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TECHNICAL REPORT

AWARE and the Sendai Framework: Operationalizing Proactive Disaster Risk Reduction through Anticipatory Action

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CGIAR Climate Action Program

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Executive Summary

The Sendai Framework for Disaster Risk Reduction 2015-2030 represents a fundamental global shift from reactive disaster management to proactive risk reduction. Its implementation, however, requires tangible mechanisms that can translate its high-level priorities into effective, on-the-ground action. This report provides an exhaustive analysis of the AWARE (Early Warning, Early Action, Early Finance) platform, a digitally enabled governance tool developed by the International Water Management Institute (IWMI), and its contributions to the Sendai Framework.

The analysis demonstrates that AWARE serves as a critical translational mechanism, operationalizing the Sendai Framework's Four Priorities for Action. It enhances the understanding of disaster risk (Priority 1) by integrating diverse data streams into a comprehensive disaster risk intelligence hub. It strengthens risk governance (Priority 2) by fostering multi-stakeholder coordination among government agencies, humanitarian actors, and local communities. It facilitates investment in disaster risk reduction (Priority 3) through its innovative pre-arranged financing module that links forecast-based triggers to timely financial disbursements. Finally, it enhances disaster preparedness (Priority 4) by moving beyond static plans to dynamic, simulation-tested anticipatory action protocols that empower communities for a more effective and dignified response.

Drawing on detailed case studies, particularly from multi-hazard simulations in Sri Lanka and deployments in African nations such as Zambia and Senegal, this report illustrates the platform's practical application. In Sri Lanka, flood and drought simulations in the Nuwara Eliya and Anuradhapura districts showcased the successful integration of early warnings via SMS, pre-emptive community actions, and the use of cash vouchers as a flexible early finance tool. These exercises not only validated the AWARE model but also catalyzed longer-term, locally-led adaptation measures, such as the community-driven restoration of the Kotagala canal.

The report further assesses AWARE's impact on the Sendai Framework's seven Global Targets. The platform makes a direct and substantial contribution to Target G (increasing access to multi-hazard early warning systems). More significantly, by linking these warnings to concrete actions and financing, AWARE creates a powerful multiplier effect, establishing the necessary conditions to achieve Targets A, B, C, and D (reducing mortality, affected people, economic loss, and infrastructure damage). Its collaborative implementation model also advances Target E (national and local DRR strategies) and Target F (international cooperation).

The report concludes that the AWARE platform is a leading innovation in anticipatory disaster risk management, offering a replicable and scalable model that accelerates the implementation of the Sendai Framework. It provides a clear pathway for nations to shift from a cycle of disaster-response-recovery to a sustainable model of proactive integrated climate risk management (ICRM) strategy, aligning with global goals for resilience and sustainable development. Strategic recommendations focus on mainstreaming anticipatory action into

national policies, investing in foundational data infrastructure, developing sustainable financing models, and prioritizing community-led, inclusive design to scale the platform's impact globally.

1. The Sendai Framework: A Global Mandate for Proactive Risk Management

The Sendai Framework for Disaster Risk Reduction 2015-2030, adopted by UN Member States in Sendai, Japan, constitutes the premier global agreement for managing disaster risk. It is a comprehensive, forward-looking framework that builds upon its predecessor, the Hyogo Framework for Action, by introducing a more profound emphasis on the management of risk rather than the management of disasters (UNDRR). This distinction is central to its purpose: to guide the substantial reduction of disaster risk and losses in lives, livelihoods, and health, as well as in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries (UNDRR).

1.1 Shifting the Paradigm from Disaster Response to Risk Reduction

The core philosophy of the Sendai Framework is a fundamental paradigm shift. It calls for a transition away from the traditional, reactive cycle of "disaster > response > recovery > repeat" towards a proactive and preventative approach focused on managing risk (UNDRR). This conceptual evolution acknowledges that while natural hazards like earthquakes, floods, and cyclones are inevitable, their transformation into large-scale disasters is not (UNDRR). Disasters are understood as the result of the complex interaction between hazards and the prevailing conditions of exposure, vulnerability, and capacity (UNDRR). Therefore, by reducing exposure and vulnerability and increasing capacity, the destructive power of hazards can be curbed (UNDRR).

This shift is underpinned by a compelling economic and social rationale. Investing in disaster risk reduction (DRR) is not a cost but a highly effective investment. Evidence suggests that DRR costs are estimated to be only 5 to 10 percent of post-disaster response and recovery costs (UNDRR). For instance, in low- and middle-income countries, every $1 invested in creating more resilient infrastructure yields approximately $4 in benefits (UNDRR). Similarly, just 24 hours of warning before a storm or heatwave can reduce the ensuing damage by 30 percent (UNDRR). The framework thus reframes DRR as an essential component of sustainable development, inextricably linked to the 2030 Agenda, the Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change, and other key international agreements (UNDRR). Achieving sustainable development is impossible without systematically building resilience to disasters (UNDRR).

The framework recognizes that the primary responsibility for DRR lies with the State, but it strongly advocates for this responsibility to be shared across an "all-of-society" partnership. This includes local governments, the private sector, civil society, and other stakeholders, fostering a collective approach to building resilience (UNDRR).

1.2 The Four Priorities for Action: Pillars of Resilience

To guide the implementation of its goal, the Sendai Framework is structured around four distinct but interrelated Priorities for Action. These priorities provide a comprehensive roadmap for countries and stakeholders to develop and execute their DRR strategies (UNDRR).

- **Priority 1: Understanding disaster risk.** This priority establishes that effective disaster risk management must be founded on a thorough understanding of risk in all its dimensions. This includes a clear comprehension of hazards, the exposure of people and assets, and the underlying vulnerabilities and capacities of communities. Such knowledge is critical for risk assessments, prevention, mitigation, preparedness, and response activities (UNDRR).
- **Priority 2: Strengthening disaster risk governance to manage disaster risk.** This priority underscores the critical role of strong governance institutions and mechanisms at the national, regional, and global levels. Effective risk governance is essential for managing disaster risk across all sectors and at all scales. It fosters the necessary collaboration, partnership, and coherence required for prevention, mitigation, preparedness, response, recovery, and rehabilitation (UNDRR). National Platforms for DRR, coordinated by designated Sendai Focal Points, are instrumental in ensuring this all-of-government and all-of-society approach (UNDRR).
- **Priority 3: Investing in disaster risk reduction for resilience.** This priority calls for a significant increase in both public and private investment in DRR. These investments should encompass both structural measures (e.g., resilient infrastructure) and non-structural measures (e.g., improved policies, early warning systems, public awareness). Such investments are deemed essential to enhance the economic, social, health, and cultural resilience of individuals, communities, and countries, thereby protecting their assets and the environment (UNDRR).
- **Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.** This final priority focuses on strengthening preparedness measures to ensure an effective and timely response to disasters. Crucially, it also integrates the principle of "Build Back Better." This means that the recovery and reconstruction phases following a disaster should be seized as opportunities to rebuild in a way that reduces future risk and incorporates resilience measures, transforming disasters into opportunities for sustainable development (UNDRR).

1.3 The Seven Global Targets: Measuring Progress in Saving Lives and Livelihoods

To monitor and assess progress towards its overarching goal, the Sendai Framework outlines seven global targets to be achieved by 2030. These targets provide clear, measurable benchmarks against which Member States report their progress through the online Sendai Framework Monitor (SFM) (UNDRR). The targets are designed to galvanize action and track reductions in losses while promoting an increase in resilience-building capacities.

The seven global targets are (UNDRR):

(a) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015.

(b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015.

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

(d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.

(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2030.

(f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030.

(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.

These targets are interconnected with the SDGs. For example, indicators for Sendai Targets A, B, C, and E are directly used to measure progress on SDG 1 (End Poverty), SDG 11 (Sustainable Cities), and SDG 13 (Climate Action) (UNDRR). This integration reinforces the central role of DRR in achieving the broader 2030 Agenda for Sustainable Development.

2. The AWARE Platform: Operationalizing Anticipatory Action through Disaster Risk Intelligence

The AWARE platform represents a significant technological and methodological advancement in the field of disaster risk management. It is a digitally enabled governance platform developed by the International Water Management Institute (IWMI) in collaboration with the CGIAR Research Initiative on Climate Resilience (ClimBeR) (CGIAR). Its fundamental purpose is to operationalize the paradigm shift advocated by the Sendai Framework, moving countries from a reactive posture to a proactive one by enabling them to protect communities before climate-related hazards escalate into full-blown disasters (CGIAR).

2.1 Defining the AWARE Platform: From Early Warning to Early Action

Finance

The AWARE platform is architected around the integrated principle of 'Early Warning, Early Action, Early Finance' (CGIAR). This tripartite structure is not a linear sequence but a deeply interconnected framework designed to create a comprehensive and effective system for managing climate-related hazards. Each component is essential for the success of the whole, emphasizing that a warning is only as valuable as the action it enables, and action is only possible with timely and adequate financing (CGIAR).

- **Early Warning:** This module serves as the information engine of the platform. It communicates timely and effective information related to impending disasters or crises, with a primary focus on floods and droughts. The platform's dashboard provides access to a wide range of indicators related to the environment, crop prices, disease, nutrition, and population displacement, drawn from satellite sensors and national government data sources (CGIAR). This allows authorities to anticipate and monitor the multifaceted impacts of climate shocks, providing governments, non-governmental organizations (NGOs), and communities with the necessary lead time to prepare and act (CGIAR).
- **Early Action:** This module is the operational core of the platform, designed to translate early warnings into concrete, pre-planned actions. It provides tools for identifying community-level risks and developing comprehensive plans to mitigate them (Amarnath & Mascarenhas, 2024). Using information from the early warning module, this component facilitates the swift implementation of actions across various sectors to minimize the negative impacts of a hazard. These actions can range from reinforcing infrastructure and pre-positioning supplies to implementing climate-resilient agricultural strategies and activating social safety nets (CGIAR).
- **Early Finance:** This module provides the critical financial linkage that makes early action possible. It integrates the early action plan with the timely allocation of financial resources to support all phases of the anticipatory response (Amarnath & Mascarenhas, 2024). By securing financing in advance and linking its release to specific forecast-based triggers, this mechanism ensures that institutions can access adequate funding at the earliest stage of an unfolding climate event (Amarnath et al., 2023a). This pre-arranged financing is crucial for smooth evacuations, maintaining food supplies, and protecting lives and livelihoods, representing a significant departure from traditional, slower post-disaster funding appeals (Adebayo Oke et al., 2023).

2.2 The Three-Phase Anticipatory Action Mechanism: Preparedness, Readiness, and Activation

The operational methodology of the AWARE platform is codified in a comprehensive Anticipatory Action Plan. This plan is not a static document but a dynamic framework that outlines specific actions to be taken across three distinct and escalating phases. This phased approach provides a structured, predictable, and scalable timeline for response, ensuring that actions are appropriate to the level of risk and lead time available.

- **Preparedness Phase:** This long-range phase begins six to nine months ahead of a potential hazard. Actions in this phase focus on building foundational capacity and long-term resilience. This includes activities like community training, inspecting and repairing water sources, developing and disseminating educational materials on water-saving techniques or food preservation, and establishing the institutional arrangements for the subsequent phases (Amarnath & Mascarenhas, 2024).
- **Readiness Phase:** This phase is triggered when a hazard is forecast for the near future, typically within a week or so. Actions become more immediate and focused on mobilizing resources and preparing for a potential activation. This can involve pre-positioning water bowsers, securing alternative livestock feed, organizing medical teams, and issuing more specific warnings to the community (Amarnath & Mascarenhas, 2024). This is often the point at which pre-arranged financing may be partially released to fund these readiness activities (Amarnath et al., 2023a; Alahacoon & Amarnath, 2023).
- **Active Phase:** This is the final and most urgent phase, triggered when a hazardous event is imminent. Actions are immediate and life-saving, focused on protecting people and critical assets. This includes community-wide alerts via megaphones or SMS, activating evacuation procedures to designated shelters, deploying emergency resources like water and medical teams, and distributing direct aid such as cash vouchers (Amarnath & Mascarenhas, 2024).

This three-phase process was rigorously field-tested during simulation exercises in Sri Lanka in 2023, in close collaboration with government departments, NGOs, and community leaders, validating its practicality and effectiveness (Amarnath & Mascarenhas, 2024).

2.3 AWARE as a Disaster Risk Intelligence Hub: Integrating Data, Technology, and Stakeholders

The AWARE platform can be understood as an operational embodiment of the emerging field of Disaster Risk Intelligence (DRI). DRI is an interdisciplinary approach that merges data analytics, digital technologies such as artificial intelligence (AI) and machine learning, and advanced financial strategies to transform vast amounts of raw data into actionable insights for proactive disaster management (GCRI). AWARE functions as a DRI hub by performing several key functions:

- **Integrating Diverse Data Streams:** The platform moves beyond simple hazard forecasting by integrating a wide array of data sources. It combines meteorological forecasts and real-time satellite data with crucial socio-economic indicators, providing a holistic and multi-dimensional picture of risk (Amarnath et al., 2023a). This leverages advancements in big Earth data, cloud computing, and AI to effectively map not just where a hazard might strike, but who and what is most vulnerable, enabling more targeted interventions (Kareff Rafisura et al., 2025).

- **Bridging Data Providers and End-Users:** A core function of the AWARE platform is to serve as a vital bridge between technical data providers and on-the-ground humanitarian actors. It connects institutions like meteorological agencies and hydrological centers with data users such as government disaster management agencies, humanitarian organizations, and local community leaders (Amarnath & Mascarenhas, 2024). This multi-stakeholder coordination is central to its design, ensuring that complex scientific data is translated into understandable warnings and triggers that can be acted upon by non-specialists, thereby improving overall disaster risk governance (Amarnath & Mascarenhas, 2024). This function addresses a common failure point in traditional early warning systems, where warnings are issued but fail to trigger a timely or effective response (Amarnath & Mascarenhas, 2024).

By providing a common operational picture and a structured framework for collaboration, the AWARE platform empowers a diverse range of stakeholders to make coordinated, evidence-based decisions, transforming risk information into life-saving action.

2.4 Clarification: Distinguishing the IWMI's AWARE Platform from the COP27 AWARe Initiative

It is critical to distinguish between two prominent but separate initiatives that share a similar name. This report focuses exclusively on the **AWARE platform**, the digitally enabled governance tool for anticipatory action developed by IWMI and CGIAR, as detailed above (Amarnath & Mascarenhas, 2024).

This is distinct from the **AWARe (Action on Water Adaptation and Resilience)** initiative, which was launched by the Egyptian Presidency at the 27th Conference of the Parties (COP27) of the UNFCCC (UNFCCC). The COP27 AWARe initiative is a high-level global political and cooperative framework aimed at catalyzing inclusive cooperation to address water as a key element of climate change adaptation and resilience (UNDESA). It focuses on policy, global workstreams, and National Voluntary Commitments, with a secretariat hosted by the World Meteorological Organization (WMO) (UNESCO).

While both initiatives address water and climate resilience, their nature and scope are different. The IWMI AWARE platform is an operational, technological tool with a specific 'Early Warning, Early Action, Early Finance' methodology that is being implemented at the country and community level. The COP27 AWARe initiative is a broader, global policy and partnership framework. The analysis that follows will concentrate on the direct, operational contributions of the IWMI AWARE platform to the implementation of the Sendai Framework.

3. AWARE's Contribution to the Four Priorities for Action of the Sendai Framework

The AWARE platform provides more than just a set of tools that are aligned with the Sendai Framework; it functions as a comprehensive translational mechanism. It takes the high-level policy ambitions articulated in the framework's Four Priorities for Action and converts them into

concrete, verifiable, and localized operational procedures. The Sendai Framework outlines what needs to be done—understand risk, strengthen governance, invest in DRR, and enhance preparedness—while the AWARE platform provides a clear and replicable methodology for how to achieve these objectives. The platform's integrated structure of Early Warning (data and risk understanding), Early Action (governance and preparedness planning), and Early Finance (investment in DRR) directly mirrors and operationalizes these four priorities. Through its digital dashboard, multi-stakeholder coordination functions, and pre-arranged financing mechanisms, AWARE provides the tangible instruments required to execute these priorities on the ground, effectively translating global policy into life-saving local practice.

3.1 Priority 1: Understanding Disaster Risk through Integrated Data and Forecasting

The Sendai Framework's first priority posits that effective DRR must be based on a comprehensive understanding of disaster risk in all its dimensions: vulnerability, capacity, exposure of persons and assets, hazard characteristics, and the environment (UNDRR). The AWARE platform directly addresses this imperative by functioning as a sophisticated system for gathering, analyzing, and disseminating risk information.

The platform provides a holistic understanding of risk by integrating diverse and multi-sectoral data streams into a single, accessible dashboard. This goes far beyond traditional meteorological forecasting. It combines advanced weather and climate predictions with satellite-based earth observation data and, crucially, with socio-economic indicators and on-the-ground vulnerability assessments (Amarnath et al., 2023a). This multi-dimensional approach allows for a more nuanced analysis that considers not just the physical characteristics of a hazard like a flood or drought, but also the specific vulnerabilities of the communities in its path. By incorporating data on livelihoods, health, nutrition, and population displacement, the platform helps to identify who and what is most at risk, enabling more targeted and equitable interventions (Amarnath et al., 2023a).

Furthermore, AWARE operationalizes risk understanding at the community level. The platform's methodology includes tools and guidance for conducting community risk assessments, focus group discussions, and key informant interviews (Amarnath et al., 2023a). This participatory approach ensures that the high-level data from satellites and models is validated and enriched by local knowledge and lived experience. It empowers communities to be active participants in identifying their own risks and developing appropriate mitigation plans, which is a core tenet of people-centered DRR. The use of advanced technologies, including artificial intelligence and cloud computing, to process this vast collection of data enhances the accuracy and timeliness of forecasts, providing the actionable disaster risk intelligence needed to trigger early action (Kareff Rafisura et al., 2025).

3.2 Priority 2: Strengthening Risk Governance via Multi-Stakeholder Coordination

Sendai's second priority emphasizes the need for strong disaster risk governance to foster collaboration and partnership across all sectors and levels (UNDRR). The AWARE platform is, at its core, a governance platform designed to facilitate precisely this kind of coordination (Amarnath & Mascarenhas, 2024). It breaks down the institutional silos that often hamper effective disaster management by creating a shared operational framework and a common language for a wide spectrum of stakeholders.

The platform's implementation model promotes multi-level coordination by bringing together government officials, emergency response managers, humanitarian organizations, technical agencies, and the local communities who are at risk (Amarnath & Mascarenhas, 2024). The case of Sri Lanka provides a clear example of this in practice. The AWARE platform is designed to be used by the national disaster response agencies in concert with other humanitarian actors, with the explicit goal of institutionalizing anticipatory disaster mechanisms across national ministries and district authorities (IWMI). The flood simulation drills in Sri Lanka involved a collaborative effort between IWMI, the DMC, World Vision Sri Lanka, the Red Cross, and local government secretariats, demonstrating a functional, multi-agency coordination mechanism in action (Amarnath et al., 2023a).

This collaborative structure directly supports the "all-of-society" approach advocated by the Sendai Framework (UNDRR). By connecting data providers (e.g., meteorological agencies) with data users (e.g., humanitarian organizations and community leaders), AWARE improves disaster risk governance and ensures that early warnings are not just issued but are received, understood, and acted upon by all relevant parties in a coherent and coordinated manner (Amarnath & Mascarenhas, 2024). The national dialogue held in Senegal upon the platform's launch further illustrates its role as a catalyst for high-level policy engagement and the development of national accountability frameworks for anticipatory action (Sambou et al., 2023).

3.3 Priority 3: Investing in Disaster Risk Reduction for Resilience

The third priority of the Sendai Framework calls for increased public and private investment in DRR to enhance resilience (UNDRR). The AWARE platform operationalizes this priority through its "Early Finance" module, which fundamentally reframes DRR investment by shifting it from post-disaster response to pre-disaster action. This proactive financing model is a direct answer to the Sendai Framework's call to move away from costly recovery efforts and toward more efficient preventative measures (UNDRR).

The Early Finance mechanism works by connecting forecast-based triggers to pre-arranged and pre-approved financial disbursements (Giriraj Amarnath et al.). This ensures that when a credible threat is identified, funding is released rapidly and predictably, without the delays associated with traditional emergency appeals (Amarnath & Mascarenhas, 2024). This pre-arranged funding is a direct investment in DRR, enabling a range of interventions that build both immediate and long-term resilience.

Examples of these resilient interventions, facilitated by early finance, include:

- **Financial Instruments for Household Resilience:** The distribution of cash vouchers, as demonstrated in the Sri Lankan flood simulation, is a key intervention. This provides households with the financial agency to purchase essential goods like food and supplies, protect their assets, and meet their immediate needs with dignity, thereby strengthening their economic resilience to the shock (IWMI).

- **Climate-Smart Agricultural Inputs:** For slow-onset events like drought, early finance can be used to distribute agricultural inputs such as drought-tolerant seeds. This is a non-structural measure that protects agricultural livelihoods, enhances food security, and builds the resilience of the rural economy (Amarnath & Mascarenhas, 2024).
- **Nature-Based and Structural Solutions:** The AWARE platform, through associated programs like the ACTION grant, can also catalyze investment in small-scale structural and nature-based solutions. The community-led restoration of the Kotagala canal in Sri Lanka, which was inspired by the flood simulation and supported by a grant, is a prime example. This project is a tangible investment in DRR that mitigates future flood risk, protects infrastructure, and provides long-term environmental and social co-benefits (Sushila De Silva, 2024).

3.4 Enhancing Preparedness for Effective, Dignified Response

Sendai's fourth priority focuses on enhancing disaster preparedness to ensure an effective response and to "Build Back Better" (UNDRR). The AWARE platform transforms preparedness from a static, plan-based exercise into a dynamic, trigger-based, and community-centered process.

The platform's Anticipatory Action Plans serve as pre-agreed operational roadmaps that clearly define the actions, roles, and responsibilities for each phase of a developing crisis (Amarnath & Mascarenhas, 2024). These plans are not left on a shelf; they are actively tested, refined, and socialized through simulation exercises like those conducted in Sri Lanka. These simulations are powerful capacity-building tools that enhance preparedness at all levels. They test the entire chain of response, from the dissemination of warnings to the execution of on-the-ground actions, identifying bottlenecks and strengthening coordination (IWMI).

Crucially, this approach empowers communities to be central actors in their own protection. By participating in the simulations, residents of Chrysler's Farm and Anuradhapura gained the practical knowledge and experience needed to respond effectively to future flood and drought events (IWMI). This builds local capacity and fosters a culture of prevention and preparedness from the ground up.

Furthermore, the interventions enabled by AWARE promote a more dignified response. The use of cash vouchers, for instance, gives affected populations the choice and flexibility to prioritize their own needs, which is a significant improvement over the top-down distribution of in-kind aid (IWMI). This aligns with the people-centered approach of the Sendai Framework, which emphasizes protecting the dignity and rights of people affected by disasters (UNDRR).

Table 1: Mapping the AWARE Platform's Features to the Sendai Framework's Four Priorities for Action

Sendai Priority for Action	Key Requirements of the Priority	Corresponding AWARE Platform Features	Illustrative Examples from Research
Priority 1: Understanding Disaster Risk	Comprehensive assessment of hazards, vulnerability, exposure, and capacity.	**Early Warning Module:** Integration of meteorological forecasts,	The platform integrates diverse data streams to provide a

		satellite data, and socio-economic indicators. **Community Risk Assessment Tools:** Methodologies for focus group discussions and key informant interviews.	comprehensive picture of flood and drought risk in Sri Lanka (IWMI). Community risk assessments inform the development of Anticipatory Action Plans (Amarnath et al., 2023a).
Priority 2: Strengthening Disaster Risk Governance	All-of-society engagement, multi-stakeholder collaboration, and clear institutional roles.	**Digitally Enabled Governance Platform:** A centralized hub connecting government agencies, NGOs, technical experts, and communities. **Anticipatory Action Plans:** Pre-agreed protocols defining roles and responsibilities.	The platform is used by Sri Lanka's Disaster Management Centre (DMC) to institutionalize anticipatory mechanisms with district authorities and humanitarian partners (IWMI). National dialogue in Senegal fosters multi-stakeholder cooperation (Sambou et al., 2023).
Priority 3: Investing in DRR for Resilience	Public and private investment in structural and non-structural measures to reduce risk.	**Early Finance Module:** Connects forecast-based triggers to pre-arranged financial disbursements. **ACTION Grant Program:** Provides funding for locally-led adaptation projects.	Cash vouchers distributed during the Sri Lanka flood simulation enable households to protect assets (IWMI). A grant supported the community-led restoration of the Kotagala canal to mitigate flood risk (Sushila De Silva). A solar-powered borehole was installed in Zambia as an anticipatory action for drought (Amarnath & Mascarenhas, 2024).
Priority 4: Enhancing Preparedness for Effective Response	Strengthening preparedness measures, empowering communities, and enabling a dignified response.	**Three-Phase Mechanism (Preparedness, Readiness, Active):** A structured timeline for escalating preparedness actions. **Simulation Exercises:** Field-testing of plans to build capacity and identify gaps.	Three-day flood and two-day drought simulations in Sri Lanka tested the entire response chain, from SMS alerts to evacuation, building community knowledge and capacity (IWMI).

4. Case Study Analysis: AWARE in Action

The theoretical alignment of the AWARE platform with the Sendai Framework is powerfully substantiated by its practical application in diverse, high-risk contexts. The detailed simulation exercises conducted in Sri Lanka, in particular, serve as more than just operational tests; they function as compelling proof-of-concept demonstrations for national governments and the wider humanitarian community. By conducting these simulations in close partnership with national authorities like Sri Lanka's Disaster Management Centre (DMC), the platform's proponents have created a tangible evidence base for the effectiveness of anticipatory action. The success of these drills—marked by timely alerts, pre-emptive community action, and efficient delivery of financial support—provides the political and operational justification needed for governments to move anticipatory action from the domain of externally-led pilot projects to institutionalized, nationally-owned policy. This strategic approach is a critical pathway for achieving Sendai Target E, which calls for an increase in national and local DRR strategies, by providing the evidence required for governments to confidently adopt and integrate these innovative frameworks into their standard operating procedures.

4.1 Sri Lanka: A Deep Dive into Multi-Hazard Anticipatory Action

Sri Lanka's geography and climate make it a microcosm of disaster risk, providing a fertile ground for testing and validating a multi-hazard anticipatory action platform like AWARE. The successful piloting of the system for both sudden-onset floods and slow-onset droughts demonstrates its flexibility and potential for nationwide scaling.

4.1.1 Context: Sri Lanka's Disaster Risk Profile

Sri Lanka is an island nation highly vulnerable to the impacts of climate change, consistently ranking among the countries most at risk from extreme weather events (United Nations DCO). Its disaster profile is dominated by hydro-meteorological hazards. Floods are the most frequent disaster, followed by landslides, extreme winds, and cyclones (Amarnath et al., 2023b). The country's central highlands are particularly prone to landslides, while the southwestern regions experience frequent riverine floods. Conversely, the northern, eastern, and northwestern regions are susceptible to severe and prolonged droughts (JICA). Between 2008 and 2022, over 3.4 million internal displacements were recorded as a result of 339 disaster events, with floods and landslides in 2017 alone displacing over 500,000 people (Global Justice Program). The economic toll is also substantial, with flooding causing over $2 billion in damages between 1990 and 2018 (Global Justice Program). This high level of risk underscores the urgent need for advanced DRR systems that can move beyond reactive response. The national Sendai Focal Point and key government partner for DRR initiatives is the Disaster Management Center (DMC) (UNDRR).

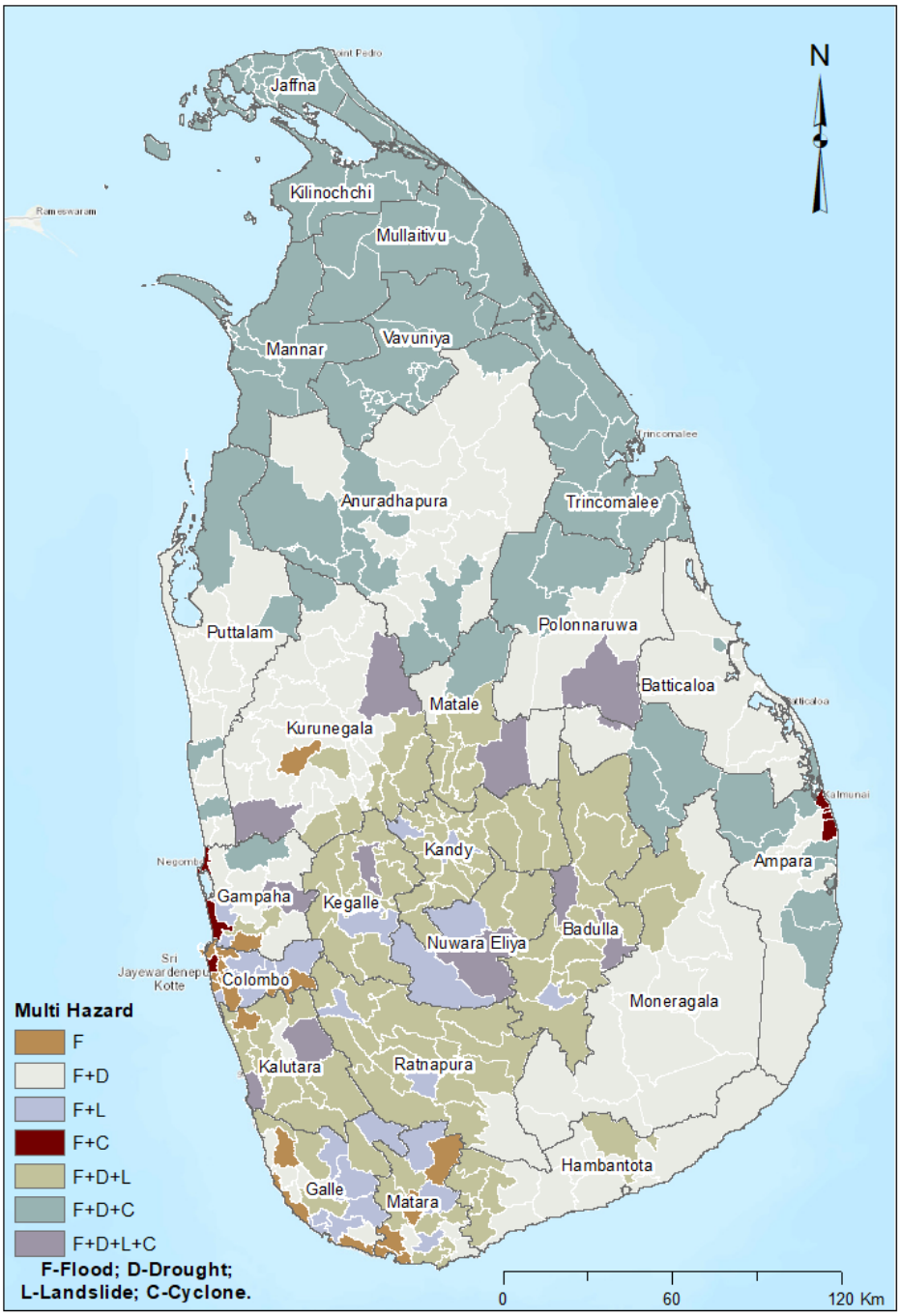

Figure 1. A multi-hazard map was developed using the hazard occurrences reported from 1977 to 2023 in the disinventar database at the Divisional Secretary Division (DSD) level in Sri Lanka (Alahacoon et al., 2026)

4.1.2 The Flood Simulation in Nuwara Eliya: Testing Triggers, Actions, and Finance

In July 2023, a pioneering three-day flood simulation was conducted in the highland community of Chrystler's Farm, Kotagala, in the Nuwara Eliya district—an area highly vulnerable to floods and landslides (Amarnath et al., 2023b). The exercise, a collaboration between IWMI, World Vision Sri Lanka, the DMC, and other local partners, meticulously tested the entire AWARE anticipatory action chain (Giriraj Amarnath et al., 2023a).

- **Triggers and Early Warning:** The simulation began with the Preparedness Trigger on Day 1. The DMC issued a first alert via SMS to the community, warning that heavy rains were expected to continue for three days (Amarnath et al., 2023b). This initial warning was coupled with consultations to educate the community on necessary actions and evacuation plans (Amarnath et al., 2023b). On Day 2, the Early Warning Trigger was activated, signaling a heightened and more imminent threat (Amarnath et al., 2023b; Alahacoon et al., 2023).
- **Early Actions:** Upon receiving the initial alert, the community immediately began pre-emptive actions. This included filling sandbags to prepare bunds and clearing blocked drains and waterways to improve drainage and mitigate the intensity of potential inundation (Amarnath et al., 2023b). These simple, low-cost actions, enabled by a timely warning, can significantly reduce flood damage.
- **Early Finance:** A critical component tested was the early finance mechanism. With the activation of the early warning trigger on Day 2, cash vouchers were distributed to the participating families (IWMI). This enabled them to purchase dry rations and other essential supplies from a pre-identified local vendor. This approach not only ensures households have access to food and necessities before being cut off by floodwaters but also empowers them with the dignity of choice and injects money into the local economy at a critical time (IWMI).
- **Activation and Evacuation:** On Day 3, the final Activation Trigger was issued. The alert was communicated throughout the community by a designated individual known as "Mr. Early Warning," who used a megaphone to signal the need for immediate evacuation (Alahacoon et al., 2023). Residents proceeded to the designated flood shelter, bringing the dry rations they had acquired. At the shelter, a structured process was followed, including registration, medical treatment for any injured persons by the Red Cross, and provision of clean water and sanitation. Notably, the shelter was organized to segregate men, women, and children to address specific needs, such as providing privacy for lactating mothers, and to create safe spaces for children to engage in educational and recreational activities (Alahacoon et al., 2023). The simulation concluded when the DMC issued an "all-clear" alert, allowing families to return home (Giriraj Amarnath et al., 2023a).

4.1.3 The Drought Simulation in Anuradhapura: Safeguarding Agricultural Livelihoods

To test the platform's utility for slow-onset disasters, a two-day community-level drought simulation was conducted in December 2024 in the Anuradhapura district, an area frequently affected by water scarcity that severely impacts agricultural livelihoods (IWMI). This exercise, a partnership between IWMI and the Department of Agrarian Development, focused on proactive strategies to mitigate drought impacts over a longer timeframe (IWMI).

- **Anticipatory Planning:** A core element of the simulation was teaching farmers to develop a three-month anticipatory plan to prepare for the onset of drought (IWMI). This involved training in adaptive agricultural techniques, including the use of drought-resistant crop varieties, strategies for early harvesting, and methods for soil moisture conservation (IWMI).
- **Phased Actions:** The simulation tested a sequence of actions across the AWARE framework's three phases (IWMI):
    - **Preparedness Phase:** This focused on disseminating seasonal drought forecasts via SMS in local languages. It also involved practical actions like inspecting and repairing existing water sources (wells and tanks) and conducting workshops on water-saving techniques like rainwater harvesting and food preservation methods to ensure household food security during a prolonged dry spell.
    - **Readiness Phase:** As the forecast indicated a worsening situation, this phase focused on resource mobilization. Actions included restoring traditional water storage systems, establishing and equipping livestock feeding grounds with alternative fodder, and strategically positioning water bowsers for rapid deployment (Alahacoon & Amarnath, 2024).
    - **Activation Phase:** Triggered by specific indicators from the AWARE platform, this phase involved the immediate implementation of response measures. This included relocating livestock to the pre-designated feeding areas, deploying the water bowsers to provide potable water to the most vulnerable households, and dispatching mobile medical teams to address health risks, particularly for children and the elderly (Alahacoon & Amarnath, 2024).

The feedback from participating farmers was positive, with one noting that the advance warning and knowledge gained allowed them to reduce the harm caused by drought and gave them the confidence to be prepared and (IWMI).

4.1.4 Locally-Led Adaptation: The Kotagala Canal Restoration Project

A significant outcome of the AWARE initiative in Sri Lanka was the demonstration of how anticipatory action can serve as a catalyst for longer-term, structural investments in resilience. The community discussions and empowerment that resulted from the Kotagala flood simulation directly led to a community-driven initiative to restore a 2 km stretch of the local canal that frequently overflowed (IWMI).

This locally-led adaptation project, supported by a ClimBeR ACTION grant, focused on rehabilitating the canal to improve water flow, reduce flood risks, and enhance community resilience (Herath, et al., 2024). An impact evaluation conducted after the project's completion highlighted its transformative success. In the year following the restoration, no flood events

were recorded in the community. The project yielded substantial social and economic benefits, including fewer disruptions to the local tea estate's operations, increased school attendance, and reduced damage to homes and infrastructure (Herath, et al., 2024).

This case serves as a powerful model for how the AWARE framework can go beyond short-term preparedness. By building community awareness, capacity, and agency (Priority 4), it can inspire and enable communities to identify and implement their own nature-based solutions (Priority 3) for long-term risk reduction (Sushila De Silva, 2024). The success of the project hinged on the active involvement of the local community, from planning to maintenance, fostering a sense of ownership that is critical for the sustainability of DRR investments (Herath, et al., 2024).

Table 2. Summary of the AWARE Anticipatory Action Simulations in Sri Lanka

Feature	Flood Simulation (Nuwara Eliya)	Drought Simulation (Anuradhapura)
Hazard	Sudden-onset flood and landslide risk	Slow-onset drought
Location	Chrystler's Farm, Kotagala, Nuwara Eliya District	Ellawewa, Galenbindunuwewa, Anuradhapura District
Key Partners	IWMI, World Vision, Disaster Management Centre (DMC), Red Cross, Local Government	IWMI, Department of Agrarian Development (DAD), Local Government, Community Leaders
Preparedness Phase Actions	Community consultations, education on evacuation plans, identification of equipment needs (e.g., for canal cleaning)	Dissemination of seasonal forecasts (SMS), inspection/repair of water sources, training on water-saving and food preservation techniques
Readiness/Early Warning Phase Actions & Triggers	**Trigger:** SMS alert from DMC on heavy rainfall forecast. **Actions:** Filling sandbags, clearing drains, community mobilization.	**Trigger:** Worsening forecast indicators. **Actions:** Restoring traditional water storage, securing livestock fodder, pre-positioning water bowsers, mobilizing medical teams.
Activation Phase Actions & Triggers	**Trigger:** Evacuation alert from "Mr. Early Warning." **Actions:** Evacuation to shelter, registration, medical aid, provision of food/water/sanitation.	**Trigger:** Forecast and indicators from AWARE platform. **Actions:** Relocating livestock, deploying water bowsers for potable water, dispatching medical teams to vulnerable households.
Early Finance Mechanism	Distribution of cash vouchers to households for purchasing dry rations and essential supplies before the flood peak.	Anticipatory Action Plans included financial budgets for interventions, with a focus on pre-allocation of resources for agricultural support.

4.2 AWARE in Africa: Context-Specific Solutions

While Sri Lanka provides a deep dive into the AWARE platform's mechanics, its deployment across several African nations demonstrates its adaptability to different hazard contexts, governance structures, and socio-economic landscapes. The platform is not a one-size-fits-all solution but a flexible framework that can be tailored to meet specific national and local needs.

4.2.1 Zambia: Anticipatory Action for Drought Resilience

In Zambia, where drought poses a significant threat to agricultural livelihoods and water security, the AWARE platform has been used to guide tangible, structural investments in resilience. Following its launch in 2023, the platform's risk identification tools were used to pinpoint areas with the highest risk of drought impacts (Amarnath & Mascarenhas, 2024). Based on this analysis, a plan was developed that identified the installation of a new water source as a critical anticipatory action. In 2023, with support from a ClimBeR ACTION grant, a solar-powered borehole was installed in Monze District (Amarnath & Mascarenhas, 2024). This intervention provides a reliable water source that will help the community manage the expected impacts of future droughts. This example showcases how the AWARE platform can guide the strategic allocation of financial resources towards physical infrastructure projects that build long-term adaptive capacity, directly contributing to Sendai's Priority 3 (Investing in DRR).

4.2.2 Senegal: Sensitizing Anticipatory Action for National Dialogue

In Senegal, the launch of the AWARE platform in October 2023 was strategically coupled with a "National Dialogue on Sensitizing Anticipatory Action" (Sambou et al., 2023). This event brought together a wide range of stakeholders to build a common understanding of the concepts and significance of the AWARE framework (Sambou et al., 2023). The focus was not just on the technology, but on fostering the multi-stakeholder collaboration and political will necessary to build strong partnerships based on trust and complementarity (Sambou et al., 2023). The dialogue highlighted how the AWARE platform could help Senegal overcome existing gaps in translating early warnings into effective early action, particularly for hazards like floods, rising sea levels, and coastal erosion that threaten the country's development goals (Sambou et al., 2023). This approach demonstrates the platform's role as a catalyst for policy-level engagement, strengthening risk governance (Priority 2) and building the institutional foundation for a national anticipatory action framework.

4.2.3 Nigeria: Enhancing Flood Resilience

Nigeria is highly vulnerable to climate change impacts and has suffered colossal socio-economic losses from major floods, such as the events in 2012 and 2022, which caused billions of dollars in damage and affected millions of people (Oke et al., 2023). In this context, the AWARE platform is being deployed as an innovative early warning and action system specifically designed to enhance flood resilience (Oke et al., 2023). The objective is to improve disaster management by integrating data, promoting proactive decision-making among stakeholders, and fostering coordinated, anticipatory measures. By leveraging technology and fostering collaboration between government agencies and communities, the platform aims to minimize the devastating effects of floods on lives, livelihoods, and the national economy (Oke et al., 2023).

4.3 Global Scalability and the Path to Institutionalization

The successful deployments in Sri Lanka, Zambia, Senegal, and Nigeria are part of a broader global strategy to scale the AWARE platform. It is also currently being piloted in a diverse set of countries including Guatemala, Kenya, Morocco, the Philippines, and Rwanda (IWMI). This expanding footprint demonstrates the model's perceived applicability across different continents and hazard types.

The proponents of AWARE explicitly position it as a replicable model that can help countries meet their international commitments. It directly supports the Paris Agreement's call for strengthened climate adaptation and early warning systems (IWMI). Furthermore, it offers a tangible pathway for countries to achieve the goals of the UN Secretary-General's "Early Warnings for All" initiative, which aims to ensure every person on Earth is protected by an early warning system by 2027 (IWMI). The platform's emphasis on community-level activation, timely financing, and data-driven decision-making positions it as a leading innovation with the potential to be integrated into national and local systems worldwide, marking a significant contribution to global resilience efforts (IWMI).

5. Impact Analysis: AWARE's Alignment with Sendai Framework Global Targets

The AWARE platform's design and operational outcomes demonstrate a strong and direct alignment with the seven Global Targets of the Sendai Framework. Its most immediate and obvious contribution is to Target G, which focuses on early warning systems. However, the platform's true impact lies in its function as a catalyst. By creating an effective, actionable early warning system, AWARE establishes the necessary precondition for achieving significant reductions in disaster-related losses, as measured by Targets A (Reduce Disaster Mortality), Target B (Reduce number of affected people), Target C (Reduce Direct Economic Loss) through D (Reduce Damage to Critical Infrastructure). An early warning is of little value if it does not trigger a timely and effective early action. AWARE's innovation is its explicit linking of the warning (Target G) to pre-planned actions and pre-arranged finance. This integrated system creates a causal chain where improved risk information directly enables the pre-emptive measures that save lives, protect livelihoods, and reduce economic and infrastructure damage. In this way, progress on Target G, when achieved through a comprehensive system like AWARE, becomes a powerful multiplier that accelerates progress across the framework's primary loss-reduction targets.

5.1 Direct Contribution to Target G: Universal Access to Multi-Hazard Early Warning Systems

Sendai Target G calls to "substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030" (UNDRR). The AWARE platform is, in its essence, an advanced multi-hazard early warning and risk information system designed to fulfill this target.

The platform's architecture is built to provide timely, effective, and, most importantly, actionable information on a range of hazards, including floods, droughts, and landslides (Amarnath & Mascarenhas, 2024). It enhances the availability of warnings by integrating global and national data sources into a coherent and accessible format for decision-makers (Amarnath et al., 2023a). More critically, it dramatically improves access by ensuring this information reaches the "last mile." The flood simulation in Sri Lanka demonstrated this clearly, where warnings originating from the national DMC were disseminated directly to community members via SMS (IWMI). This direct-to-community communication, combined with local champions like "Mr. Early Warning," ensures that risk information is not only received but also understood and trusted by the people who need it most. By providing a replicable model for integrating early warning, early action, and early finance, AWARE offers a clear pathway for countries to meet the goals of the UN's "Early Warnings for All" initiative, which is a key mechanism for achieving Target G globally (IWMI).

5.2 Quantifying the Potential to Reduce Losses (Targets A, B, C, D)

While attributing specific reductions in losses to a single platform in real-world disaster scenarios is complex, the operational logic of the AWARE platform and the outcomes of its simulations provide compelling evidence of its potential to make substantial contributions to the Sendai Framework's four loss-reduction targets.

- **Target A (Reduce Mortality) and Target B (Reduce Affected People)**: The primary goal of anticipatory action is to save lives and reduce human suffering. The AWARE platform contributes directly to these targets by enabling timely and orderly evacuations before a hazard's peak impact. The flood simulation in Nuwara Eliya, where the community evacuated to a designated shelter based on a clear trigger, is a direct illustration of a mechanism designed to reduce deaths and missing persons (Indicator A-1) (Amarnath et al., 2023a). By prompting pre-emptive actions like reinforcing defenses and clearing waterways, the platform also helps to reduce the number of people whose homes are damaged or destroyed (Indicators B-3, B-4), and by extension, the total number of people directly affected by the disaster (Indicator B-1) (UNDRR).
- **Target C (Reduce Economic Loss) and Target D (Reduce Infrastructure Damage)**: Proactive measures enabled by AWARE are designed to mitigate direct economic losses and protect critical assets. The drought simulation in Anuradhapura, which trained farmers in adaptive techniques and the use of drought-tolerant seeds, is a clear strategy to reduce direct agricultural loss (Indicator C-2) (Amarnath & Mascarenhas, 2024). The pre-emptive clearing of canals and reinforcement of bunds in the flood simulation are actions aimed at

reducing direct economic loss in the housing sector (Indicator C-4) and to other productive assets (UNDRR). The Kotagala canal restoration project represents a more permanent, structural investment in DRR (Priority 3) that directly reduces disaster damage to local infrastructure (Target D) and prevents future economic losses (Target C) for the community and the local tea estate (Herath, et al., 2024). Just 24 hours of warning can cut ensuing damage by 30 percent, and AWARE provides lead times of days or even months, amplifying this potential for loss reduction (UNDRR).

5.3 Fostering National Strategies and International Cooperation (Targets E, F)

The AWARE platform's implementation model is inherently collaborative and designed to be integrated into national systems, thereby contributing directly to Targets E and F.

- **Target E (Increase National and Local DRR Strategies):** AWARE is not designed to operate in a vacuum but to be integrated into and enhance existing national and local DRR strategies. The platform's deployment acts as a catalyst for governments to adopt and institutionalize anticipatory action. The close collaboration with Sri Lanka's DMC, which has stated its intention to integrate AWARE into national contingency planning, is a direct contribution to achieving Target E (IWMI). Similarly, the national dialogue in Senegal was explicitly aimed at sensitizing government stakeholders to build a national framework for anticipatory action (Sambou et al., 2023). By providing a proven methodology and the supporting technology, AWARE helps countries develop and implement DRR strategies that are in line with the Sendai Framework, a key indicator for both SDG 1 and SDG 13 (UNDRR).
- **Target F (Enhance International Cooperation):** The AWARE platform is itself a product of international cooperation. It was developed by international research organizations (IWMI, CGIAR) and is funded by international partners (Amarnath & Mascarenhas, 2024). Its deployment in countries like Sri Lanka, Zambia, and Senegal is carried out in partnership with national governments and international NGOs (e.g., World Vision) (Amarnath et al., 2023). This model embodies the spirit of Target F by providing developing countries with sustainable support, technology transfer, and capacity building to implement the Sendai Framework. The platform's design as a replicable and scalable model facilitates the sharing of knowledge and best practices across borders, further strengthening international cooperation in DRR (IWMI).

6. Conclusion and Strategic Recommendations

The analysis presented in this report confirms that the AWARE platform is far more than a technological tool for disaster forecasting. It is a comprehensive, integrated climate risk management (ICRM) strategy and governance framework that successfully operationalizes the core principles of the Sendai Framework for Disaster Risk Reduction. By systematically linking early warning with pre-planned early actions and pre-arranged financing, AWARE provides a tangible and replicable methodology for executing the paradigm shift from reactive disaster response to proactive risk management. It effectively translates the Sendai Framework's abstract priorities into concrete, localized, and finance-backed interventions,

thereby serving as a powerful accelerator for achieving its global targets. The platform's demonstrated success in diverse contexts, from the multi-hazard landscape of Sri Lanka to the drought-prone regions of Zambia, validates its potential as a leading global innovation in anticipatory disaster risk management.

6.1 Synthesizing AWARE's Role as an Accelerator for the Sendai Framework

The AWARE platform's primary contribution lies in its ability to bridge the persistent gap between warning and action. It addresses the four Sendai Priorities for Action in a cohesive and synergistic manner. It builds a deep understanding of risk (Priority 1) by transforming multi-source data into actionable intelligence. It strengthens governance (Priority 2) by creating a common operational picture that unites government, humanitarian, and community stakeholders. It materializes investment in DRR (Priority 3) by shifting financial resources to the pre-disaster window, where they can be used most effectively to build resilience. Finally, it revolutionizes preparedness (Priority 4) by making it a dynamic, tested, and community-driven process that upholds the dignity of those at risk.

This integrated approach creates a virtuous cycle. By directly fulfilling Target G (Early Warning Systems), AWARE enables the pre-emptive actions necessary to make significant progress on Targets A, B, C, and D (Reducing Losses). Simultaneously, its collaborative implementation model advances Target E (National Strategies) and Target F (International Cooperation). In doing so, AWARE provides a clear and compelling pathway for nations to not only meet their commitments under the Sendai Framework but also to enhance their resilience in the face of escalating climate-related shocks, contributing to the broader 2030 Agenda for Sustainable Development.

6.2 Recommendations for Scaling, Integration, and Sustainable Financing

For policy advisors and program managers at national disaster management agencies and international development organizations, the success of the AWARE model offers a clear direction for integrated climate risk management (ICRM) strategy and investment. The following recommendations are proposed to scale its impact and ensure its long-term sustainability.

- **Recommendation 1: Mainstream Anticipatory Action into National DRR Strategies and Legal Frameworks**. Governments, with the support of international partners, should move beyond pilot projects and work towards the formal integration of anticipatory action frameworks like AWARE into national and local DRR plans, budgetary processes, and relevant legal frameworks. The examples from Sri Lanka, where the DMC is moving to integrate AWARE into national contingency planning, and Senegal, where a national dialogue was held to build a supportive policy environment, should be used as models. This institutionalization is critical for ensuring long-term ownership, sustainability, and scalability.
- **Recommendation 2: Invest in Foundational Data Ecosystems and Local Infrastructure.** The effectiveness of a sophisticated platform like AWARE is contingent upon the quality and availability of foundational data (e.g., meteorological data, high-

resolution topographical maps, socio-economic data) and the reliability of local infrastructure (e.g., mobile communication networks for alerts, functioning local markets for cash voucher programs). International cooperation under Target F should prioritize investments that strengthen these foundational capacities in the most vulnerable countries. This includes supporting national meteorological services, investing in open data platforms, and ensuring that last-mile communication channels are robust and inclusive.

- **Recommendation 3: Develop Blended and Sustainable Financing Models for Early Action.** While initial funding for AWARE's implementation has come from research and development grants, long-term sustainability requires a shift towards more diverse and predictable financing models. National governments and development partners should explore blended finance strategies that integrate anticipatory action with national social protection systems, capitalize national disaster funds for pre-disaster allocation, and leverage innovative risk transfer mechanisms. Exploring the use of forecast-based index insurance, for instance, could provide a market-based mechanism to trigger rapid payouts for anticipatory action, complementing public funds (ACRE).
- **Recommendation 4: Prioritize and Resource Community-Led Design and Inclusive Implementation.** The success of the Kotagala canal restoration and the detailed, people-centered procedures in the Sri Lankan simulations underscore a critical lesson: anticipatory action is most effective when it is co-designed with and led by local communities. All future scaling efforts must prioritize a bottom-up approach that empowers local actors and ensures the inclusion of the most vulnerable groups, including women, children, persons with disabilities, and the elderly. This requires allocating specific resources for community engagement, participatory risk assessment, and capacity building at the local level to ensure that anticipatory action plans are not only technically sound but also socially equitable and culturally appropriate.

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