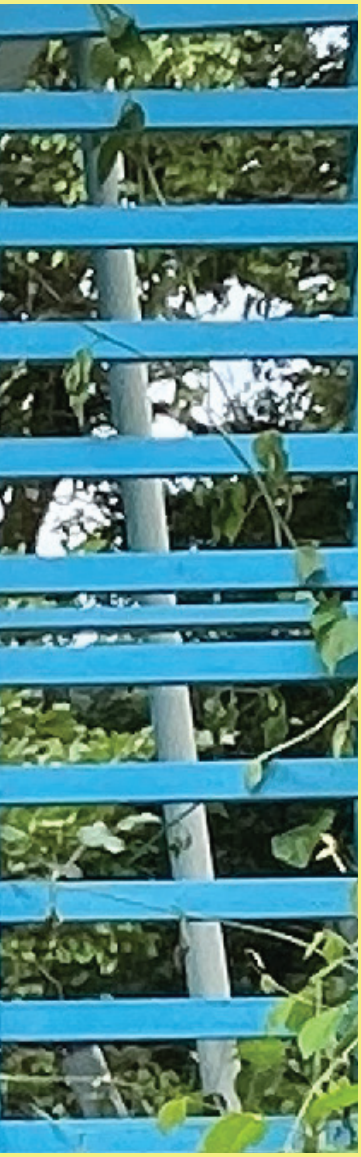
Independent Evaluation Office
GLOBAL ENVIRONMENT FACILITY

20 ANNIVERSARY

GEF Support to Climate Information and Early Warning Systems

An Evaluation Report by the GEF IEO

2025 | March



GEF Support to Climate Information and Early Warning Systems

Evaluation Report No. 169
March 2025

Independent Evaluation Office
GLOBAL ENVIRONMENT FACILITY
20 ANNIVERSARY

1818 H Street, NW, Washington, DC 20433
Internet: www.gefieo.org/; email: gefevaluation@thegef.org

This report was presented to the GEF Council in June 2023.

ISBN: 978-1-64233-054-0

Task Team Leader: Anna Birgitta Viggh, aviggh@thegef.org
Chief Evaluation Officer: Geeta Batra

Cover design: AM Mascia Design + Illustration Inc.
Interior design and layout: Nita Congress
Editing: Karen Holmes
Cover photo: A combined pump station and office building in Hojancha, Guanacaste Province, Costa Rica, supported by the GEF through a Special Climate Change Fund project aimed at strengthening the capacities of rural aqueduct associations to address climate change risks in water-stressed communities. Photo by Anna Viggh, GEF IEO.

All dollar amounts are U.S. dollars unless otherwise indicated.

GEF replenishment periods: **Pilot phase:** 1991–94; **GEF-1:** 1995–98; **GEF-2:** 1999–2002; **GEF-3:** 2003–06; **GEF-4:** 2006–10; **GEF-5:** 2010–14; **GEF-6:** 2014–18; **GEF-7:** 2018–22; **GEF-8:** 2022–26

Contents

Tables

Foreword

Utilizing climate information and early warning systems (CIEWS) is crucial for reducing vulnerability to climate change impacts and enhancing climate resilience. Expanding CIEWS and integrating it with disaster risk reduction and management strategies has proven effective in lowering mortality rates in regions affected by major disasters. The Global Environment Facility (GEF) has supported CIEWS primarily through its adaptation funds—namely the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF). These funds have incorporated CIEWS into their climate change adaptation strategies since 2010. The LDCF and SCCF have provided significant support to least developed countries and small island developing states, which bear a disproportionate burden of disaster-related economic losses relative to the overall size of their economies.

This evaluation reviewed projects addressing CIEWS and assessed their relevance, results, and sustainability to identify lessons for future programming. The evaluation found that projects and interventions focused on CIEWS have generally performed well. However, challenges persist in integrating early action measures with disaster events and in transforming CIEWS knowledge into actionable and accessible information, often referred to as the critical "last mile." To overcome the last mile challenge, GEF projects must prioritize community engagement, capacity building, and the development of tailored communication strategies to address the specific needs and challenges of remote and vulnerable communities.

The CIEWS evaluation findings were presented to the 66th GEF Council meeting in February 2024. The Council took note of the evaluation recommendations and endorsed the management response to address them. Through this report, the GEF Independent Evaluation Office intends to share the lessons from this evaluation with a wider audience.

Geeta Batra
Director, GEF Independent Evaluation Office

Acknowledgments

Anna Viggh, Senior Evaluation Officer in the Global Environment Facility Independent Evaluation Office (GEF IEO) led this evaluation. Core evaluation team members included Molly Watts Sohn, then an IEO Evaluation Analyst; Rasec Niembro, IEO Evaluation Analyst; and consultants Skye Turner-Walker and Veena Ramachandran. Country case studies were conducted by Anna Viggh, Rasec Niembro, and Ariana Araujo Resenterra (Costa Rica), Skye Turner-Walker and Erneus Kaijage (Tanzania), and Skye Turner-Walker (Tonga). Neeraj Kumar Negi, IEO Senior Evaluation Officer, provided comments on the draft report as well as the internal peer review. The evaluation benefited from oversight and support from Geeta Batra, Chief Evaluation Officer and GEF IEO Director since April 2024; and Juha Uitto, GEF IEO Director until March 2024.

Marie-Constance Manuella Koukoui, Senior Executive Assistant, supported the evaluation team; Juan Jose Portillo, Senior Operations Officer, provided operations/administrative oversight. Karen Holmes edited the report, and Nita Congress designed and laid out the publication and provided editorial quality control.

The GEF Secretariat, as well as many of the GEF Agencies, provided information, data, and insights during interviews and meetings. Critical information was provided during the country case study work by the GEF focal points, national and local government staff, GEF Agencies, and civil society organizations in the three case study countries.

The GEF IEO is deeply grateful to all these individuals and institutions for their contributions, which were critical to the success of the evaluation. Final responsibility for this report remains firmly with the Office.

Abbreviations

CIEWS	climate information and early warning systems
CREWS	climate risk and early warning system
EWS	early warning system
GCF	Green Climate Fund
GEF	Global Environment Facility
IEO	Independent Evaluation Office
LDC	least developed country
LDCF	Least Developed Countries Fund
SCCF	Special Climate Change Fund
SIDS	small island developing states
UN	United Nations
UNDP	United Nations Development Programme
WMO	World Meteorological Organization

Executive summary

Climate information and early warning systems (CIEWS) play a crucial role in diminishing vulnerability to climate change impacts and fostering climate change resilience. Globally, there is growing recognition of the significance of CIEWS, which have become integral to climate change adaptation. The expansion of CIEWS, when integrated with disaster risk reduction and management, has demonstrated effectiveness in lowering mortality rates in regions affected by major disasters. Moreover, investments in CIEWS consistently reveal a robust benefit-to-cost ratio, showcasing their potential to not only safeguard lives but also to protect valuable assets. CIEWS are noted in the programming strategy of the Global Environment Facility (GEF) on adaptation to climate change and were designated one of the four priority themes in the 2022–26 strategy for the GEF's Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF). These two funds are the principal vehicles for the GEF's efforts to support climate change adaptation, especially in least developed countries (LDCs) and small island developing states, which bear a disproportionate burden of disaster-related economic losses relative to the overall size of their economies.

This evaluation aims to understand how projects funded by the GEF Trust Fund, the LDCF, and the SCCF have incorporated CIEWS into their programming strategies. Additionally, it seeks to provide evidence on the performance of these interventions through an assessment of their relevance, results, and sustainability. The overarching objective is to inform future GEF programming on CIEWS by offering valuable insights into successful areas and identifying aspects that require additional focus for achieving sustainable outcomes.

Key findings and conclusions

GEF support for CIEWS demonstrates a strong alignment with the GEF Trust Fund and LDCF/SCCF strategies and remains highly relevant to the distinctive circumstances and challenges in various contexts. GEF projects were responsive to the demands of beneficiary countries and driven by recognition of the need for CIEWS. These needs were shaped by geography, climate-related hazards, and specific national requests. Additionally, there was strong alignment between projects and the global distribution of climate-related hazards, particularly in Africa.

GEF projects have faced challenges in effectively transitioning from their primary focus on supporting early warning systems to fully integrating early action measures within disaster events. While GEF projects have improved the generation of climate information and early warnings, evidence indicates a lack of systematic knowledge transfer for appropriate responses in disasters. Furthermore, limited attention has been dedicated to fostering community-level risk awareness and building capacity for appropriate responses among the population. The success of translating warnings into actions depends on, among other factors,

comprehensive national and local plans, coupled with communication infrastructure and knowledge for effective response.

GEF CIEWS projects performed strongly in terms of effectiveness, but the long-term sustainability of their outcomes remains uncertain. Although GEF CIEWS projects have encountered challenges, particularly in the realms of communication and preparedness activities, they have collectively achieved success in fulfilling objectives across various CIEWS domains, notably in facilitating warning services through infrastructure development and capacity building. Nevertheless, sustaining funding and resources for the main outcomes generated by GEF projects is not guaranteed in the long term since meeting the costs of CIEWS operation and maintenance is often challenging, especially for LDCs.

There are noteworthy successes in effectively incorporating CIEWS components into existing systems, leveraging technologies, and enhancing the results of other interventions. GEF CIEWS projects consistently integrated and capitalized on preexisting services and platforms. Through synergies with established services, CIEWS interventions targeted the mitigation of gaps within the climate information value chain. This approach sought to broaden information accessibility and stimulated user adoption and application of climate information services. Moreover, these GEF projects have shown a substantial catalytic potential. They have established a robust foundation for continuing their impacts, and have often been subsequently or additionally financed by other climate funds to involve larger-scale interventions and greater financial resources, enhancing their transformative capacity.

Notable progress has been made in the development of infrastructure and capacity building for CIEWS, although a critical "last mile" challenge persists. While GEF projects have successfully enhanced forecasting capabilities, including strengthening the institutional capacity of meteorological offices in LDCs and their ability to use CIEWS, the need remains to transform this knowledge into actionable and accessible information. GEF projects have not consistently accounted for the challenges in project implementation at the last mile of service delivery, particularly in the distribution of climate information and warnings to local communities often marginalized by disaster risk reduction strategies. These communities require special consideration and focused attention to ensure they are not inadvertently left behind.

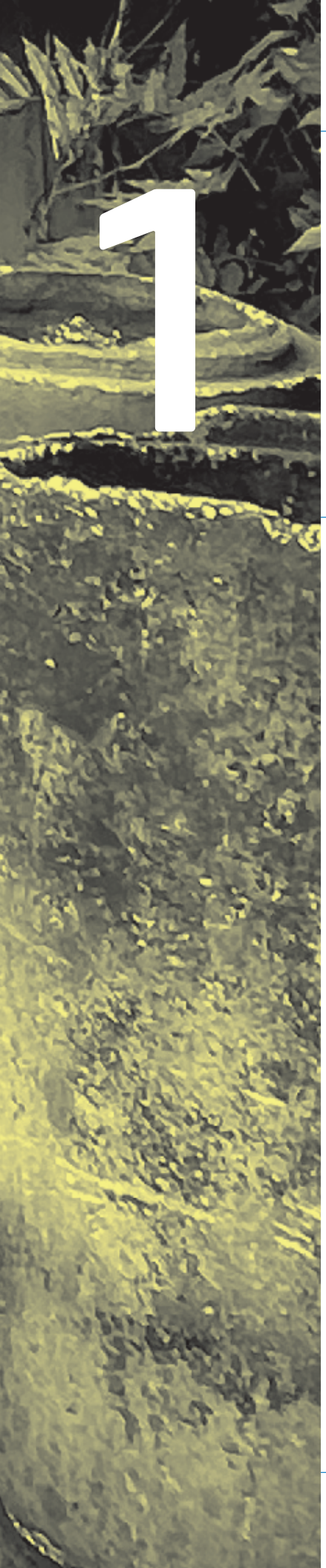
Recommendations

Recommendation 1: GEF projects should shift their focus from solely providing early warning information to fostering early actions during disaster events. GEF projects ought to prioritize data usability and ensure that both national and local plans are in place. This involves establishing effective communication systems and providing the necessary knowledge of how to respond once a warning is issued. To overcome the last mile challenge, GEF projects must prioritize community engagement, capacity building, and the development of tailored communication strategies to address the specific needs and challenges of remote and vulnerable communities.

Recommendation 2: The GEF Secretariat, the GEF Scientific and Technical Advisory Panel, and the GEF Agencies should continue aligning indicators with established good practices. GEF projects should adopt the most fitting indicators in line with World Meteorological Office guidelines and informed by international good practices and lessons learned from past experiences. These indicators would effectively measure the success of CIEWS interventions, serve as a roadmap for future interventions, and provide information to global results frameworks. Furthermore, for effective monitoring, GEF projects should set minimum standards for measuring and tracking CIEWS components at the project level. In alignment with ongoing efforts to streamline and simplify the GEF results framework,

this approach emphasizes repurposing existing indicators at the project level rather than introducing new ones. The overarching goal is to enhance the quality of measurement and tracking of the application of CIEWS components, ensuring that interventions are well-informed and impactful.

Recommendation 3: The GEF Secretariat and the GEF Agencies should continue to explore strategies to enhance the financial sustainability of CIEWS components. The significant costs associated with the operation and maintenance of CIEWS initiatives require a tailored approach to secure long-term financing to enable their continued success beyond the project's completion. Recognizing the complexities of engaging the private sector and acknowledging their potential role, particularly in LDCs, GEF projects are encouraged to support efforts to create an enabling environment for the private sector in developing innovative adaptation solutions derived from CIEWS. This is especially important considering the multiple applications and increasing advantages that CIEWS offers to several sectors, including transportation, agriculture, tourism, finance, and insurance.



1 Introduction

The importance of climate information and early warning systems (CIEWS) has been increasingly emphasized globally and has become an integral component of climate change adaptation. The United Nations (UN) Secretary-General recently highlighted this importance, stating, "Early warning systems are one of the most effective risk reduction and climate adaptation measures for reducing disaster deaths and economic losses" (UNDRR 2023). The scaling up of CIEWS combined with disaster risk reduction and management has been shown to reduce the number of deaths in areas affected by major disasters.[1]

CIEWS are vital in reducing vulnerability to the impacts of climate change and building climate change resilience. Investments in CIEWS have been consistently shown to have a solid benefit-to-cost ratio and the potential to save both lives and assets. The financial savings of CIEWS have tended to reach at least 10 times the cost of their investment (GCA 2019). Early warning—for example, 24 hours before a disaster event or hazard—can reduce damage by 30 percent. Investing $800 million in early warning systems (EWS) in developing countries would reduce losses by between $3 billion and $16 billion annually.[2] The Global Commission on Adaptation found that investing $1.8 trillion globally in five priority areas, with CIEWS being one of these priority areas, could generate $7.1 trillion in total net benefits over the 10-year period 2020 to 2030 (GCA 2019).

The Global Environment Facility (GEF) addresses the effects of climate change in its programming strategies. The impacts of climate change are also implicitly addressed by the GEF in several ways. GEF programming directions lay out

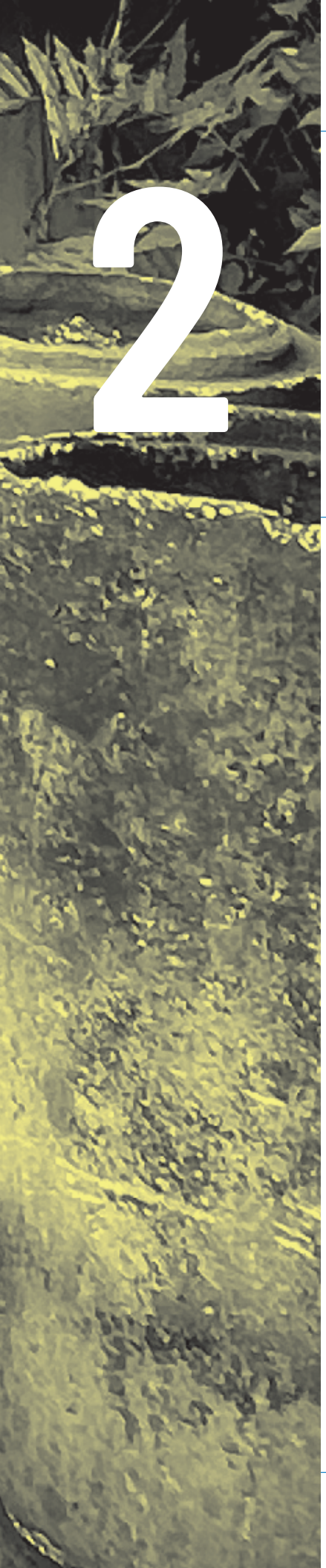
[1] For example, Cyclone Amphan in Bangladesh (2020), floods in Sri Lanka (2017), and droughts in Kenya (2010), among others.

[2] Source: United Nations Office for Disaster Risk Reduction, Early Warnings for All (EW4All) web page, accessed December 2023.

strategies for achieving global environmental benefits under each GEF focal area for a four-year period. From 2010 onwards, the GEF Secretariat developed four-year programming strategies on adaptation to climate change for the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF), coinciding with GEF replenishment periods. For CIEWS to be incorporated within country priorities as an integral part of climate resilience strategies, strengthening CIEWS has therefore become a commonly deployed intervention for the LDCF and by several SCCF, GEF Trust Fund, and multitrust fund projects.

CIEWS are noted in the GEF programming strategy on adaptation to climate change and are one of the four priority themes in the LDCF and SCCF strategy for 2022–26. Also, both the GEF-7 and GEF-8 replenishment programming directions note that investments to support flood and drought CIEWS will be made under the international waters focal area to support the focal area's third objective, enhance water security in freshwater ecosystems. Project interventions have included investments in automated weather stations and their operations and maintenance, agrohydromet and hydrometeorological forecasting, institutional capacity building, and technologies to meet the particular challenges of delivering the "last mile" of climate and early warning services (streamlining and efficiency technologies).

This evaluation identifies both strengths and areas requiring increased attention in GEF projects featuring CIEWS interventions. By examining GEF relevance, results, and sustainability, the evaluation provides evidence on the performance of GEF interventions addressing environmental aspects related to CIEWS. With CIEWS designated as one of the four priority themes for the LDCF and the SCCF, and its recognition as a priority theme in the GEF Programming Strategy on Adaptation to Climate Change from July 2022 to June 2026 (GEF 2022), the evaluation aims to inform future GEF programming on CIEWS by offering insights into areas of success and those requiring additional focus for sustainable outcomes.



2 Background

2.1 Context

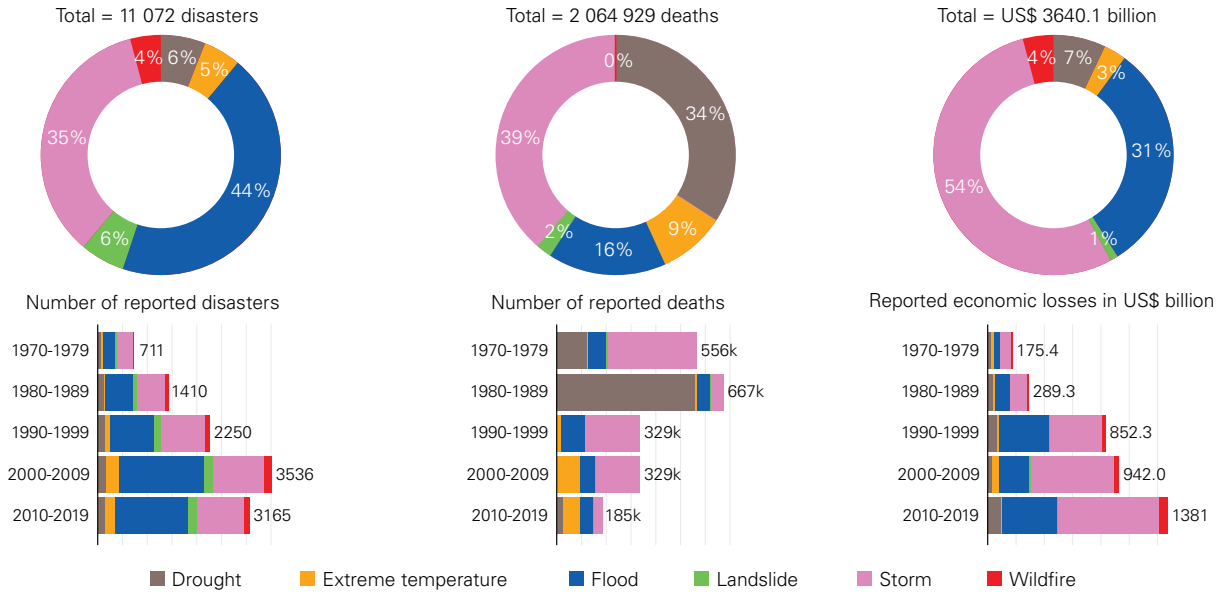
Between 2015 and 2021, an estimated 1 billion people were affected by disasters, and 300,000 people went missing or were lost. Annual reported losses averaged $330 billion. In 2021 alone, 38 million new internally displaced people were recorded, 60 percent of whom were displaced because of climate-related disasters (Ijjasz, Risk, and Gianfranchi 2022). Out of all the global disasters, deaths, and economic losses attributed to various factors, 79 percent were linked to weather, water, and climate-related hazards worldwide. These incidents accounted for 56 percent of total reported deaths and contributed to 75 percent of the economic losses associated with disasters during that period (figure 2.1; WMO 2020). Floods globally affected at least 1.4 billion people between 2000 and 2019, while drought affected at least 1.6 billion people during the same period.[1] Given these implications, hydrometeorological impacts and disaster events are a critical consideration for CIEWS.

For the 2020–29 decade, these trends are likely to escalate. The World Meteorological Organization (WMO) predicts that global temperatures will reach record levels between 2023 and 2027 due to heat-trapping greenhouse gases and an El Niño event. The chances of the annual average near-surface global temperature rising more than 1.5°C above preindustrial levels are 66 percent (WMO 2023). Additionally, the WMO predicts that at least one of the next five years will be the warmest on record (WMO 2023).

Least developed countries (LDCs) and small island developing states (SIDS) are the most acutely affected (GCF 2022), bearing the disproportional burden of disaster-related economic losses relative to their national gross domestic product

[1] Source: United Nations Office for Disaster Risk Reduction, Water Risks and Resilience web page, accessed December 2023.

Figure 2.1 Number of disasters, deaths, and economic losses globally (1970–2019)



Source: WMO 2020, figure 3.

(Ijjasz, Risk, and Gianfranchi 2022). According to recent data, SIDS have lost $153 billion due to weather, climate, and water-related hazards since 1970. This amount is substantial when considering that the average gross domestic product for SIDS is $13.7 billion. Additionally, 1.4 million people in LDCs lost their lives due to similar hazards, accounting for 70 percent of total deaths from natural hazards (WMO 2020).

At the same time, regions face disparities in their progress in establishing CIEWS, and special assistance is needed for LDCs, SIDS, and Africa (UNDRR and WMO 2022). To date, one-third of the world's people, mainly in LDCs and SIDS, are not covered by EWS.[2] Yet, countries with limited early warning coverage have eight times higher disaster mortality rates than those with comprehensive coverage. As of 2022, only half of countries globally were protected by multihazard EWS; numbers are even lower for developing countries, with less than half of the LDCs and only one-third of SIDS having multihazard EWS.[3] Figure 2.2 shows the global coverage of reported EWS by country in March 2022 for the Sendai Framework for Disaster Risk Reduction's target G.[4]

These figures are echoed by the WMO in its 2020 State of Climate Services report. Data provided by 138 WMO members show that just 40 percent of them have multihazard EWS. One-third of the population in the 73 countries that provided information are not covered by early warnings (WMO 2020).

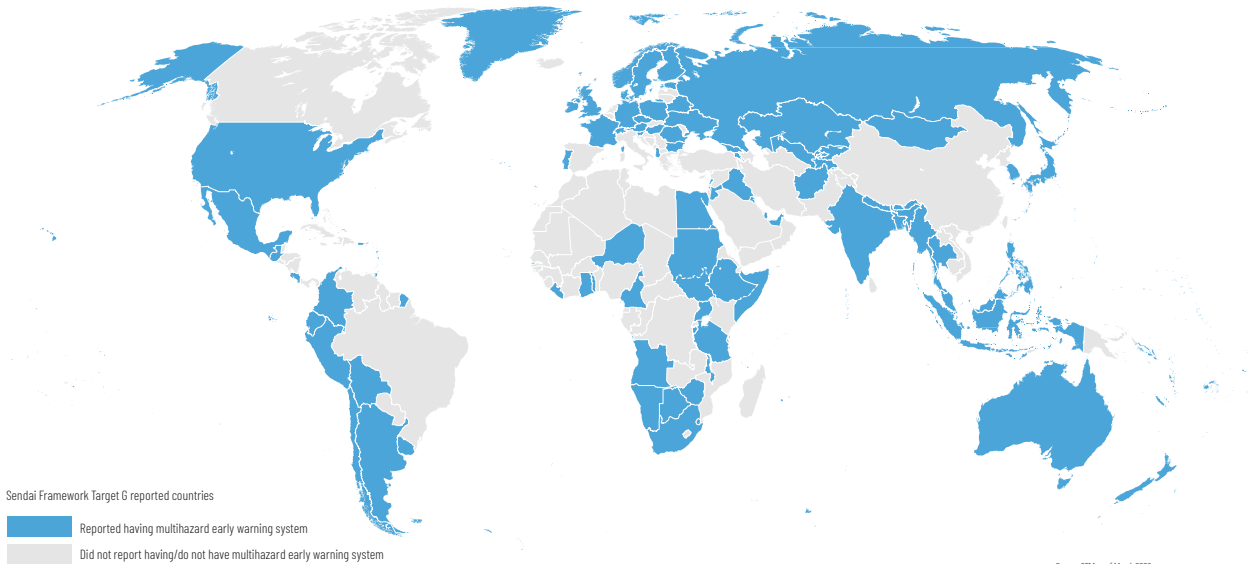
The early warning process includes detection, analysis, prediction, warning dissemination, and response

[2] Source: United Nations Office for Disaster Risk Reduction, Early Warnings for All (EW4All) web page, accessed December 2023.

[3] Source: United Nations Office for Disaster Risk Reduction, Early Warnings for All (EW4All) web page, accessed December 2023.

[4] Global target G: "Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030."

Figure 2.2 Global coverage of reported early warning systems, by country, March 2022



Source: UNDRR and WMO 2022.

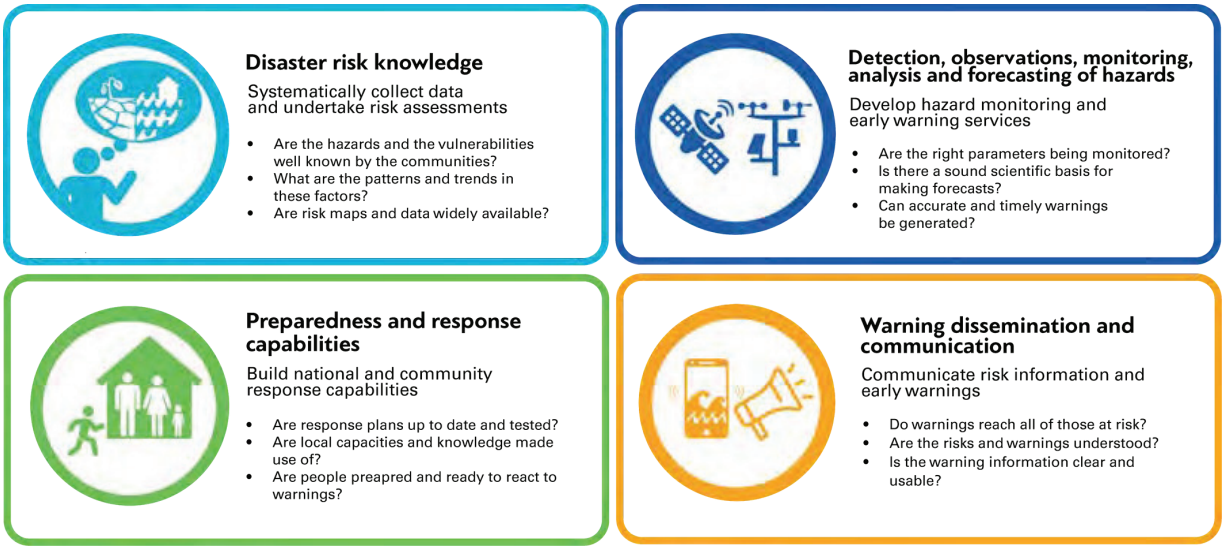
decision-making and implementation. These critical elements in EWS are true for climate information and early warning. Good practice in climate information and early warning emphasizes four main pillars of an EWS, which are generally described as disaster risk knowledge; hazard detection, monitoring, forecasting and analysis; warning dissemination and communication; and preparedness and response capabilities (figure 2.3).

Following are critical considerations when establishing CIEWS:

- **Innovation.** Introduce creative solutions to address problems.
- **Efficiency and efficacy.** An *effective* practice achieves the desired results and has a positive impact within its context (e.g., preparedness). An *efficient* practice achieves these results with the best use of available resources.
- **Sustainability.** The sustainability of a CIEWS refers to its ability to maintain its results for the future or a reasonable period.
- **Replicability or transferability.** Good practice can be adapted to new contexts while following the initial guidelines to achieve similar results.
- **Involvement of community.** The participation of citizens in disaster preparedness and risk reduction practices through community engagement can lead to enriched early warning good practices. This behavioral change represents a tangible improvement.
- **Inclusiveness.** Vulnerable groups often bear a disproportionate burden during climate-related disasters. Involving them in the development of EWS ensures that specific vulnerabilities are identified and addressed. This approach includes engaging vulnerable groups, and incorporating the elderly, people with disabilities, LGBTQI+ individuals, women, and children.

For early warning to be effective, most critically it must require the direct participation of at-risk communities, facilitate public education and awareness of risks, entail efficient message and warning dissemination,

Figure 2.3 The four components of early warning



Source: WMO 2022, figure 3.

and maintain constant preparedness for early action. Good practice involves the participation and consideration of vulnerable groups, and emphasis is on inclusivity in the design of any early warning. Multiple studies have identified the issue of the "last mile"—that is, the connection of CIEWS to end users in local communities—as the biggest challenge to successful CIEWS. The International Federation of Red Cross and Red Crescent Societies, for example, highlights that climate information and early warning "cannot simply improve weather, climate and hydrological information, services, and infrastructure" (IFRC 2022, 9). This poses the danger of relegating individuals to the role of mere users, with their involvement in the system becoming an afterthought. In connecting people as the final point in the system, technological and scientific factors are emphasized. At the same time, it is assumed that all the relevant data, information, and knowledge are housed outside of local communities (Marchezini et al. 2018).

To make the last mile effective, variations of community-based EWS have emerged, including community-based, participatory, and people-centered EWS. Participation in early warning repositions involvement of end users in the process.

Finally, having preparedness and response plans and capabilities—including at the local government level—is vital to ensure that people take appropriate action using early warning information to successfully reduce the impacts of extreme events and prepare for unavoidable impacts before they happen. Preparation and response plans at the local government level are crucial for effectively responding to warnings from regional or national hydrometeorological services (WMO 2022).

2.2 Evaluation purpose, scope, and objectives

The purpose of this evaluation is to provide evidence on the relevance, effectiveness, and sustainability of the portfolio of GEF-supported interventions on CIEWS. The evaluation aimed to identify lessons

applicable to the GEF by obtaining evidence-based findings of what works, why, and for whom. The evaluation reviewed projects addressing CIEWS and identified lessons relevant to the GEF, the LDCF, and the SCCF in future programming of CIEWS interventions. Furthermore, this evaluation provides evaluative evidence on the performance and trends of an intervention area that has been elevated in the GEF-8 adaptation strategy to a priority theme. It excludes early warning for nonclimate-related hazards like earthquakes and tsunamis but includes multihazard systems. Although intended for use by the GEF and the LDCF/SCCF Councils, the GEF Secretariat, and GEF Agencies, this evaluation will also be relevant to donors, government officials, and practitioners in developing countries.

2.3 Methodology and evaluation questions

Key evaluation questions

Broad evaluation questions set out for the evaluation addressed four issues:

- How do GEF-administered trust funds support CIEWS?
- How effective are the CIEWS interventions financed by the GEF?
- What is the added value of GEF support for CIEWS interventions?
- What are the lessons learned specific to the design and implementation of CIEWS projects supported by GEF-administered trust funds?

A set of subquestions and methods for capturing the answers to these key questions are included in the evaluation matrix (annex A).

Portfolio selection and review

The evaluation considered a portfolio of projects with CIEWS investments included within their components from the GEF-3 replenishment period onward. The evaluation used various methods, including a portfolio desk review of projects addressing CIEWS, a review of good practices in CIEWS, project site visits, case studies, and key informant interviews. The protocols for reviewing the portfolio's effectiveness were based on good practices established in the literature. Detailed information collection and follow-up probing for information were conducted through the case studies/project site visits and interviews with key informants.

The evaluation team selected a portfolio of 55 projects. Of these, 43 received financing from the LDCF, seven from the SCCF, three from the GEF Trust Fund, and two from multitrust fund initiatives. A list of these projects is provided in annex B. The selection of the evaluation portfolio was conducted by performing a text search in the project titles, objectives, components, outcomes, and outputs of LDCF, SCCF, and GEF Trust Fund projects from GEF-3 to GEF-7 using a taxonomy of keywords related to CIEWS.[5] The evaluation team manually validated the projects for relevance, applying consistent inclusion and exclusion criteria and retaining projects that aligned with the evaluation's scope and objectives. Projects that referred to CIEWS for climate change mitigation purposes and those that did not address hazards due to climate change were excluded. The final evaluation portfolio includes projects focused on adaptation and response to climate hazards, each carefully chosen for their relevance to the evaluation's focus. The evaluation applied a mixed-methods approach using both quantitative and qualitative methods as outlined below.

[5] Keywords included "early warning," "EWS," "climate information," "climate change information," "climate service," "climate change service," "climate data," and "forecasting." Dropped, canceled, and project implementation review–rejected projects were removed.

A detailed desk review of the selected projects (ongoing and closed) was conducted using a portfolio review protocol to extract data on CIEWS interventions. The review protocol, which is available on the GEF IEO web page for this evaluation, was developed to ensure a consistent approach to the extraction of data on the type of CIEWS intervention; sources of funding; results; types of indicators; replicability; sustainability; gender dimensions; lessons learned; and the added value of the LDCF, the SCCF, and the GEF Trust Fund in CIEWS interventions from project documents. Data analysis allowed the evaluation team to identify trends in CIEWS support.

Literature review of good practices in CIEWS

A substantial body of academic and practice-based literature on CIEWS exists. Therefore, the evaluation includes a review of good practices and aims to provide useful insights for the GEF's future programming. This focuses on identifying the most effective elements in CIEWS for climate change adaptation, with a review of literature from 2019 onward. As noted earlier, the review is limited to climate change adaptation and excludes early warning for nonclimate-related hazards like earthquakes and tsunamis but includes multihazard systems.

Case studies

To complement the portfolio analysis and to better understand how systems work in practice, four projects in three countries addressing CIEWS were selected as case studies. The purposeful selection of these projects (see annex C) aimed to reflect a diversity of GEF funds, regions, scale of CIEWS development, and different implementation stages (e.g., completed or ongoing). Where opportunities existed, an examination of the functioning of CIEWS in the incidence of a disaster event or forecasted impacts was included in the case study. Through these three case studies, the evaluation aimed to understand outcomes in a country context, the mechanisms by which the outcomes were achieved, and the factors contributing to observed outcomes. The case studies comprise national and regional projects in Costa Rica, Tanzania, and Tonga, as follows:

- **Costa Rica:** Strengthening Capacities of Rural Aqueduct Associations' (ASADAS) to Address Climate Change Risks in Water Stressed Communities of Northern Costa Rica (GEF ID 6945, United Nations Development Programme [UNDP])
- **Tanzania:** Strengthening Climate Information and Early Warning Systems in Tanzania to Support Climate Resilient Development and Adaptation to Climate Change (GEF ID 4991, UNDP) and Strengthening Transboundary Cooperation and Integrated Natural Resources Management in the Songwe River Basin (GEF ID 9420, African Development Bank)
- **Tonga:** Pacific Resilience Program (GEF ID 5814, World Bank).

Key informant interviews

Interviews were conducted with selected stakeholders from the GEF Secretariat, the GEF Agencies, the GEF Scientific and Technical Advisory Panel, the United Nations Framework Convention on Climate Change (UNFCCC), and relevant project in-country stakeholders. These interviews aimed to triangulate findings from the desk review and case studies. A complete list of interviewees is in annex E.

2.4 Limitations and quality assurance

The evaluation has gone through a comprehensive quality assurance process. The draft approach paper and draft evaluation report were circulated and validated before finalization through a feedback process

with the key stakeholders. In addition to GEF Independent Evaluation Office (IEO) management and peer review, the evaluation's designs and methods have been carefully documented, adhering to the principles of independence, impartiality, credibility, and utility.

The evaluation encountered three limitations. First, there was a lack of clear identification of CIEWS projects in the evaluation portfolio since climate information and early warning interventions are not tagged in the GEF Portal. To address this limitation, the evaluation team cross-checked the portfolio information downloaded from the GEF Portal with the management information systems of GEF Agencies before conducting any analysis. Additionally, the team considered the inclusion of direct references to CIEWS in project results frameworks as a legitimate threshold for inclusion, as this would capture projects where CIEWS outcomes were explicitly targeted and monitored.

A second limitation arose from CIEWS interventions being a part of overarching project activities that were not specifically listed as project objectives. This made it challenging to discern the precise outcomes directly linked to CIEWS components. While this condition did not affect project-level assessments, it posed challenges for attributing specific outcomes to individual CIEWS interventions.

Third, the evaluation faced constraints related to data quality and stakeholder engagement, primarily due to inconsistencies in the quality of terminal evaluations. To mitigate these issues, the evaluation employed a combination of semistructured interviews with key informants and in-depth case studies, and leveraged insights from portfolio reviews and analysis to triangulate and verify all the data gathered.

2.5 Concepts and definitions

Climate information services

For the purposes of this evaluation, climate information services refers to the collection and interpretation of observations of actual (past and present) weather and climate as well as simulations of both past and future periods (forecasting) to provide a credible, relevant, and usable interpretation of weather and climate information.[6] These can include information access to interpreted targeted climate information that is relevant, reliable, accurate, communicated appropriately, and assists decision-making based on anticipating and managing the risks of changing and variable climate.

Climate services rely on data generated from national and international databases providing information on temperature, rainfall, wind, soil moisture, and ocean conditions as well as projections and scenarios, and risk and vulnerability analyses. When these data are combined with socioeconomic variables and other nonmeteorological data—such as data on agricultural productivity, road and infrastructure plans and mapping, health trends, and human settlements in high-risk zones—the combined information can be customized into climate information services. This climate information can then provide climate services such as projections, trends, economic analysis, and services tailored for specific uses to assist in adaptation to climate variability and climate change, particularly for decision-makers in climate-sensitive sectors.

[6] The definition for climate services and climate services information outlined here is based on information from CARE's Climate Change and Information Resilience Information Center on its Climate Information Services web page and the WMO's Global Framework for Climate Services What are Climate Services? web page, both accessed December 2023.

The WMO's Global Framework for Climate Services sets out the framework for developing and applying climate services to accelerate and coordinate technically and scientifically sound climate information and measures. By doing so, it aims to improve climate-related decision-making addressing climate-related risks.[7]

Early warning systems

EWS are designed to provide timely and effective information to help people prepare for and respond to hazards. Each of these agendas recognizes the centrality of resilience and support for building resilience by facilitating decision-making based on obtaining reliable information on how risks can be reduced for human and natural systems (Flood et al. 2021). The United Nations Office for Disaster Risk Reduction defines an EWS as

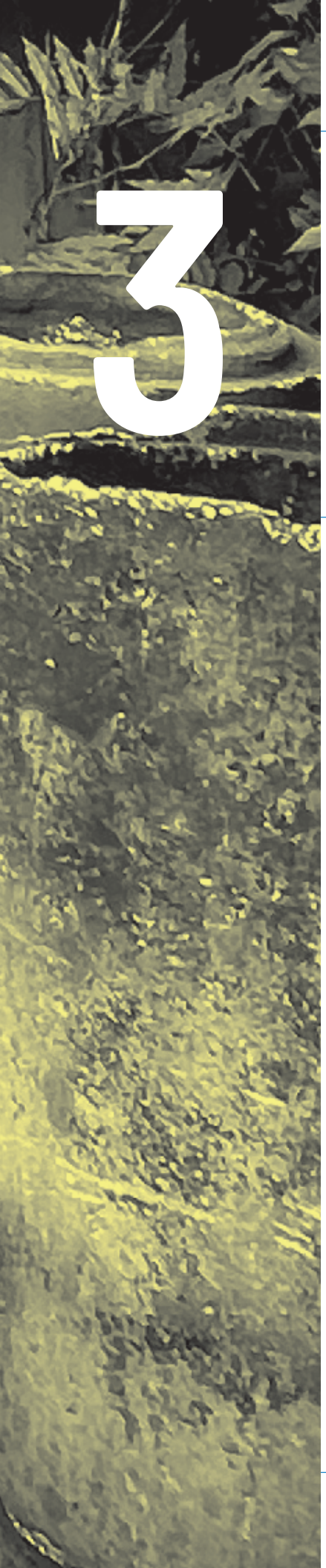
> [a]n integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events. (United Nations General Assembly 2016, 17)

[7] Source: WMO's Global Framework for Climate Services What are Climate Services? web page, accessed December 2023.

In LDCF/SCCF strategy documents, an EWS is often discussed in combination with forecasting. For this evaluation, forecasting or providing timely information to improve decision-making for avoiding damage and losses can be considered a vital element of an EWS.

Climate information and early warning systems

Formal definitions for CIEWS and associated terms have yet to be provided in GEF documents. Recently, however, climate information and EWS have been considered together, including in the review of the evaluation portfolio of projects related to early warning and climate information services for the purposes of climate change adaptation. Climate and weather information dissemination has become synonymous with EWS for responding to the hazards and impacts caused by climate change; both are referred to in this report under the umbrella term of CIEWS. Similarly, funds focused on climate change, such as the Green Climate Fund (GCF), consider these as combined rather than separate systems for specific disasters. Therefore, this evaluation does not specifically distinguish between climate information systems and EWS. Instead, it is understood that climate information and early warning are integrated in good practices for climate change adaptation.



3 GEF support to CIEWS

3.1 GEF programming strategies for adaptation

GEF programming directions lay out strategies for achieving global environmental benefits under each GEF focal area for four years. Starting from 2010, the GEF Secretariat has developed four-year programming strategies specifically focused on adaptation to climate change for the LDCF and the SCCF, coinciding with GEF replenishment periods. CIEWS have been noted in all the adaptation to climate change strategies since 2010 and have been elevated to one of the four priority themes in the strategy for 2022–26. While less common, CIEWS have also been included in some past GEF programming strategies related to climate. In LDCF/SCCF strategy documents, CIEWS are often discussed in conjunction with forecasting. For the purposes of this evaluation, forecasting, or "the provision of timely information to improve the management in the emergency phase" (Merz et al. 2020, 2) can be considered a vital element of an EWS.

Climate information and early warnings have been included in LDCF and SCCF adaptation strategies from the 2010–13 strategy through the current 2022–26 strategy. Table 3.1 provides an overview of discussions of CIEWS in GEF strategies.

3.2 Characteristics of CIEWS evaluation portfolio

The evaluation portfolio includes a variety of CIEWS projects, distributed across different GEF funding cycles. Specifically, there are 3 projects from GEF-3, 7 from GEF-4, 26 from GEF-5, 12 from GEF-6, and 7 from GEF-7. Twenty-seven of these projects are ongoing, while 28 have been completed. Of the 28 completed projects, 26 have undergone terminal evaluation, providing valuable insights into their outcomes

Table 3.1 Overview of CIEWS in LDCF/SCCF adaptation strategies 2010–2026

Strategy	Summary
2010–13 LDCF/SCCF adaptation strategy (GEF 2010)	• This first GEF programming strategy for adaptation included "improving the monitoring of diseases and vectors affected by climate change, and related forecasting and early-warning system, and in this context improving disease control and prevention" as one of nine programming priorities for the SCCF. • CIEWS are also mentioned as an example of LDCF interventions under the categories of both disaster risk management and natural resource management and as an example of SCCF interventions under disaster preparedness and risk management. • Early warning and forecasting are listed as the fifth largest sector where urgent and immediate adaptation projects were needed, based on identification in NAPAs. • A specific output (2.2.1) was included under Objective CCA-2: Increasing adaptive capacity, on "Systems in place to disseminate timely risk information."
2014–18 LDCF/SCCF adaptation strategy (GEF 2014)	• CIEWS are included in the results framework for LDCF/SCCF programming. • CIEWS are listed under Objective 2: Strengthen institutional and technical capacities for effective climate change adaptation for Outcome 2.3: Access to improved climate information and early-warning systems enhanced at regional, national, subnational and local levels. • An indicator for the number of EWS established or strengthened is also included in the results framework, with a baseline of 30 in 24 countries and a target to support all LDCs. Further, a specific indicator measuring the number of people (percentage of whom are female)/ geographical area with access to improved climate information services was included in the revised results framework of the LDCF and the SCCF. • CIEWS are noted under discussions of coastal zone management and climate information services, as well as in a discussion of LDCF financing needs. • As in previous strategy, CIEWS related to the monitoring of diseases and vectors affected by climate change are listed as one of nine programming priorities for the SCCF. • The strategy notes that 16 percent of the NAPA thematic priorities are categorized as early warning and disaster risk, showing that the sectoral distribution of LDCF and SCCF investments was closely aligned with country demand as well as the mandate of the funds. • The strategy reports a $40+ million regional initiative aimed at strengthening hydrometeorological services and early warning systems in nine LDCs in Sub-Saharan Africa. • The strategy reports that the GEF's adaptation program has provided considerable support toward weather and climate monitoring, data collection, and EWS, comprising 12% and 6% of all LDCF and SCCF investments, respectively.
2018–22 LDCF/SCCF adaptation strategy (GEF 2018)	• CIEWS are mentioned twice: in a discussion of mainstreaming adaptation across GEF themes, as an example of the type of LDCF activity that might be seen in multitrust fund projects; and in the discussion of enhanced private sector engagement as an opportunity for transforming markets for adaptation technologies and innovations with private sector partners. • In the LDCF/SCCF results framework, "Vulnerability to climatic hazards reduced through new or improved early warning systems" is considered as Output 1.1.3 in seeking to "Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation." • This programming period follows the adoption of the 17 SDGs of the 2030 Agenda for Sustainable Development. SDG 13 (take urgent action to combat climate change and its impacts) comprises a specific target (13.3) mentioning the goal to "improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning." According to the strategy, the GEF's adaptation program is well aligned and capable of contributing to SDG 13 and helping to lay the groundwork for other goals.

(continued)

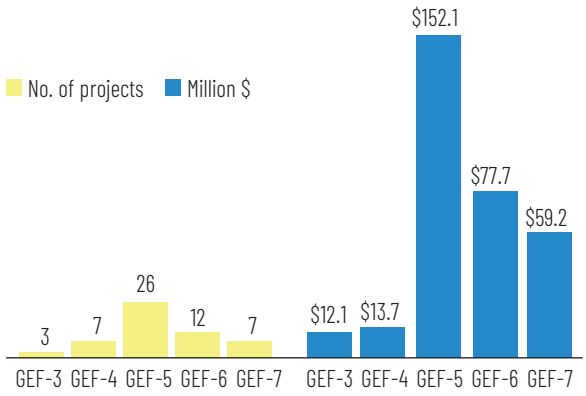
Table 3.1 Overview of CIEWS in LDCF/SCCF adaptation strategies 2010–2026 *(continued)*

Strategy	Summary
2022–26 LDCF/SCCF adaptation strategy (GEF 2022)	• The most prominent inclusion of CIEWS in this strategy is as one of four themes in the programming architecture. Under this theme, both the LDCF and the SCCF will support EWS and climate information systems "with a focus on bridging climate information value chain gaps, expanding access to early warning systems, and striving for greater user uptake and application of climate information services." • In the global context section of the strategy, CIEWS are noted as contributing to reduced risk and informed decision-making by communities, along with other interventions. A subindicator on CIEWS is included in the results framework for the period: number of direct beneficiaries from the new or improved climate information services including early warning systems (sex-disaggregated). • CIEWS are also mentioned in Priority Area 1 for the SCCF: Supporting the Adaptation Needs of SIDS, as one area where the SCCF has a successful track record. • The strategy mentions that, since the creation of the LDCF, it has supported a wide range of sectoral priorities, with climate information services having the third highest participation (53%), just behind water (55%) and agriculture and food security (67%). The SCCF's sectoral distribution shows climate information services (37%) as the second most active, just behind water (43%).

Note: NAPA = national adaptation program of action; SDG = Sustainable Development Goal. Discussion excludes examples of CIEWS projects presented as part of the general narrative of strategies.

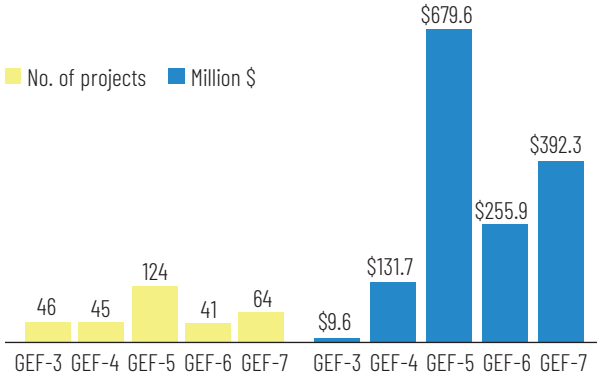
and impacts. Each GEF replenishment period has seen an important allocation of funds dedicated to CIEWS. Notably, GEF-5 stands out in terms of support, as the majority of projects in the CIEWS evaluation portfolio were funded by the LDCF (78 percent), and the largest share of LDCF projects and funding was approved during GEF-5. Figures 3.1 and 3.2 illustrate the distribution of CIEWS projects and LDCF project funding by GEF replenishment period. However, there was a funding constraint in GEF-6 and GEF-7, which resulted in slower approvals compared to GEF-5. The data show a strong positive correlation between the number of CIEWS projects and LDCF projects by GEF replenishment period (0.88), and a very strong positive

Figure 3.1 Distribution of CIEWS evaluation portfolio by GEF replenishment period, by number and funding of projects



Source: Project documents.

Figure 3.2 Distribution of all LDCF projects by GEF replenishment period, by number and funding of projects

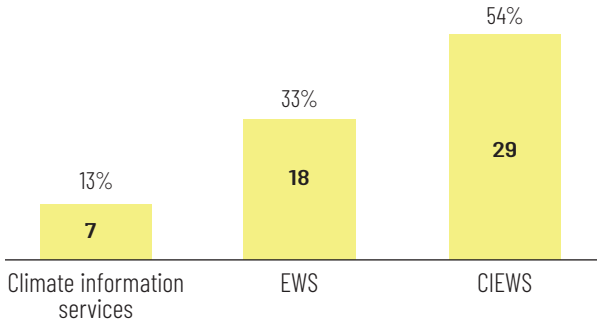


Source: Project documents.

correlation between the funding of CIEWS projects and LDCF projects by GEF replenishment period (0.94). This highlights the significance of the LDCF in supporting CIEWS interventions.

It is imperative to emphasize the significance and thematic approach of CIEWS, along with its evolution across GEF replenishment periods, within the projects in the evaluation portfolio. As illustrated in figure 3.3, seven projects highlighted their involvement in climate information services, accounting for 13 percent of the overall portfolio by number of projects. Eighteen projects focused on supporting EWS, constituting 33 percent of the portfolio. The evaluation team identified 29 projects, comprising a substantial 54 percent of the portfolio, in which EWS and climate information services were integrated as joint interventions. This integrated approach underscores the consistent strategy of GEF-funded projects to leverage the synergistic benefits of climate information services for enhancing the development of EWS.

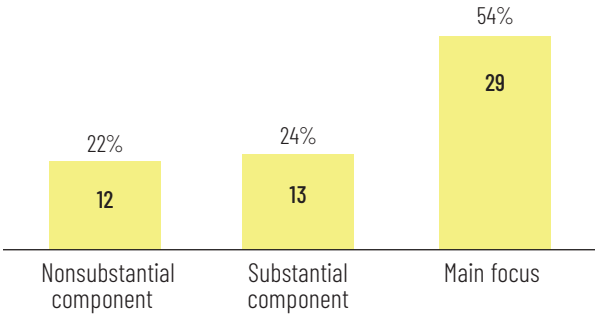
Figure 3.3 Main emphasis of CIEWS interventions in evaluation portfolio projects



Source: Project documents.

Figure 3.4 provides a detailed breakdown of the specific interventions related to CIEWS within projects. In 29 projects, constituting 54 percent of the total projects reviewed, CIEWS interventions were the primary focus. For 13 projects, accounting for 24 percent of the projects reviewed, CIEWS featured as a substantial component. In the case of 12 projects, which make up 22 percent of the portfolio by number of projects, the CIEWS-related intervention was not considered substantial although still a relevant aspect that deserves consideration within the portfolio. The portfolio review of these projects indicates that the average CIEWS component accounts for between 15 and 35 percent of the specific funding allocated.

Figure 3.4 Extent of CIEWS interventions in evaluation portfolio projects



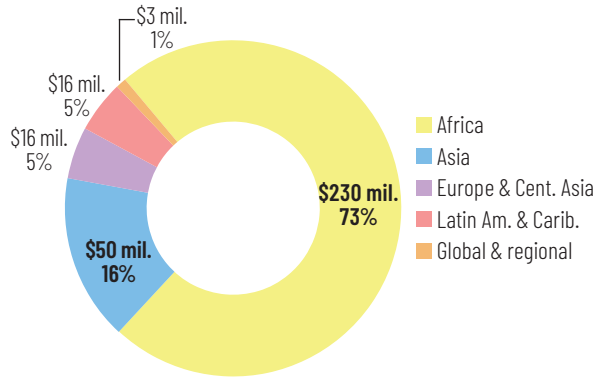
Source: Project documents.

GEF project financing through its different funds totaled $314.8 million for the CIEWS evaluation portfolio of projects.[1] The average grant size stood at $5.7 million; the median grant size was $5.2 million, showing a standard deviation from the mean of $2.9 million. The largest grant made was $17.8 million—for Building Resilience of Health Systems in Pacific Island LDCs to Climate Change (GEF ID 8018, UNDP)—and the smallest grant was $0.9 million—for Strengthening of The Gambia's Climate Change Early Warning Systems (GEF ID 3728, United Nations Environment Programme).

[1] GEF project financing refers to a grant or concessional financing provided from any GEF-managed trust fund to support the implementation of any full-size project, medium-size project, enabling activity, or program. This excludes financing, Agency fees, and project preparation grants.

In terms of distribution of number of projects by region, Africa was the most prominent region, representing 71 percent of the entire CIEWS evaluation portfolio. Asia accounted for 16 percent, Europe and Central Asia for 7 percent, and Latin America and the Caribbean for 4 percent of the portfolio's composition. The portfolio mirrored a similar trend in terms of GEF financing, as shown in figure 3.5.

Figure 3.5 Geographic distribution of LDCF, SCCF, and GEF Trust Fund financing in the evaluation portfolio



Source: Project documents.

There has been a noticeable shift toward financing regional CIEWS projects, which began during GEF-4. By the onset of GEF-6, regional projects accounted for 25 percent of the total projects approved during that replenishment period (table 3.2). This strategic shift aligns with the international practice of recognizing the transboundary nature of risks and climate-related disasters (Benzie and Harris 2020).

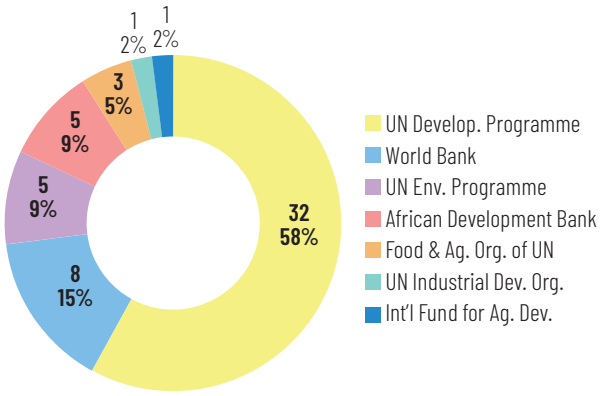
Table 3.2 CIEWS multicountry projects over the GEF replenishment periods

Period	No. of multicountry projects	Percent of multicountry projects
GEF-3	0	0
GEF-4	1	14
GEF-5	3	12
GEF-6	3	25

Source: Project documents.

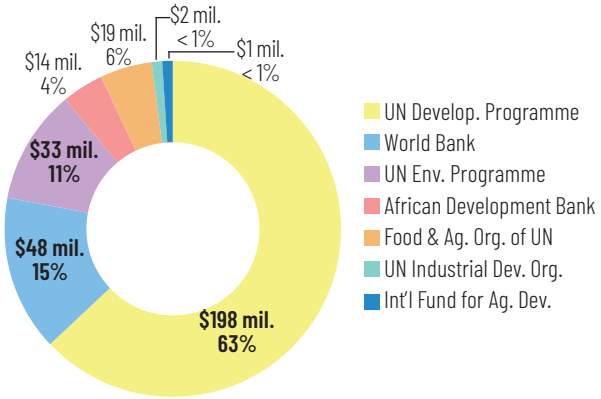
In terms of funding sources for the CIEWS evaluation portfolio, 78 percent (43 projects) received financing from the LDCF, while another 13 percent (7 projects) found support from the SCCF. Approximately 4 percent (three projects) were financed by the GEF Trust Fund, and an additional 4 percent (two projects) constituted multitrust fund initiatives. The breakdown of the evaluation portfolio by Agency share of projects and funding is depicted in figures 3.6 and 3.7. Among

Figure 3.6 Number of CIEWS evaluation portfolio projects by Agency



Source: Project documents.

Figure 3.7 Funding amount for CIEWS evaluation portfolio projects by Agency (million $)



Source: Project documents.

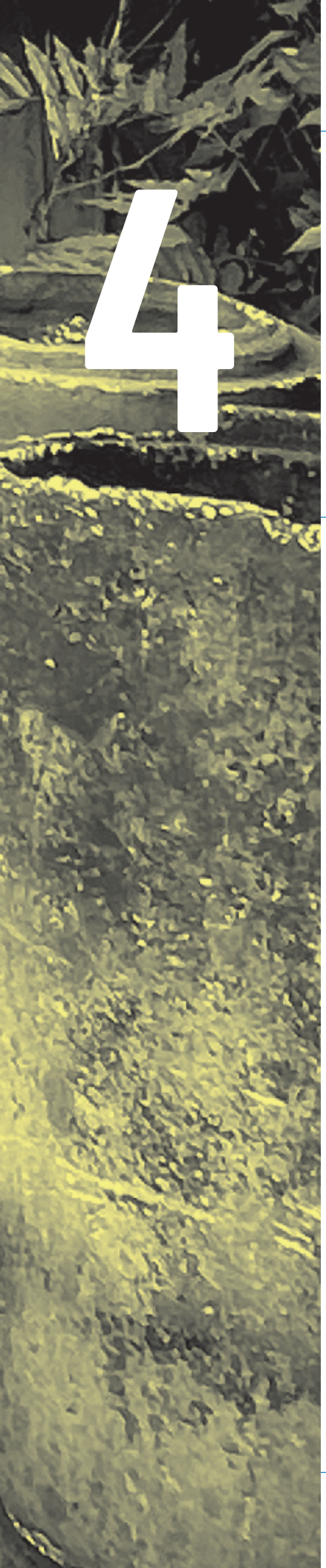
the seven Agencies represented in the evaluation portfolio, UNDP has the largest share of projects—32 of 55 projects, or 58 percent of the total. The World Bank serves as the GEF Agency for eight projects, constituting 15 percent of the portfolio. The United Nations Environment Programme and the African Development Bank serve as the GEF Agency for five projects, or 9 percent of the portfolio, each.

Cofinancing refers to additional financing beyond that provided by the GEF that supports implementation of a GEF-financed project or program, facilitating the achievement of its objectives. Table 3.3 delineates the levels of GEF project financing in relation to expected cofinancing levels for the projects in the evaluation portfolio. The table illustrates a consistent trend, with GEF financing consistently hovering around 20 percent in later GEF replenishment periods, albeit with minor fluctuations during the earlier replenishment periods. Overall, the GEF cofinancing ratio remained at 7:40, indicating that GEF financing constituted 17.5 percent of the total project portfolio funding. Note that these data reflect expected project cofinancing at the Chief Executive Officer (CEO) endorsement/approval stage and do not represent actual materialized cofinancing at project completion. Annex D provides further information on support for CIEWS from other, non-GEF donors.

Table 3.3 GEF financing and cofinancing of CIEWS evaluation portfolio projects

GEF period	GEF financing amount (million $)	Cofinancing amount (million $)	GEF contribution as % of total GEF financing + cofinancing (million $)
GEF-3	12.0	61.2	16.4
GEF-4	13.7	37.8	26.6
GEF-5	152.0	849.4	15.2
GEF-6	77.7	280.6	21.7
GEF-7	59.2	231.5	20.3
Total	314.8	1,800.0	17.5

Source: GEF Portal.



4 Key findings

4.1 Relevance

CIEWS projects demonstrate strong alignment with GEF Trust Fund and LDCF/SCCF strategies. Projects within the CIEWS evaluation portfolio approved in GEF-3 and GEF-4 are in accordance with programming documents prioritizing an upstream and transboundary approach. This approach, tailored to the unique context of each country, aims to furnish decision-makers and stakeholders with timely and accurate information about climate patterns, trends, and potential hazards. Upstream projects typically involve the deployment of meteorological and climate monitoring stations, satellite observations, climate models, and data analysis techniques.

For instance, the project Strengthening Climate Information and Early Warning Systems in Malawi to Support Climate Resilient Development and Adaptation to Climate Change (GEF ID 4994, UNDP) received support from the LDCF for the procurement and installation of 40 meteorological monitoring stations with telemetry, archiving, and data processing facilities to gather upstream data. The project also included training for equipment maintenance and repair, computer infrastructure, and telecommunications. Similarly, Tanzania's CIEWS project contributed to improved water management through enhanced equipment, such as automated stations. The installation of automatic weather stations has increased the accuracy, quality, and timeliness of data, especially during the rainy season and other critical times.

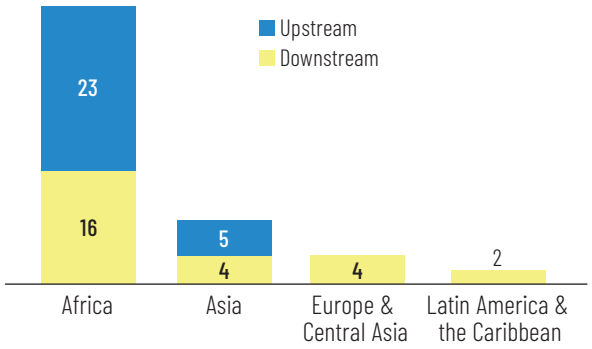
More recent projects in the CIEWS evaluation portfolio have shifted toward a downstream approach, a transition that is also evident in the most recent GEF and LDCF/SCCF programming documents. This approach revolves around the translation and application of upstream climate information at local levels and in local contexts. The objective of downstream projects is to provide actionable and context-specific information to individuals, communities, and organizations, facilitating the implementation of appropriate response measures and promoting advanced planning

to mitigate the impacts of climate hazards and risks. Consequently, this enhances resilience to climate change impacts and supports adaptation efforts. Key features of downstream CIEWS include tailoring climate information to the specific needs and vulnerabilities of local communities; translating complex climate data into user-friendly formats and languages; and disseminating information through various channels, such as mobile apps, community radio, or local networks, to facilitate planned responses.

The Climate Resilient and Sustainable Capture Fisheries, Aquaculture Development, and Watershed Management (GEF ID 10411, African Development Bank) project, approved in 2022, serves as an illustration of the downstream application of upstream data. Implemented in Malawi and financed by the LDCF, the project entails the installation of hydrometeorological systems for early warnings. Local communities will take charge of managing these systems, addressing issues such as vandalism, operation and maintenance, low usage; and ensuring timely communication. Apart from collecting data sent to meteorological services for processing, trained local fishers will utilize simple and mainstreamed technologies, such as mobile phones, to connect with the national forecast system and receive information about potential extreme weather conditions in the lake area. This system aims to establish and operate a communication and dissemination scheme, informing communities about impending threats and enabling disaster response teams to prepare against climate-related risks.

This trend of transitioning over time from the prioritizing of upstream approaches to achieving a balance between upstream and downstream activities was identified across different regions (figure 4.1). Countries in Africa and some areas in the Asia-Pacific region demonstrated a balanced prioritization of both upstream and downstream activities within the project's focus. In contrast, projects in countries in Europe

Figure 4.1 Number of CIEWS evaluation portfolio projects by approach type



Source: Project documents.

and Central Asia and parts of Latin America and the Caribbean focused on GEF support for downstream activities. The CIEWS evaluation portfolio comprises 29 upstream projects and 26 downstream projects.

GEF projects focusing on CIEWS were demand-driven by country beneficiaries. Through interviews, project documents, and country case studies, a consensus emerges that the CIEWS components were demand-driven, with key stakeholders recognizing the imperative need for CIEWS. These needs were closely linked to geographic considerations, climate-related hazards, and the specific requirements of each country. The GEF Secretariat established a broader strategic direction, emphasizing the significance of climate information services and related infrastructure. Furthermore, it allowed flexibility for individual countries and agencies to identify specific activities. This approach often aligned with national priorities, enabling a tailored response to each region's unique circumstances and challenges.

For instance, in Tonga, the Pacific Resilience Program adjusted legislative frameworks, such as legal acts related to disasters, to align with national priorities. Simultaneously, the project provided flexibility to include postcyclone support following Cyclone Gita in 2018 and much-needed assistance after the cyclone

disaster impacts for water, sanitation, and hygiene activities, along with strengthening shelters on critical, hard-hit islands.

Another example is Costa Rica's rural aqueduct associations project, whose interventions in the aftermath of Hurricane Otto in 2017 were crucial. As the GEF Agency, UNDP developed an active response coordinated with the National Emergency Commission to articulate actions at the local level that continued throughout the project. One of these interventions was the design and implementation of an EWS for the five communities most exposed to sudden events (floods, mud avalanches) due to hydrometeorological conditions in the municipality of Upala.[1] Field interviews confirmed that the project interventions were sensitive to the country's economic, social, and environmental conditions, demonstrating a high degree of relevance in the design and implementation stage.

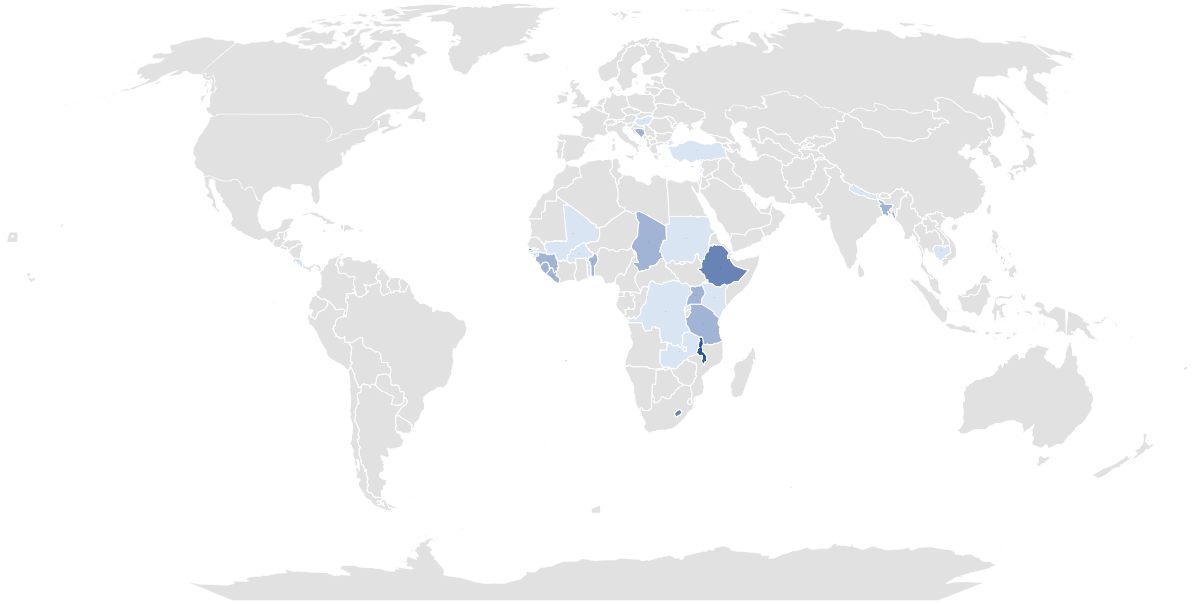
The data indicate that CIEWS projects are effectively targeting regions with higher risks due to climate-related hazards. CIEWS interventions by GEF-supported projects are mapped in figure 4.2; figure 4.3 shows the global distribution of climate-related risks as elaborated by the World Bank, which calculates vulnerability-weighted mortality risk values for each country across climate-related disasters. Comparing the two maps underscores the strategic alignment between the CIEWS evaluation portfolio and the distribution of climate-related hazards by mortality risk. This alignment is particularly precise in Africa, where CIEWS interventions closely correspond to the risk distribution. Notably, as learned from stakeholder interviews, the LDCF has proven to be highly instrumental and appreciated by stakeholders for delivering CIEWS interventions, particularly in fragile and conflict-affected situations.

In the three countries where case studies were conducted—Costa Rica, Tanzania, and Tonga—the GEF performed well in targeting subnational areas that were highly relevant as hotspots of climate-related risks. In Costa Rica, CIEWS interventions funded by the SCCF concentrated on the country's northern region. According to climate change scenarios provided by the WMO, this area faces a concerning outlook in the short term, with an anticipated 15 percent reduction in rainfall by 2030 and a 35 percent decrease by 2050. These extreme conditions are expected to further exacerbate climate conditions, particularly in areas such as the Guanacaste and Alajuela Cantons.

In Tonga, the Pacific Resilience Program strategically targeted cyclone-prone islands where the intensity of cyclones is predicted to increase. Having successfully provided cyclone early warning in 2018, the program has established emergency operations centers in otherwise isolated island cluster regions (Ha'apai, Vava'u, and Nuku'alofa). It also facilitated accessible warnings to communities and information dissemination on how to prepare for emergencies. Similarly, in Tanzania's CIEWS project, key subregions were targeted for improvement in the country's hydromet monitoring network. This enhancement aimed to provide region-specific flood and drought forecasting, and climate information for early warning and long-term planning.

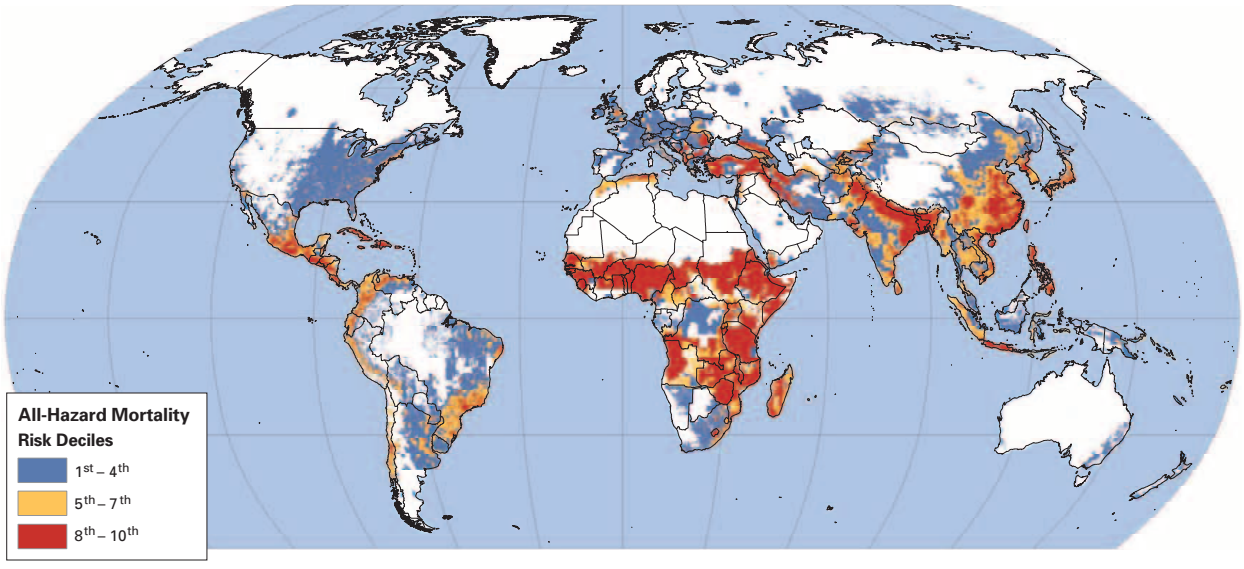
[1] One of the CIEWS components, the Upala hydrological station, was the first of its kind to be installed in Costa Rica. It contains a sensor that measures the level of the Zapote River; it is located on the Canalete Bridge and can be monitored in real time by anyone, via a web page. The water measurements are updated every five minutes, which allows strict control of the river. The National Meteorological Institute regulates the station and maintains constant communication with the municipal emergency committee, the community emergency committees, and regional liaisons from the National Emergency Commission. An early warning protocol alerts the population of the center of Upala that they have between 45 minutes and 1 hour to try to protect their property, remove their belongings, and find a safe place to shelter while the water drops. As soon as the alert is generated, authorities activate a siren at the municipality of Upala, along with the sirens of local emergency entities.

Figure 4.2 Global distribution of CIEWS evaluation portfolio projects



Source: Project documents. Map © Australian Bureau of Statistics, GeoNames, Microsoft, Navinfo, Open Places, OpenStreetMap, TomTom, Zenrin.

Figure 4.3 Climate-related hazards by mortality risk distribution



Source: Dilley et al. 2005, figure 7.1.

CIEWS projects funded through GEF-administered trust funds primarily address disaster events related to hydrometeorological hazards,[2] with a particular focus on fluvial floods, coastal floods, and droughts. A significant portion of the evaluation portfolio, comprising 36 projects (66 percent), directs interventions toward various aspects of climate information services. Climate services rely on data generated from national and international databases providing information on temperature, rainfall, wind, soil moisture, and ocean conditions as well as projections and scenarios, and risk and vulnerability analyses. When these meteorological data are combined with socioeconomic variables and other nonmeteorological data—such as information on agricultural productivity, road and infrastructure plans, mapping, health trends, and human settlements in high-risk zones—the combined data set can be tailored into climate information services. These services include projections, trends, economic analyses, and customized offerings for specific uses to aid adaptation to climate variability and change.[3] These services are particularly valuable for decision-makers in climate-sensitive sectors.

Figure 4.4 provides an illustration of the primary hazards addressed by the projects in the evaluation portfolio. Floods and extended periods of rainfall constitute the most prevalent category, followed by droughts and other heat-related conditions. While the GEF's primary focus is on environmental and climate-related issues, a subset of CIEWS projects (12 percent) also aims to provide information and early warnings for nonclimate-related disasters, such as geological events (tsunamis, volcanic eruptions, and earthquakes).

Local communities were found to be the primary focus in the design of CIEWS projects. As shown in figure 4.5, 39 percent of these initiatives prioritize community and local levels as their primary focus. Following closely behind are projects with a national scope, accounting for 33 percent, while those at the state level constitute 20 percent, and multicountry efforts represent 7 percent of the total.

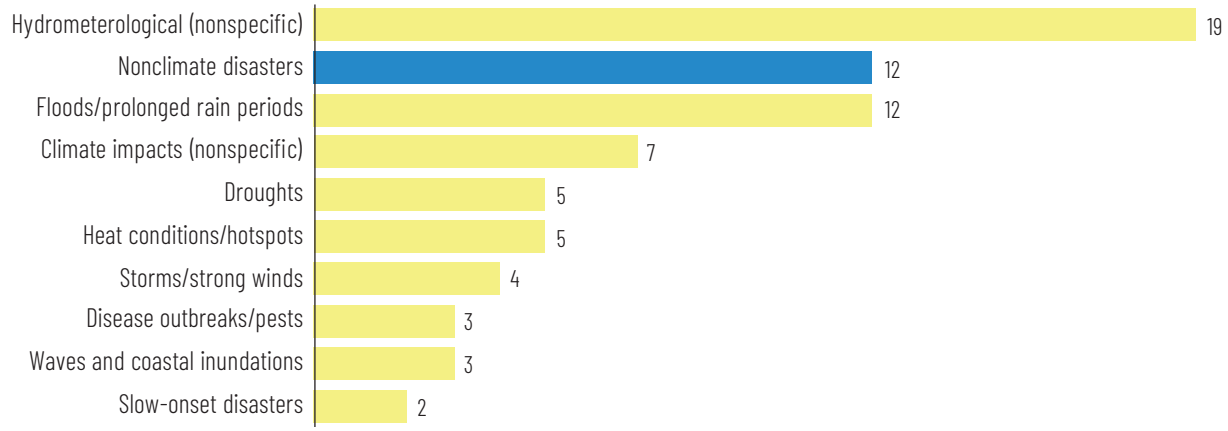
For instance, the project Adaptation to Climate Change in Arid Lands (GEF ID 3249; World Bank) was designed to address the challenges of drought, which have historically affected poor rural communities in Kenya. Notably, the project introduced the innovative approach of community participation in both the design and implementation phases of the project—an approach that had not been used by the GEF in addressing climate change in Kenya. As a direct result of the training facilitated by the project, government extension officers at the community level in Mumoni and Kyuso successfully integrated adaptation strategies into municipal development plans. They have also incorporated climate seasonal predictions and early warning alerts into their outreach efforts within the communities they serve.

The primary beneficiaries of CIEWS interventions are concentrated within the agricultural and fisheries sectors. A comprehensive analysis of completed and ongoing projects found that 46 percent of initiatives specifically targeted farmers and rural communities as their primary beneficiaries (figure 4.6). Coastal populations and fishers were the focus of 31 percent of projects; 7 percent were dedicated to forestry-related efforts; and 16 percent had no specified beneficiaries,

[2] According to the United Nations Office for Disaster Risk Reduction, "Hydrometeorological hazards are of atmospheric, hydrological, or oceanographic origin. Examples are tropical cyclones (also known as typhoons and hurricanes); floods, including flash floods; droughts; heatwaves; cold spells; and coastal storm surges. Hydrometeorological conditions may also be a factor in other hazards, such as landslides, wildland fires, pest incidence (i.e., locust plagues), epidemics, and the transport and dispersal of toxic substances and volcanic eruption material." Source: Sendai Framework Terminology on Disaster Risk Reduction Definition: Hazard web page.

[3] WMO's Global Framework for Climate Services web page, accessed December 2023.

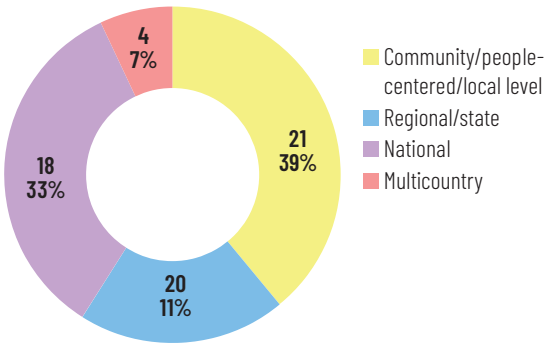
Figure 4.4 Types of climate impacts and risks targeted through GEF-supported CIEWS (number of projects)



Source: Project documents.

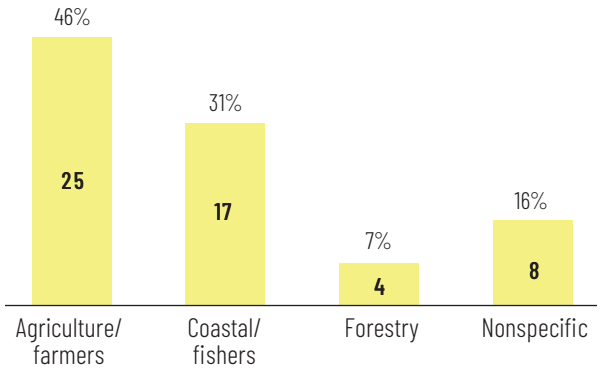
Note: Data do not sum to the total number of projects in the portfolio, as one project can encompass multiple disaster events.

Figure 4.5 Primary scope of CIEWS evaluation portfolio projects



Source: Project documents.

Figure 4.6 Beneficiaries of CIEWS evaluation portfolio projects



Source: Project documents.

encompassing projects with beneficiaries by geographical area and multiple ecosystems. For those dependent on terrestrial and marine-based livelihoods in the context of climate change and variability, climate information, forecasting, and early warning are critical for decision-making. Access to and understanding of agrometeorological information, for instance, are prerequisites for productive and efficient management and decision-making concerning agricultural activities.

In the Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Guinea (GEF ID 8023, UNDP) project supported by the LDCF, funds were strategically utilized to establish critical infrastructure, thereby enhancing the accessibility of climate information. This initiative supported the Guinean National Directorate of Meteorology in delivering high-quality hydrometeorological data to farmers, enabling them to anticipate climate-induced

disasters and take necessary measures proactively. These actions included the development of crop calendars; early detection of heavy rains, storms, and floods; and monitoring water courses to adapt to the impacts of climate-related risks.

This targeting of agrometeorological information was common across other projects, given the vulnerability of farmers to climate change and the impact of variability, facilitating climate risk–informed decision-making in assisting adaptation. For example, in Tanzania's CIEWS project, farmers in Arusha, exposed to drought and flood, were selected within their wards to receive monthly early warning and climate information forecasting. This allowed them to adapt their cropping and farming practices accordingly.

CIEWS initiatives within LDCF, SCCF, and GEF Trust Fund projects have strategically integrated with and leveraged existing services and warning system platforms. Notably, 75 percent of these projects built upon existing services or leveraged existing platforms. Integration commonly involved national meteorological services that collect weather and monitoring data, such as information on flooding, soil humidity, and tidal gauges. Some projects also leverage international data and regional information platforms and services.

For instance, Tonga's Pacific Resilience Program utilizes Pacific Community services and information. By leveraging these existing services, CIEWS interventions fill gaps in the climate information value chain, broaden access to information, and encourage greater user uptake and application of climate information services.

As an illustration, the project Strengthening Liberia's Capability to Provide Climate Information and Services to Enhance Climate Resilient Development and Adaptation to Climate Change (GEF ID 4950, UNDP) successfully implemented a fully functional EWS by procuring and installing 11 automatic weather stations on cell phone communication towers, which are owned by telephone companies and are spread across the country. With sites identified and mapped by the Ministry of Transport, these weather stations generate hourly weather information, which is updated on a newly developed ministry weather site. The primary purpose of this system is to broadcast weather information to enable local farmers and other users to make informed decisions related to their livelihoods, which are heavily dependent on weather conditions. This is an example of proactive coordination undertaken by multiple stakeholders to ensure the effective implementation of the EWS.

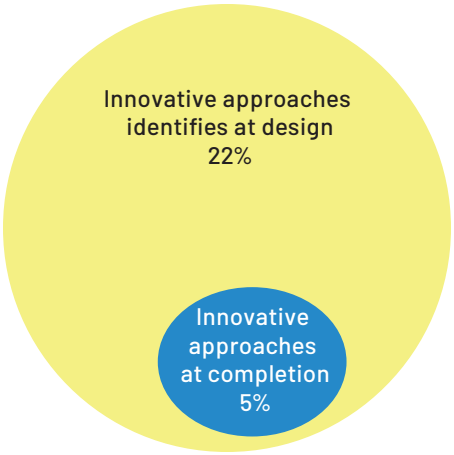
Overall, the integration and leveraging of interventions in existing services and platforms has been a key strategy in GEF projects, allowing for efficient utilization of resources and enhancement of climate information services.

Utilization of innovative approaches in GEF projects has been limited. While certain innovative approaches were piloted and received support via CIEWS interventions, such experiences have been infrequent. As shown in figure 4.7, 22 percent of the projects included in the evaluation portfolio mentioned the utilization of innovative approaches during the design phase. However, a mere 5 percent of the projects reported successful implementation of these innovative approaches at the time of the terminal evaluation.

Key stakeholders interviewed as part of the study noted that the innovative approaches employed in these projects included the use of mobile apps, toll-free numbers, community radios, VHF radios, and AM transmitters as communication channels.[4]

[4] The projects were Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change (GEF ID 5003, UNDP), Climate Change Adaptation in the Eastern Caribbean Fisheries Sector; and Strengthening Climate Information and Early Warning Systems for Climate

Figure 4.7 Innovation in CIEWS evaluation portfolio projects



Source: Project documents.

Furthermore, the portfolio analysis indicated that multiple projects had adopted innovative risk and vulnerability platforms to facilitate information sharing between beneficiaries and policy makers. The SCCF, which supported non-LDCs, has been able to support more innovative CIEWS activities (e.g., as part of the Southeast Europe and Caucasus Regional Catastrophe Risk Insurance Facility). In terms of data management techniques, several projects piloted the use of spatial data.[5]

Costa Rica's rural aqueduct associations project provides a notable example of an innovative approach, with the project implementing an alarm system using sensors to monitor the water level of the Zapote River. This system had the advantage of low maintenance costs, making it a cost-effective solution. To improve communication efficiency, the project utilized user-friendly and readily accessible communication tools, including social networks and cost-free cross-platform instant messaging platforms. By harnessing these tools, the project successfully disseminated crucial information to the broader population, ensuring that they were well informed and capable of taking appropriate actions in response to the water-level monitoring data.

A prevalent and noteworthy innovative approach involves implementation of community-based initiatives. Platforms like WhatsApp and Facebook groups were frequently employed to facilitate effective communication among community members.

The Community-based Climate Risks Management in Chad (GEF ID 8001, UNDP) project developed a people-centered EWS that actively engaged and reached communities. As part of its innovative approach, the project utilized the climate information generated to design a financial instrument. This instrument provided services such as microcredit and climate index microinsurance to 500 vulnerable households and farmers. The objective was to break the cycle of poverty by providing low-income households, farmers, and businesses with access to liquidity to safeguard their livelihoods during and after climate-related disasters. By combining agricultural microinsurance with agricultural microcredit, insurance companies could save on administration costs and extend their services to remote areas. This approach, contingent on accurate climate information, proved to be beneficial for both the insurance companies and the communities they served.

GEF projects wield a significant catalytic potential. In certain instances, CIEWS initiatives have not only established a robust foundation for sustaining the impacts initiated in their implementation but also demonstrated transferability to other regions. A

Resilient Development and Adaptation to Climate Change in Guinea-Bissau (GEF ID 10105, UNDP).

[5] Specifically, the Reducing Vulnerability and Increasing Adaptive Capacity to Respond to Impacts of Climate Change and Variability for Sustainable Livelihoods in Agriculture Sector in Nepal project (GEF ID 5111, Food and Agriculture Organization of the United Nations), the Community Resilience to Climate and Disaster Risk in Solomon Islands Project (GEF ID 5581, World Bank), and the Building Resilience of Health Systems in Pacific Island LDCs to Climate Change project.

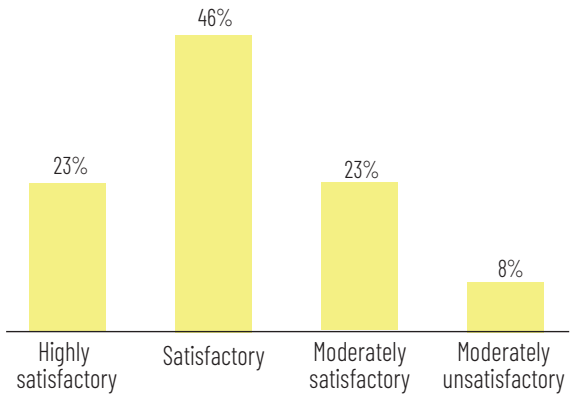
notable trend is the subsequent financing of projects, based on the successful outcomes of GEF initiatives, by other organizations such as the GCF. This aims to sustain their success and unlock the potential for larger-scale interventions. The GCF's involvement brings a significant increase in financial resources, thereby enhancing the transformative capacity of these projects. This support facilitates scaling-up of interventions, enabling broader coverage and far-reaching influence for climate risk–informed and early warning decision-making. The interdependent relationship between GEF projects and subsequent GCF funding underscores the catalytic role played by GEF initiatives in stimulating broader, transformative actions to address climate challenges.

For instance, components from the project design and lessons learned during implementation of the Addressing the Risk of Climate-induced Disasters through Enhanced National and Local Capacity for Effective Actions (GEF ID 4976, UNDP) project in Bhutan played a decisive role in designing the GCF project Scaling-up Multi-hazard Early Warning Systems and the Use of Climate Information in Georgia—also executed by UNDP—and financed by $27 million from the GCF. This initiative effectively established and upgraded a flood forecasting early warning system along the Rioni River, significantly improving the resilience of 258,841 households, as reported in the project's 2022 implementation report.

4.2 Effectiveness

Most CIEWS projects with terminal evaluations have achieved satisfactory outcomes. Of the 26 projects with a terminal evaluation, 92 percent received ratings in the satisfactory range, encompassing highly satisfactory, satisfactory, and moderately satisfactory. Only 8 percent received a moderately unsatisfactory rating, and none was assessed as unsatisfactory or highly unsatisfactory (figure 4.8). In comparison, 81 percent of the 1,294 projects from GEF-managed trust funds included in the IEO terminal evaluation database and spanning GEF-3 to GEF-5 are rated in the satisfactory range—11 percentage points less than the CIEWS projects.

Figure 4.8 Outcome ratings of CIEWS evaluation portfolio projects

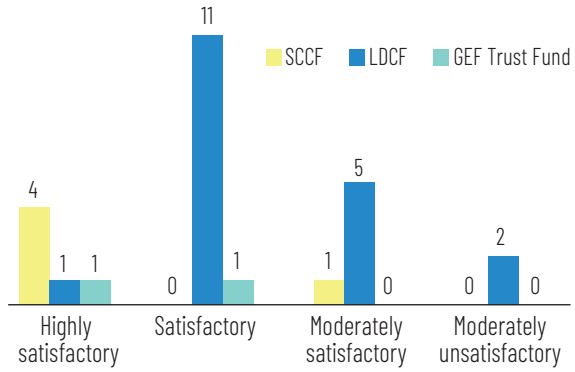


Source: Project documents.

However, a considerable proportion of CIEWS projects are still in the process of implementation. Consequently, it is reasonable to anticipate that the percentage of satisfactory ratings may decline, as projects facing implementation challenges are more likely to experience delayed completion and thus be overrepresented among those that have not yet undergone terminal evaluation, particularly for the GEF-5 replenishment period, which includes most of the projects in the CIEWS evaluation portfolio.

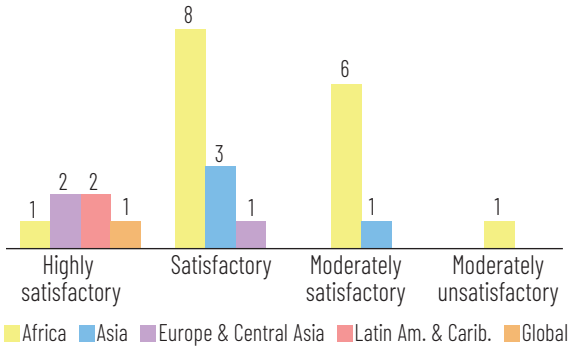
Significant variations in outcome ratings exist across project categories, with distinctions based on regions and funds. Figure 4.9 shows the number of projects within different categories that received outcome ratings based on cumulative data from terminal evaluations. Historically within the GEF portfolio, a higher proportion of projects financed by the SCCF have achieved highly satisfactory outcomes, a trend reaffirmed in the CIEWS evaluation portfolio (figure 4.10). Conversely, a lower percentage of projects in Africa, in general, have met the criteria for satisfactory outcomes—although,

Figure 4. 9 CIEWS evaluation portfolio project ratings by fund (number of projects)



Source: Project documents.

Figure 4.10 CIEWS evaluation portfolio projects' rating by region



Source: Project documents.

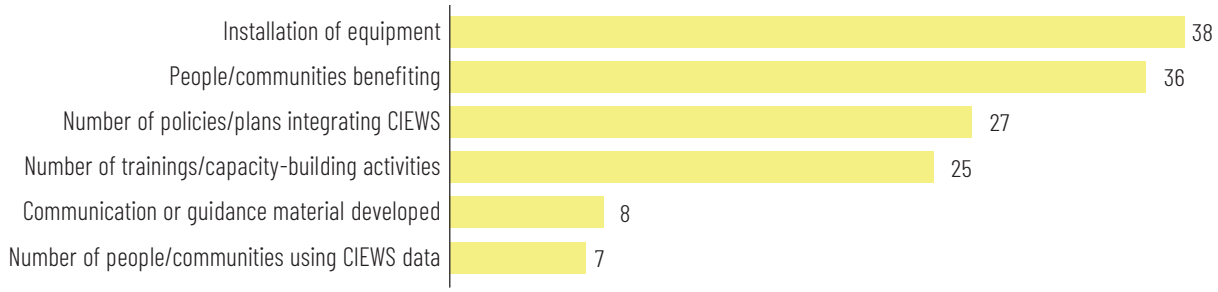
within the specific context of the CIEWS portfolio, there has been a notable improvement in project outcomes in the region. Notably, 93 percent of completed projects in Africa have received a rating in the satisfactory range, aligning with overall portfolio performance.

Although the outcome ratings are favorable, an assessment of the results framework for CIEWS components found that 73 percent of projects require more thorough design. The review of completed and ongoing projects, coupled with interviews with key stakeholders, highlights one prevalent issue: the choice of indicators may not adequately reflect the specific goals and objectives of the CIEWS interventions. In some instances, indicators were chosen for their simplicity rather than their capacity to accurately measure the project's contribution to building resilience and adaptive capacity over time. As illustrated in figure 4.11, a majority of indicators used in projects incorporating CIEWS components tend to focus on successful equipment installation or the number of beneficiaries residing in the intervention areas.

While establishing target numbers for equipment installation and beneficiary counts can be informative, indicators of this nature may fall short of providing a comprehensive project assessment due to inherent ambiguities. For instance, there are examples where the installed equipment ceases to function effectively postproject completion, often due to insufficient funding and an inadequate operation and maintenance framework.

Upon detailed review and in interviews, design issues were identified, for example, in the CIEWS project included in the Tanzania case study. In this project, activities had been underbudgeted in design costings, and therefore underresourced, affecting the implementers' ability to undertake all planned project activities. Of note in these findings were the underestimation of costs for technology and local sourcing expenses for certain equipment (e.g., automated weather stations), as well as ongoing subscription costs to the platforms and databases supporting equipment in operation. Thus, the reported total of installed equipment may not accurately reflect the operational reality. Furthermore, the total count of beneficiaries as reported by the project may be derived from the general population within the project's geographic area rather than those individuals who genuinely have access to CIEWS data. This approach fails to offer insights into the actual utilization of CIEWS data by the project's intended beneficiaries.

Figure 4.11 Types of indicators tracked in CIEWS evaluation portfolio projects (number of projects)



Source: Project documents.

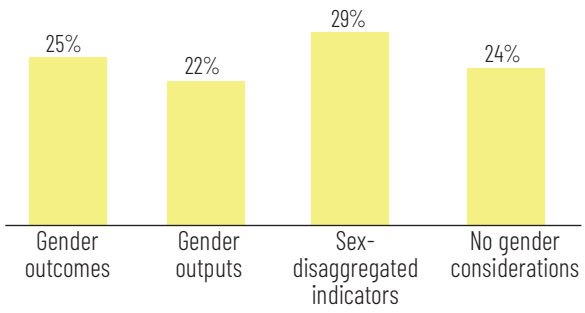
Note: Data do not sum to the total number of projects, but rather to the sum of all the indicators used across all the projects in the evaluation portfolio.

Another example is the project Adapting to Climate Change-Induced Coastal Risks in Sierra Leone (GEF ID 5902, UNDP), which adopted the number of beneficiaries as the key indicator to measure the progress of its objectives. This approach encountered significant challenges. The terminal evaluation found that the project team included the entire population in the targeted area in its assessment, rather than specifically focusing on individuals actively engaged in adaptation measures. Furthermore, the evaluation identified that the mobile phones provided by the project at each site, which were intended for receiving and disseminating weather information, remained underutilized, particularly for disseminating information. Consequently, direct beneficiaries did not derive the expected benefits from the information generated, highlighting a flaw in the design and application of the chosen indicator.

While CIEWS projects demonstrated a close alignment with national priorities aimed at reducing the vulnerability of women and other marginalized groups, the degree to which this integration has been achieved remains somewhat constrained. The evaluation team classified the CIEWS evaluation portfolio and assessed the degree to which projects included gender in three components of project design: outcomes, outputs/activities, and indicators. The relative degree to which gender is integrated into an operation is positively related to the number of components that incorporate gender. For example, those that include gender elements in all three components have a relatively high degree of integration. Using this criterion, an analysis of the consideration of gender inclusivity in CIEWS interventions showed that 25 percent of projects included explicit outcomes targeting gender inclusivity, 22 percent included gender in project outputs or activities (mainly through training or workshops) as their highest level of gender integration, 29 percent only included sex-disaggregated indicators, and 24 percent did not mention relevant gender considerations (figure 4.12).

The predominant strategy for incorporating gender considerations at an outcome level encompasses

Figure 4.12 Gender components in CIEWS evaluation portfolio projects (percent of projects)



Source: Project documents.

several key elements. The approach entails adapting and implementing CIEWS project activities based on a comprehensive understanding of gender dynamics and the potential disproportionate impacts of climate change on women. This includes conducting gender-specific analyses during vulnerability assessments and integrating gender-responsive budgeting to ensure the allocation of resources for specific activities addressing women's adaptation needs, such as livelihood options.

It further involves incorporating women's perspectives in both the development and implementation phases of the project as well as efforts directed at building women's capacities by actively involving them in generating climate and socioeconomic information to address their specific areas of concern. A crucial aspect is strengthening women's roles in mainstreaming adaptation processes within national, regional, and local policies, plans, and budgets—extending to their involvement in sectoral decision-making, particularly in the most-vulnerable sectors and sites. Lastly, emphasis is placed on promoting the active participation of women in emergency committees and management systems, assigning them significant roles in institutions and organizations.

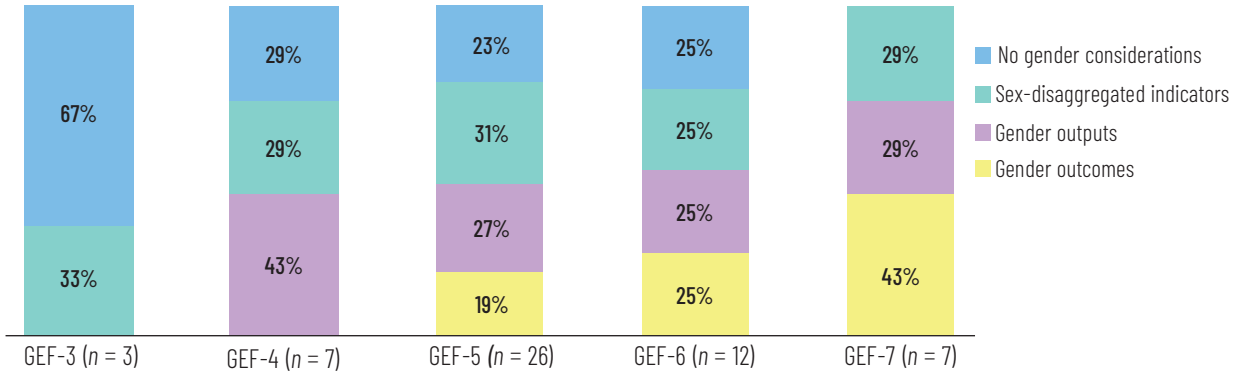
As an example of a high degree of gender integration, a gender-based vulnerability assessment was conducted across various targeted villages and regions as part of the Guinea CIEWS project's preparation phase. The primary goal of this assessment was to identify specific climate information needs related to gender vulnerabilities. The climate information needs assessment placed particular emphasis on the requirements of vulnerable women to develop tailored tools to ensure their easy access to the information necessary for enhancing their resilience to climate change impacts. There were specific gender-oriented outcomes and outputs, along with the utilization of SMART (specific, measurable, achievable, relevant and time-bound) indicators to assess the effectiveness of their interventions.

A comparative analysis of gender components across GEF replenishment periods reveals a shift in priorities. Notably, these components received less emphasis during GEF-3 and GEF-4 (figure 4.13). There was a consistent improvement in prioritization during GEF-5 and GEF-6, reaching a substantial 43 percent in project design during GEF-7. The recognition that gender mainstreaming was less effectively implemented in earlier projects has been noted in previous IEO evaluations. This observation is attributed to the fact that a new GEF Policy on Gender Equality was approved by the GEF Council in 2017. After the policy was adopted, the GEF Secretariat developed guidelines to facilitate its successful implementation in collaboration with the GEF Agencies. This process involved consultations with the GEF IEO, GEF Agencies, and various stakeholders to ensure comprehensive input and expertise.

Efforts to include and focus interventions on vulnerable and marginalized populations show mixed results. Interviews and case studies accentuated the connection between the most-vulnerable groups and their heightened exposure to climate-related risks, indicating the inherent need for CIEWS interventions—particularly at the community level—to address their particular needs. Many projects explicitly aim to bridge the information gap for communities lacking Internet or television access, primarily through radio-based data dissemination or by providing mobile phones (smartphones) for communities to access critical climate information and early warnings.[6] These initiatives targeted marginalized and

[6] Examples of these projects include Capacity Development for Climate Change Mitigation through Sustainable Forest Management in non-Annex I Countries (GEF ID 3818, World Bank), the Malawi CIEWS project, Strengthening Climate Information and Early Warning Systems in Africa to Support Climate Resilient Development and Adaptation to Climate Change—Burkina Faso (GEF ID 5003, UNDP), and Flood

Figure 4.13 Gender components by GEF replenishment period in CIEWS evaluation portfolio projects



Source: Project documents.

vulnerable populations, especially in rural regions, utilizing local languages and diverse communication methods. Other projects proactively integrated indigenous knowledge to serve communities with distinct languages and requirements, with the documentation of such knowledge as a promising step toward addressing climate-related challenges.[7]

Insights from stakeholder interviews highlighted ongoing challenges in effectively delivering outreach programs aimed at marginalized groups. These discussions also mentioned the crucial role of capacity building within organized communities and in reaching dispersed groups with restricted access to essential services or ability to participate in organized activities during times of disaster. Notably, the portfolio review analysis uncovered limited information on this aspect. This limitation reflects insufficient discussion of marginalized populations in projects rather than implying such populations are absent from project sites.

Collaboration, tailored interventions, and a focus on improving data usability consistently emerge as critical factors supporting the effectiveness of CIEWS projects. Effective collaboration with government entities—especially meteorological departments, disaster preparedness and response agencies, and humanitarian organizations like the Red Cross and the Red Crescent—is a crucial factor for ensuring the efficacy of climate information services being integrated into projects. Involving multiple agencies from different government levels is also vital in promoting broader utilization of climate data.

For instance, The Gambia's Strengthening Climate Change Early Warning Systems project shifted from an absence of climate information systems in the country to establishing an operational system actively endorsed by the government and subsequently extended using its resources. A significant lesson learned underscored the importance of initiating cross-sectoral engagement from the project's outset. While climate information systems initially seemed solely an environmental sector project, stakeholders from various sectors, including transportation, agriculture, and tourism, became engaged during the

Hazard and Climate Risk Management to Secure Lives and Assets in Mali (GEF ID 5855, UNDP).

[7] These projects were the Integrated Disaster and Land Management Project (GEF ID 4709, World Bank), Costa Rica's rural aqueduct associations project, and Strengthening Rural and Urban Resilience to Climate Change and Variability by the Provision of Water Supply and Sanitation in Chad project (GEF ID 10089, African Development Bank).

implementation stage, broadening the project's scope and enhancing its intended outcomes.

Similarly, Tanzania's CIEWS project highlighted the critical nature of inclusivity alongside coordination. Engaging all key government agencies—including the meteorological services authority, the prime minister's office responsible for disaster risk management, the water ministry, local government authorities, communities, and users—in coordinating information inputs and networks, as well as packaging information for users, proved to be crucial for success.

In the Caribbean, the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (GEF ID 5667, Food and Agriculture Organization of the United Nations) project highlighted the importance of adopting adaptive management approaches within CIEWS projects, emphasizing the need to remain flexible and tailor interventions to align with the unique requirements and capacities of diverse communities. Establishing a supportive environment for EWS within the community proved to be crucial. This encompasses establishing a well-structured response plan and addressing institutional and community preparedness issues.

This project underscores the importance of stakeholder engagement and of securing community buy-in and active involvement in planning and executing EWS. Although precise data on loss prevention were scarce, and even more challenging to assign attribution, the training in global positioning systems (GPS) and VHF radios provided by the project to 1,300 stewards and fishers might have played a role in preventing the loss of lives in certain areas. The St. Kitts and Nevis Coast Guard has reported a considerable improvement in sea safety, noting a decline in the number of fishers going missing at sea. Prior to the project's implementation, an average of four such cases were reported annually. Since the project's completion, no such cases have been reported.

The portfolio review, case studies, and interviews offered compelling evidence on data usability, highlighting its pivotal role in the effectiveness of CIEWS interventions. Clear, user-friendly information enables communities and authorities to take necessary precautions and implement evacuation plans promptly; this can significantly reduce the impact of disasters, and ultimately enhance climate information to improve socioeconomic benefits.

For instance, the Strengthening Climate Information and Early Warning Systems in Zambia (GEF ID 4995, UNDP) project supported the efficient and effective use of hydrometeorological and environmental information in communities. According to the project's terminal evaluation, over 60,000 small-scale farmers—constituting 100 percent in the targeted areas and 60 percent of whom were women—benefited from weather and climate information between 2016 and 2019. This weather and climate information contributed to a substantial increase in maize production from 600 kilograms per hectare to 2.2 tons per hectare, thus enhancing food security by meeting the average family's requirement of 400 kilograms of maize, with the surplus serving as a valuable source of income generation. Moreover, the accessibility of weather and climate information has encouraged crop diversification, leading farmers to cultivate additional crops like legumes and engage in small livestock rearing.

A similar case was identified in Ethiopia, where the Implementing Climate Resilient and Green Economy Plans in Highland Areas (GEF ID 6967, UNDP) project provided 500 plastic rain gauges to farmers and training to interpret the gathered data. This effort significantly expanded access to weather monitoring, equipping beneficiaries with accurate information to make informed decisions. This proved especially crucial as changing weather patterns rendered certain crops, traditionally grown in these communities, no longer viable.

Integrating hazards, vulnerabilities, and risk reduction measures enhances institutional effectiveness, operational efficiency, and public preparedness, contributing to the overall effectiveness of CIEWS. Empirical evidence underscores the critical importance of concurrently considering hazards and vulnerabilities for optimizing risk reduction outcomes. Projects that systematically and comprehensively integrate these components demonstrate heightened success in improving institutional effectiveness, streamlining the efficiency of actions, and refining public preparedness. Despite these benefits, projects in the evaluation portfolio lack a systematic and comprehensive integration of climate information and EWS into broader disaster risk management strategies. This gap suggests the full potential of these projects may not be realized, as the synergies between climate-related information and disaster risk reduction strategies are not optimally leveraged.

While there has been some progress, the challenge of reaching the "last mile" persists. As noted earlier, the last mile refers to the delivery of information and services to local communities. The last mile terminology acknowledges that even when comprehensive systems are in place, their effectiveness ultimately depends on successfully reaching and engaging the most-vulnerable and remote communities. This requires not only making climate information accessible but also tailoring it to local needs, ensuring comprehensibility for diverse users, and enabling informed decisions and actions. The last mile approach emphasizes the importance of community involvement, user-centered design, and effective communication to bridge the gap between centralized data and the people relying on it for their safety, livelihoods, and resilience to climate-related challenges.

Despite the progress made in infrastructure development and capacity building, CIEWS projects have not consistently overcome the challenges of the last mile. For instance, 11 projects in African LDCs, approved through the LDCF in 2014 and implemented by UNDP, successfully established essential infrastructure, including the establishment of hydrological and meteorological stations; effectively improved the capabilities of national agencies; and successfully integrated new equipment into national systems. However, despite UNDP's efforts to develop last mile services to meet needs identified through knowledge management products and the introduction of potential partners, the evidence shows a significant gap between the availability of early warning information and its effective delivery to those who need it most. As a result, despite progress in new infrastructure and capacity building, the last mile communities in the UNDP projects continue to be underserved and disproportionately affected by climate-related disasters and challenges.

CIEWS projects have shown limited effectiveness in transitioning from solely supporting CIEWS to integrating early action measures within disaster events. While projects have supported countries in accessing and disseminating warnings, the effectiveness of these warnings in saving lives hinges on more than just accessibility. The evaluation team did not find concrete evidence that CIEWS projects consistently succeeded in imparting not only information but also systematic knowledge to populations regarding appropriate responses once a warning is issued. This knowledge gap is particularly pronounced when instructing communities on distinct actions required for various types of climate-related disasters. Information and data extracted from the portfolio review and case studies show that to translate early warnings into early actions, comprehensive national and local plans must be in place. The presence of both communication infrastructure and knowledge of how to act upon the warnings ensures the successful transition from awareness to life-saving action.

For instance, the Strengthening Climate Information and Early Warning Systems in São Tomé and

Príncipe for Climate Resilient Development and Adaptation to Climate Change (GEF ID 5004, UNDP) project focused heavily on improving warning mechanisms, such as the development of meteorological and community alert systems. However, the project falls short of providing tangible support for early actions during disasters. While it successfully strengthens the capacity to issue timely warnings, the implementation lacks crucial elements, such as community drills, pre-positioning of emergency supplies, or establishing safe evacuation routes. As a result, despite the improved warning systems, the affected communities face challenges in effectively responding to disasters due to a lack of practical support for early actions.

One example of a project that successfully implemented early warning alerts is Integrating Community-based Adaptation into Afforestation and Reforestation Programs in Bangladesh (GEF ID 4700, UNDP). The CIEWS component of this project focused on strengthening the capacity of vulnerable communities to cope with the increasing risks associated with climate change, particularly cyclones and associated storm surges. The project designed an EWS tailored to the local context. It included the installation of weather monitoring equipment, the establishment of communication channels with local communities, and the development of user-friendly alert messages. These alerts provided timely information on approaching cyclones and storm surges, enabling residents in the project area to take necessary precautions and evacuate to safer locations. The EWS not only delivered advance warnings but also conveyed specific information about the potential impacts of the impending cyclones and recommended actions to be taken.

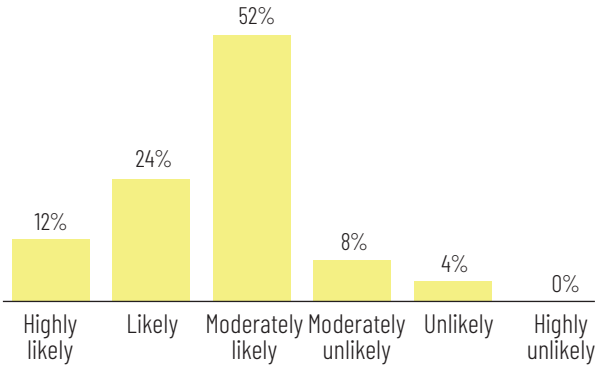
According to the 2020 project implementation review, 5,800 Cyclone Preparedness Programme community volunteers underwent comprehensive training. This training emphasized the critical roles these volunteers play during disasters and educates them in mitigating the impact of cyclones and storm surges. This activity was conducted in close collaboration with the Department of Disaster Management. The department has received further support to develop an action plan to facilitate the identification and management of shelters and evacuation routes in the event of a disaster, enhancing the overall preparedness and resilience of the communities involved. This project is a remarkable example of how GEF-supported initiatives can strengthen the resilience of vulnerable communities by implementing effective EWS that translate into early actions.

4.3 Sustainability

Projects in the evaluation portfolio exhibited promising sustainability ratings; however, the specific outcomes of CIEWS cannot be ensured over the long term. Sustainability ratings estimate the extent to which a project's outcomes are likely to be durable, and the extent to which a project is likely to achieve its expected long-term impact. Of all CIEWS projects in the evaluation portfolio that have undergone terminal evaluation, 88 percent received a rating within the likely range for project sustainability at completion (figure 4.14). This compares to 68 percent of the projects in the overall GEF portfolio. The difference can be attributed to several factors. A considerable number of CIEWS projects initially adopted an infrastructure-based adaptation approach, which included interventions related to risk management. These projects started by addressing basic infrastructure needs as an initial step, progressively broadening their scope, and contemplating the integration of CIEWS components. This approach effectively demonstrated the crucial role of CIEWS interventions in averting losses from natural disasters, involving communities, and empowering them to manage these tools for long-term project sustainability.

For stakeholders who still needed to fulfill their basic infrastructure needs, CIEWS interventions were

Figure 4.14 Sustainability ratings of CIEWS evaluation portfolio projects (percent of projects)



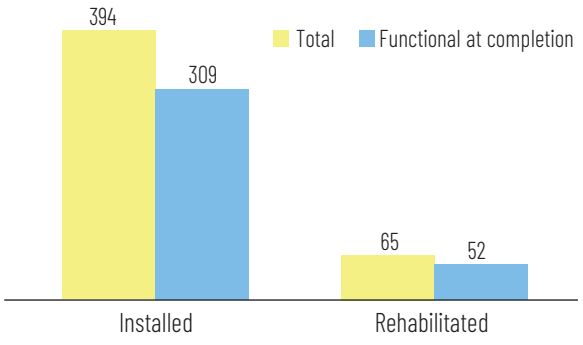
Source: Project documents.

often perceived as a subsequent stage of development, deemed feasible only after addressing more urgent necessities. However, transformative experiences resulting from hazards that caused community shocks and significant damage heightened awareness and motivation for engagement with CIEWS interventions. The difficult situation faced by communities that historically have been affected by natural disasters was identified as a trigger that opened an exceptional window of opportunity for full commitment to CIEWS components. For instance, in Costa Rica, stakeholders in the Guanacaste and Alajuela cantons were deeply affected by Hurricane Otto in 2017 and Storm Nate in 2018, and exhibited a strong eagerness to participate in the development of tools, mechanisms, and procedures aimed at preventing more substantial losses during future natural events. The enthusiastic involvement of these stakeholders played a pivotal role in achieving success and ensuring the long-term sustainability of the rural aqueduct associations project.

Some of the projects' main CIEWS outcomes showed issues related to operation and maintenance at completion. Several projects supported the installation of hydrometeorological stations and automated weather stations. The portfolio review analysis found that approximately 394 weather stations had been installed and 65 others had been rehabilitated or repaired. However, at project completion, only 309, or 78 percent, of the weather stations were deemed functional (figure 4.15). A similar percentage of the weather stations that had been rehabilitated or repaired were functional at project completion—80 percent (52 stations).

Notably, the Malawi CIEWS project encountered significant challenges in this context. The project's terminal evaluation highlighted critical issues stemming from a lack of funding for operation and maintenance, leading to obstacles to the utilization of weather stations. Challenges included a shortage of paper for mechanical recording of temperature and humidity; and unpaid water bills, resulting in water supply interruptions—and consequently, no water being available to refill evaporation pans (limited to a few liters per day at most). Moreover, funding has not been available since September 2017 to reimburse personnel responsible for reading river water level measurements ($10 per month per person). The strategy proposed during project design to boost revenue for covering operation and maintenance costs proved unsuccessful, and no commercial weather services were developed for sale. The outlook for financial sustainability was assessed as unlikely.

Figure 4.15 Status of weather stations installed and rehabilitated by CIEWS evaluation portfolio projects



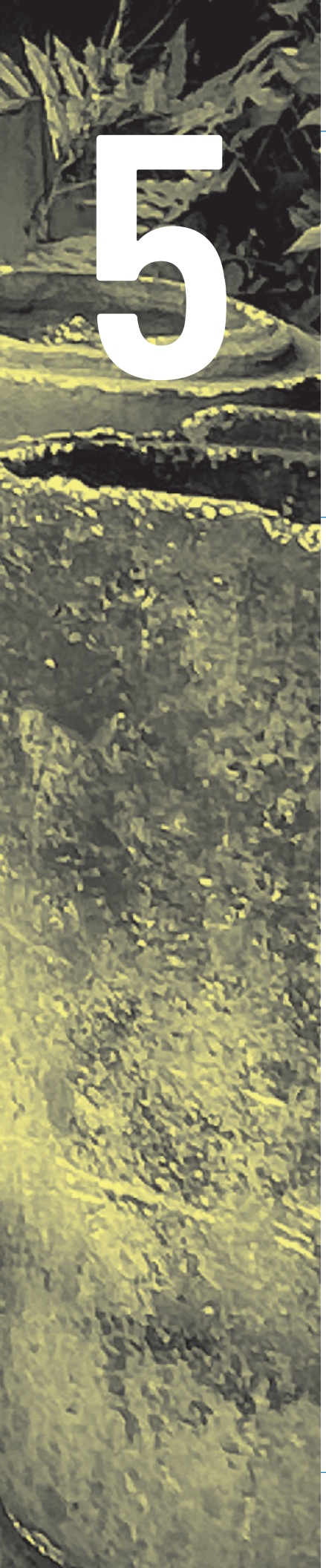
Source: Project documents.

Despite the increasing importance of climate resilience and the critical role played by accurate and timely information in disaster risk reduction, private sector involvement in CIEWS projects remains constrained. Several factors contribute to this limitation according to information collected from interviews, case studies, and the portfolio review analysis. First, many stakeholders believe that financing for climate information services should solely rely on public funds, with no consideration for contributions from the private sector. Second, the lack of a well-defined participation framework and incentive structures deters private sector involvement. In some cases, competition between governments and the private sector for the provision of climate information services overrides collaboration efforts.

Liberia's CIEWS project aimed to engage the private sector in developing fee-based meteorological and hydrological services while establishing a framework for dialogue on both public and private financing to support the creation of climate information and EWS. No visible progress was achieved toward these objectives, resulting in an unsatisfactory rating for this outcome.

Other efforts were made with more positive results in Cambodia, where the Strengthening Climate Information and Early Warning Systems to Support Climate Resilient Development and Adaptation to Climate Change (GEF ID 5318, UNDP) project developed a feasibility study and an engagement strategy for incorporating the private sector in CIEWS activities. Despite facing limitations, the project achieved concrete results by creating partnerships with companies dedicated to allocating a portion of their corporate social responsibility funds to improve environmental and climate change adaptation initiatives.

Another interesting example is the project SMART-FARM—A Data and Digital Technology Driven and Farm Management Solution for Climate Resilience (GEF ID 10965, International Fund for Agricultural Development), which stands out as a promising initiative focused on leveraging data and digital technology specifically designed for climate resilience. Currently in progress in Ethiopia and Rwanda, the project strategically devises engagement strategies to involve private sector stakeholders. The primary objective is to elevate the visibility of agricultural value chains, with the potential outcomes of risk mitigation and strengthening of these chains. The reinforced chains, in turn, are anticipated to attract increased investments from diverse entities such as agroprocessing companies, input suppliers, financial institutions, telecommunication companies, and development agencies. This collaborative effort involves extensive networks of smallholder farmers under the platform. To secure the platform's economic sustainability, the project is exploring the adoption of a user subscription model. This model is reinforced by the provision of value-added services through innovative technology. The overarching goal is to establish a robust and self-sustaining ecosystem that brings benefits to both farmers and various stakeholders within the agricultural value chain. This approach reflects a forward-thinking strategy to create lasting positive impacts in the realm of climate-resilient farming practices with the support of the private sector.



5 Conclusions and recommendations

5.1 Conclusions

GEF support for CIEWS demonstrates a strong alignment with GEF Trust Fund and LDCF/SCCF strategies and remains highly relevant to the distinctive circumstances and challenges in various contexts. In the early GEF replenishment periods, projects in the evaluation portfolio emphasized an upstream approach, involving meteorological and climate monitoring stations, satellite observations, climate models, and data analysis techniques. Recent projects have shifted toward a downstream approach, aiming to deliver practical and tailored information to individuals, communities, and organizations, facilitating effective climate change adaptation. This transition from a predominantly upstream focus to a more balanced approach is evident over time and across different regions. GEF projects were responsive to the demands of beneficiary countries and were driven by the recognition of the need for CIEWS. These needs were shaped by geography, climate-related hazards, and specific national requests. Additionally, there was strong alignment between GEF projects and the global distribution of climate-related hazards, particularly in Africa.

In GEF projects, CIEWS components often lack systematic and comprehensive integration into disaster risk management strategies. While CIEWS are designed to provide vital information for disaster preparedness and response, their effectiveness is limited when they are not seamlessly integrated into broader disaster risk management strategies. This lack of integration can lead to a fragmented approach, where CIEWS components are provided in isolation, rather than forming part of a holistic disaster risk reduction framework. GEF projects often fell short of achieving systematic integration of EWS into comprehensive disaster risk management and reduction programs, as well as for practical strategies for proactively mitigating the impact of climate-related disasters and reducing associated vulnerabilities. These initiatives should also contribute to broader social and economic development to strengthen local resilience to climate change. Addressing this deficiency by fostering more

cohesive integration of CIEWS into broader risk reduction frameworks could significantly enhance the overall impact and effectiveness of GEF projects in mitigating climate-related risks.

GEF projects have faced challenges in effectively transitioning from their primary focus on supporting EWS to fully integrating early action measures within disaster events. While GEF projects have improved the generation of climate information and early warnings, evidence indicates a lack of systematic knowledge transfer to communities for appropriate responses, especially for different types of climate-related disasters. Furthermore, limited attention has been dedicated to fostering community-level risk awareness and building capacity for appropriate responses among the population. The success of translating warnings into actions depends on, among other factors, comprehensive national and local plans, coupled with communication infrastructure and knowledge for effective response.

Although there have been improvements in the vertical logic of project designs, substantial opportunities remain for enhancing project results frameworks and the learning process. The evidence highlighted a significant lack of improvement in the quality of indicators used to track CIEWS interventions in GEF projects. Notably, good practices for CIEWS indicators as documented by the WMO encompass metrics such as number of the population covered by early warnings per 100,000 inhabitants, number of evacuees (corresponding to indicator G-6 of the Sendai Framework for Disaster Risk Reduction), number of individuals provided shelter, and quantification of avoided human and economic disaster losses. None of these examples of high-quality indicators were found to be utilized in GEF projects, as selected project indicators mostly prioritized simplicity over effectively measuring project contributions to the long-term development of resilience and adaptive capacity.

GEF projects performed strongly in terms of effectiveness, but the long-term sustainability of their outcomes remains uncertain. Although GEF CIEWS projects have encountered challenges, particularly in the realms of communication and preparedness activities, they have collectively achieved success in fulfilling objectives across various CIEWS domains, notably in facilitating warning services through infrastructure development and capacity building. Nevertheless, sustaining funding and resources for the main outcomes generated by GEF projects is not guaranteed in the long term since meeting the costs of operation and maintenance of CIEWS is often challenging, especially for LDCs. Additional factors identified as potential risks to the sustainability of GEF projects include the variability of government priorities, limited collaboration among GEF Agencies and countries, insufficient community involvement in system maintenance, and high turnover of technicians within government agencies. On a practical level, it is essential to conduct a comprehensive evaluation of financial and governance risks and integrate them into the exit strategy of GEF projects. This should involve a thorough assessment of annual operating, maintenance, and replacement costs for infrastructure assets, covering an initial period of five to seven years. This assessment can help identify any funding shortfalls and inform the development of a strategy to address them effectively.

There are noteworthy successes in effectively incorporating CIEWS components into existing systems, leveraging technologies, and enhancing the results of other interventions. State-of-the-art, technology-based projects—or even standard solutions used in developed countries—may not necessarily be the best or the most affordable option for low-income countries. This is because they often entail escalating operation and maintenance expenses, which can place an added strain on public budgets. The GEF projects reviewed by this evaluation consistently integrated and capitalized on preexisting services and platforms. Through these synergies with established services, CIEWS interventions targeted the mitigation of gaps within the climate information

value chain. This approach sought to broaden information accessibility and stimulated user adoption and application of climate information services. Moreover, these GEF projects have shown a substantial catalytic potential. They have established a robust foundation for continuing their impacts, and have often been subsequently or additionally financed by the GCF to involve larger-scale interventions and greater financial resources, enhancing their transformative capacity.

Notable progress has been made in the development of infrastructure and capacity building for CIEWS, although the critical "last mile" challenge persists. While GEF projects have successfully enhanced forecasting capabilities, including strengthening the institutional capacity of meteorological offices in LDCs in their ability to use CIEWS, the need remains to transform this knowledge into actionable and accessible information. GEF projects have not consistently accounted for the challenges in project implementation at the last mile of service delivery, particularly in the distribution of climate information and warnings to local communities often marginalized by disaster risk reduction strategies. These communities require special consideration and focused attention to ensure they are not inadvertently left behind.

5.2 Recommendations

Recommendation 1: GEF projects should shift their focus from solely providing early warning information to fostering early actions during disaster events. GEF projects ought to prioritize data usability and ensure that both national and local plans are in place. This involves establishing effective communication systems and providing the necessary knowledge of how to respond once a warning is issued. To overcome the last mile challenge, GEF projects must prioritize community engagement, capacity building, and the development of tailored communication strategies to address the specific needs and challenges of remote and vulnerable communities.

Recommendation 2: The GEF Secretariat, the GEF Scientific and Technical Advisory Panel, and the GEF Agencies should continue aligning indicators with established good practices. GEF projects should adopt the most fitting indicators in line with WMO guidelines and informed by international good practices and lessons learned from past experiences. These indicators would effectively measure the success of CIEWS interventions, serve as a roadmap for future interventions, and provide information to global results frameworks. Furthermore, for effective monitoring, GEF projects should set minimum standards for measuring and tracking CIEWS components at the project level. In alignment with ongoing efforts to streamline and simplify the GEF results framework, this approach emphasizes repurposing existing indicators at the project level rather than introducing new ones. The overarching goal is to enhance the quality of measurement and tracking of the application of CIEWS components, ensuring that interventions are well-informed and impactful.

Recommendation 3: The GEF Secretariat and the GEF Agencies should continue to explore strategies to enhance the financial sustainability of CIEWS components. The significant costs associated with the operation and maintenance of CIEWS initiatives require a tailored approach to secure long-term financing to enable their continued success beyond the project's completion. Recognizing the complexities of engaging the private sector and acknowledging their potential role, particularly in LDCs, GEF projects are encouraged to support efforts to create an enabling environment for the private sector in developing innovative adaptation solutions derived from CIEWS. This is especially important considering the multiple applications and increasing advantages that CIEWS offers to several sectors, including transportation, agriculture, tourism, finance, and insurance.

Annex A

Evaluation matrix

Key question	Indicators/measures	Sources of information	Methodology
1. How do GEF-administered trust funds support CIEWS?			
1a. What types of disaster events are being targeted and what types of activities associated with CIEWS are funded by LDCF, SCCF, and the GEF Trust Fund to support CIEWS?	Number of projects supporting: • Risk knowledge • Monitoring and warning service • Dissemination and communication • Response capability	Project proposals and performance documents	Project portfolio review
1b. Are LDCF, SCCF, and GEF Trust Fund projects addressing the most relevant aspects of CIEWS?	Alignment of project design with international good practices	Academic literature and practice-based studies, project proposals and performance documents, GEF Agencies, country stakeholders	Good practices summary, project portfolio review, interviews, case studies
1c. What proportion of the project deals with climate information and early warning in GEF projects?	Project funding allocated to CIEWS	Project proposals and terminal evaluations	Project portfolio review
1d. Are LDCF, SCCF, and GEF Trust Fund projects integrating or leveraging other services and warning system platforms?	Evidence of integration, replication, or scaling up	Project proposals, PIRs, terminal evaluations, GEF Secretariat, GEF Agencies, country stakeholders	Project portfolio review, interviews, case studies
2. How effective are the GEF-supported CIEWS interventions?			
2a. How have CIEWS interventions performed based on performance documentation?	Development outcome and progress implementation ratings for CIEWS interventions	Project terminal evaluations, midterms reviews, PIRs	Project portfolio review, case studies
2b. How effective have CIEWS interventions been when tested with disaster events?	Aggregated results from completed projects and projects under implementation with available performance information	Project terminal evaluations, midterms reviews, PIRs	Project portfolio review
2c. How have CIEWS interventions considered gender and inclusivity?	Type/extent of gender analyses, actions, or results delivered through CIEWS projects	Project proposals, performance documents and terminal evaluations, GEF Secretariat, GEF Agencies, country partners	Project portfolio review, interviews, case studies

Key question	Indicators/measures	Sources of information	Methodology
3. What is the added value of GEF support in CIEWS interventions?			
3a. What innovations, approaches, or new technologies are being piloted or supported within LDCF, SCCF, and GEF Trust Fund projects?	Number of projects supporting innovations, approaches, or new technologies	Project proposals, PIRs, terminal evaluations, GEF Secretariat, GEF Agencies, country stakeholders	Project portfolio review, interviews, case studies
3b. What indicators are being used to track the effectiveness of CIEWS outcomes, and how successful are the outcomes?	List of indicators, evidence of outcomes	Project proposals, PIRs, terminal evaluations, GEF Secretariat, GEF Agencies, country stakeholders	Project portfolio review, interviews, case studies
3c. What are the risks to sustainability of CIEWS outcomes?	Aggregate ratings of likely sustainability of outcomes, perception of stakeholders	Project terminal evaluations, country stakeholders	Project portfolio review, interviews, case studies

Note: CIEWS = climate information and early warning systems; LDCF = Least Developed Countries Fund; PIR = project implementation report; SCCF = Special Climate Change Fund.

Annex B

CIEWS portfolio

GEF ID	GEF period	GEF fund	GEF Agency	Project title	Country	Region
2553	GEF-3	SCCF	UNDP	Piloting Climate Change Adaptation to Protect Human Health	Barbados, Bhutan, China, Fiji, Jordan, Kenya, Uzbekistan	Global
2630	GEF-3	GET	UNDP	Lake Balaton Integrated Vulnerability Assessment, Early Warning and Adaptation Strategies	Hungary	Europe and Central Asia
3249	GEF-3	SCCF	WB	Adaptation to Climate Change in Arid and Semi-Arid Lands	Kenya	Africa
3704	GEF-4	LDCF	UNDP	Integrated Adaptation Programme to Combat the Adverse Effects of Climate Change on Agricultural Production and Food Security in Benin	Benin	Africa
3728	GEF-4	LDCF	UNEP	Strengthening of the Gambia's Climate Change Early Warning Systems	Gambia, The	Africa
3838	GEF-4	LDCF	UNEP	Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas	Rwanda	Africa
3841	GEF-4	LDCF	UNEP	Build Lesotho's Capacity for Monitoring and Predicting Climate Change Impacts, Delivering Early Warning for Extreme Events, and Local and National Planning for Adaptation to Climate Change	Lesotho	Africa
4018	GEF-4	LDCF	WB	São Tomé and Príncipe: Adaptation to Climate Change	São Tomé and Príncipe	Africa
4469	GEF-5	GET	UNDP	Integrated Approach to Management of Forests in Turkey, With Demonstration in High Conservation Value Forests in the Mediterranean Region	Türkiye	Europe and Central Asia
4700	GEF-4	LDCF	UNDP	Integrating Community-based Adaptation into Afforestation and Reforestation Programmes in Bangladesh	Bangladesh	Asia
4709	GEF-5	MTF	WB	GGW: Integrated Disaster and Land Management (IDLM) Project	Togo	Africa
4950	GEF-5	LDCF	UNDP	Strengthening Liberia's Capability to Provide Climate Information and Services to Enhance Climate Resilient Development and Adaptation to Climate Change	Liberia	Africa

GEF ID	GEF period	GEF fund	GEF Agency	Project title	Country	Region
4958	GEF-5	LDCF	UNDP	Climate Risk Finance for Sustainable and Climate Resilient Rain-Fed Farming and Pastoral Systems – Sudan	Sudan	Africa
4991	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Tanzania for Climate Resilient Development and Adaptation to Climate Change	Tanzania	Africa
4992	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems In Africa for Climate Resilient Development and Adaptation to Climate Change – Ethiopia	Ethiopia	Africa
4993	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change	Uganda	Africa
4994	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change – Malawi	Malawi	Africa
4995	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Eastern and Southern Africa for Climate Resilient Development and Adaptation to Climate Change – Zambia	Zambia	Africa
5002	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Western and Central Africa for Climate Resilient Development and Adaptation to Climate Change	Benin	Africa
5003	GEF-5	LDCF	UNDP	Strengthening climate information and early warning systems in Africa for climate resilient development and adaptation to climate change – Burkina Faso	Burkina Faso	Africa
5004	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in São Tomé and Principe for Climate Resilient Development and Adaptation to Climate Change	São Tomé and Principe	Africa
5006	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change	Sierra Leone	Africa
5049	GEF-5	LDCF	UNDP	Adaptation to Climate Change in Vanuatu	Vanuatu	Asia
5071	GEF-5	LDCF	UNEP	Strengthening Climate Services and Early Warning Systems in The Gambia for Climate Resilient Development and Adaptation to Climate Change	Gambia, The	Africa
5111	GEF-5	LDCF	FAO	Reducing Vulnerability and Increasing Adaptive Capacity to Respond to Impacts of Climate Change and Variability for Sustainable Livelihoods in Agriculture Sector in Nepal	Nepal	Asia
5318	GEF-5	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change	Cambodia	Asia
5328	GEF-5	LDCF	FAO	Building Climate Change Resilience in the Fisheries Sector in Malawi	Malawi	Africa
5451	GEF-5	LDCF	WB	Strengthening Hydro-Meteorological and Climate Services	Congo, Dem. Rep.	Africa

GEF ID	GEF period	GEF fund	GEF Agency	Project title	Country	Region
5581	GEF-5	LDCF	WB	Community Resilience to Climate and Disaster Risk in Solomon Islands Project	Solomon Islands	Asia
5604	GEF-5	SCCF	UNDP	Technology Transfer for Climate Resilient Flood Management in Vrbas River Basin	Bosnia and Herzegovina	Europe and Central Asia
5667	GEF-5	SCCF	FAO	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project	St. Vincent and the Grenadines, Grenada, Dominica, St. Lucia, Trinidad and Tobago, Antigua and Barbuda	Latin America and Caribbean
5723	GEF-5	SCCF	WB	West Balkans Drina River Basin Management Project	Bosnia and Herzegovina, Serbia, Montenegro	Europe and Central Asia
5814	GEF-5	SCCF	WB	Pacific Resilience Program	Pacific Islands (regional), Tonga	Asia
5855	GEF-5	LDCF	UNDP	Flood Hazard and Climate Risk Management to Secure Lives and Assets in Mali	Mali	Africa
5902	GEF-5	LDCF	UNDP	Adapting to Climate Change Induced Coastal Risks in Sierra Leone	Sierra Leone	Africa
6926	GEF-6	LDCF	UNEP	Strengthening Climate Services in Lesotho for Climate Resilient Development and Adaptation to Climate Change	Lesotho	Africa
6945	GEF-6	SCCF	UNDP	Strengthening Capacities of Rural Aqueduct Associations' (ASADAS) to Address Climate Change Risks in Water Stressed Communities of Northern Costa Rica	Costa Rica	Latin America and Caribbean
6968	GEF-6	LDCF	UNDP	Chad National Adaptation Plan	Chad	Africa
6984	GEF-6	LDCF	UNDP	Building Resilience of Health Systems in Asian LDCs to Climate Change	Bangladesh, Cambodia, Lao PDR, Myanmar, Nepal, Timor-Leste	Asia
8001	GEF-6	LDCF	UNDP	Community-based Climate Risks Management in Chad	Chad	Africa
8014	GEF-6	LDCF	AfDB	Climate Change Adaptation for Sustainable Rural Water Supply in Lowlands Lesotho	Lesotho	Africa
8018	GEF-6	LDCF	UNDP	Building Resilience of Health Systems in Pacific Island LDCs to Climate Change	Kiribati, Solomon Islands, Tuvalu, Vanuatu	Asia
8023	GEF-6	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Guinea	Guinea	Africa

GEF ID	GEF period	GEF fund	GEF Agency	Project title	Country	Region
9194	GEF-6	LDCF	UNIDO	Strengthening Adaptive Capacities to Climate Change through Capacity Building for Small Scale Enterprises and Communities Dependent on Coastal Fisheries	Gambia, The	Africa
9303	GEF-6	LDCF	UNDP	Climate Change Adaptation in the Lowland Ecosystems	Ethiopia	Africa
9364	GEF-6	LDCF	WB	São Tomé and Príncipe Additional Financing - West Africa Coastal Area Resilience Investment Project	São Tomé and Príncipe	Africa
9420	GEF-6	GET	AfDB	Strengthening Transboundary Cooperation and Integrated Natural Resources Management in the Songwe River Basin	Tanzania, Malawi	Africa
10089	GEF-7	LDCF	AfDB	Strengthening Rural and Urban Resilience to Climate Change and Variability by the Provision of Water Supply and Sanitation in Chad	Chad	Africa
10105	GEF-7	LDCF	UNDP	Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Guinea-Bissau	Guinea-Bissau	Africa
10160	GEF-7	LDCF	UNDP	Increased Resilience and Adaptive Capacity of the Most Vulnerable Communities to Climate Change	Guinea	Africa
10203	GEF-7	LDCF	AfDB	Strengthening the Adaptive Capacity and Resilience of Communities in Uganda's Watersheds	Uganda	Africa
10376	GEF-7	LDCF	UNDP	Enhancing the Resilience of Vulnerable Coastal Communities in Sinoe County of Liberia	Liberia	Africa
10411	GEF-7	LDCF	AfDB	Malawi - Climate Resilient and Sustainable Capture Fisheries, Aquaculture Development and Watershed Management	Malawi	Africa
10415	GEF-7	MTF	UNDP	Adaptation to Climate Change in Vanuatu – Phase II	Vanuatu	Asia
10965	GEF-7	LDCF	IFAD	SMARTFARM - A Data and Digital Technology Driven and Farm Management Solution for Climate Resilience	Ethiopia, Rwanda	Africa
4976	GEF-5	LDCF	UNDP	Addressing the Risk of Climate-induced Disasters through Enhanced National and Local Capacity for Effective Actions	Bhutan	Asia

Source: GEF Portal.

Note: **Fund:** GET = GEF Trust Fund; LDCF = Least Developed Countries Fund; MTF = multitrust fund; SCCF = Special Climate Change Fund. **GEF Agency:** AfDB = African Development Bank; FAO = Food and Agriculture Organization of the United Nations; IFAD = International Fund for Agricultural Development; UNDP = United Nations Development Programme; UNEP = United Nations Environment Programme; UNIDO = United Nations Industrial Development Organization; WB = World Bank.

Annex C

Selection of case study projects

Case study projects were carefully selected based on a set of objectives and country-specific characteristics, including diversity of GEF funds, representation of various GEF Agencies, consideration of diverse country conditions, and different stages of development and implementation of climate information and early warning systems (CIEWS). Specifically, the chosen projects are as follows:

- Strengthening the Climate Information and Early Warning Systems in Tanzania to Support Climate Resilient Development and Adaptation to Climate Change (GEF ID 4991, United Nations Development Programme; Least Developed Countries Fund; completed)
- Pacific Resilience Program (GEF ID 5814, World Bank; Special Climate Change Fund; Tonga, regional; under implementation)
- Strengthening Capacities of Rural Aqueduct Associations (ASADAS) to Address Climate Change Risks in Water-Stressed Communities of Northern Costa Rica (GEF ID 6945, United Nations Development Programme; Special Climate Change Fund; completed)
- Strengthening Transboundary Cooperation and Integrated Natural Resources Management in the Songwe River Basin (GEF ID 9420, African Development Bank; GEF Trust Fund; regional Malawi and Tanzania; under implementation).

The case studies drew evidence from four primary sources: desk reviews, portfolio inputs, field visits, and interviews with key stakeholders. The desk review provided a summary of project characteristics and outcomes, government priorities, the GEF's approach, and relevant documentation at the project level. Portfolio inputs, generated through portfolio review, offered insights into operational relevance and effectiveness. Interviews were conducted during missions and both directly and indirectly engaged stakeholders, including beneficiaries.

The evaluation team utilized a standardized template and methodology connected to the evaluation questions. Evaluators were tasked with ensuring the defensibility of causal inferences drawn from the cases studied. This involved employing precisely specified causal theories, giving careful consideration to alternative explanations, and assessing the trustworthiness and probative value of the evidence supporting causal inferences in the examined cases. Subsequently, the evaluative evidence was compiled and integrated to establish a foundation for further generalization.

Annex D

Support for CIEWS from other donors

The funding allocated for disaster risk management initiatives, particularly those involving climate information and early warning systems (CIEWS) and rapid response systems, has seen a steady increase over the years. In the period 2013–14, it stood at $1.9 billion, rising to $2.9 billion in 2015–16 and to an annual average of $6.6 billion by 2017–18 (WMO 2020). Despite this upward trend, these figures represent a relatively small portion of the resources available in the context of total annual adaptation finance and overall adaptation needs.

Tracking of investments intended to enhance risk information and improve meteorological and hydrological early warning systems remains somewhat lacking in granularity, making it challenging to conduct a precise assessment of the required financing for hydromet systems and their specific components that warrant attention. Nonetheless, emerging data provide valuable insights into the levels and directions of funding in this domain. Sources of these data include the World Bank, the Adaptation Fund, the Climate Investment Funds, the Green Climate Fund (GCF), the United Nations Development Programme (UNDP), and the World Meteorological Organization.

In 2015, the **World Bank** announced the Climate Risk and Early Warning Systems (CREWS) initiative, which aimed to strengthen multihazard early warning systems in least developed countries and small island developing states. CREWS projects are implemented by the World Bank, the World Meteorological Organization, and the United Nations Office for Disaster Risk Reduction, through a special program managed by the World Bank's Global Facility for Disaster Reduction and Recovery. Since inception of the CREWS initiative, $88 million has been allocated to cover all costs related to country, regional, and global projects. Most CREWS projects are in Africa.

According to the 2022 CREWS annual report, sand and dust warnings issued in Burkina Faso since 2018 have proved helpful for health, agriculture, and transportation (CREWS 2022). New partnerships will extend such warnings to six other Sahelian countries and provide a daily weather service to better protect the lives and livelihoods of 107 million people. Additionally, 15 countries in Central and West Africa have improved their access to standardized early warning information through improved mobile phone technology and alerting practices.

Besides the CREWS initiative, in 2020, World Bank funding supporting hydromet components amounted to $1.1 billion spread across more than 60 projects—an increase over the 2019 level of $944 million (World Bank 2020). Asia ($453 million) and Africa ($353 million) account for the highest share of the total funds, followed by South-West Pacific ($100 million) and Europe ($83 million).

As of June 2020, the **Adaptation Fund** portfolio consisted of a total of $745 million funding 107 projects for

adaptation across various sectors.[1] Of that total, 102 projects amounting to $580 million have hydromet components. Those projects are geographically distributed as follows: $225 million in Africa; $129 million in the Pacific, Central America, and the Caribbean; $101.5 million in Asia; $99 million in South America; and $26 million in Eastern Europe. The total invested in hydromet components is $46 million, of which $20 million is directed to Africa; $8 million to South America; $7 million to Asia; $5 million to Europe; and $3 million to the Pacific, Central America, and the Caribbean. From the total portfolio, $17 million is financing the disaster reduction and recovery sector, of which $6 million is directed to Africa. The Adaptation Fund has channeled $65 million toward climate information services. This financial backing is geared toward establishing infrastructure for climate information services and enhancing the capabilities of crucial government institutions and other stakeholders.

The **Climate Investment Funds** have allocated $220 million of a $1.2 billion climate-resilience budget to fortify hydrometeorology and climate services in selected nations (CIF 2023). This investment spans the entire spectrum of weather and climate information services, encompassing aspects such as data collection and monitoring, data management, research, forecasting, modeling, and the development of improved services. Additionally, it emphasizes the critical component of training and capacity building.

At the 26th United Nations Climate Change Conference (COP26) in November 2021, the **GCF** announced that it had become the world's largest financer of climate information services and early warning systems. It stated that $1.2 billion of the GCF's approved budget has been allocated to CIEWS, including approved and pipeline operations, representing 40 projects and 12 percent of its total historical funding portfolio (GCF 2021). CIEWS projects funded by the GCF focus on expanding the hydrometeorological observation network and modeling capacities to secure reliable information on climate-induced hazards, vulnerability, and risks. The Asia-Pacific and Africa regions dominate the portfolio with a combined share of 85 percent of the total resources. Latin America and the Caribbean and Eastern Europe account for 11 percent and 4 percent, respectively.

UNDP administers and operates the Systematic Observations Financing Facility (SOFF), created in December 2018 to facilitate investments and projects related to systematic observations and data collection for addressing climate change, enhancing climate resilience, and improving early warning systems. As of July 2023, it had supported 40 initiatives around the world with an average of $100,000 per initiative.

[1] Source: Adaptation Fund website, Projects & Programmes,

Annex E

Interviewees

Global/central stakeholders

Aloke Barnwal, Senior Climate Change Specialist, GEF Secretariat

Jason Spensley, Senior Climate Change Specialist, GEF Secretariat

Ayanleh Daher Aden, Climate Change and Green Growth Officer and GEF Executive Coordinator, African Development Bank

Edward Carr, Former Panel Member for Climate Change Adaptation, GEF Scientific and Technical Advisory Panel

Virginia Gorsevski, Programme Officer, GEF Scientific and Technical Advisory Panel

Guirane Samba N'diaye, Economist, African Development Bank

Djibril Diagne, Principal Water and Sanitation Engineer, African Development Bank

Iris Monnereau, Regional Project Coordinator of the Climate Change Adaptation of the Eastern Caribbean Fisheries Sector Project (CC4FISH), Food and Agriculture Organization of the United Nations

Francis Phiri, Aquaculture Specialist, Food and Agriculture Organization of the United Nations Malawi

Pradeep Kurukulasuriya, former GEF Executive Coordinator, UNDP-Global Environmental Finance

Srilata Kammila, Head of Climate Change Adaptation, UNDP

Benjamin Larroquette, Regional Technical Advisor, UNDP

Daniel Pouakouyou, Task Manager, United Nations Environment Programme

Paul Desanker, Manager in the Adaptation Programme, United Nations Framework Convention on Climate Change Secretariat

Costa Rica

Enid Chaverri, GEF Focal Point, Ministry of Environment and Energy

Kifah Sasa, UNDP, Auxiliary Resident Representative

Elena Vargas, UNDP, Nature, Climate and Energy Program Officer

Gerardo Quirós, UNDP, Disaster Risk Management Advisor

Rafaella Sánchez, UNDP, Gender Officer

Rafael Barboza, Sub Delegated Systems Management, Institute of Aqueducts and Sewers

Rodolfo Ramírez, Sub Delegated Systems Management, Institute of Aqueducts and Sewers

Laura Torres, Sub Delegated Systems Management, Institute of Aqueducts and Sewers

Katia Carvajal, Agricultural Engineer, National Meteorological Institute

José Alberto Navarro, Hydrology and Early Warning Systems, National Meteorological Institute

José Retana, Development and research, National Meteorological Institute

Emel Rodriguez, Director, Community Water League

Liany Alfaro, Chief, ORAC (regional Institute of Aqueducts and Sewers AyA office) Liberia

Prisiclla Guido, Administrator, ASADA (Rural Aqueduct Association) Artola

Alonso Bustos, President, ASADA (Rural Aqueduct Association) Nuevo Colón

Magally Aguilar, Administrator, ASADA (Rural Aqueduct Association) Nuevo Colón

Luane Rosales, Treasurer, ASADA (Rural Aqueduct Association) Nuevo Colón

Lina Gallo, Tax Official, ASADA (Rural Aqueduct Association) Nuevo Colón

Ernesto Bonilla, Assistant Planning Manager, Municipality of Carrilo

Jorge Mario González, Administrator/Vice Mayor, ASADA (Rural Aqueduct Association) Bijagu, Municipality of Upala

Mireidy Torres, Social Development, IMAS (Joint Social Welfare Institute)

Yamileth López, Mayor, Municipality of Upala

Miguel Torres, Local/Municipal Emergency Committee, Upala community,

Carlos Centeno, Local/Municipal Emergency Committee, Upala community,

Sandra Álvarez, Local/Municipal Emergency Committee, Upala community,

Marcela Mora, Engineer, ORAC (regional Institute of Aqueducts and Sewers AyA office) Ciudad Quesada

Héctor Paniagua, Chief, ORAC (regional Institute of Aqueducts and Sewers AyA office), Ciudad Quesada

Francisco Acuña, Inspector, ORAC (regional Institute of Aqueducts and Sewers AyA office) Ciudad Quesada

Luis Diego Alfaro, Engineer, ORAC (regional Institute of Aqueducts and Sewers AyA office) Ciudad Quesada

Stephanie Guillén, Administrator, ORAC (regional Institute of Aqueducts and Sewers AyA office) Ciudad Quesada

Lidier Esquivel, Head of research and risk analysis, National Emergency Commission

Lil Soto, Program Manager, Avina Foundation

Yamileth Astorga, Professor, University of Costa Rica

Tanzania

Sergio Valdini, Deputy Resident Representative, UNDP Tanzania

Gertrude Lyatuu, Portfolio Lead, Nature and Ecosystem, UNDP Tanzania

Abbas Kitogo, Portfolio Lead Energy, Climate Change and Disaster Risk Management, UNDP Tanzania

Angwi Mbandi, M&E Analyst, UNDP Tanzania

Abdul Bangula, Principal Country Program Officer, African Development Bank

Doreen Kumwenda, Agricultural Economist, African Development Bank (Malawi)

Justice, Water Sanitation Engineer, African Development Bank

Ladislaus Chang'a, Acting Director General, Tanzania Meteorological Authority

Mgudula Rambika, Acting Manager of Technical Service, Tanzania Meteorological Authority

Kantamla Mafuru, Manager, Central Forecasting Office, Tanzania Meteorological Authority

Mathew Ndaki, Senior Meteorologist, Early Warning and Systematic Observation Financing Project, Tanzania Meteorological Authority

Nobeta Sanga, Meteorologist, Tanzania Meteorological Authority

Lovina Japhet, Meteorologist, Tanzania Meteorological Authority

Paul Deogratious, Acting Director of Environmental Impact Assessment, Vice President's Office

Kemilembe Mutasa, Acting Director of Environment, Vice President's Office

Thomas Bwana, GEF Desk Officer, Vice President's Office

Fainhappy Kimambo, GEF Desk Officer, Vice President's Office

Mwanamkuu Mwanyika, Senior Hydrologist, Ministry of Water

Charles Msangi, Project focal Person, Prime Ministers' Office, Disaster Risk Management Department

John Kavishe, Acting Basin Director, Lake Nyasa Basin Board

Petro Mligo, Hydrology Technician, Lake Nyasa Basin Board

Elly Mwigio, Civil Engineer, Lake Nyasa Basin Board

Boniphace Ndhakomwa, Social Infrastructure Specialist, Secretariat of the Joint-Songwe River Basin Commission

Rehema Omindo, Community Participation Specialist, Secretariat of the Joint-Songwe River Basin Commission

John Mtandi, Hydrology and Flood Early Warning Specialist, Secretariat of the Joint-Songwe River Basin Commission

Philipo Patrick, Senior Hydrologist, Pangani Basin Water Board

Omary Gumbo, Water Engineer, Pangani Basin Water Board

Ayubu Stanley Mwangoka, Principal Technician Hydrologist, Pangani Basin Water Board

Bakari Mohamed Bamba, Hydrologist, Pangani Basin Water Board

Digna Massawe, Former District Disaster Coordinator, Arumelu District Council and District Disaster Planning and Management Committee

Loveness Tikwa, Farmers, project beneficiaries, Majengo Village, Majengo Ward

Aizack Mbise, Farmers, project beneficiaries, Maroroni Village, Maroroni Ward

Tonga

Paula Ma'u, Chief Secretary and Secretary to Cabinet, Prime Ministers' Office

'Ofa Fa'anunu, Director, Tonga Meteorological Services

Saane Lolo, Deputy CEO and Head of Aid Management and Resilient Development Division, Ministry of Finance

Ana Kolokihakaufisi, Project Manager, PREP Tonga

'Elina Kaufusi Bloomfield, Communication and M&E Officer, PREP Tonga

References

All URLs were checked before publication.

Benzie, M., and K. Harris. 2020. "Transboundary Climate Risk and Adaptation." Science for Adaptation Policy Brief No. 2. World Adaptation Science Programme Secretariat, United Nations Environment Programme, Nairobi.

CIF (Climate Investment Funds). 2023. *Impact. Delivered. CIF Annual Report 2022*. Washington, DC: World Bank.

CREWS (Climate Risk and Early Warning Systems). 2022. *Annual Report 2022: How Do We Keep Ourselves Safe? Delivering Early Warning for Everyone*. Washington, DC: World Bank.

Dilley, M., R.S. Chen, U. Deichmann, A.L. Lerner-Lam, and M. Arnold. 2005. "Natural Disaster Hotspots: A Global Risk Analysis." World Bank, Washington, DC.

Flood, S., Y. Jerez Columbie, M. Le Tissier, and B. O'Dwyer, eds. 2021. *Creating Resilient Futures: Integrating Disaster Risk Reduction, Sustainable Development Goals and Climate Change Adaptation Agendas*. Cham, Switzerland: Palgrave Macmillan.

GCA (Global Commission on Adaptation). 2019. "Adapt Now—A Global Call for Leadership on Climate Resilience." GCA, Rotterdam.

GCF (Green Climate Fund). 2021. "GCF boosts SIDS early warning systems to avert climate-related disasters." News update, November 15.

GCF (Green Climate Fund). 2022. "Climate Information and Early Warning Services Sectoral Guide." Sectoral Guide Series. Green Climate Fund, Yeonsu.

GEF (Global Environment Facility). 2010. "Revised Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF)." GEF/LDCF.SCCF.9/4/Rev.1. GEF, Washington, DC.

GEF (Global Environment Facility). 2014. "GEF Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and the Special Climate Change Fund." GEF/LDCF.SCCF.16/03/Rev.01. GEF, Washington, DC.

GEF (Global Environment Facility). 2018. "GEF Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and the Special Climate Change Fund and Operational Improvements July 2018 to June 2022." GEF/LDCF.SCCF.24/03. GEF, Washington DC.

GEF (Global Environment Facility). 2022. "GEF Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and the Special Climate Change Fund for the GEF-8 Period of July 1, 2022, to June 30, 2026 and Operational Improvements." GEF/LDCF.SCCF.32/04/Rev.01. GEF, Washington DC.

IFRC (International Federation of Red Cross and Red Crescent Societies). 2022. "Engaging in Climate Risk and Early Warning Systems (CREWS) Projects: To Ensure They Reach the 'Last/First Mile'." IFRC, Geneva.

Ijjasz, E., V. Risk, and R. Gianfranchi. 2022. "Bringing the Pieces of the Early Warning Puzzle Together for Climate-Smart Economies." Global Center on Adaptation blog post, December 13.

Marchezini, V., F.E.A. Horita, P.M. Matsuo, R. Trajber, M.A. Trejo-Rangel, and D. Olivato. 2018. "A Review of Studies on Participatory Early Warning Systems (P-EWS): Pathways to Support Citizen Science Initiatives." *Frontiers in Earth Science* 6.

Merz, B., C. Kuhlicke, M. Kunz, M. Pittore, A. Babeyko, D.N. Bresch et al. 2020. "Impact Forecasting to Support Emergency Management of Natural Hazards." *Reviews of Geophysics* 58 (4).

United Nations General Assembly. 2016. "Report of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction." 71st session, 1 December, agenda item 19(c). United Nations, New York.

UNDRR (United Nations Office for Disaster Risk Reduction). 2023. "Early Warnings For All initiative scaled up into action on the ground." Press release, March 21.

UNDRR and WMO (United Nations Office for Disaster Risk Reduction and World Meteorological Organization). 2022. "Global Status of Multi-Hazard Early Warning Systems: Target G." UNDRR, Geneva.

WMO (World Meteorological Organization). 2020. "2020 State of Climate Services: Risk Information and Early Warning Systems." Report No. 1252. WMO, Geneva.

WMO (World Meteorological Organization). 2022. "Early Warnings for All: Executive Action Plan 2023–2027." The UN Global Early Warning Initiative for the Implementation of Climate Adaptation.

WMO (World Meteorological Organization). 2023. "WMO Global Annual to Decadal Climate Update (Target Years: 2023–2027)." WMO, Geneva.

World Bank. 2020. *Annual Report 2020: Supporting Countries in Unprecedented Times*. Washington, DC: World Bank.

The Independent Evaluation Office (IEO) of the Global Environment Facility (GEF) was established by the GEF Council in July 2003. The Office is independent from GEF policy making and its delivery and management of assistance.

The Office undertakes independent evaluations at the strategic level. These evaluations typically focus on cross-cutting themes, such as focal area–wide topics or integrated approaches to delivering global environmental benefits. The IEO presents a GEF-wide annual performance report and also undertakes institutional evaluations, such as assessing GEF governance, policies, and strategies. The Office's work culminates in a quadrennial comprehensive evaluation of the GEF.

The Office cooperates with professional evaluation networks on developing evaluation approaches, setting standards, and delivering training—particularly with regard to environmental evaluation and evaluation at the interface of environment and socioeconomic development. We also collaborate with the broader global environmental community to ensure that we stay on the cutting edge of emerging and innovative methodologies.

To date, the Office has produced over 160 evaluation reports; explore these on our website: **www.gefieo.org/evaluations**.

Independent Evaluation Office, Global Environment Facility
1818 H Street, NW • Washington, DC 20433, USA
www.gefieo.org

@gefieo @gefieo

Independent Evaluation Office
GLOBAL ENVIRONMENT FACILITY

20 ANNIVERSARY