INTERNATIONAL

Emerging Practice for Integrating and Implementing Early Warning Systems and Climate Information Services in NAPs and NDCs

Discussion Paper

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Countries should integrate and implement Early Warning Systems (***EWS***) and Climate Information Services (***CIS***) into their National Adaptation Plans (***NAPs***) and Nationally Determined Contributions (***NDCs)***, pursuant to the UN's goal of "Early Warnings for All by 2027." EWS and CIS are crucial for saving lives, managing climate risks, and building resilience, especially in vulnerable regions and communities. The paper highlights examples in which these systems have been incorporated in national plans in ways that attract investment and improve climate adaptation. It also sets out related actions that should be prioritized.

The global stocktake (***GST***) outcome from COP28 highlights the critical role of EWS, referencing EWS three times in recognition of their importance in protecting lives, reducing poverty, and mitigating the impacts of extreme weather events.[1] As countries face fast-approaching deadlines for submitting their NDCs and NAPs, as well as responding to the UNSG EW4All initiative by 2027, integrating EWS and CIS into national climate strategies is more urgent than ever.

Embedding EWS and CIS into NDCs and NAPs is essential for aligning domestic climate action with international goals, attracting investment, and building resilience across sectors. Governments, especially in Least Developed Countries (***LDCs***), Small Island Developing States (***SIDS***), and across Africa and Latin America, are encouraged to seize opportunities to close capacity and data gaps, improve coordination for disaster risk reduction, and strengthen early warning capabilities.

To accelerate progress, countries are urged to enhance EWS and CIS integration by committing to EW4All by 2027, advancing technological infrastructure, leveraging global and regional initiatives, improving institutional coordination, supporting knowledge-sharing platforms such as the Santiago Network, and developing clear national implementation roadmaps. Examples from country experience demonstrate how EWS and CIS have been incorporated into NDCs and NAPs, as well as insights from field-level initiatives. These examples offer practical lessons and entry points to attract targeted investments that can further support the development and implementation of robust, climate-resilient systems.[1]

[1] On 29 May 2025, the Center for Climate and Energy Solutions (***C2ES***), UN Development Programme (***UNDP***) and the Risk Informed Early Action Partnership (***REAP***) hosted a webinar on "Emerging Practice for Integrating and Implementing Early Warning Systems into NAPs and NDCs." The link to the webinar can be found here.

Contents

Questions for consideration

- What are some key "entry points" that countries can use to incorporate EWS and CIS into existing or upcoming NDCs/NAPs?
- How can alignment between national policies and international frameworks (like the NAPs and NDCs) help attract climate finance for EWS and CIS?
- What lessons can be drawn from regarding successful integration of EWS/CIS into NDCs and NAPs?

A. Introduction

1. Countries must respond quickly and tangibly to the UNSG call for EW4All by 2027, recognizing that a third of the world still does not have access to EWS.[2] This call was included as a target to achieve the framework for the Global Goal on Adaptation (*GGA*) (UAE Framework for Global Climate Resilience) and reaffirmed by the COP28 first GST (*GST1*).[3]
2. To achieve EW4All by 2027, countries should consider opportunities to prioritize both CIS and EWS in the formulation of their NDCs and NAPs, which are due this year.
3. EWS and CIS are essential for protecting livelihoods, reducing poverty and economic loss, saving lives, and reducing the impact of disasters and extreme weather events.[4] The benefits of effective national and regional EWS are immediate, direct, and visible. EWS help mitigate disaster risks by giving advanced notice, allowing for preparedness such as evacuation, and informing decision-making before a disaster strikes.[5] CIS are critical for effective climate risk management and the long-term resilience of people, communities, and businesses.
4. LDCs, SIDS, and other countries in Africa, Latin America, and the Caribbean suffer from the greatest gaps in data and finance for implementing EWS.[6] Significant financial resources are needed to rapidly implement EWS and provide CIS in developing countries.
5. Other significant challenges in designing and implementing EWS are: limited data and technological capacity; lack of coordination between governance systems; ineffective and limited communication systems; fragmented national planning; and limited knowledge and capacity of people and communities to respond.

[1] This paper has benefited tremendously from the feedback, inputs, and insights from a number of experts, including: Liam Fee, Rohini Kohli, Mark Tadross, and Montserrat Xilotl from UNDP, and Ben Webster from REAP.

B. Prioritizing Implementation of EWS and CIS

6. To achieve EW4All by 2027, countries need to set in place domestic and national policies and plans for addressing hazard risks and the vulnerabilities underpinning and exacerbating those risks.
7. Parties that have yet to submit their NDCs and NAPs still have time to integrate EWS and CIS. Those that have already done so have a valuable basis in their NDCs and NAPs to enhance implementation to advocate for scaled-up implementation of EWS.
8. There is a range of ongoing initiatives and opportunities to support countries in integrating EWS and CIS into their NDCs and NAPs. However, the full potential of scaling these efforts, particularly through increased ambition in the formulation and implementation of NAPs and NDCs, has yet to be fully realized.
9. All submitted NAPs contain at least one reference to early warning systems. This highlights a strong recognition of the importance of EWS across countries' adaptation planning frameworks. However, implementation has not always kept pace with these commitments. Many countries (129) have formally requested support for enhancing their EWS and climate information, yet the response rate to these requests has been lower than for other forms of support. [7]
10. This signals a gap between planning and operational delivery that needs to be addressed. In addition, it's important to acknowledge that the first two generations of NDCs primarily focused on mitigation, with limited attention to adaptation or loss and damage. The current NDC 3.0 process represents a critical opportunity to integrate adaptation and loss and damage more fully, helping to ensure coherence across climate-related policies and actions. Finally, this also offers a chance to strengthen linkages with the Sendai Framework, aligning disaster risk reduction, climate adaptation, and sustainable development strategies for more effective and coherent action at all levels.[8]

Prioritizing Implementation of EWS and CIS in NDCs and NAPs

Countries can strengthen the integration of EWS and CIS within their NAPs and NDCs by:

- committing to EWS by 2027 in NDCs, and NAPs: This is important to save lives, mobilize resources, attract investment, set out strategic national planning progress, measure current actions, and plan for future ones.
- upgrading or advancing technology: Policies in NAPs and NDCs could be focused on upgrading the technological components of EWS, enhancing forecasting accuracy and dissemination systems.
- leveraging existing initiatives: Highlighting and aligning with global initiatives such as the Climate Risk and Early Warning Systems *(CREWS)* Initiative and the Systematic Observations Financing Facility *(SOFF)* can mobilize technical and financial support for national EWS and CIS efforts.
- enhancing institutional coordination: Strengthening collaboration between National Meteorological and Hydrological Services (*NMHSs*) and disaster risk management agencies ensures more coherent and effective EWS.
- supporting knowledge and data sharing: Continued support for the Santiago Network for L&D is critical to expanding risk knowledge and data exchange, particularly in LDCs, SIDS, as well as countries in the Caribbean, Latin America, and Africa.
- developing implementation roadmaps and frameworks: Establishing national roadmaps and strategic frameworks enables structured, phased implementation of multi hazard EWS (*MHEWS*) and helps align them with broader climate adaptation and development goals.

C. Country Experiences

11. Several countries have demonstrated strong progress in advancing EWS and CIS at the programmatic level. In some cases, they have done so through explicit prioritization in their NAP and/or their NDC. Including CIS and EWS in a NAP can help governments align national priorities with funding opportunities, facilitating access to international climate finance and ultimately the support needed to implement these systems.

12. These policies and plans can help funnel and attract investment to projects and provide a coherent framework for targeting future investment, ensuring they are guided to where they are most needed. Below is a snapshot of case studies of programmatic interventions to modernize and strengthen CIS and EWS in NAPs and NDCs and to attract investment. These examples include:

- Benin: Benin's NAP[9] highlights an EWS project, "Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities." Benin received support from the Adaptation Fund (channeled through its National Environment Fund) for the project, which is executed by the National Meteorological Agency.[10]
- Colombia: In 2019, the NAP Global Network supported Colombia in piloting an EWS for a community water supply–a priority identified in the country's NAP.[11] The project, "Reliable Water Supply in an Unpredictable Climate," showcases how localized EWS can be integrated into national adaptation strategies.[12]
- Malawi: With GCF funding, the Malawi government, including its Departments of Disaster Management Affairs and Climate Change and Meteorological Services, have enhanced the protection and resilience of rural communities and livelihoods through the use of modernized CIS and EWS.[13] The project encompasses a comprehensive suite of modern hydrological and metrological equipment and systems designed to collect, analyze, and disseminate critical climate data.[14] These systems are aligned with Malawi's NAP, which focuses on improved weather and climate monitoring for EWS, preparedness, and timely response.[15] Malawi's 2021 NDC references explicit goals for effective and efficient EWS.[16] The alignment of these national policies across the NAP and NDC ensures coherence and achievement of goals.
- Mozambique: In its 2021 NDC, Mozambique detailed strategic actions to enhance and strengthen domestic early warning capacities, aligning its EWS initiatives with national development priorities and climate targets. In February 2023, Mozambique launched a national roadmap for a MHEWS. The combination of increased funding, strategic planning, and improved coordination and implementation has notably saved lives. The strengthened NDC implementation and roadmap planning played a key role in reducing the impact of Tropical Cyclone Freddy on vulnerable communities.[17]
- Timor-Leste: By making EWS a priority in Timor-Leste's NAP,[18] the country secured funding from the GCF, in partnership with the UN Environment Programme, for its project "Enhancing Early Warning Systems to Build Greater Resilience to Hydro-Meteorological Hazards in Timor-Leste."[19]

D. C2ES Resources

Enhancing Action and International Cooperation for Early Warning Systems, October 2024
https://www.c2es.org/document/enhancing-action-international-cooperation-for-early-warning-systems/

E. Additional Resources

13. National focal points for NDCs and NAPs can use the following resources to support the implementation and integration of MHEWS and CIS into NAPs and NDCs:

- Climate Project Explorer: The Climate Project Explorer platform delivers a comprehensive overview of global climate finance initiatives and projects.[20]
- Knowledge Nook (kNook): The kNook *Dashboard* tab provides a high-level overview of key metrological trends, while the *Data* tab offers in-depth insights into specific country requests.[21]
- NDCP Best Practice Briefs: The NDC Partnership created best practice briefs summarizing information for NDC formulation and implementation and highlighting effective practices. This includes those found in the *Whole-of-Society Stakeholder Engagement Brief*, which outlines inclusive approaches to stakeholder engagement.[22]
- NDC Clinic Overview (Panama, May 2025): The NDC Clinic hosted in Panama City from 22–23 May 2025 supported countries in effectively implementing NDCs through knowledge sharing on finance, policy, coordination, private sector engagement, and data-driven planning.[23]
- NDC Navigator: The NDC Navigator is a centralized resource hub offering tools, case studies, and guidance to support the enhancement and implementation of NDCs.[24]
- Risk Informed Early Action Partnership (*REAP*) Resources on Risk Management: REAP's platform includes resources focused on integrated climate and disaster risk management.[25]
- WMO-Green Climate Fund Methodology: This methodological guide presents structured approaches for developing climate science information to inform climate action.[26]

F. References

[1] UN Framework Convention on Climate Change [hereinafter UNFCCC], *Outcome of the first global stocktake, Decision 1/CMA.5, ¶¶ 49-50, 64(a)* (December 13, 2023), https://UN.int/documents/6370.
[2] UN Disaster Risk Reduction [hereinafter UNDRR] and World Metrological Organization [hereinafter WMO], *Global Status of Multi-Hazard Early Warning Systems 2024* (Geneva, Switzerland: UNDRR and WMO, 2024), https://library.wmo.int/records/item/69085-global-status-of-multi-hazard-early-warning-systems-2024.
[3] UNFCCC, *Outcome of the first global stocktake, Decision 1/CMA.5, ¶¶ 49-50, 64(a)*.
[4] WMO, *Early Warnings for All: Executive Action Plan 2023-2027* (Geneva, Switzerland: WMO, November 2, 2022), 13, https://wmo.int/media/magazine-article/overview-of-early-warnings-all-executive-action-plan-2023-2027.
[5] Intergovernmental Panel on Climate Change [hereinafter IPCC], "Summary for Policymakers," in Climate Change 2023 Synthesis Report. Contribution of Working Group II to the Sixth Assessment Report of the IPCC, Ch. 17, figure 17.3 (Geneva, Switzerland: IPCC, 2023), doi: 10.59327/IPCC/AR6-9789291691647.001.
[6] UNDRR and WMO, *Global Status of Multi-Hazard Early Warning Systems 2023* (Geneva, Switzerland: WMO and UNDRR, 2023), https://wmo.int/publication-series/global-status-of-multi-hazard-early-warning-systems-2023.
[7] "What are early warning systems and why do they matter for climate action?," UN Development Programme Climate Promise, February 28, 2025, https://climatepromise.undp.org/news-and-stories/what-are-early-warning-systems-and-why-do-they-matter-climate-action.
[8] "Setting and Achieving Targets and Actions," NDC 3.0 Navigator, accessed August 22, 2025, https://ndcnavigator.org/routes/adaptation-goal/targets-actions/.
[9] UNFCCC, *Plan national d'adaptation aux changements climatiques du Bénin Ministère du Cadre de Vie et du Développement Durable Direction Générale de l'Environnement et du Climat* (DGEC) (Benin, DGEC, 2022), https://unfccc.int/sites/default/files/resource/PNA_BENIN_2022_0.pdf.
[10] Adaptation Fund, *Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin* (Benin: Adaptation Fund, 2025), https://www.adaptation-fund.org/project/strengthening-meteorological-services-and-establishing-a-multi-hazard-early-warning-system-to-enhance-the-climate-resilience-of-local-communities-in-benin/.
[11] Government of Colombia, Plan Nacional de Adaptacion al Cambio Climatico (August 30, 2021), https://unfccc.int/sites/default/files/resource/Colombia-NAP-Spanish.pdf.

[12] "Reliable Water Supply in an Unpredictable Climate," NAP Global Network, accessed August 4, 2025, https://napglobalnetwork.org/stories/reliable-water-supply-in-an-unpredictable-climate/.
[13] "Saving Lives and Protecting Agriculture Based Livelihoods in Malawi: Scaling Up the Use of Modernized Climate Information and Early Warning Systems," UNDP, accessed July 21, 2025, https://www.adaptation-undp.org/projects/gcf-saving-lives-protecting-agriculture-based-livelihoods-malawi-m-climes.
[14] "Modernized Climate Information and Early Warning Systems," Malawi Ministry of Climate Change and Metrological Services, accessed June 4, 2025, https://www.metmalawi.gov.mw/organisation/projects/modernised-climate-information-and-early-warning-systems/.
[15] Government of Malawi, Malawi's National Adaptation Plan Framework (March 2020), https://napglobalnetwork.org/wp-content/uploads/2020/03/napgn-en-2020-malawis-national-adaptation-plan-framework.pdf.
[16] Republic of Malawi, Malawi's First NDC, 56 (July 2021), https://unfccc.int/sites/default/files/NDC/2022-06/Malawi%20Updated%20NDC%20July%202021%20submitted.pdf.
[17] UNDRR Regional Office of Africa and UN Mozambique, "Cyclone Freddy puts Mozambique's early warning system to the test," UNDRR, accessed June 4, 2025, https://www.undrr.org/feature/cyclone-freddy-puts-mozambique-s-early-warning-system-to-the-test#:~:text=MAPUTO%2C%20Mozambique%20%2D%20Days%20before%20Cyclone,to%20shelters%20on%20hig.
[18] UNFCCC, Timor-Leste's National Adaptation Plan Addressing climate risks and building climate resilience (2021), https://www4.unfccc.int/sites/NAPC/Documents/Parties/Timor%20Leste%20NAP.pdf.
[19] Green Climate Fund, *Enhancing Early Warning Systems to build greater resilience to hydro-meteorological hazards in Timor-Leste* (Songdo, South Korea: Green Climate Fund, 2021), https://www.greenclimate.fund/document/enhancing-early-warning-systems-build-greater-resilience-hydro-meteorological-hazards-timor.
[20] "Multilateral Climate Funds," Climate Project Explorer, accessed June 6, 2025, https://climateprojectexplorer.org/.
[21] "All Data," NDC Partnership, accessed August 5, 2025, https://ndcpartnership.knack.com/knook#data-and-reports/.
[22] NDC Partnership, *Whole-Of-Society Approaches To Inclusive Stakeholder Engagement* (Washington, DC: NDC Partnership, March 2024), https://ndcpartnership.org/sites/default/files/2024-03/whole-society-approaches-inclusive-stakeholder-engagement-best-practice-brief.pdf.
[23] "NDC Clinic Climate Week 2025: Dialogue for Ambition and Implementation," UNFCCC, accessed June 6, 2025, https://unfccc.int/event/ndc-clinic.
[24] "NDC 3.0 Navigator," NDC Navigator, accessed June 6, 2025, https://ndcnavigator.org/.
[25] "Resources on Comprehensive Risk Management," Risk Informed Early Action Partnership [hereinafter REAP], (August 26, 2024), https://www.early-action-reap.org/resources-comprehensive-risk-management. "Resource Library," REAP, accessed July 21, 2025, https://www.early-action-reap.org/resources-library.
[26] WMO, *Developing the Climate Science Information for Climate Action,* WMO-No. 1287 (Geneva, Switzerland: WMO and Green Climate Fund, 2022), https://library.wmo.int/records/item/53280-developing-the-climate-science-information-for-climate-action.