Strategy for Implementation of Early Warning for All (EW4ALL) for Somalia

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Acronym

AA	Anticipatory Action
AM	Amplitude Modulation
AMM	Africa Media Monitor
APIs	Application programming interfaces
ARC	African Risk Capacity
AWD	Acute Watery Diarrhea
AWS	automated weather station
BCPs	Business Continuity Plans
CAP	Common Alerting Protocol
CB	Cell-Broadcast
CBDRM	Community Based Disaster Risk Management
CBO	Community-based organization
CBS	Central Bank of Somalia
CCA	Climate Change Adaptation
CCM	Convention on Cluster Munitions
CIMA	International Centre for Environmental Monitoring
CPC	Civil protection committee
CREWS	Climate Risk and Early Warning Systems
CRVA	Climate risk and vulnerability assessments
CSO	Civil Services Organization
DDMT	Disaster Management Team
DFID	Department for International Development Government of the United Kingdom
DINA	Drought Impact and Needs Assessment
DM	Disaster Management
DMA	Disaster Management Agency
DMC	Disaster Management Committee
DRM	Disaster Risk Management
DRMCG	Disaster Risk Management Coordination Group
DRR	Disaster Risk Reduction
DTM	Displacement Tracking Matrix
DTS	Disaster Tracking System
EOC	Emergency Operation Centre
ETT	Emergency Tracking Tools
EW	Early Warning
EW4ALL	Early warning for all
FAO	Food and Agriculture Organization
FEWSNET	Famine Early Warning Systems Network
FGS	Federal Government of Somalia
FM	Frequency Modulation
FSNAU	Food Security and Nutrition Analysis Unit
GDP	Gross domestic product
GIS	geographic information system

GMAS	Global Multi-hazard Alert System
GPS	The Global Positioning System
GSM	Global System Mobile
GTOS	Global Terrestrial Observing System
HC	Humanitarian Coordinator
HCT	Humanitarian Country Team
HPC	High-performance Computer
IBF	Impact-based Forecast
ICPAC	IGAD Climate Prediction and Applications Centre
ICS	Incident Command System
ICT	Information and Communications Technology
IDP	Internally Displaced Person
IDRR	International Day for Disaster Reduction
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross and Red Crescent Societies
IGAD	Intergovernmental Authority on Development
IGADD	Intergovernmental Authority on Drought and Development
LITK	local, indigenous and traditional knowledge
ILK	Indigenous and local knowledge
INGO	International Non Government Organization
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
ITU	International Telecommunication Union
IRV	Interactive Voice Response
L & D	Loss and Damage
LB-SMS	Location-based SMS
LCG-DER	local coordination group on disaster emergency response
LNHAs	Local National Humanitarian Actors
LNNGOs	Local and National NGOs
MoAI	Ministry for Agriculture and Irrigation
MoFBE	Ministry of Fisheries and Blue Economy
MOLFR	Ministry of Livestock, Forestry And Range
MoPIED	Ministry of Planning, Investment and Economic Development
MoEWR	Ministry of Energy & Water Resources
MoHADM	Ministry of Humanitarian Affairs and Disaster Management
MTR	Mid Term Review
NAPA	National Adaptation Plan of Action
NCA	National Community Authority
NDMF	National Disaster Management Fund
NDRMC	National Disaster Risk Management Council
NDVI	Normalized Difference Vegetation Index
NMHEWC	National Multi-hazard Early Warning Center
NMHEWS	National Multi-hazard Early Warning System(Online)
MHEWS	Multi-hazard Early Warning System(Online)

NGO	Non-Government Organization
NMHSs	National Meteorological and Hydrological Services
NSO	National Statistical Office
OCHA	Office for the Coordination of Humanitarian Affairs
OI	Officer In-charge
OPM	Office of the Prime Minister
PDNA	Post-disaster loss, damage, and needs assessment
Q&A	Questions and answers
RPDNA	Rapid Post-Disaster Needs Assessment
RVAC	Risk and Vulnerability Assessment Committee
RS	Remote Sensing
RMC	Regional Meteorological Center
RSMCs	Regional Specialist Meteorological Center
SADD	sex, age, disability disaggregated data
SDG	Sustainable Development Goals
SDRMCG	Somalia Disaster Risk Management Coordination Group
SFDRR	Sendai Framework on Disaster Risk Reduction
SMS	Short Message Service
SNDMP	Somalia National Disaster Management Policy
SNDP	Somalia National Development Plan
SoDMA	Somalia Disaster Management Agency
SoD	Standing orders in Disaster
SoP	Standard Operating Procedure
SRCS	Somalia Red Crescent Society
SWALIM	Somalia Water and Land Information Management
SWALIM	Somalia Water and Land Information Management
TWG	Technical Working Group
UAV	Unmanned aerial vehicle
UHF	Ultra-high frequency
UN	United Nations
UNCCA	United Nations Convention against Corruption
UNCDF	UN Capital Development Fund
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United nations international children's emergency fund
UNRCO	United Nations Resident Coordinator Office
UNV	UN Volunteers
VAC	Vulnerability Assessment Committee
WASH	Water, sanitation, and hygiene
WFP	UN World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization

Contents

Executive Summary

The proposed Early Warning for All(EW4ALL) implementation strategy considers Somalia's existing disaster/climate risk, fragility, conflict, and vulnerability (FCV) context. A robust implementation of Information and Communication Technology (ICT) for multi-hazard/disaster risk management governance systems is considered the most appropriate solution to the governance paradox. It concurrently leverages how to overcome governance fragility challenges and bridge the gaps among last-mile non-state development actors, the private sector, and central-level federal and state actors (government) in the disaster risk management governance system. The most considerable imperative is that the Somali mobile penetration reaches 80% of the country's population, laying the groundwork for an ICT-driven, agile online system structured as an open-ended system to facilitate the implementation of the EW4ALL pillar actions for Somalia.

The proposed ICT tools-driven online system of the national multi-hazard early warning system (NMHEWS) underscores the technical nexus of fostering potential digital partnerships among all actors through the implementation of ICT tools-based informed multi-hazard risk governance management and the overall improvement of hydrometeorological services and Early Warning Systems. More specifically, the purpose of this report is to provide valuable insights into the nuances of ICT-driven early warning systems (EWS) implementation within affected contexts against growing natural hazards, offering technical risk-governance and identifying entry points where an ICT tools supported mechanism to link climate frontline stakeholders, community and smallholder entrepreneurs as last-mile key informant and to be interacting them with the EW4ALL system, enhancing last-mile stakeholder digital coordination, optimizing multi-hazard risk-informed and climate proof local development planning, resource allocation, and fostering community readiness to better preparedness for, respond to and resilience-building to any impending hazardous multi-hazards.

All significant inputs for the development of this EW4ALL implementation strategy came from a field mission to Somalia, stakeholder consultations, and a physical visit to the relevant government entities in Somalia.

1.0 Introduction

Considering Somalia's existing disaster/climate risk, fragility, conflict, and vulnerability (FCV) context, it is highly advisable that Somalia implement an ICT-driven online platform for a national multi-hazard early warning system (NMHEWS). This system is essential for providing precision-level hazard early warning, impact forecasting, weather warning alerts, sectoral elements, risk-informed climate-proof planning, and support for disaster risk management governance. It will also prepare the climate frontline (last-mile) for, respond to, and recover from extreme weather events & multi-hazards.

The implementation strategy was derived from the field mission for the institutional assessment and stakeholder consultations of Early Warning for All (EW4ALL) implementation in Somalia. The field mission aims to assess the existing institutional capacity in hydrometeorological service delivery, considering its multidimensional aspects and operational modality.

The primary objective of the assessment is to evaluate the institutional capacity to fully implement Early Warning for All (EW4ALL), encompassing its structure, methodology, tools, and processes. It will also analyze the core stakeholders' capacity to implement the EW4ALL pillar actions and devise strategies for implementing EW4ALL, considering the context of Somalian Fragility, Conflict, and Vulnerability (FCV).

One of the technical aspects of assessing physical visits is the SoDMA NMHEWC, which reviews the overall operational status and service delivery capacity. It also reviews the ICT infrastructure, database, hardware, software, system components, network topology, internet backbone, data connectivity, and human resources capacity in handling disaster risk information management.

To conduct technical reviews on the systemic structure and interoperability of the EW4ALL implementation of all pillar actions, which depend on coordination and partnership mechanisms, operational capacity to determine hazard detection, forecast production, hazard impact analysis, risk communication, and better preparedness and response capacity.

The assessment is intended to investigate the operational capability of the SoDMA national hazard early warning center (NMHEWC), the Somalian climate vulnerable sector ministry, regarding its existing institutional capacity, technical structure, ICT structures, functional and operational capability of handling the multi-hazard early warning functions, products, services, coordination mechanism, etc.

UNDRR undertook an initiative to enhance Somalian capacity to improve the Early Warning for All (EW4ALL) initiative by implementing all pillar actions with an already developed Roadmap of action plans. The assessment investigated the overall disaster risk management governance capacity and the existence of local government-level disaster risk management systems. Following the typical structures of a Multi-hazard early warning system for African Countries.

1.1 Objective of the Assessment and Full-scale EW4ALL Implementation Strategy Development:

- The objective of the field mission is to assess Somalia's institutional capacity to enhance multi-hazard risk knowledge, prepare for multi-hazard early warnings, and improve dissemination capacity.
- Diagnose the multi-hazard early warning system, identify the bottlenecks and gaps of the inclusive multi-hazard risk governance system, and provide recommendations and a way forward
- Stakeholder consultation and diagnosis of risk knowledge management, hazard detection, and providing precision-level early warning; multi-hazard risk communication gaps and recommendations for systemic improvements; investigation of institutional mechanisms; partnership and coordination of preparedness and response management assessment; underlying indicative gaps, provide recommendations, and prepare implementation strategy for the Somalian context.

1.2 Assessment Methodology

The methodological approach of assessment follows through several strategic tools, e.g., from March 23 – 27, 2025, to conduct stakeholder consultation with Key Informant Interview (KII) with key stakeholders (sector ministries/departments, UN Agencies) to investigate the institutional capacity of in terms of implementation of EW4ALL Pillar actions/intervention. Conducted physical visits to review the NHMWEC infrastructure, hardware, software, communication tools, database, servers, storage system, internet connectivity, and digital partnership with other key actors. Side-by-side, the comprehensive desk reviews of all websites, information disclosure policy, strategy, and NHMWEC's products and services for the end users. Assessment reviews of the current set of stakeholder coordination and partnerships regarding multi-hazard early warning service deliveries, as well as all pillar activities and engagement of last-mile stakeholders in Disaster Risk Management (DRM). Assessment interacted with stakeholders using the following questionnaires to identify indicative gaps.

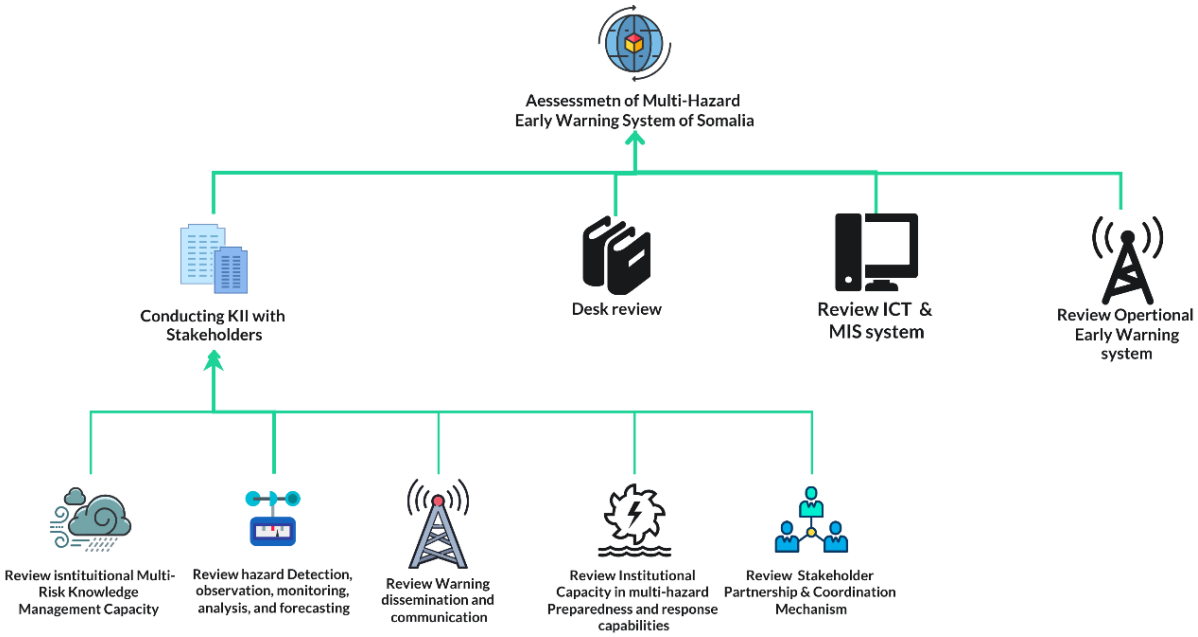

Figure 1: Institutional Assessment Methodology

- What are the Operational Structure and service Delivery Capacity gaps of NMHEWC concerning the EW4ALL Roadmap?
- What about the existing ICT system and structure at the SoDMA and other sector departments (Service delivery Capacity, Hardware, Software, IT-capable, Human Resources) in place?
- What is the level of use of the GIS & Remote Sensing Section (Service delivery Capacity, Hardware, Software, IT Human Resources), Field-level data collection, collation, and production-informed tools (GIS Maps)
- What about the current status of NHMS, EWS minimum capability in data collection, risk data collection, repository development, L&D data collection mechanism, PDNA, RPDNA capacity?
- Existing capacity of climate vulnerability sector ministries and departments in climate and multi-hazard risk assessment capacity (methodology, guidelines, tools, process), indicative gaps, and recommendations.
- Current capacity of sector-level risk data collection, age-sex, disability disaggregated data(SADD) collection mechanism, data-collation, databases, repository & informed tools development (GIS map/atlas, reports, etc.) capacity.
- What is the current stakeholder partnership and coordination framework structure for disaster risk governance management, risk and vulnerability assessment, and risk-informed sectoral planning, and how can it be effectively partnered with the CERWS GHA and EW4ALL for full-scale implementation?
- The level of the ICT/GIS system, GIS, and Remote Sensing Map production system of FAO-SWALIM of MoEWR.
- What is the current level of national hydromet services, the status of observation stations, data collection, collation, and processing mechanisms?

- What is the current data sharing and information exchange mechanism with upper-riparian transboundary (Ethiopia, Kenya) & inland flood forecasting and early warning systems, inland heavy rainfall forecasting and Outlook System, operational forecasting system, impact forecasting system, and overall forecasting capability, bulletin preparation, and forecast-based early action protocol development?
- What is the current national risk communication framework, roadmap, Structures and processes, national media outlets, broadcasting channels, dissemination channel, community-based end-to-end early warning mechanism, warning understandability by the frontline community, warning receiving modalities, gaps, and challenges
- What is the current risk dissemination framework? How do national Radio/TV broadcasters broadcast access every day's forecasts, mandates, Memoranda of Understanding (MoUs), and accountability of national broadcasters in broadcasting emergency weather bulletins, weather warnings, and alerting?
- How does the last-mile off-grid remote/hard-to-reach area community/household receive water warning?
- What are the indicative forecast dissemination barriers and challenges, and how can bottlenecks be addressed?
- Reviews of the national risk communication framework, roadmap, structure, process gaps, and challenges
- Assessment of national media outlets, broadcasting channels, and dissemination channels
- Community-based end-to-end early warning mechanism, warning understandability by frontline community warning receiving modalities, gaps, and challenges
- Review local government planning process, gender-inclusive participatory local government /clan level development planning, gender-inclusive DRR Planning, and interventions by state and non-state actors
- What is the current DRM structure, risk governance mechanism, structure, and functional status of the Civil Protection Committee (CPC)/Disaster Management Committee(DMC), Disaster Preparedness, response, and recovery planning process?
- Assessment of the current Disaster Emergency Declaration Process, UN /INGO-led cluster coordination, response mobilization, and humanitarian action. Evaluation of Local Level (District/Village) level DRM Plans,(Preparedness, response, and recovery), humanitarian action
- Assessment of Sector-level DRR interactions at the local level, Review of local government planning processes, gender-inclusive participatory local government/clan-level development planning, and gender-inclusive DRR Planning and interventions by state and non-state actors.
- 1.3 Consultation Process:
- Organize Meetings with SoDMA NMHEWC Team (ICT Department, hazard risk analysis team, DRR Department, Humanitarian Affairs Department, Planning and M & E Department), and other relevant officials/stakeholders.
- Consultation with the Livestock, Agriculture, and Water Resources Department.
- Consultation with UN Agencies (UNDP, FAO, WFP)
- Consultation with the technical working group of national hydromet services of the Ministry of Energy and Water Resources (MoEWR), Somalia Water Sources Information Management System
- Meeting with NCA and Broadcasters to discuss the challenges of weather forecasting and bulletin preparation.

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2.0 Challenges of Multi-hazard Risk Management Governance in the Somalin FCV context :

a) Political fragility and a centralized governance system for risk-informed development:

Climate/multi-hazard risk management governance processes encompass a concerted approach among sectors and stakeholders that need to address all cross-cutting issues. Systematic and cohesive policy alignments, as well as inclusive & concerted programmatic interventions, are undertaken by the sectors. Inter- and intra-institutional partnership and coordination mechanisms are also in place. However it also requires a holistic sectoral agreed consensus on risk assessment & information sharing, coordination, collaboration, inclusive level of participatory last-mile local climate governance system is in place, local resource mobilization for the climate resilient local development actions, service delivery capacity stakeholders, and inclusive and finally the participatory engagement of last-mile stakeholders and frontline community with the localized risk-informed development initiatives.

In Somalia, federal and state actors-led service deliveries to the last mile are hindered by fragmented and self-proclaimed governance, clan-based fragility, a territorially fragmented governance system, conflicts, and a largely siloed approach to CSO-led local development service deliveries. The diagram below illustrates that Somalia has a limited extent of nexus between the centralized nature of federal, member state governance systems, poorly functioning district local governments, and sector departments, hindering the expansion of risk-informed service delivery at the last mile. On the other hand, the most prominent last-mile development actors are INGO-led CSOs and UN Agencies, which mostly adopt a siloed approach and are less partnered with government actors to bring up an inclusive climate risk governance management system for Somalia.

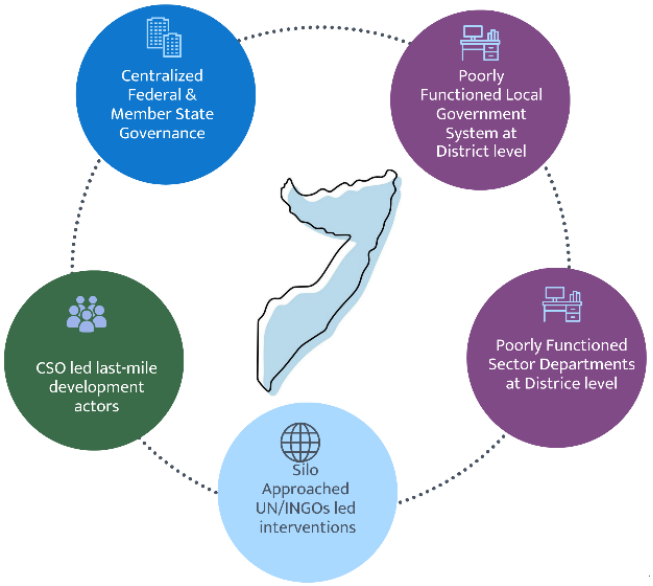


Figure 2 : Political fragility and a centralized governance system(Source : Z M Sajjadul Islam)

In this paradoxical context, binding all relevant stakeholders digitally /remotely, mandating them with ICT-driven strategic partnership and coordination, avoiding the looming governance fragility, and transforming them into ICT-enabled stakeholder-partnered, inclusive multi-hazard early warning systems and risk-informed local development will be leveraged to distantly nexused the platform to the virtually centralized and decentralized functioned digital multi-hazard risk governance system.

Unlocking all fragmented governance paradoxes to create a digitally functioning and level playing platform with nexused functional partnerships that hold all stakeholders, sectoral actors, local government entities, CSOs, and

frontline communities accountable to the affected population (digitally) out of the box, and getting rid of already suffering from FCV paradigms of governance.

b) Current practices of the Silo-approach implementation modality:

Most actors in the federal and state (sector ministry, sector department, district administration) and non-state (INGOs, CSOs) sectors, who adopt risk-informed development activities, often employ a siloed approach, maintaining minimal coordination, partnership, and information disclosure. This approach essentially hinders the interactive and stakeholder-coordinated EW4ALL Pillar's specific participatory actions. However, on the outset, the Multi-hazard and Climate risk management governance typically depends on agreed consensus on coordination, partnership, local governance system, local resource mobilization for the climate resilient local development actions, service delivery capacity stakeholders, and inclusive and participatory engagement of last-mile stakeholders and frontline community with the localized risk-informed development initiatives. The figure 2 shows that Somalia government sector ministry/department has a limited extent of partnership nexus between the centralized nature of the federal and member-state governance systems, poorly functioning district local government, and sector departments to provide risk-informed service delivery at the last mile, and UN and other INGOs' development efforts at the regional, local level, which take a mostly siloed approach and dependency on CSOs.

c) Sector level minimal level of data coordination, exchange, and disclosure:

Although having around 80% mobile users across the country, unfortunately, most of the climate vulnerable government sector departments at central, member state and district level have limited level of use ICT systems (hardware, software, and communication systems), Management Information System(MIS) for systematic inventorying of multi-hazard and climate risk information, lack of tailored risk information being disseminated through the organizational website. Inadequate data sharing protocols/MoUs, mandates by central/state governments on multi-hazard risk assessment, tailor-made repository development, web-based data sharing, and disclosure are needed to support the development of impact weather forecasts and risk-informed DRM planning at the local level.

d) Inadequate sector-level risk assessment, systematic risk repository development:

Disaster risk management planning requires tailored, localized risk information for local disaster preparedness, response, and recovery planning. The department needs to access the information for planning purposes. Generally, non-state actors, such as local NGOs, are the primary actors in last-mile development.

e) Inadequate surface weather observation:

Most weather observation stations are manual, and time-series data acquisition from them does not occur systematically and regularly. As a result, point-based nowcasting services are not happening, and forecast verification is also being hindered. Due to inadequate institutional capacity, Somalia has limited hydro-meteorological data gathering, monitoring, real-time tracking, and forecasting. It is urgent that the WMO, UNDP and UNEP to close the climate and weather observations data gap of most severe shortfalls in observations, and prioritizing EW4ALL Pillar-2 and to call the Systematic Observations Financing Facility (SOFF) long-term financial and technical assistance to support the generation and sharing of basic weather and climate observations, according to the internationally agreed Global Basic Observing Network (GBON) regulations.

In Somalia, the GBON-compliant limited extent of hydrometeorological observation capacity is due to insufficient automatic hydro-meteorological stations on the ground, manual data reading, data transmission difficulties, and regular operation and maintenance support. Hydrometeorological data gathering, monitoring, and forecasting in real-time tracking, exchange of information, and forecasting are limited due to insufficient automatic hydrometeorological stations on the ground and the limited capacity of their systems in hydrometeorological forecasting.

f) Inadequate local-level Disaster Risk Management capacity

The magnitude and trend of climate risks are mounting with the changing climate regime in Somalia. Over the past 48 years, statistics of disaster events show that most of the disaster events are rapid and sudden onset (floods, cyclones, diseases, outbreaks), and simultaneously, slow, protracted droughts are also severe and recurrent, as evidenced by the occurrence of hydrometeorological and agricultural droughts every year. These essentially contributed to the loss and damage of livelihood and productive sectors. Fundamentally, the graph signifies the essentiality of an ICT-driven functional early warning system. Climate change-induced internal and external displacement intensifies demographic and socioeconomic risk factors..

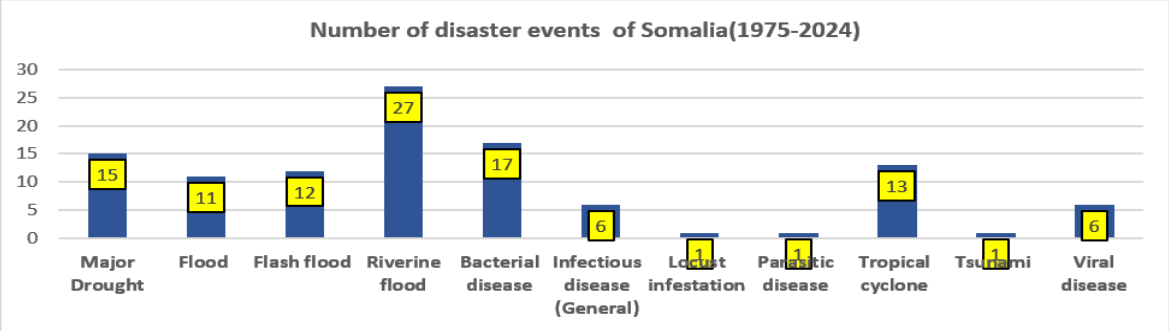


Figure 3: Somalia Disaster events (1975-2024) : Source EM-DAT Apr 2024 (48 years Disaster incidence dataset for Somalia)

The Hydro-meteorological data gathering, monitoring, and forecasting in real-time tracking, exchange of information, and forecasting are limited in extent due to an insufficient number of automatic hydro-meteorological stations on the ground, manual data reading and data transmission difficulties, regular operation and maintenance support, and the limited capacity of its systems in hydrological forecasting. For Somalia to have robust weather forecasting and impact-based Early Warning Systems (EWS), real-time monitoring systems for meteorological and hydrological conditions must be strengthened by automating existing stations and installing new automated stations. This includes, but is not limited to, the development of real-time data transmission for flood monitoring by expanding the spatial coverage of hydro-meteorological stations and upgrading the current quality and timeliness of the information.

Inadequate, tailored, risk-informed planning and intervention: The county lacks sector-level institutional capacity in systemic climate risk assessment, risk repository, or tailored, informed planning tools. There is less institutional accountability, as well as a lack of mandates, an information management system, a policy framework, methodology tools, guidelines, and a task force for conducting sector-level risk assessments. The sector department is supposed to have a risk database and a GIS, at least for their repository, to support project design and implementation..

g) **Inadequate tailored, risk-informed planning and intervention: T**he county has yet to have sector-level institutional capacity in systemic climate risk assessment, risk repository, or tailored, informed-planning tools. There is less institutional accountability, mandates, an information management system, a policy framework, methodology tools, guidelines, and a task force for conducting sector-level risk assessment. The sector department is supposed to have a risk database, GIS at least for their repository, and supporting project design and implementation.

2.1 Recommendations for Overcoming the Indicative Challenges and exploring an ICT-driven multi-hazard risk management system can be implemented in the Somalia FCV context

a) **Improving ICT-based risk governance at central, member state, regional, district, and village levels:**

- The FCV context hinders the bottom-up and top-down development planning and intervention processes. On the other hand, disaster risk management must always address the emergencies induced by impending

multi-hazards, as the loss of lives is imminent. Therefore, ICT tools-based governance systems can be used to close the risk-informed development gaps. The ICT-driven whole-of-society approach is the most advanced and robust tool, where the community at the frontline serves as the first responder, along with other functional communities at the local level. The first responder would be able to use the Online risk database, which would be interfaced with Kobo-toolbox and other survey and GPS placemark tracking apps.

- All the CSO-led stakeholders (CPC/DMC, Village level government /Clan-based leaders, mosque based committee, local charities) would be able to conduct apps-based multi-hazard exposers, risk and vulnerability assessment, send georeferenced elements specific information during disaster onset, they will be able to send georeferenced disaster events hotspots, event situation awareness related information and concurrently all information to be disseminated to online/mobile apps for the whole-of-the-society awareness and resilience building, DRM, DRR.
- The local CSOs, NGOs, academia, students, R & D organization, value chain operators, stakeholders, entrepreneurs, etc., would also be the key informants to provide/update the onset multi-hazard event situation during disaster emergency, on the regular basis the georeferenced elements specific climate/multi-hazard exposure information to central servers via apps.
- Mandating Sector departments (Crop agriculture, livestock, WASH, water sector, health, and fisheries) to send elements of specific georeferenced climate exposure, risk, and vulnerability information to a central server via an online database system.
- The Sector department would be able to interpret the sectoral elements' exposure, risk, and vulnerability whenever they can access high-resolution spatiotemporal-scale weather warnings.
- High-density, point-based surface observation and ICT-driven impact forecasts; sectoral element-level operational and impact forecasts; operational forecasts for basic service delivery structures (power stations, healthcare facilities, lifeline service delivery utility services); and point forecasts for high-value elements (city, municipality, urban centres, IDP, rural settlements).
- The community will receive weather alerts through mobile apps, WhatsApp, SMS, IVR, and cell broadcasts. It will be informed of the threshold level of impact forecast to take precautionary and preparedness measures. The Geospatial mobile apps will be able to provide GIS map-based emergency preparedness and evacuation advisories on where to locate emergency shelters and core family shelters.
- ICT based management of disaster CPC/DMC with showing standing orders on disasters (SoD), tracking of all local actors/stakeholders on 5W manner to avoid duplication, overarching interventions and identifying the non-intervention and hard-to-reach areas
- The ICT-based DRM system will conduct the RPDNA, quantify the initial L&DS statistics of lifesaving sectors, and identify the required immediate emergency humanitarian responses, resource mobilization gaps, needs, and priorities.
- The Local Civil Protection Committee (CPC) could disseminate end-to-end community-based early warning and concurrently develop forecast-based anticipatory action for the locality.
- The ICT online dashboard will support the humanitarian community in developing forecast-based early anticipatory action in planning, implementing, and responding to disasters. For Pillar 4 interventions, the actors would be able to access online digital disaster emergency planning.
- Online apps for collecting Loss and Damage statistics from the community level: The information can be validated using crowdsourced big data and information gathered by the app-based hazard L&Ds tracking system to understand the impending onset of disasters that induce damage and losses on the ground. The incident tracking and event situation updates provide a way forward to calculate the next-level impacts over the changing scale intensity and frequency of hazardous effects that continue (e.g., flood, cyclone), and can support the development of impact forecasts and event situations at the next level. This integrated impact analysis informed decision-making, provided a forecast-based early action protocol, and enabled informed decision-making for mobilizing humanitarian action on the ground. Which will. Remove the silos approach barrier by implementing a centralized process..

2.2 Objective of the Interoperable NMHEWS for Somalia :

Online Multi-hazard risk information management system: In a traditional emergency preparedness and humanitarian action coordination context, it is often unclear who is responsible for what. There is a huge institutional coordination gap among the stakeholders.
Multi-hazard risk management is typically a coordinated effort in which, while early warnings are being issued, the next level of prerequisites translates impending, anticipatory risk into anticipatory actions, which require significant local-level coordination. The Interoperable system renders an integrated approach to workability, ensuring that everyone knows who will be doing what, where, when, and how, thereby promoting inclusive local-level participation. The system can leverage precision-level information to formulate a response mechanism and perform multiple tasks related to impending multi-hazards, including assessing the likelihood of impacts and determining the impacts experienced at the frontline after landfall, as well as the intensity and trajectory of Impacts.

ICT system for disaster risk management: Improving risk governance is an integrated job that requires last-mile engagement with the process, the ICT tools driven and interoperable early warning platform can keep every local level CPC informed about the impending hazard condition, and the community/frontline would be able to interpret the magnitude and intensity of the hazard risk, and accordingly, individual-level anticipatory action can be developed as part of an end-to-end early warning system.

Closing the list-mile risk information gaps: Designing online/Android apps, and engaging frontline stakeholders, smallholder enterprises, humanitarian actors, and CPC volunteers as grassroots-level informants, to promote inclusive digital participation in community-level risk and vulnerability information and element-specific risk information.

2.3 Urgency of Implementation of ICT-based Multi-Hazard Risk Management Governance:

Climate change-induced multi-hazard management highly depends on a systemic and structural risk management approach in any country. Robust multi-hazard risk management governance mostly depends on an ICT-based structure and functional process to support the four Pillar actions: planning, task management, and mitigation.

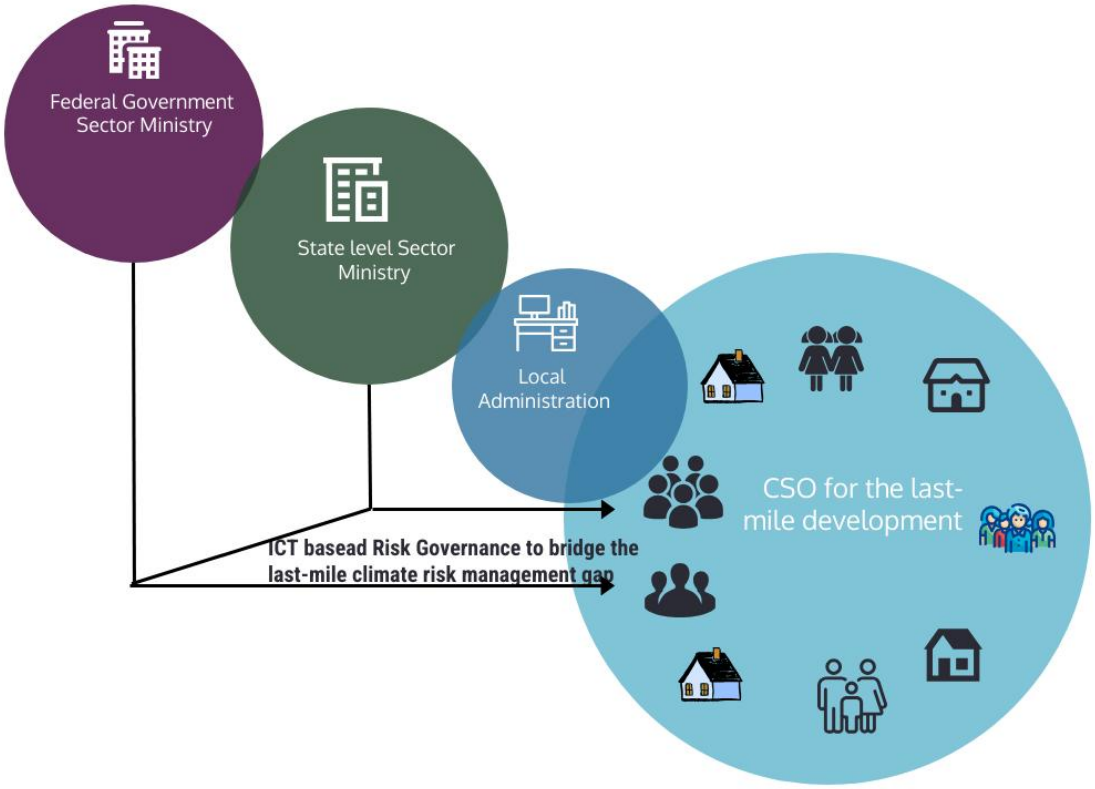


Figure 4: ICT-based Risk Governance to bridge the last-mile climate risk management(Source : Z M Sajjadul Islam)

The Somalian current multi-hazard risk management governance buildup on divergence patterns of governance(above figure) in which governments are tangled by the centralized and statehood policy and programmatic silo approach, poorly functioned local government system and CSO dominated last-mile development approach in which the central & state government system need to establish effective service delivery mechanism with ICT powered multi-hazard risk management and governance system.

Climate change-induced multi-hazard risk management depends on a country's competence, ICT-powered risk management governance, inclusive stakeholders' coordination and partnership, and mandated structural processes. Robust risk management governance depends on the highest ICT-based structure and functional processes to support the four Pillar actions.

The Somalian multi-hazard risk management governance system needs to build up from the multiple divergence patterns of governance e.g., centralised and statehood policy and programmatic silo approach, poorly functioned local government system and CSO dominated last-mile development approach in which the central & state government system need to establish effective service delivery mechanism with ICT powered multi-hazard risk management and governance system.

The INGO-led local NGOs and CSOs are the last-mile actors for the multi-hazard risk-informed development. Central and state-level sector ministries and departments must close the gap by implementing an ICT-driven risk governance management system. The figure below highlights the governance gaps and emphasizes the importance of ICT-based risk governance. Figure 4 depicts how far the federal and state governments are lagging in bridging the last-mile multi-hazard risk-informed development, inadequate coordination, and partnership with last-mile CSOs in the given FCV context of Somalia.

2.4 Key indicators of ICT-driven EW4ALL action priorities for Somalia in FCV context.

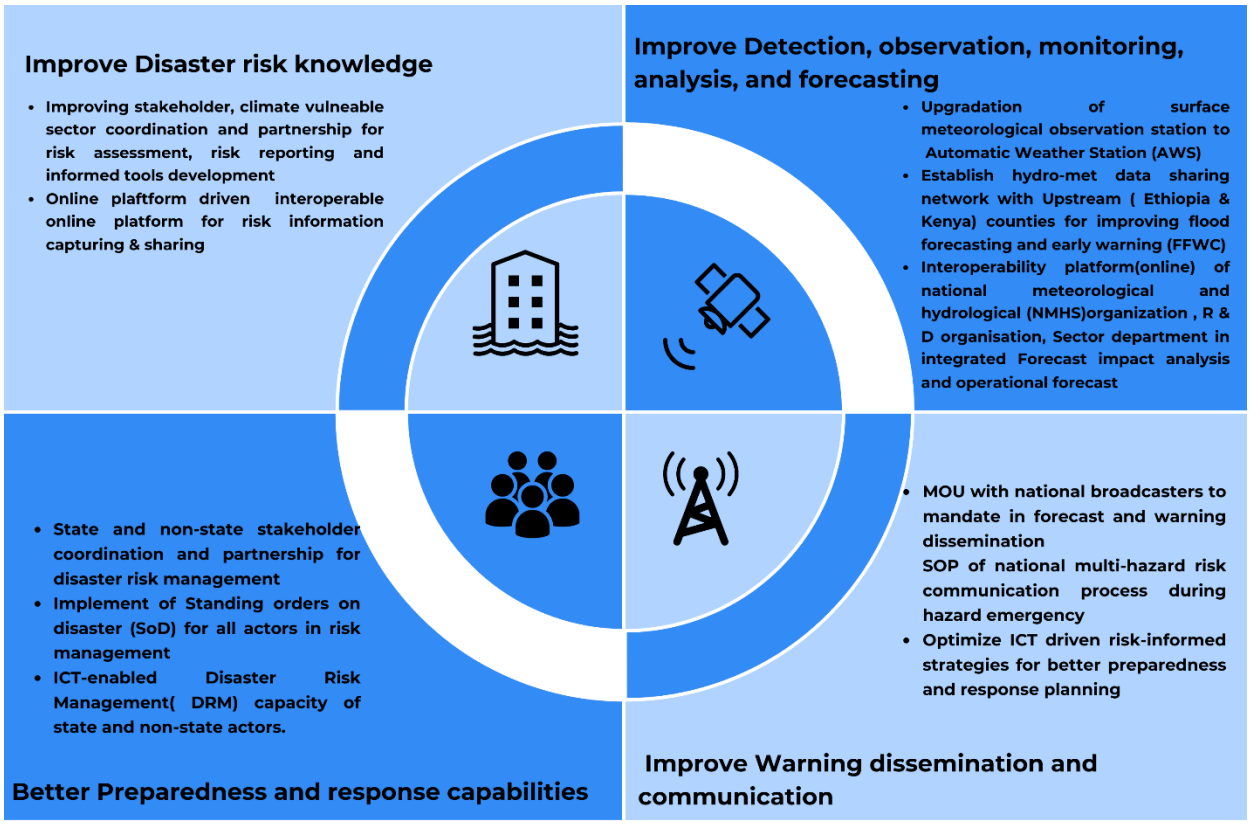


Figure 5: Key indicators of ICT-driven EW4ALL action priorities (Source : Z M Sajjadul Islam)

3.0 Pillar 1 Implementation Strategy (Improving Disaster Risk Knowledge):

Improving Risk knowledge : Communities at the climate frontline need to understand the persistent and impending multi-hazard, socioeconomic, and other risk drivers in the locality. Localized online risk knowledge can boost their risk perception. Online apps-based information management and participatory risk and vulnerability assessment, participatory focus-group discussion, social vulnerability mapping, elements specific risk profiling, risk ranking and prioritization, etc., will help communities continue to monitor and learn about climate change and impending multi-hazard risks which they are likely to be exposed, anticipatory Loss and Damage (L&Ds), and identify potential preparedness, response and mitigating actions.

Risk transfer and pre-arranged financing are critical to addressing capacity gaps and investing in the infrastructure required to implement, operate, and maintain MHEWS. This enables stakeholders to work alongside other mechanisms, allowing forecast-based Anticipatory Action (AA). For example, multi-hazard informed-social protection interventions can be integrated with disaster risk management and climate change adaptation measures to better anticipate and respond to all impending shocks.

3.1 The ongoing SoDMA Structure :

The SoDMA developed organogram still has not positioned NMHEWC as a center of excellence for multi-hazard risk management. The SoDMA organizational diagram shows that NMHEWC is not aligned as a separate entity and functional unit for handling early warning service delivery. Over the NMHEWC institutional human resources, the unit has some technical staff, but for full-scale operability, the center needs to recruit more thematic forecasters, numerical weather prediction (NWP) expert, meteorologist, hydrologist, impact forecasters, GIS & Remote Sensing Mapping Specialists, Database programmer, web programmer, geospatial programmer, ICT specialist, hazard risk specialist, DRR Specialist, Risk communication specialist etc.

However, in terms of multi-hazard early warning operational capability, the center still needs an intensive ICT structure, robust datacenter and high-speed internet connectivity (Tier 3 or 4) technical specialization for hazard risk management, HPC (higher Processing Computing) servers, GSM Modem for spreading mobile messages, big-data and crowd-source data capture, analysis, hazard detection & analysis from crowd source observation data, and enhanced institutional capacity to handle the multi-hazard early warning service deliverability.

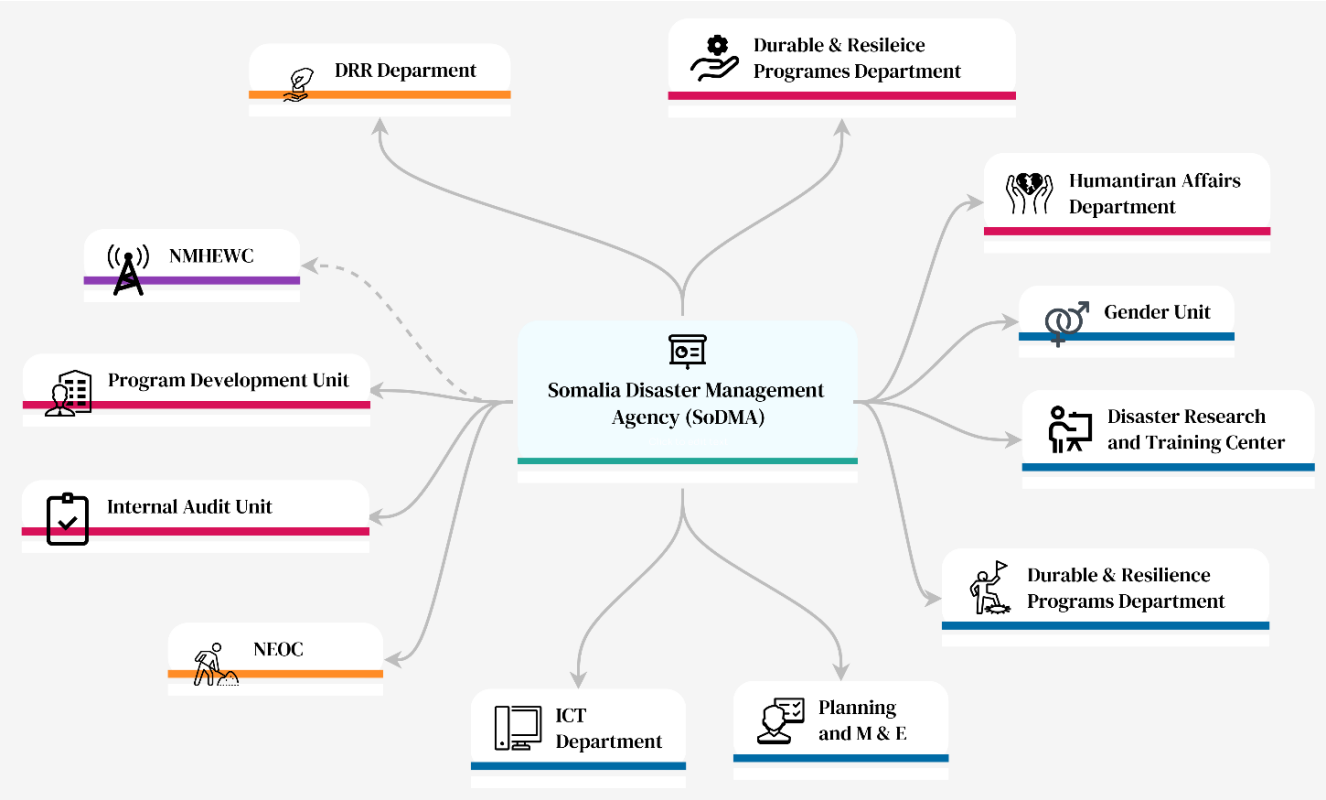


Figure 6 : Ongoing SoDMA Structure

3.2 The NMHEWC ongoing operational structure :

Under the existing structure, the center has a limited operational capacity. The ICT structure and process are very initial and insufficient to run the center with multitasking capability. Currently, the center has the following hardware and service deliverability: The center runs as an isolated and intranet workstation modality for SoDMA internal use only. The department sector cannot digitally access the forecast output, bulletin, and resources because there is no online data center, and online systems are not functional except the SoDMA portal, which has organizational highlights. Therefore, the NMHEWC product and services are limited to SoDMA use only. The following are the types of workstations used.

a) **7 HP PRODESK (Processor i5, RAM 8GB, Windows 10 Pro):** These computers are low-configured and have little processing power for multitasking. The workstation-specific tasks are designated as follows;

1. **HP PRODESK-1** Running the Zoom Earth live weather map
2. **HP PRODESK-2** Maintain an Excel sheet on Rain Gauge data of 40 rain gauge stations (decadal dataset)
3. **HP PRODESK-3** Running GFS weekly forecast
4. **HP PRODESK-4** Running WFP PRISM System on the climate risk monitoring system. The system shows 10-day rainfall forecasts (GFS Global decadal forecasts), rainfall anomaly, SPI, last rain days, temperature, phase classification, earthquake disaster assistance global system, customized global system cascading data used social economic vulnerability data ground truth Layers, rainfall, temperature, NDVI, SPI. Social economic vulnerability etc.
5. **HP PRODESK-5** Running ICPAC East Africa hazard watch and weather forecasts
6. **HP PRODESK-6** Running Drought Monitor portal
7. **HP PRODESK-7** Running myDEWETRA global platform of CIMA Research Foundation

b) **4 HP Desktop Computers (Processor i7 8Gen, RAM 16GB, Windows Home) :** Uses for hazard analysis

c) 1 PC Running DesInveter online database: Update and maintenance DesInventer online database

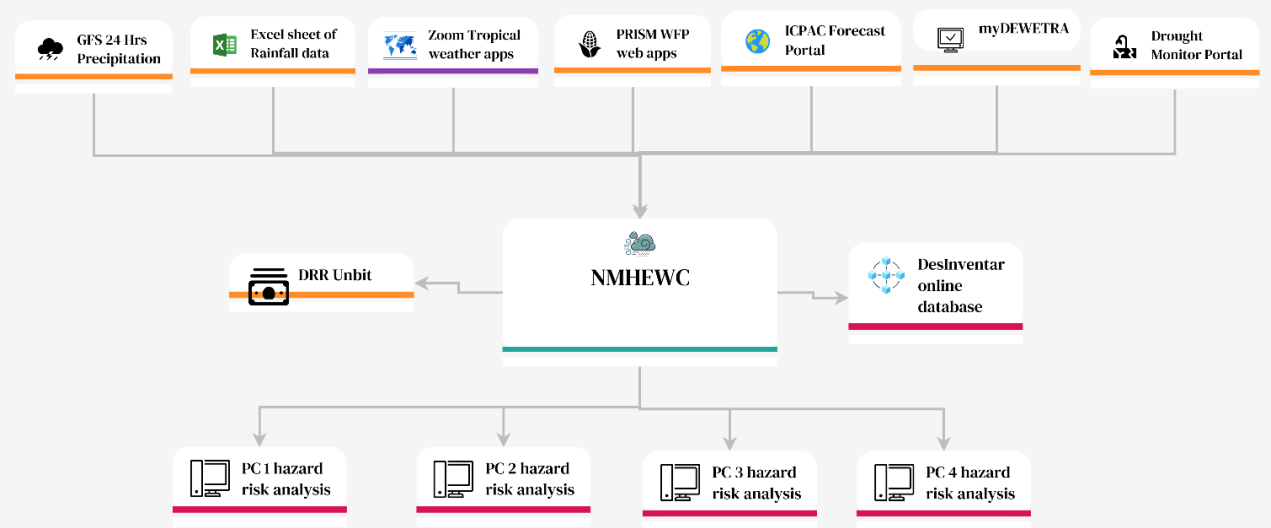


Figure 7 : Ongoing NMHEWC structure

The above diagram shows that NMHEWC currently has a preliminary service delivery capability on multi-hazard risk management.

- Data center capability: The center does not have any designated Server for data processing and analytics
- Data Storage: Does not have any Server and storage devices for data storage
- Software: Having ArcGIS 10.4, QGIS software
- Internet Backbone: The center is connected to a local broadband cable with limited internet bandwidth, which can support one-way internet traffic only. The center does not have an online database server for external data access.
- Data exchange, coordination, and partnership with other stakeholders: No ICT-online database dissemination system, no formal MoU mandates with other sector ministries and non-state actors for information exchange and coordination. No formally designated risk and vulnerability assessment committee, structure, methodology, or tools for Post-disaster damage, loss, and needs assessment (PDNA). The information is collected by engaging local enumerators and mosque imams as primary informants for sending information to the district administration.
- Desinventar database: The center currently updates and maintains L&D information in the Desinventar database. The archives have L&D statistics from 2021.
- National Emergency Operations Center (NEOC): NEOC operates separately and is located outside of the SoMDA Complex. NEOC works on Somalia's ad hoc Emergency response to a well-prepared and structured response to any natural, man-made, conflict, or Climate change-related hazards and shocks. NEOC remains in its role of Preparedness and coordination..

3.3 Proposed Interoperable NMHEWS :

The deployment of proposed NMHEWS is basically an operational shift from a centralized controlled physical operational NMHEWC (limited capacity) to a robust ICT-driven interoperable multi-hazard early warning system(MHEWS) with concurrent multitasking capability, relational database management system, Relational

Database Management System (RDBMS), database interface with online portal and online apps, big data collection system with mobile apps, survey data collection with mobile apps (user-friendly apps), geolocation place mark tracking with ESRI Survey 123, GPS logger, Qfield, etc. The system will be an online platform connecting all government actors, non-state actors (CSOs), stakeholders, enterprises, private sectors, and other relevant parties digitally, as well as last-mile stakeholders and individuals. The system will promote an inclusive and integrated digital organization, overcoming procedural and institutional barriers to the disaster risk management (DRM) system.

The proposed system will function as a command-and-control system, with risk information being provided directly by the primary informants, namely the grassroots-level households and communities. Secondary informants would be stakeholders and service providers at the last mile, and tertiary informants would include the district administration, sector extension departments, city or municipality, and urban-level actors. The system will have real-time oversight capacity, hazard event tracking, and real-time dissemination.

For overcoming the institutional partnership and coordination barriers on climate and multi-hazard risk information exchange and mandating stakeholders in multi-hazard risk information management, the following are the recommendations;

3.3.1 Establish a digital partnership among the stakeholders and prime actors:

- Mandating stakeholders and partners to provide information proactively and to update regularly.
- Facilitate unlimited sessions on specific GIS maps with impact interpretations at various capital stages of high-impact forecasted lead times and lifecycles, including advisors, warnings, and alerting, by plotting hotspots over the map and maintaining records for future use.
- An Online data communication and sharing facility.
- An online dashboard control panel for constant monitoring of stakeholders' activities, who provide what type of information
- Volunteers, smallholder farmers, and herders living in remote areas can capture information offline and transmit it when they access cell phone networks.
- Capture crowd-sourced multi-hazard incident data from social networks for event situational update
- A household with apps can send georeferenced information, such as disaster incidence information, with geolocation.
- Every stakeholder should easily understand the roles and responsibilities of risk data capture, impact interpretation, technical briefings, information updates and uploads, and dissemination.
- An online forum group enables experts/specialists/crowdsourcers to provide valuable input and exchange knowledge, ideas, expertise, insights, and best practices related to natural hazards.
- Process-centric Standard Operating Procedures (SoP) risk information communication, input data access, GIS-based interpretation, and direct uploading to the platform for dissemination is the one-stop solution for IBF
- Provide a timely, familiar, and consistent source of advice to government and emergency responders for civil contingencies and disaster response.

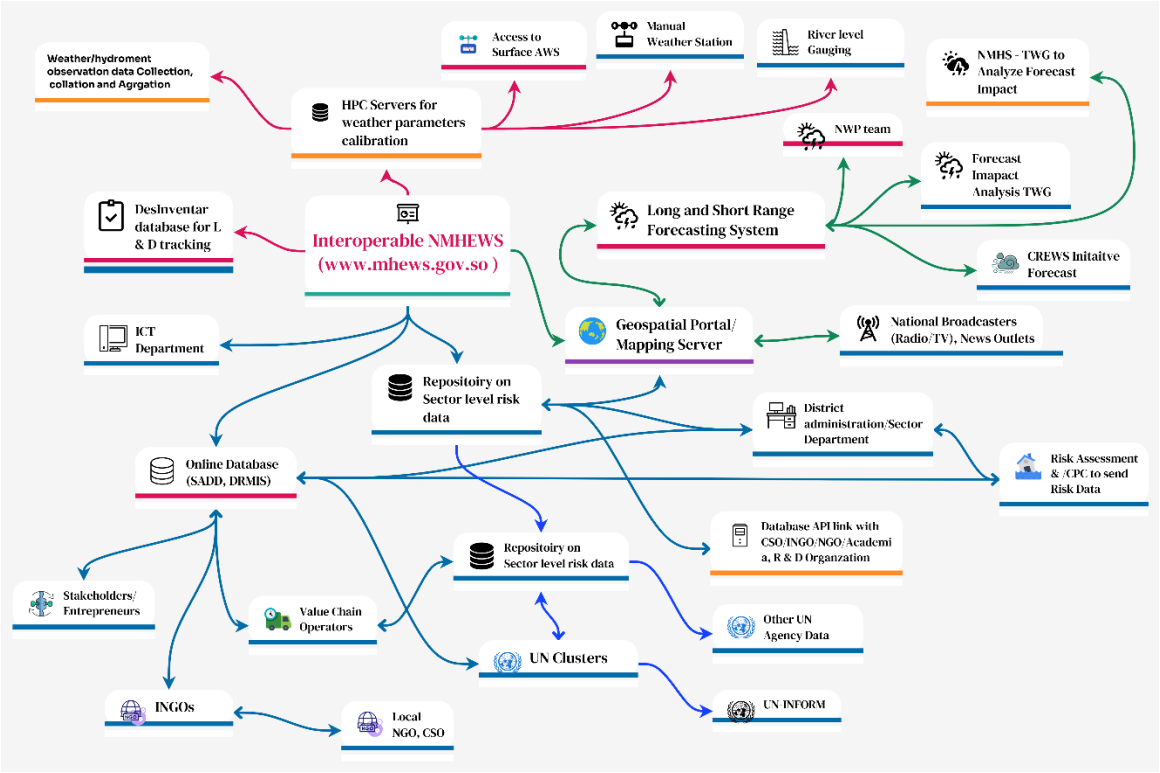


Figure 8: Diagram of proposed digital Partnership and Coordination with the Sector agency, INGOs, UN Agencies(Source : Z M Sajjadul Islam)

3.3.2 Design and implementation of an Interoperability Online geospatial system:

- • Develop an integrated remote and digital partnership with all climate-vulnerable sector ministries, local government /public administration, and the CSOs, the Private sector is to play a pivotal role in the multi-hazard early warning operational value chain
- Design, development, and implementation of the online database, geospatial maps with a geospatial database, and a spatial information system so that every key stakeholder can contribute to an integrated
- The sector department is to be mandated to conduct Climate and weather risk and vulnerability assessment on the sector level elements, develop a risk repository, and share with the platform
- Acquire time-series and real-time ECV weather parameters and climate information services by upgrading surface observation with AWS.
- Multi-hazard risk information collection, hazardous situations, and disaster incidence tracking
- Promoting point forecast of high-value elements (city, municipality, IDPs) , nowcasting, multi-hazard detection, tracking, and hazard impact analysis
- Data and Information coordination and deployment of impact-based forecasting (IBF) online platform. Currently, the UNDRR-CREWS initiative is supporting the SoDMA in this regard.
- Organise regular workshops/consultations/seminars/Meetings to improve service delivery:
- Installation of ground-level hybrid observation mechanism

Scale-up and disseminate the CREWS Initiatives' myDEWETRA forecast output to the online interoperable platform for tailored multi-hazard risk management and impact forecasting to general audiences

3.4 : ICT Structures of Interoperable Online NMHEWS Platform:

Integrated ICT Structures for IBF Platform: An integrated information and communication technology-based IBF platform is required to manage impact forecasting, data coordination, partnership development, expertise opening sharing, and integrated collaboration efforts of partners.

An ICT-enabled open-source GIS platform would suit weather data acquisition from a hybrid system (Figure 18), extreme weather-induced multi-hazard incidence tracking, forecasting, impact analysis, and delivery/dissemination of classified and useful climate information services to end-users and the climate frontline community.

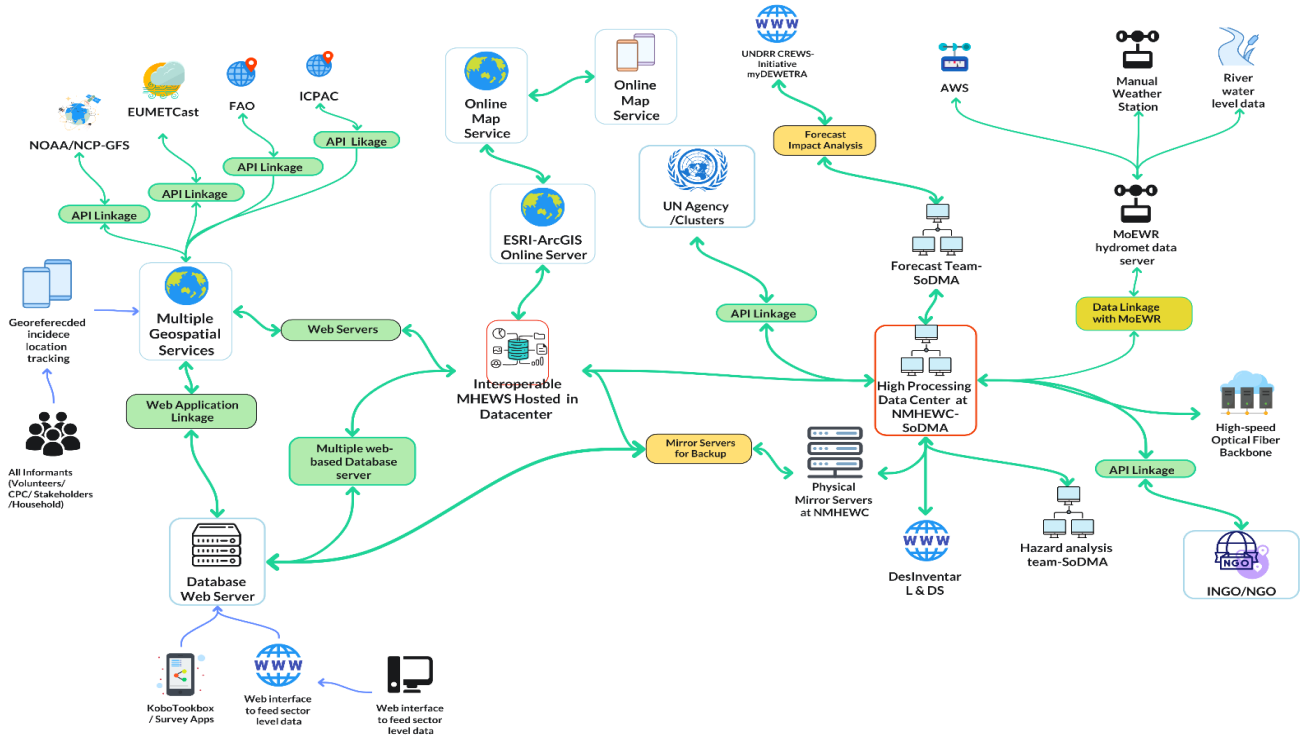


Figure 9: Diagram of ICT system structure and process for an interoperable MHEWS (Source : Z M Sajjadul Islam)

3.5 Proposed capacity-building plan for technical experts :

UNDRR CREWS has already started capacity building for relevant institutions as part of the process. Table Top Exercise(TTX) training is being imparted to SoDMA NMHWEC's technical staff to contribute to operationalizing and assessing multi-hazard Early Warning and Early Action Systems (EW-EAS).

Further capacity building will be imparted to other relevant sector departments. The proposed Training of Trainers (ToT) programme for enhancing stakeholders' capacity in Impact Forecasting capability may be given to the following stakeholders.

Table: Proposed CREWS Initiative Training participants

Sector Ministry /Department	Type of Staff	Type of Training
Ministry of Energy & Water Resources[1]	b) Hydrologists (2) c) Meteorologists (1) d) GIS &RS Expert (3) e) Water Resources	TOT/TTX
Ministry of Agriculture and Irrigation	f) Technical Expert g) IT Expert h) Computer Programmer	TOT/TTX
Ministry of Livestock, Forestry, and Range	i) IT/MIS Expert	TOT/TTX
Ministry of Health and Human Services	j) District health information system (DHIS2) expert k) IT Expert	TOT/TTX
Ministry of Environment and Climate Change	l) IT Expert	TOT/TTX
Ministry of Fisheries and Blue Economy	m) Technical staff of the Department of Information & Technology	TOT/TTX
Ministry of Planning, Investment, and Economic Development	n) Management Information System (MIS) Officer	TOT/TTX
National Communication Authority (NCA)	o) ICT experts	TOT/TTX
FM Radio/Satellite TV Broadcasters/News Agency	p) Weather Forecaster/Meteorologist q) IT Expert	TOT/TTX
FAO	r) GIS Experts (5) s) Remote Sensing Experts (2) t) GNSS Surveyor (engineering survey) (2)	TOT/TTX
WFP	u) GIS Experts v) Remote Sensing Experts	TOT/TTX
UNDP	w) GIS Experts x) IT Expert	TOT/TTX
University, Academia, R&D organization	y) Faculty member of hydrology, meteorology/geography, Water resource engineering/ civil engineering/ agriculture engineering, etc.	TOT/TTX

3.6 Implementation of Open-Source Geospatial Platform :

The functional paradigm of IBF is to establish a digital relationship among the partners, with easy plug & play interfaces that allow partners/ sector departments to access forecast data directly (publicly available) with opensource GIS software(QGIS/ArcGIS), overlaying CSV/Shapefile of weather(temperature, precipitation, wind, and other multi-hazard parameters/variables) impact threshold with color-coded areas with sector & elements(water, livestock's, agriculture, soil, land management, infrastructures, and communication elements are falling under the pink color, red, orange, yellow and green zone with numerical/amount of yield interact over the ground and impacting of types of elements and with spatiotemporal level.

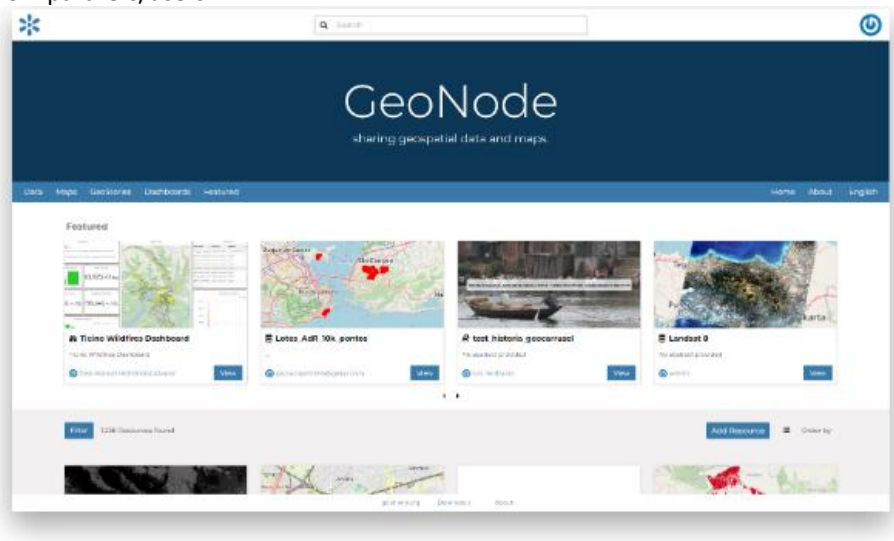
[1] Proposed by MoEWR

All sector departments should be capitates to use the open-source geospatial Platform to avail themselves of the benefits of data sharing, online mapping, flexibility, and cost efficiency with the least-cost solutions (purchasing some APIs, e.g., Google Earth, Google Earth Engine, leaflet, Open Layer, open street map, etc.). Those can be anchored with the integrated IBF platform quite easily and completed hassle-free..

3.6.1 Component of Open-Source Geospatial Platform:

a) Installation of Geonode Server

GeoNode is a web-based application and platform for GIS maps and web-based mapping services. It allows for the integrated creation of GIS feature shapefiles, data, metadata, and map visualization. Each dataset in the system can be shared publicly or restricted to allow access to only specific users(partners /Sector Department). Features like user profiles, providing technical narratives, file uploading, commenting, rating systems, etc., allow for quick input from partners/users.



3.6.2 Installation of Geoserver :

GeoServer is an open-source geospatial tool. Implementing the system will significantly lower the financial barrier to entry when compared to proprietary GIS products. In addition, GeoServer is not only available free of charge but also open source. Bug fixes and feature improvements in open-source software occur transparently, often at an accelerated pace compared to closed software solutions. GeoServer is a Java-based server that allows users to view and edit geospatial data. Integrate With Mapping APIs. Using open standards set forth by the Open Geospatial Consortium (OGC), GeoServer allows for great flexibility in map creation and data sharing.

GeoServer allows us to display spatial information to the world. Implementing the Web Map Service (WMS) standard, GeoServer can create maps in a variety of output formats. The server supports most of the available tools, e.g., OpenLayers, Leaflet, Google Maps, Google Earth, Microsoft Bing Maps, and MapBox, and can connect with ESRI ArcGIS and QGIS software.

3.6.3 Anchoring Google mapping tools :

- Google Earth: For accessing Google map resources with very few subscriptions paying to Google, the IBF platform will be able to utilize all Google GIS features accessed by Geoserver, geonede server, user end desktop QGIS and ArcGIS software(free) for analyzing the impact of all elements, calculate/estimate impact number and types of

elements are likely to impact, select particular elements are damaged, hotspot location of multi-hazards and publishing all impacts through MHEWS-IBF platform.

- Google Earth Engine: Most powerful and up-to-date satellite images are included to analyze all the necessary features of crop- agriculture, livestock rangeland, vegetation coverage, waterbody, , land cover, land use, agroecology, soil degradation, desertification, etc., can be created by using the readily available code and necessary customization. By using this tool, the sector department will be able to define pasture biomass conditions, delineate pastureland areas with classification, and select cultivable forage cropping areas, water resources, etc, for weather and Climate-related risk and vulnerability analysis.
- Google Common Alerting Protocol(CAP) – Public alert (Freeware) : Using the location information in a CAP alert allows Google Public Alerts to focus the display of an alert to users in a particular area. In addition to the user's search term, the display is governed within Google Public Alerts by a relative priority based on CAP alert values such as Severity, Urgency, and Certainty, as well as date/time values. Users interested in all active alerts in an area can use the homepage at http://www.google.org/publicalerts.

3.6.4 Installation and Configuration of Surveying Apps.

a) **Open Layer:** Open Layer is a client mapping web GIS application. Local volunteers/surveyors can use open layer apps to capture location and on-the-fly mapping, incorporating pictures and geolocation placemarks for GeoServer for publishing.
b) **GPS data logger and GPS essential apps** are alternatives to Open Layer and are the most useful surveying tools. It can capture any placemark(point), line (road network), and polygon features (Ger Location, grazing areas, Pasture location, river cross-section, can track vulnerable road, road network) and save as kmz, kml format. In the given case, at the local level, the team (sector department-led technical group) asked any volunteers to send the placemark of IDPs/settlements location/herder grazing areas, multi-hazard affected areas e.g. flood/flash flood incidence place with geolocation captured photograph to send via WhatsApp/google drive/Facebook etc. for impact analyses, anticipatory action planning, contingency planning and, response financing.

3.6.5 Deploying File-Sharing Tools :

Several tools are available for developing CAP on marking the location of multi-hazards with thresholds of impact (both in point and polygon shape files) that can be plotted with the map, with some technical briefing of color-coded thresholds over the map. The CAP-enabled emergency alerting system e.g. Google Public Alerts freeware, paid service like ESRI ArcGIS platform, etc.

3.6.6 Implementing Web converting common alerting protocol (CAP)apps :

Several tools are available for developing CAP on marking the location of multi-hazards with thresholds of impact (both in point and polygon shape files) that can be plotted with the map, with some technical briefing of color-coded thresholds over the map. The CAP-enabled emergency alerting system e.g. Google Public Alerts freeware, paid service like ESRI ArcGIS platform, etc.

3.7 Rationale of ICT-integrated Interoperable Online NMHEWS platform to support impact-based forecast (IBF):

ICT System: The basic principle of the MHEWS-Impact-based forecast (IBF) online platform is to shift from the regular pattern of weather forecasters (what weather would be) to translating the weather phenomena to what weather will do and how it will interact with the ground. The complete functional system will be able to catch weather inputs and process with an ICT-engineered system capacity to interpret weather-induced advisories, anticipatory impacts, the severity of impending risks and vulnerabilities, and anticipatory loss and damage scenarios with higher spatial and temporal resolution for the vulnerable sectors, elements, and community.

Installation of ground-level hybrid observation mechanism :

Considering the multiple functionalities of the IBF system, from capturing the wide range of impact information from the ground, processing big data, inclusive participation of a wide range of stakeholders, and keeping the target audience updated about ongoing weather hazardous phenomena informed, IBF need to well interface with ground level hybrid observations(figure 18) by engaging the community, sectoral technical experts working at the last-mile, volunteers, SoDMA designated technical and volunteering teams at the last-mile

MHEWS-Impact-based forecast (IBF) online platform can leverage to deploy and activate crowd-sourced observation mechanisms for getting comprehensive and higher resolution of ground-level weather parameters, characteristic of extreme weather parameters on the prevailing conditions for better impact analysis and bringing detailed risk scenarios of the grounds, e.g., which elements are impacting at what level, etc.

Weather-induced risk and vulnerability tracking, interpretation, and dissemination :

A hybrid (figure 18) surface observation mechanism (AWS, manual met stations, crowdsource observations) essentially has a comprehensive observation for understanding the trend of weather patterns, extreme characteristics, frequency, and intensity. Based on weekly, monthly, sub-seasonal, and seasonal anomalies, and the incidence of multi-hazard events, develop a complete GIS map-based analysis disseminated through the online geospatial portal to keep the planning desk informed. This is a critical, informed tool for planning tasks at every level, enabling every audience to understand the weather patterns, extreme characteristics, frequency, and intensity of weather-related hazards comprehensively. This understanding is essential for planning SOPs and business community plans for the next season or year accordingly.

Multi-hazard and disaster incidence and situation tracking and archive:

IBF needs to have a track record of how hazardous weather phenomena turn into multi-hazards and disasters, and the incidence of loss and damage (L&D) information required.

Leveraging record-keeping and disseminating a wide range of forecasting products, outlooks, and advisories on weather, and simultaneously to the similar interpretation of observed weather.

Effective inputs for developing annual climatology and climate change paradigms include systematic surface observations, global and regional climate change model outputs, and the creation of comprehensive reports.

Scope of verification and retrofitting, and correctness of the Dynamical downscaling model:

Ground-level compressive observed weather phenomena, elements-level impacts, sectoral-level impacts, and loss and damage scenarios will be able to provide attribute information for model fitness, forecast verification, and bias correctness at the end of the day.

Leverage to develop the statistical model with the spatial and temporal resolution, high-resolution Dynamic downscale model on rapidly developing weather systems, e.g., Sand and dust storm, heatwave, dry spell, convective weather events (heavy rain, thunderstorm, hailstorm, lightning), severe thunderstorms, , high wind-induced impacts, heatwave, sand/dust storm) that have caused human lives and lost livestock.

Effective risk communication and sectoral coordination :

Leveraged to develop a complete culture of compliance with mandatory stakeholders' interactivity to provide risk and vulnerability data inputs, risk interpretation of risk on every forecast, risk data coordination, and exchange of all relevant stakeholders.

3.8 Improving Risk Knowledge of stakeholders

Given the multiple factors of the paradox of fragmented governance, a diverse multi-hazard risk paradigm, climate impact, and conflicts, internal displacement triggers multiple-level risks and vulnerabilities to the food security and livelihoods of the population living at the last mile. The livelihoods of the last-mile Somali climate frontline population are primarily agropastoral and are heavily impacted by extreme weather events. However, frontline communities have limited access to climate early warnings. The FCV context governance paradigm attributes ICT-driven disaster risk governance as a tangible solution to reach the climate frontline community and make them key informants for providing multi-hazard exposure, risk, and vulnerability information. This approach keeps them informed about impending multi-hazards, enabling them to respond well to crisis management. Figure 1 reveals that the state actor service delivery is inadequately decentralized. The field mission identified that the silo approach to disaster risk management services is being carried out, with almost all actors being engaged. Ironically, the CSOs are the prime actors involved in last-mile disaster risk management and local development. The following options are harmonized for bridging the last-mile multi-hazard risk knowledge gaps.

- MHEWS connected ICT-based interactive mobile apps(GPS survey apps, Kobo-toolbox, GIS map Survey apps) for connectivity with the last-mile climate-vulnerable community
- Conduct mobile apps based on climate exposure, risk and vulnerability assessment
- Conduct mobile apps for the VAC/actors, community based on RPDNA
- Develop mobile apps for the Crop-agriculture sector so that farmers as primary informants can send elements specific (standing crops, water availability & stress, rainfall variability data, crop loss data, crop yields, pest manifestation, market price, L&DS, etc) specific georeferenced risk and vulnerability information and receive classified risk information for risk management and resilience building.
- Improve national broadcasting to enhance disaster risk knowledge, emergency preparedness, response, recovery, emergency evacuation, etc

3.9 Improving Sector Value Chain Operators' Risk Knowledge:

Rationale for transforming into ICT-driven multi-hazard risk governance.

- Government state actors lack (MoPIED) ICT-driven risk knowledge management capacity, developing inter-sector coordination, and a partnership mechanism for climate risk information sharing. They also lack a management information system for inventorying risk information at the institutional level.
- Poor information management staffing patterns, inadequate ICT equipment, and an MIS system for inventorying the elements' hazard impacts.
- Post-disaster L&D assessments are being conducted through part-time enumerators, inadequate tools, methodology, and processes, and elements of specific georeferenced information are not collected to support next-level impact forecasts of impending hazardous weather.
- Establish digital formal coordination and partnerships among state actors, non-state actors, and the private sector to collaborate and coordinate last-mile risk information management and develop tailored informed planning tools for the DRR/CCA scheme design and implementation.
- MoUs and mandates for State control of private broadcasters and telephone companies lack an accountability framework. The regulatory authority (NCA) is imposing mandates on last-mile actors to hold them accountable for time-series wealth forecasts, special weather bulletins, weather warning message broadcasting, and dissemination, among other responsibilities.
- Risk-informed tools, evidence-based tools to improve state actors' policy, mandates, institutional accountability, and support for fiscal resources to mobilize for the last-line risk-resilient development (DRR, CCA, NbS)
- Expect some humanitarian assistance (food) the government lacks budgetary incentives for implementing climate-adaptive livelihood interventions for the frontline community

3.10 Following are the recommendations for Disaster Risk Knowledge Management Governance

The proposed Online MHEWS platform has a multifaceted and multitasking capacity. It allows the stakeholders to work remotely and contribute data, information, and updates to the platform regularly. The system will facilitate a multi-hazard risk repository and a risk knowledge bank that are precursors to instrumentalizing the EW4ALL systemic functionality, in which Somalia needs to overcome institutional task management barriers.

a) Improving data-driven decision-making: Climate-vulnerable key sector ministries, such as MoHADM (SoDMA), MoEWR, MoAI, MoLFR, MoH, and MoFBE, establish a national climate risk and vulnerability assessment committee (VAC)/Task Force team, represented by sectoral technical experts, stakeholders, CPC/DMC, and the frontline community. Somalia requires consensus and agreement among state actors, humanitarian actors, stakeholders, UN agencies, INGOs, local NGOs, and CSOs on climate and multi-hazard risk assessment, as well as creating a sense of ownership among those stakeholders in the collection of locally sourced multi-hazard data and its dissemination through mobile apps. The ICT online database system, along with its front-end apps and processes, would support a national statistical data clearinghouse for conducting census surveys and collecting disaggregated sex, age, and disability (SADD) data from community and household levels.

b) The roadmap intended to establish and mandate accountability of institutional/stakeholders for the collection of climate risk and vulnerability disaggregated datasets on agriculture, water, livestock, fisheries, agroforestry, WASH, health, physical infrastructures & communication, municipalities & urban centers, commercial hubs, IDP, human settlements, and housing sectors need to provide supports for developing climate and multi-hazard risk maps, risk and vulnerability profiling, and repository development. The UN Cluster system proposes that essential inputs can support government disaster risk management and development frameworks, state actor-driven humanitarian action, and a national risk management coordination framework.

c)

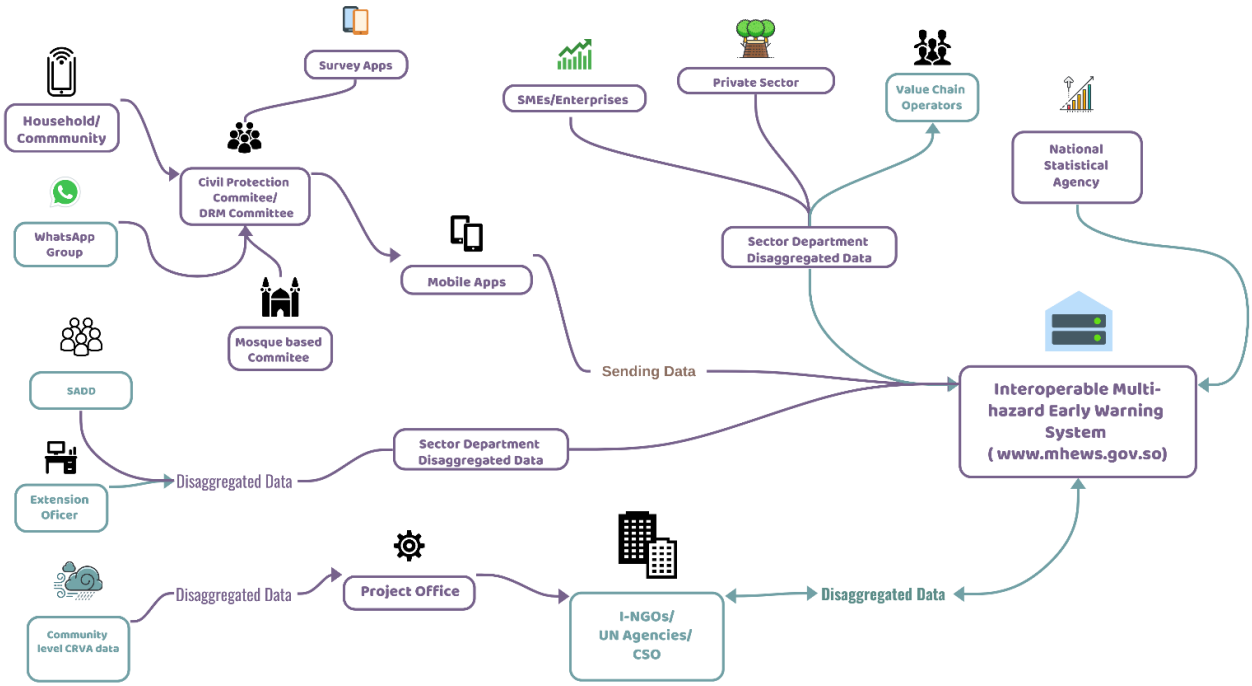


Figure 10: *Disaggregated data collection framework for collection of Age, sex, disability disaggregated data(SADD) , sector-level elements specific attribute data* (Source: Z M Sajjadul Islam)

- Establish digital partnerships and coordination: The system will enable every stakeholder to hold themselves accountable for conducting multi-hazard risk assessments and managing risk knowledge. It will serve as a de facto platform for connecting state and non-state actors, as well as the private sector, for climate risk and vulnerability assessments, including RDPNA and PDNA, and risk knowledge management at the local level. Establish adequate consensus and agreement among state actors, humanitarian actors, stakeholders, UN

agencies, INGO consortia, local NGO consortia, and CSO engagement on risk assessment, as well as the collection of locally sourced climate data.

- Developing GIS-based risk atlas & Database: All climate-vulnerable sector departments need to coordinate all basic inputs to develop a geospatial database, a GIS-based map, a District-level GIS-based map, and a risk atlas for analyzing GIS-based multi-hazard risk and vulnerability, developing informed tools for disaster preparedness and humanitarian response planning, and preparing the Hazard database.
- MIS & GIS set up at local level sector departments: Install MIS & GIS systems at the district administration and sector department levels to analyze GIS-based multi-hazard risk and vulnerability, inadequately informed tools for disaster preparedness, and humanitarian response planning.
- Establishment of Vulnerability Assessment Committee (VAC): This is an important organ for Risk assessment. Most urgently, the Climate Risk and Vulnerability Assessment Committee (RVAC) should be established with representatives of all stakeholders (mentioned in the above disaggregated data collection framework). The online database and apps will support the management of the RVAC committee, and all the stakeholders, representative groups, smallholder farmers, fishermen, herders, IDPs, other livelihood groups, and individuals would be the primary informants to send the elements specific information through customized survey apps(Kobo-Toolbox). It can be conducted remotely following the functional community-level climate /multi-hazard risk and vulnerability assessment framework.

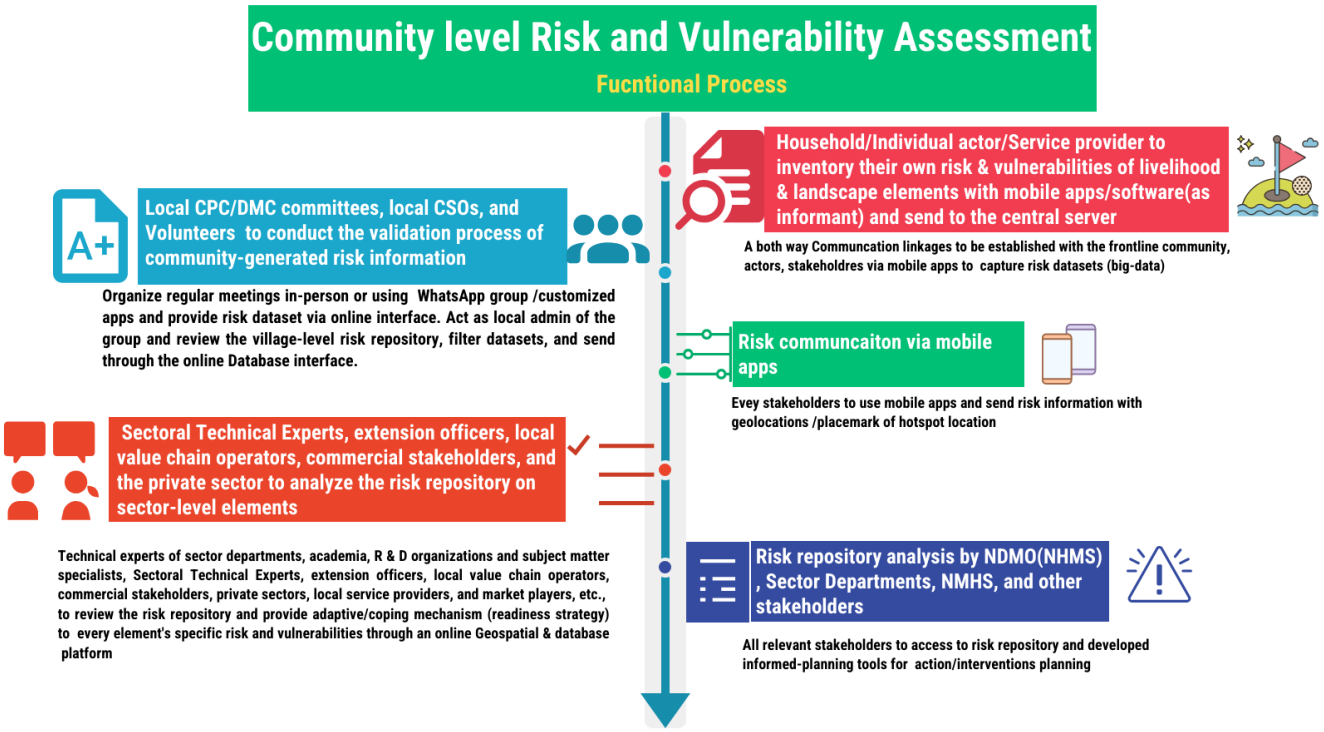


Figure 11: Figure 11: Remotely conducting – Community Risk Assessment Framework (for Somalia FCV context) – which is to be undertaken by the frontline community/local stakeholders (Source : Z M Sajjadul Islam)

Table: Tools to facilitate the RVAC team to conduct the assessment

Element-specific dataset	Mapping Supports	Technical Training Support to RVAC	Local CPC at the City, Municipality, and community level	Areas of Assessment
Sector-specific elements	• UN Agencies : • INGOs :	• Technical training on Online OpenStreetMap(	CPC/DMC at the City level, CPC/DMC at the Municipality level,	z) MIRA, • RPDNA • PDNA

Element-specific dataset	Mapping Supports	Technical Training Support to RVAC	Local CPC at the City, Municipality, and community level	Areas of Assessment
	• Local Governments (City Corporation/ Municipality/Clan System) • Government Sector Departments at the sub-national level • University Students • Commercial entrepreneurs • Telecom Companies Institutes • Colleges • Local IT Companies • IT expert working with CSOs • Other relevant agency	www.openstreetmap.org) community mapping • A pool of Somali technical Experts residing in the USA, Canada, Europe, and other countries to assist in data analysis • GIS Specialist/experts of sector departments, University Faculty, College Faculty, and individual experts • Local IT Companies • IT/GIS Experts of UN Agencies • IT/GIS Experts of INGOs • IT/GIS Experts of CSO	CPC/DMC at the Community level to facilitate the frontline community for inventorying all elements relating to their livelihood security, food security, and built environment	• DINA, Community • CRVA, • Sector level CRCV

3.11 Review Stakeholder Partnership & Coordination Mechanism

he full-scale implementation of EW4ALL Pillar Actions requires indispensable coordination and service delivery capacities to ensure the connectedness of sector ministries and sector-engaged stakeholders with the system, and to maintain its operational effectiveness for demand-driven service deliveries. The engineering aspect of the MHEWS platform involves designing an ICT-enabled, robust architecture for optimal operability, interfacing multiple sources of information, and ensuring recurrent processability. The IBF product output system optimally functions through an interactive partnership of stakeholders across the country. The sector-specific impact level analysis of hazardous weather parameters involved the involvement of designated specialized national hydrometeorological organizations (NMHS), sectoral departments, R&D organizations and specialists, academia, mandated partners, commercial stakeholders, herders, and vulnerable communities to contribute inputs for making the IBF readily available and on time.

Figure 12: Stakeholder map (Proposed) (Source : Z M Sajjadul Islam)

Mandating the stakeholders above through a set of standard operating procedures (SoP) viably to a common consensus of a proactive, time-critical partnership and collaboration amongst the wide range of technical partners and agencies engaged in meteorology, climatology, hydrology, disaster risk management, local government sectors, pre-disaster risk assessment group, post-disaster damage, loss, and needs assessment (PDNA) group, disaster first-responders, vulnerable community, herders group, etc., for the contribution. The IBF system thus ensures a functional partnership by encouraging stakeholders to access the platform with a sense of ownership, thereby imperatively demanding a weather information service delivery process tailored to the MHEWS required data/information needs, informed tool development, and deliverables for climate and disaster emergency management.

The IBF process depends on the multifaceted, interactive, functional, regular, and proactive coordination mechanism amongst all stakeholders. The data-sharing protocol for the MHEWS-led impact forecasting process. The MHEWS needs to classify the stakeholder categories, the responsibilities over risk information coordination, risks, and impending impact interpretation over the imminent onset of extreme weather events, and manage the risk and vulnerabilities of induced disaster

3.12 Partnership for Data Coordination and Exchange Mechanism

The initial MHEWS-IBF workflow analyzes the impacts of impending extreme weather that has just been forecasted. Still, the whole IFB mechanism demands multiple layers of information, e.g., requisites of background risk & vulnerability datasets are essential. The IBF process comes across over the steps and primarily to do a background check of the persistent risk and vulnerabilities being inherited from the landscape, local weather & climate system, and inbuilt environmental context, and secondly to estimate the risk, vulnerability, exposure, and sensitivity over the standing elements(annexure 1) at the event of impending extreme /hazardous weather are likely to be interacting with the ground, thirdly, stakeholders need to know how and what level of frequencies of the extreme weather events are turning multi-hazards. Finally, the whole MHEWS mechanism needs to track hazardous events until they dissipate and take stock of the trail of L&D being yielded by the localized disaster.

Considering the above functional steps, the IBF workflow is segmented into several workstreams, and at any given stage, stakeholder engagement is critical. The integrated impact-based forecast (IBF) process requires an input system that captures, stores, and archives root-level sectoral and element risk and vulnerability data for the purpose-driven IBF process. The partners and stakeholders must provide their climate risk and vulnerability (CRVA) data and information to review persistent risks and vulnerabilities and update the information in the IBF system regularly.

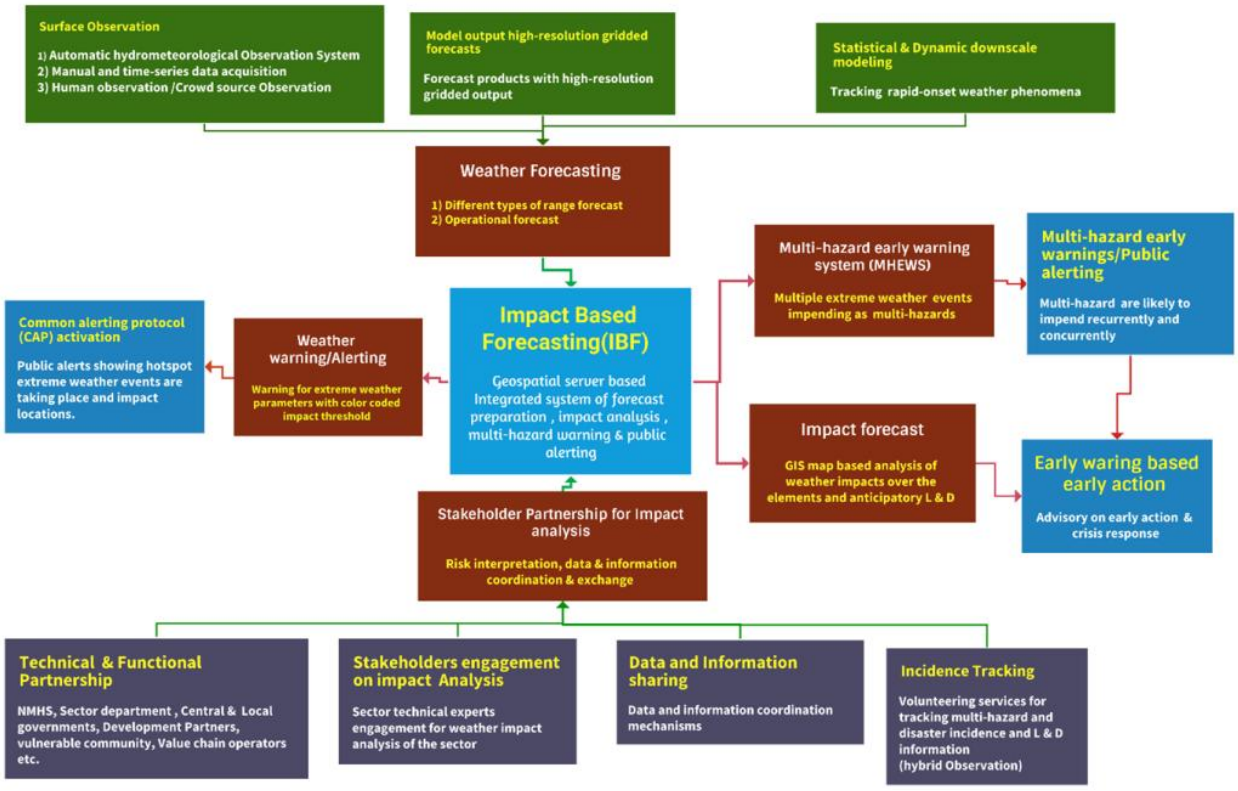


Figure IBF Framework (Source : Z M Sajjadul Islam)

Considering the above functional steps, the IBF workflow is segmented into several workstreams, and at any given stage, stakeholder engagement is critical. The integrated impact-based forecast (IBF) process requires an input system that captures, stores, and archives root-level sectoral and element risk and vulnerability data for the purpose-driven IBF process. The partners and stakeholders must provide their climate risk and vulnerability (CRVA) data and information to review persistent risks and vulnerabilities and update the information in the IBF system regularly.

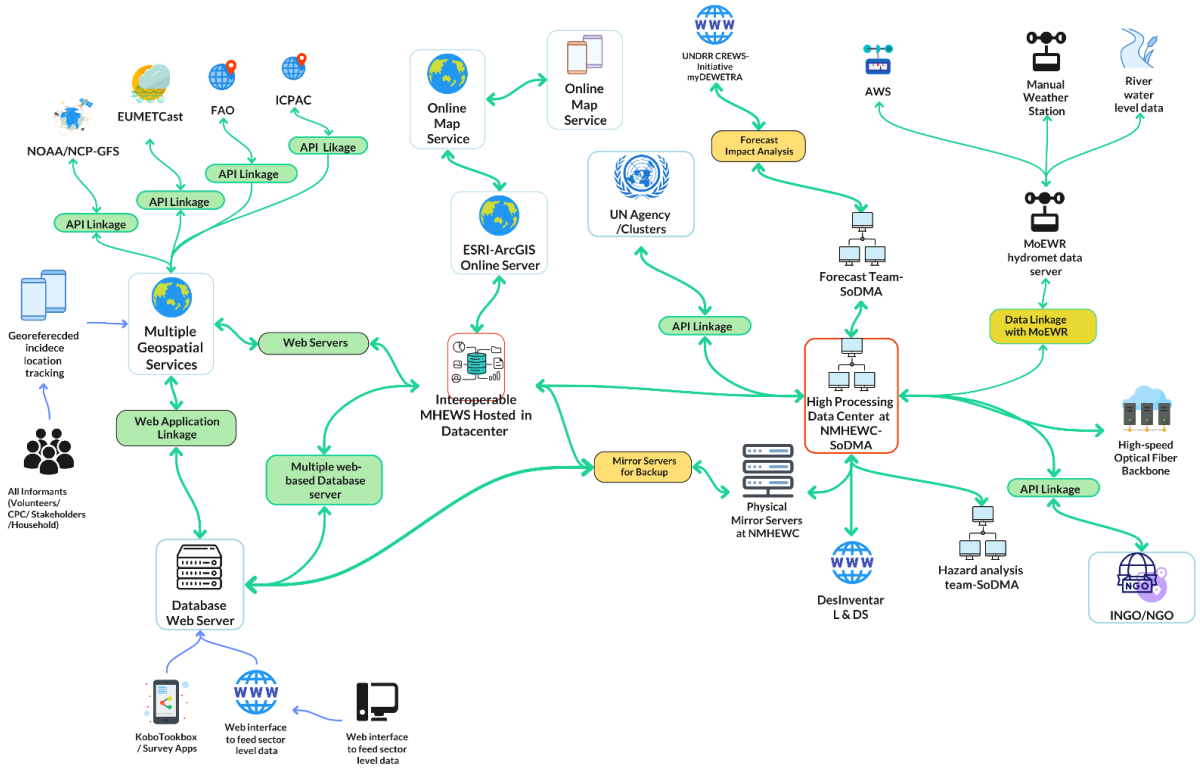
For analyzing high-impact events, the IBF impact analysts (meteorologists) team always needs to conduct background checks (from the impact database) for similar weather events that are anticipated or impending, as these are considered high-impact weather conditions. The partnership process to be mandated by the essential background (risk repository development and understanding) works need to be done by the partners for strengthening the IBF process, as it is such a hybrid process that forecasters, sector/elements risk & vulnerability analysts always need to be well concerted with climate change impacts, climate variables/parameters, weather, impending multi-hazards, spatiotemporal impact interpretation, weather risk and vulnerability assessment and risk prioritizations.

All participating stakeholders, partners, authorities, and vulnerable communities are to be mandated to contribute elements specific to baseline risk and vulnerability information for the effectiveness and efficiency of the system-IBF partnership mechanism. The partnership mechanism facilitates two-way communication, e.g., providing the baseline risk and vulnerability geolocation information of every element and harmonizing risk-informed tools, thereby benefiting the sectoral planning process, which continues even after the development and implementation of impact-based forecasting services. Members of the partnership can monitor the effectiveness of forecasts and warnings and provide feedback for improvement.

Partners have important roles in risk communication and analyzing the impact on forecasts and warnings. Essential partners are to be mandated with responsibilities for early actions to prepare for and respond to hazardous weather and climate events. These actions include advising vulnerable communities on what to do in extreme weather or climate events, combining partners' anticipatory advice with impact-based advice

3.13 Upgradation and Activation of Interoperable Situation Room and NMHEWS at NMHEWC of SoDMA:

Diagram of Interoperable Situation Room at NMHEWC of SoDMA and online MHEWS design being proposed in such a way that it would have digital connectivity with all internal and external data sources.



(Source : Z M Sajjadul Islam)

- Establish a robustly configured online interoperable **NMHEWS** system to access weather parameters of Somalian terrestrial weather, hydromet observation network, and the acquisition of the time-series weather ECV parameters, data calibration, colligation, parameter aggregation, etc.
- Establish API data Linkages with the regional weather/climate information data hubs (ICPAC), essentially to inform the weather & climate warning system
- Establish API data Linkages to access real-time ECV & weather parameters from the transboundary (Ethiopia & Kenya) observation networks (heavy rainfall data, flood level data, catchment area hydrological datasets, river level datasets, wind speed, drought, storms etc.)
- Establish API data Linkages to access WMO's regional DCPCs, RSMC, WMO Information System (WIS) network, WMO GTS network, EUMETCast data hubs, and ECMWF data hubs.
- Establish linkage with the Indian Ocean Tsunami Alert Center in Jakarta, Indonesia.
- Accessing and anchoring UN Agency produce risk information repositories - FAO, WFP, Anchoring FAO-SWALIM, IOM-DTM (Displacement Tracking matrix), UNHCR Operational data portal, WFP(Food Security), WFP Logistic network/telecommunication system, WASH Cluster database, CREWS Initiative, RIMES, CIMA Research Foundation myDEWETRA, ICPAC forecast/outlook, Education Cluster Database, UNICEF-MICS, World Bank (GFDRR, Databank), UNOCHA -INFROM, Food Security and Analysis Unit (FSNAU) & IDEA of FAO, IFRC-Anticipatory Hub, USAID-FEWSNET, Greater Horn of Africa Climate Outlook Forum (GHACOF)etc., for feeding information in integrated multi-hazard early warning system (MHEWS & impact forecasting support.
- Accessing real-time satellite-based atmospheric observation systems, installations of PUMA (Preparation for the Use of Meteo-sat in Africa) 2025 satellite links (EUMETCast, ECMWF, European Met services, NOAA, Indian

Ocean network, The Regional Basic Climatological Network (RBCN), Global Terrestrial Network – Rivers (GTN-R), etc., for the acquisition of Basic Hydro-Meteorological Data (BMD).

- The EW4ALL interoperable Situation room is intended to support the four pillars actions by supplying climate risk information, tailored, informed tools, complementing the EW4ALL action and process ;

3.14 NMHEWS responsibilities for improving risk knowledge :

3.14.1 Understanding Disaster Risk of the Locality

Underlined all the crucial stakeholders engaged in the last-mile disaster risk management that they need to have a clear understanding of the landscape vulnerability of their locality, persistent residual risk & vulnerabilities in the given case of multi-hazards already impacting the landscape with intensities, the elements were exposed to, and came under L&D, all those factors need to be well understood by the last-time stakeholdres/actors. Following local stakeholders, the sector extension department, the local CPC, and stakeholders must understand the climate risk and vulnerabilities.

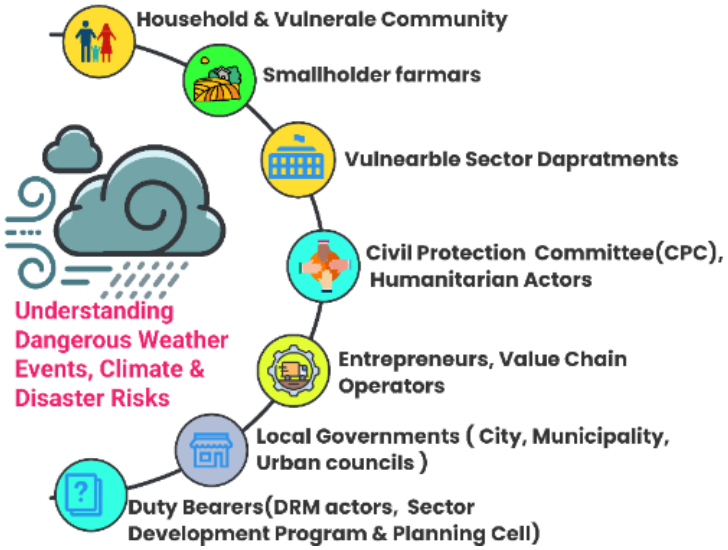


Figure 13 : Local stakeholders

3.14.2 Frontline community needs to understand Disaster Risk in their Locality :

The frontline vulnerable community is constantly addressing the persistent and impending climate and multi-hazard risk phenomena to sustain their daily livelihood and safeguard their livelihood assets. However, the global climate perturbation and local-level effects are increasingly threatening food and livelihood security in the long run. Therefore, the community needs to understand and remain aware of the risk factors affecting the locality and the factors that contribute to the displacement of vulnerable communities. Given the Somali landscape's vulnerability to arid and desert climates, which return with persistent drought and an arid environment in the Horn of Africa. The increased intensity and frequency of El Niño and La Niña contribute to hazardous weather events, such as heavy rainfall-induced flooding and severe droughts, in the affected areas.

Due to the vast, elongated coastline of the Horn of Africa, the Coastal cities, townships, and dispersed settlements of the countries are highly vulnerable to another inter-tropical convergence zone tropical storm in the western Indian Ocean, accompanied by storm surges, which can potentially cause huge Losses and Damages. Considering the diverse and rapidly changing climate conditions, the most effective solution to keep the frontline informed is the deployment of an ICT-enabled multi-hazard early warning system, an end-to-end early warning mechanism, multi-hazard risk assessment capacity, and micro-level community-based forecasts. A standard alerting system will support the community in undertaking anticipatory action, and appropriate adaptive preventive measures are required for saving lives and properties. .

3.14.3 Enhancing the risk knowledge of Smallholder crop farmers:

In Somalia, the country's economy is primarily based on livestock, crop agriculture, and fisheries. Those elements boosted the rural economy. Smallholder farmers often struggle to access tailored weather and climate information, as well as precision-level multi-hazard early warnings, to prepare for and respond to impending hazardous weather. In the long run, they must protect their livelihood assets (crop-agriculture, livestock, fisheries, agroforests, fruit gardening, etc.), which requires a precision level and specific early warning and services with anticipatory actions. Smallholder and commercial farmers' value chain operators must understand localized weather anomalies. Still, the precision level of weather forecasts and alerts enables them to take anticipatory actions and make adaptations.

The anticipatory action planners, value chain operators, commercial entrepreneurs, market promoters, sector extension officers, frontline smallholder farmers, and livestock herders need to have elements of specific ground-level time-series information provided by the farmers.

Elements	What would be the case in the event of hazardous impending weather?	What would be climatic shocks, residual impacts on the elements				Proposed Anticipatory Action	ICT tools for climate risk management
		Exposure	Sensitivity	Vulnerability	Risk		
Crop Maize, bananas, sugarcane, rice, cotton, vegetables, grapefruit, mangoes, and papayas,	Dry spells are forecasted	% Volume of crop land will be exposed?	•Is the variety of crops sensitive to dry spells? •Will the level of crop be able to sustain a dry spell?	•After 3 weeks, supplemental irrigation to be provided for crop survival •Which Crop variety can sustain 3 weeks with dry spells because of drought-tolerant varieties? •Crop withstanding capacity against hazardous weather (rank)	% of yield loss	Based on elements-specific data from the ground, the AA team would be able to provide precision-level advisories on any impending weather conditions and actions are required to save the elements	Making farmers and livestock herders the primary informants and using ICT apps-based tools with two-way communication
Livestock (cattle)	Heatwave/Dry spells are forecasted	Number of cattle will be exposed to dry spells/heatwaves, and health hazards are reported?	•Based on the health condition % the percentage of cattle will be sick in the level of Tampere	•Supplementary feeds and weather-protective livestock-yards/sheds are available to withstand the weather conditions	% of loss & damage are likely	Based on elements-specific data from the ground, the AA team would be able to provide precision-level advisories on any impending weather conditions, and actions are required to save the elements	Making herders as primary informants and with ICT apps-based tools with two-way communication

All georeferenced, tailor-made information can be disseminated through online portals or mobile apps, with maps showing the impact of changing weather conditions. In this regard, ICT-based tools would be helpful for evidence-based anticipatory action planning to minimize the loss and damage of productive assets/elements on the ground..

3.14.4 Climate Vulnerable Productive Sector Departments :

Sectoral needs to understand the Exposure, Sensitivity, Vulnerability, and Risk of all the elements on the ground through the conducted locality risk assessment. The department must constantly be updated about weather anomalies, warnings, alerts, etc. The sector department needs to perform a climate risk and vulnerability assessment of sectoral elements, develop a risk repository, and maintain it in the weather hazard calendar and crop calendar.

The most vulnerable sectors are livestock, crop agriculture, water, fisheries, and WASH. Sector-level stakeholders, such as lead farmers, smallholder farmers, commercial farmers, value chain operators, CSOs, community leaders, Mosque Imams, etc., should contribute sector-level risk and vulnerability information to enhance sector-level risk knowledge.

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Sector	Elements	Geolocation of elements	Elements damaged by historical disasters & type of damage	Climate exposure	Risk Rank	Vulnerabilities	L&D statistics	How to conduct the assessment
		Lat/Long						
Crop-agriculture	• All types of crops • Agroecology-based croplands • Seasonal and Perennial rivers for surface irrigation • Surface irrigation point • Underground borehole • Dug-well • Water body for irrigation • Canal for irrigation • Lake for irrigation • Pond for irrigation			Present condition of elements with given hazardous weather parameters (Heatwave, High winds, rainfall anomalies, localized storms etc.)	Ranking elements with Very-high, high, medium, and low risk	Withstanding capacity against the weather anomalies, hazardous weather parameters	Lead-farmers, Heders, Fishermen, CSOs, Community leaders, Mosque Imam, Village-level committees to update L&Ds weekly	Customized mobile apps for facilitating the survey/assessment

Sector	Elements	Geolocation of elements	Elements damaged by historical disasters & type of damage	Climate exposure	Risk Rank	Vulnerabilities	L&D statistics	How to conduct the assessment
		Lat/Long						
	• Water Point(Borehole) for irrigation • Spring for irrigation • Dug a well for irrigation							
Livestock	• Camel • Cow harder shed • Buffalo's • Goats have a harder shed • Sheep gave harder shed • Poultry firms	Geolocation of herder firms						
WASH	• Waterpoint for IDPs • Community borehole Rainwater Point Functional • Community borehole Rainwater Point seasonally operational • Abandoned borehole • Pipelined waterpoint • Community WASH point with Schools • Dug well for IDPs • Household level Dug well							
Water Sector hydrological resources	• Canal • River • Lake • Pond • Spring							
Health	• Hospital • Rural Clinic • Urban primary healthcare center • Family Planning Center							

3.14.5 Improving risk knowledge of Civil Protection Committee(CPC)/Disaster management Committee :

Somalia needs a Civil Protection Committee (CPC)/Disaster Management Committee to support the risk assessment, enhance community risk knowledge and risk perception, and support end-to-end and community-based early warning systems. The CPC/DMC needs to be the key informant, and the committee needs to be connected with ICT tools/mobile apps for sending community-level L&Ds information, event situation updates of multi-hazards turning into disaster events, community humanitarian needs and priorities, etc. .

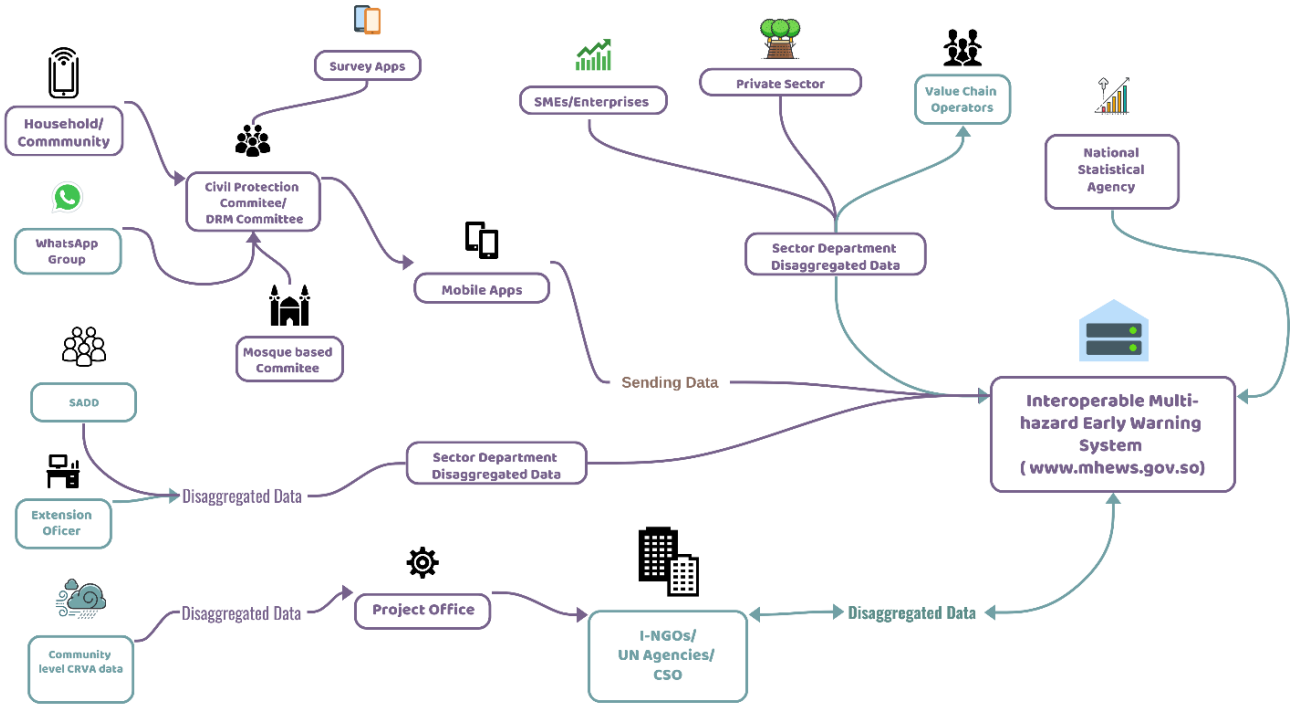

Figure 14 Local level risk communication methodology : (Source : Z M Sajjadul Islam)

Currently, SoDMA and other sector departments conduct limited extent post-disaster L&D assessments with support from the Mosque Imam during Friday prayers. In the ICT based open-ended, MHEWS, every CPC stakeholder/participant will be able to act as a primary informant and source information for the society and can play a significant role in local-level disaster risk management, be able to send event situation updates, send local L&D updates, and develop a local Disaster preparedness, response, and recovery plan..

3.14.6 Improving risk knowledge of Humanitarian actors :

In the event of impending dangerous multi-hazards, humanitarian actors need to access time-critical impact forecasts for planning forecast-based immediate anticipatory action, considering the scale, intensity, and scalability of impending multi-hazards likely to cause L&Ds on the ground. ICT-based interoperable MHEWS can improve risk information management and facilitate humanitarian action. ICT-based georeferenced emergency management is required to conduct emergency preparedness and responses. IT apps based on 5W (Who, will be doing what, where, when, and how) for intervention SoP and standing orders can avoid overarching planning, duplicity of actions, govern hard-to-reach areas, and uniformly mobilize humanitarian assistance at the last-mile..

3.14.7 Improving risk knowledge of entrepreneurs & Value Chain Operators

The Value Chain Operators and Entrepreneurs need to be updated about the weather forecast, as impending extreme weather events are likely to hamper their daily value chain operations and daily business, input supplies, output markets, as the Somalian economy largely depends on crop agriculture and livestock, etc., the weather risk-informed whole value chain operations. The entrepreneurs need to know what extreme weather conditions can impact the market value chain, Process value chain, storage facility, etc. The precision level impacts weather forecasts and nowcasting services required for better operations to minimize the L&Ds and undertake cost-in-action based on the estimates.

3.14.8 Improving risk knowledge of Local Governments (City, Municipality, Urban councils) actors to deal with the climate crisis

For inclusive and risk—informed local-level sectoral development planning, local governments (City corporations, municipalities, and towns) need to depend on tailored and climate risk-informed tools. In the Somali harsh climate regime, the landscape is highly vulnerable to climate change-induced multi-hazards. Water and livelihood security for any given part of the country are in peril. Therefore, high-value elements, e.g., crowded cities, municipalities, etc., need point-based weather forecasts. The urban local government needs to conduct climate and multi-hazard risk and vulnerability assessments and to develop a repository of urban elements and GIS maps (risk profile atlas) showing impacts of multi-hazards and analysis on how these elements are getting vulnerable to flooding levels, landslides, dust and sandstorms, and other multi-dimensional risks of the locality.

GIS map-based multi-hazard maps, as well as a repository of elements of the local government, infrastructures, basic service delivery structures, and utility services ,etc., can support local government in risk-informed local development planning. The dashboard on risk and vulnerability information, historical multi hazards background, Persistent climate risks and vulnerability, Changing climate and recurrence of the hazardous events, nature of impending multi hazards on the ground can support Government duty bearer and planning desk for risks informed Action planning, annual development programme (ADP), Multi-year action planning and multifaceted development approach for the sectors..

3.14.9 Improving risk knowledge of Duty Bearer/Local Disaster Management Committee (DMC)/Civil Protection Committee :

CPC at the frontline can play a pivotal role in improving disaster risk knowledge of the last-mile frontline community and individuals. An ICT-based and online geospatial risk atlas, a risk database with attribute information on the elements, is easily accessible to the frontline community at the last mile actors, stakeholders, duty bearers, and the government itself, can be leveraged to improve disaster risk knowledge. The whole society needs to understand the country's persistent and impending climate risk and vulnerabilities to adapt their livelihood to the imminent crisis. The proposed system, having versatility, rendered an open-ended online platform, apps, and social networked tools to integrate social & human capitals(to motivate the community as first responders) to manage disaster risk at the neighborhood and community level.

The system will have traceability of 5W workstream (who is doing what, where, when, how) as 80% mobile penetration is a great imperative to DMC/CPC for connecting the community via social networking tools, and the online DMC/CPC committee (WhatsApp, Telegram, Disaster Alert apps) will be able to interact with Online apps, the geo-spatial risk information portal. The local DMC /CPC can play a pivotal and participatory role in networking and mobilizing the community for disaster preparedness, response, and recovery efforts. The online interoperable MHEWS developed mobile apps, weather warnings, and alerts will support stakeholders in getting them well prepared for the impending multi-hazards. At the same time, they will be able to send risk data and L&D information to a central server for next-level preparedness and response planning using the apps.

4.0 Pillar 2 : Improving surface observation, Monitoring, and Forecasting

4.1 The existing hydro met services- Somalia faces daunting challenges in implementing the Pillar

- The WMO still needs to conduct Somalia-level Country Hydromet Diagnostics (CHD) assessments to stocktake the functional stations of existing hydromet stations that are currently operational, as well as to acquire the types of parameters for weather observation data. WMO essentially conducts CHD and determines the geographically positioned number of basic surface observation stations and automatic weather stations (synoptic capability) required for acquiring Essential Climate Variables (ECVs), requirements of EMMETCast atmospheric observation data acquisition, accessing the ECMWF Short-range forecast synoptic charts and forecast data, requirements of telemetry river level monitoring, and floating buoys-based sea-surface observation. By conducting all those assessments, WMO needs to develop a system upgrade strategy and improve weather observation and detection mechanisms.
- WMO needs to conduct an assessment of the operational status of all installed Hydromet observation stations in Somalia and identify GBON (Global Basic Observing Network) standard, operational capacity, and type of instruments installed for the kinds of weather parameters data acquisition, review the sitting classification for the surface observations on stations on land, procedure for updating the guide to instruments and methods of observation, etc., and provide the necessary technical assistance and diagnostic reports for upgrading stations to GBON standards. WMO to Develop a GBON compliance National observation network development plan with budgets based on the Somalian landscape, arid climatology, landcover types, and elongated vast sea proximity context, determine to identify and address type of observation, forecast model, impact-based forecasting, climate and hydrometeorological outlooks are being required for Somalia and close the service delivery capacity gaps for priority hazards, such as heatwaves, floods, tropical cyclones, persistent and flash droughts etc.

4.1 Current forecasting mechanism of Somalia :

Currently, the national hydrometeorological working group of MoEWR acts as an ad hoc body for conducting observation and providing a limited extent of daily and weekly forecasting of rainfall, temperature, and operational flood forecasts, as shown in the following diagram.

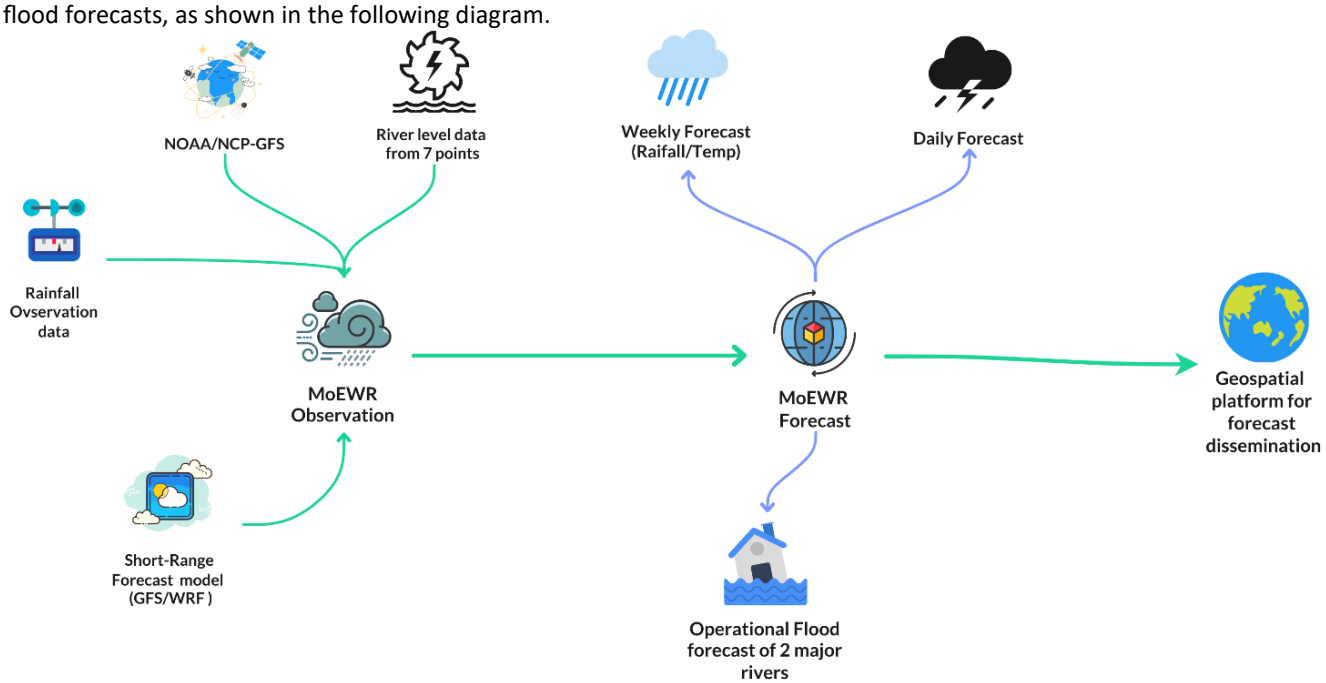

Figure 15 : Current Forecasting Mechanism of Somalia (Source : Z M Sajjadul Islam)

4.2 Indicative challenges in national forecasting service delivery :

- The MoEWR led an ad-hoc hydromet Working Group, which is working independently to develop rainfall and flood forecasts disseminated through the FAOSWALIM web portal.
- A few hydrometeor observation stations are acquiring rainfall (AWS) parameters. ECVs are not observed across the stations, which is a significant backdrop of the unavailability of surface observations ECV parameters data, resulting in no nowcasting services, point-based forecasting, and forecast verification are not happening.
- The MoEWR needs depend on global forecast models (GFS, WRF) for forecasting, and the country still lacks a precision-level, spatiotemporal, high-resolution daily weather forecasting facility.
- WMO has not conducted any diagnostic assessment of the operational status of all installed Hydromet observation stations in Somalia. This widens the considerable gaps in surface observations, improving nowcasting facilities and forecasting verifications.
- Still, the country has not made a significant step forward in establishing institutional arrangements for the national meteorological-hydrological services (NMHS) organization within the context of the FCV governance process.
- There is still no partnership, collaboration, mandates, or coordination structure among central and state government actors to work collaboratively on improving national hydrometeorological services.
- Still, SoDMA/MoEWR having lacks of institutional policies and programmatic mandates and accountability for implementing core activities of improving weather observation, providing daily/weekly short-range forecasting, hazard monitoring, detection, and sharing output services for the wider root-level stakeholders and other relevant sector departments as risk mitigation efforts

4.3 Recommendations on improving the national forecasting service delivery :

To overcome the complexities in partnership, collaboration, mandates, or coordination, consensus-building is emphasized to contribute to the implementation of national hydromet service deliverability. The tangible solution is implementing an ICT-Web-based system capable of handling interoperability and allowing multiple organizations and stakeholders to work together to deliver hydromet services, weather warnings, common alerts, and impact forecasting. The diagram below outlines an interoperable NMHEWC system with functional linkages with stakeholders through the ICT-online task management system and procedures.

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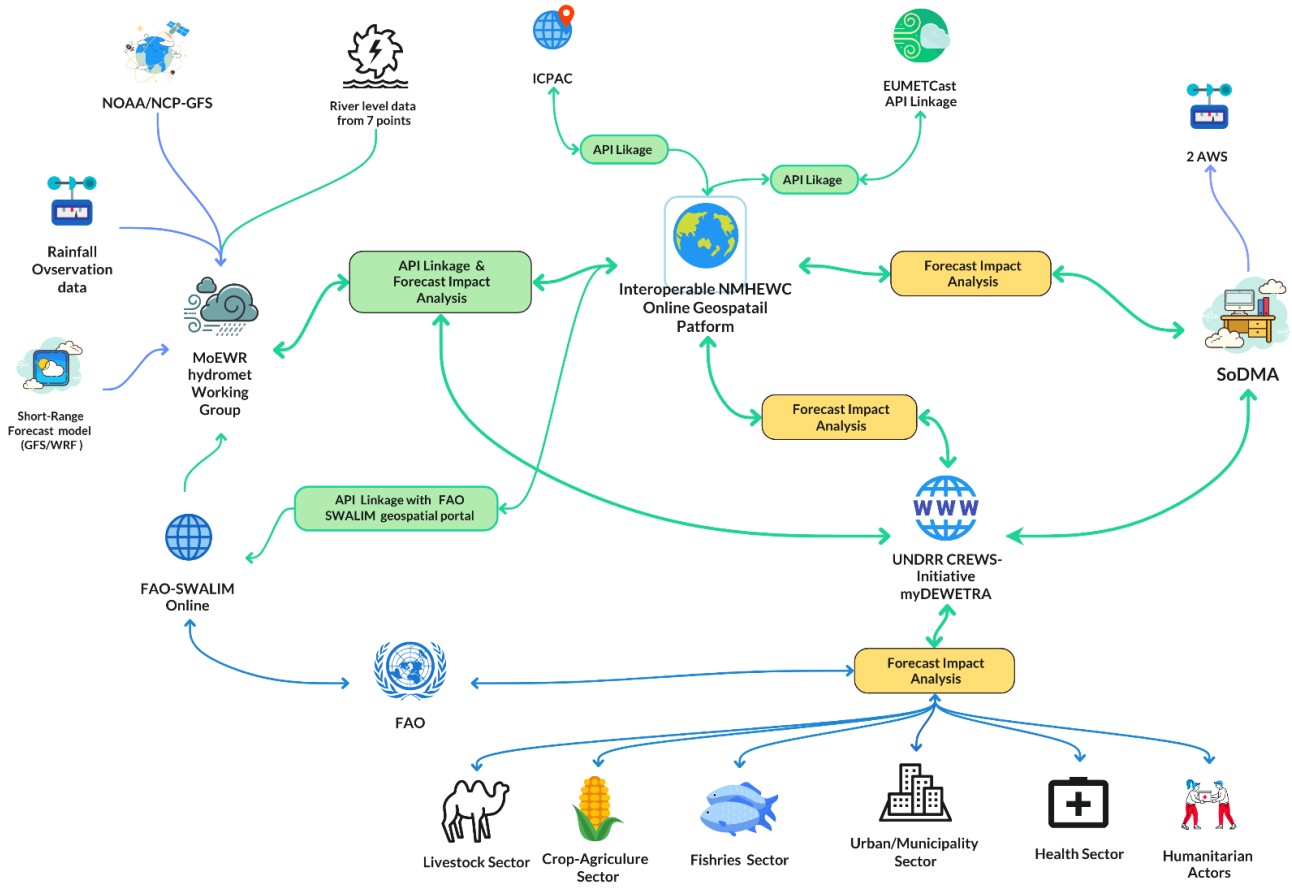


Figure 16 : Proposed interoperable NMHEWC system for all actors and stakeholders to work together(Source : Z M Sajjadul Islam)

The above functional diagram illustrates that the sectors need to contribute to an ICT-based interoperable MHEWS for improving the development of the impact and operational forecast value chain.

- Improving homegrown short-range forecasting Capacity. Implementing the UNDRR CREWS initiative to improve interoperable forecasting capability and Early Warning-based Early Action(EWEA) planning and implementation.
- Improving FAOSWALIM's current flood forecasts, developing transboundary data-driven flood forecasting, and precision-level flood warning of the two major river systems of the Juba and Shabelle Rivers of Somalia.

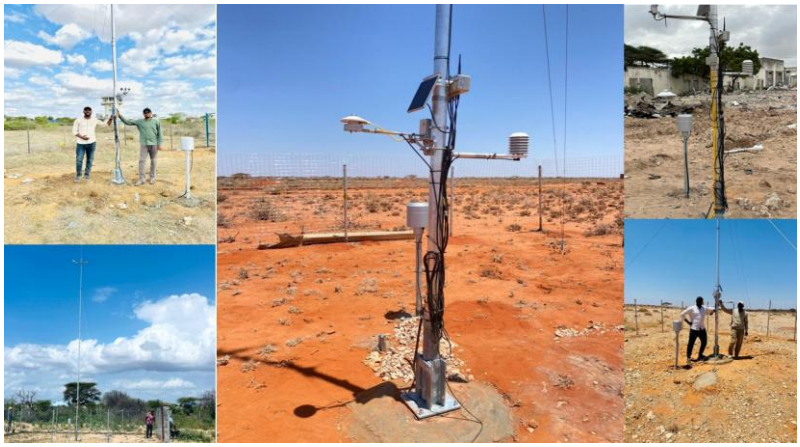


Figure 17: Some of the Hydro-met stations managed by the MoEWR

4.4 Recommendations on improving the sector-specific national forecasting service delivery :

- Mandate relevant stakeholders (state and non-state) in collection and coordination of Crowdsource information onset of weather emergencies: Developing district and community level crowdsource network (WhatsApp, Telegram, Facebook, Kobo-toolbox, SurveyMonkey, GPS logger, GPS essential) connecting all vulnerable herders, smallholder farmers, community, s, enterprises, CSO running projects team, lead farmers, financing institutions, credit operators, mobile baking outlets, insurance companies, etc., for collecting onset weather conditions, impacts over the elements, onset-hazard event situation updates via interoperable NMHEWS running apps, social networking tools etc.
- Human-driven tracking of every on-set multi-hazard impacts/incidence is currently taking place on the ground, e.g., heavy-rainfall induced flash-floodings, sand & dust storms, thunderstorms, tornadoes & hailstorms, ongoing event situation, trails of loss & damage figures.
- Activating hybrid observations(AWS and human-driven) for instantly tracking a convective weather system /rapidly developing weather conditions in any given season, damaging winds (area of extent) induced storm, constant windspeed, sand & dust storms, etc., monitoring,
- Setting up lighting detectors and other AWS sensors for tracking RDT near the high-value elements (City, municipality)
- Mandating volunteers to remain alert for collecting crowdsourced event situation/incidence (geolocation)

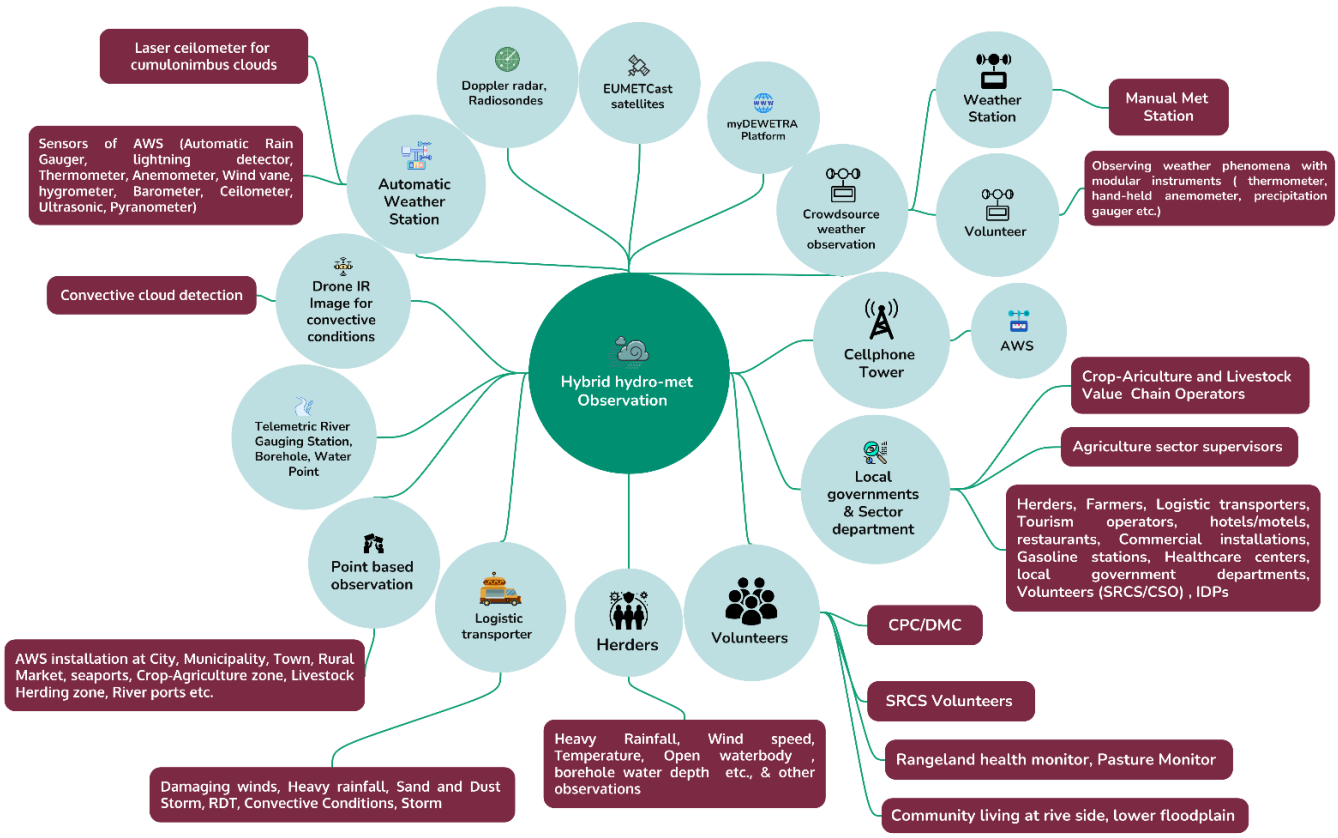


Figure 18 : Proposed hybrid observation mechanism (Source : Z M Sajjadul Islam)

4.5 Recommendations on improving hydrometeorological services: :

a) Installation of an independent National Meteorological Agency (NMA) :

- Installation of jointly operational and maintained by the key agencies, e.g., MoEWR, SoDMA, MoAI, MoLFR, MoH, MoFBE, for improving existing hydromet stations, upgradation of manual stations, and the newly installed AWS for the acquisition of ECVs.
- Establish linkage with the WMO regional specialized meteorological centers (RMC).
- Establish linkage with regional and transboundary NMHS organizations/networks.
- Provisioning long-term operational budgets of the National Meteorological and Hydrological Services (NMHSs)
- Installation of real-time satellite-based atmosphere observation systems, Preparation for the Use of Meteosat in Africa (PUMA) 2025 satellite links (EUMETCast, ECMWF, European Met services, NOAA, Indian Ocean network, The Regional Basic Climatological Network (RBCN), Global Terrestrial Network – Rivers (GTN-R), etc., for the acquisition of Basic Hydro-Meteorological Data (BMD).
- Improve the coordination mechanism of the weather /climate data information exchange and the coordination mechanism
- Memorandum of Understanding (MoU) needs to be signed between federal sector ministries, sector departments, and other stakeholders (INGs, UN Agencies, CSOs)
- Improving the Hydrological Status and Outlook System (HydroSOS) with the implementation of CREWS initiatives
- Installation of high-density AWS of GBON (Global Basic Observing Network) standard for acquisition of ECVs across the country
- Observation data gathering from hybrid sources (livestock herders, smallholder farmers, marketplaces, cities, municipalities, towns, ports, other KPIs for nowcasting, point-based forecasts and operational forecasts

b)Improving homegrown short-range forecasting Capacity :

The table narrates how to improve forecasting capabilities as advised in the following.

Forecast input data	Data provider	Forecast preparation	Impact forecast support	Forecast dissemination support
Essential Climate Variables (ECVs) of atmospheric observation	• myDEWETRA • PUMA 2025 • ECMWF Reanalysis v5 (ERA5)EUMETCast • NOAA-CPC/netCDF • ICPAC	• MoEWR • SoDMA-CREWS initiatives	• MoEWR • SoDMA • MoAI • MoLFR • MoH • MoFBE	• National Broadcasters mandated by NCA • National Telecom Operators mandated by NCA • MoEWR geospatial portal • SoDMA geospatial portal • Central forecast portal (www.weagher.gov.so) • myDEWETRA Platform
Operational Flood Forecast	• myDEWETRA Flood Risk (GAR) • AWS • River sensor data • GFS Forecast model • GloFAS • ICPAC forecast	• FAO-SWALIM operational flood forecast • myDEWETRA Flood Risk (GAR) of CREWS Initiative • GloFAS • ICPAC	• MoEWR • SoDMA • MoAI • MoLFR • MoH • MoFBE	• National Broadcasters mandated by NCA • National Telecom Operators mandated by NCA • MoEWR geospatial portal • SoDMA geospatial portal • Central forecast portal (www.weagher.gov.so) • myDEWETRA Platform

Forecast input data	Data provider	Forecast preparation	Impact forecast support	Forecast dissemination support
Now casting	• Meteo France RDT • myDEWETRA GSMap • EUMETCast RDT • Point based AWS observation (city/Municipality, IDPs/Towns) data of ECVs • PUMA 2025	• MoEWR hydro-met working group • SoDMA forecast analysis tam	• MoEWR • SoDMA • MoAI • MoLFR • MoH • MoFBE	• National Broadcasters mandated by NCA • National Telecom Operators mandated by NCA • MoEWR geospatial portal • SoDMA geospatial portal • Central forecast portal (www.weagher.gov.so) • myDEWETRA Platform
Impact forecast	• Point based AWS observation (city/Municipality, IDPs/Towns) data of ECVs • myDEWETRA • PUMA 2025 • ECMWF Reanalysis v5 (ERA5) data • EUMETCast • Meteo France RDT • EU-Forecast Models • NOAA-CPC/netCDF • ICPAC	• MoEWR hydro-met working group • SoDMA forecast analysis tam	• MoEWR • SoDMA	• National Broadcasters mandated by NCA • National Telecom Operators mandated by NCA • MoEWR geospatial portal • SoDMA geospatial portal • Central forecast portal (www.weagher.gov.so) • myDEWETRA Platform

c) Improving Impact Forecasting Capacity :

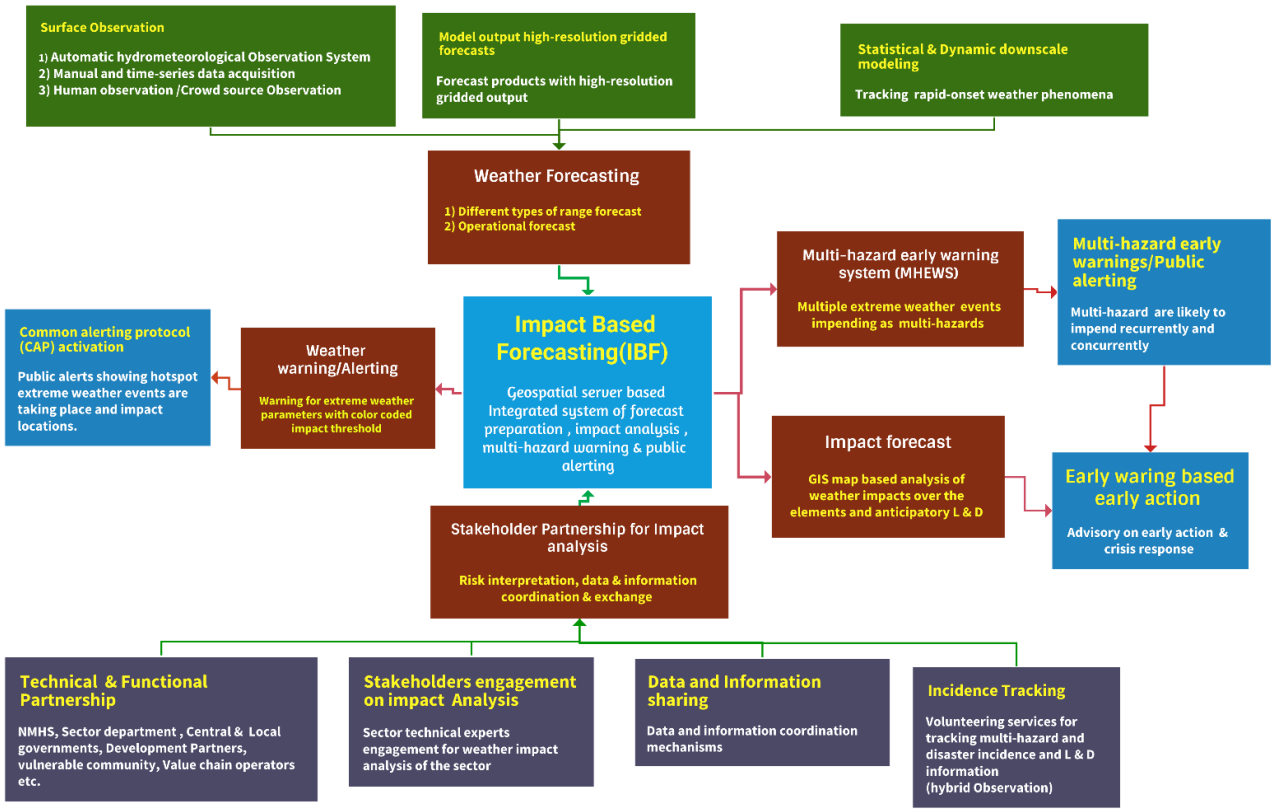


Figure 19 : Proposed Impact-based -Forecasting (IBF) Framework (Source : Z M Sajjadul Islam)

d) Improving Sector-level Impact Forecast and Operational Forecast:

Table: Forecast requirements for Somalia

Forecasts	Sector	Purpose	Comments
Seasonal forecasts, monthly forecasts, monthly, decadal, weekly, at spatial and temporal scales	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	• Sector Preparedness Plan • Risk-informed sector-level planning • DRR, CCA Planning • Livestock sector, Water Sector, WASH sector, crop-agriculture, livelihood, food security sector planning	EAP, EWEA, EWAA, SoP, SoD, EA , FbF, IBF
Forecasting Rapidly Developing Thunderstorm(RDT), heavy rainfall storm wind, tornadoes, Dust & sand storm	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	Thunderstorm-based operational forecasts (CAPE, trough, Airmass, Air-vapor, RH, lightning), what is the probability of heavy rainfall	
Cyclone early warning system	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	• Impact forecast for cyclone early warnings • Impact forecast for deep-sea fishing • Impact forecast for Coastal City, a municipality for forecast-based emergency preparedness	
Food security early warning	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	• Impact forecast for Food security Impact forecast	
Famine early warning	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	Impact forecast for Famine	
Drought early warning	•Crop Agricultural Sector •Water Sector •Livelihood Food Security •IDP Settlements •WASH sector •Fisheries sector	Impact Forecast for Drought	
Livestock sector early warning system	•Livestock sector	Impact forecast for Livestock	

a) Improving the borehole/water monitoring system:

Improving the borehole/water monitoring system:

Somalia Groundwater Monitoring: The FAO estimates that there are approximately 600 boreholes across the country, out of which only 35 boreholes are hourly acquiring groundwater table and water quality data through

an Iridian satellite-connected automatic data monitoring system. However, acquiring many borehole datasets is essential for having the functional and operational status of all essential drinking water points across the country.

Recommendations:

- Due to rainfall variability, dry and hot spells, and an arid climate, La Niña events frequently lead to reduced rainfall in East Africa, resulting in severe droughts. The groundwater table is severely depleted, and the borehole becomes unusable. Therefore, the groundwater table of the geographical area, along with hourly/daily monitoring of the borehole water table, is essential for ensuring water security and livelihood security.
- Installation of the groundwater table measuring instrument, water quality testing, and sending information to the central server via apps
- The borehole/water monitoring system is required to develop forecasts on extreme weather impacts on the WASH and water sectors.

Sector	Elements	Stakeholders to provide the Dataset for forecast impact analysis	Tools for data collection
Water Point /borehole	• Drinking water Borehole • Solar PV-powered water point	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies • FAO-SWALIM, • SoDMA, • Agriculture Development, • Livestock Department, • City & Municipality • INGO	• Mobile apps • GPS survey • App-based survey (Kobo-toolbox)
WASH	Dug well	• FAO dug well database • MoEWR dug well database • INGOs (IP) dug well inventory database • CSO/NGO dug well inventory database • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies =	
WASH	Rainwater harvesting facility	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies • FAO-SWALIM, • SoDMA, • Agriculture Development, • Livestock Department, • City & Municipality	

Sector	Elements	Stakeholders to provide the Dataset for forecast impact analysis	Tools for data collection
WASH	Open water body for easily treating the households	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies	
WASH	Water desalination facility in coastal areas for drinking water supply	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies	
WASH	Surface water treatment facility for the drinking water supply	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies	
WASH	Sanitation Point at the community and IDP level	• MoEWR inventory and GIS maps on location • UNCEF WASH cluster database, MICS, School-based WASH database • IOM DTM • FAO borehole database • FAO AWS(iridium satellite connected automated monitoring system) • UNHCR, WFP, UNDP, other UN Agencies • FAO-SWALIM, • SoDMA, • Agriculture Development, • Livestock Department, • City & Municipality	

b)Improving Crop Agricultural agro-climate forecasting and early warning :

Challenges :

- Significant changes in precipitation, including dry spells and droughts, as well as high temperatures and water stress, lead to land degradation and other environmental challenges, ultimately resulting in water shortages and degradation of crops and livestock.
- Famine is the cause of food insecurity in Somalia..

Recommendations:

- UNDRR-CREWS for enhancing the capacity of the NMHS(SoDMA, MoEWR) Crop Agricultural sector, agroclimatic forecasting, and early warning
- Develop a climate risk and vulnerability assessment (CRVA) methodology, tools, and guidelines for the crop agriculture sector, as well as a hazard vulnerability assessment for the livelihood sector.

- FAO, WFP, INGOs, and CSOs need to analyze the links between early warning, early action, and community-based adaptation to improve anticipation, adaptive capacity, and disaster risk management simultaneously.
- The FAO needs to localize the Global Information and Early Warning System on Food and Agriculture (GIEWS) for Somalia and anchor GIEWS with an ICT-based online database and geospatial interoperable MHEWS, connecting smallholder farmers, vulnerable communities, value chain operators, state (sector department), and non-state actors for supporting the following ;

Type of elements	**Geo location(Lat/Long)**	**Exposure**	**Risk**	**Vulnerability**	**The type of weather forecast and warning are required**	**The type of impact forecast is required**	**Responsible entity for forecasting/ IBF**
Elements of the Crop agriculture sector	**Crop-land specific geolocation to track the crop lands**	**Which external weather parameters are exposed to the Elements?**	**What are the risks of L&D due to extreme weather parameters?**	**Coping capacity of each element**	**Agrometeorological forecasts**	**Impact forecasts /Operational Forecasts of extreme weather events are likely to be impending**	• **MoEWR** • **SoDMA** • **FAO** • **MoAI** • **WFP** • **INGOs** • **CSOs**
•Seedling	Geolocation of permanent seedling areas	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
•Sapling	Geolocation of permanent Sapling areas	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
•Horticulture	Geolocation of permanent Horticulture	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
•Soil health/moisture	Geolocation of the soil health monitoring point	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
•Rainfed crops	Geolocation agriculture blocks for rainfed croplands (paddy, maize, etc)	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
•Irrigation-dependent crops	Geolocation of standing crops and agri-blocks requires	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP	•Impact Forecasts	

Type of elements	Geo location(Lat/Long)	Exposure	Risk	Vulnerability	The type of weather forecast and warning are required	The type of impact forecast is required	Responsible entity for forecasting/ IBF
	supplementary irrigation				Agrometeorological forecast (daily)		
•Agroforestry		Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP Agrometeorological forecast (daily)	•Impact Forecasts	
•Fruit garden		Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP Agrometeorological forecast (daily)	•Impact Forecasts	
Value Chain elements	**Geological location of all value chain inputs, suppliers, and output markets**						
Input supplier depot		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
Output wholesale market		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
Cold storage facility		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
Storage godown/CSD/Silos		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	
Certified Seeds Agency		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	•Impact Forecasts	

c) Improving Water sector Operational & impact-based forecasting:

Challenges :

- There is a lack of climate risk and vulnerability assessments, as well as a water sector-specific repository for tracking and monitoring water bodies, rainfall variability, and changes and anomalies in weather parameters related to hydrological and meteorological phenomena.
- Lack of data-sharing MoU with the upstream Ethiopian and Kenyan National Hydrological and Meteorological Services (NHMS) organization in river flows, reservoirs, groundwater levels, lakes, and soil moisture in local catchments across the region.
- Lack of integrated hydrological and meteorological early warning systems, impact forecasting, and operational forecasting

Recommendations:

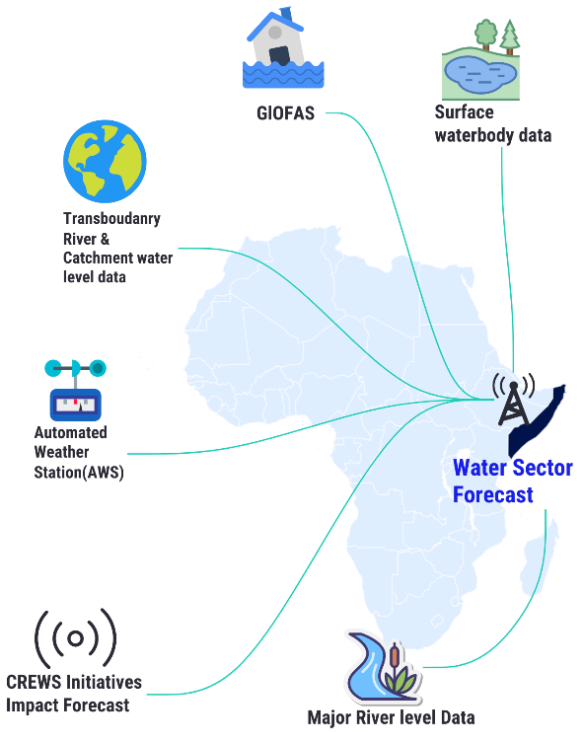


Figure 20: Water sector Operational & impact forecasting(Source : Z M Sajjadul Islam)

- UNDRR-CREWS initiative Capacity Building Support for the sector department for preparing forecasts (warning, alerting, and bulletin) for the water sector and sectoral elements
- Develop a climate risk and vulnerable asset management methodology, tools, and guidelines for assessing risks in the water sector.
- FAOSWALIM, MoEWR, and SoDMA need to work with an interoperable and integrated MHEWS system to provide EWS in the water sector(Surface water stress, groundwater table, Borehole water availability, etc.).
- FAOs, WFP, INGOs, and CSOs need to research and analyze the links between early warning, early action, and community-based adaptation to improve anticipation, adaptive capacity, and disaster risk management simultaneously.
- FAO Drought portal needs to be anchored with interoperable and integrated MHEW.
- The FAO needs to localize the Global Information and Early Warning System on Food and Agriculture (GIEWS) for Somalia and anchor GIEWS with an ICT-based online database and geospatial interoperable

NMHEWC, connecting smallholder farmers, vulnerable communities, value chain operators, state (sector department), and non-state actors for supporting the following ; ;

Type of elements	**Geo location(Lat/Long)**	**Exposure**	**Risk**	**Vulnerability**	**The type of weather forecast and warning are required**	**The type of impact forecast is required**	**Responsible entity for forecasting/IBF**
Elements of the Crop agriculture sector	**Crop-land specific geolocation to track the crop lands**	**Which external weather parameters are exposed to the Elements?**	**What are the risks of L&D due to extreme weather parameters?**	**Coping capacity of each element**	**Agrometeorological forecasts**	**Impact forecasts /Operational Forecasts of extreme weather events are likely to be impending**	• **MoEWR** • **FAO** • **MoAI** • **WFP** • **INGOs** • **CSOs**
•Seedling	Geolocation of permanent seedling areas	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
•Sapling	Geolocation of permanent Sapling areas	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
•Horticulture	Geolocation of permanent Horticulture	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
•Soil health/moisture	Geolocation of the soil health monitoring point	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
•Rainfed crops	Geolocation agriculture blocks for rainfed croplands (paddy, maize, etc)	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
•Irrigation-dependent crops	Geolocation of standing crops and agri-blocks requires	Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP Agrometeorological forecast (daily)	• Impact Forecasts	

Type of elements	Geo location(Lat/Long)	Exposure	Risk	Vulnerability	The type of weather forecast and warning are required	The type of impact forecast is required	Responsible entity for forecasting/IBF
	supplementary irrigation						
•Agroforestry		Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP Agrometeorological forecast (daily)	• Impact Forecasts	
•Fruit garden		Farmers to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP Agrometeorological forecast (daily)	• Impact Forecasts	
Value Chain elements	**Geological location of all value chain inputs, suppliers, and output markets**						
Input supplier depot		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
Output wholesale market		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
Cold storage facility		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
Storage godown/CSD/Silos		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	
Certified Seeds Agency		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	• Operational Forecasts • Weather Warning /CAP • Agrometeorological forecast (daily)	• Impact Forecasts	

d)Improving livestock sector impact forecasting

Challenges :

- Lack of climate risk and vulnerability assessment, and the Livestock elements-specific repository for forecasting impact analysis
- Changing weather conditions, Precipitation variability, extreme temperatures, heatwaves, dry spells, droughts, and the drying up of water bodies lead to pastoral degradation, water shortages, and persistent droughts that hinder livestock farming.
- Droughts severely affect the livelihoods and food security of pastoralists and agro-pastoralists. Moreover, the lack of pasture and shortage of water availability resulting from the drought led to acute morbidity, increased common diseases and outbreaks, and caused mortality among livestock.
- Household-level famine and IDP are the causes of early livestock sales to ensure food security.
- Lack of a weather and climate forecasting system for undertaking anticipatory actions for early stocking inputs for saving livestock population planning, the pricing efficiency of cost-in-action for a two-tier model for capturing the effect of cattle characteristics on impending impact hazards, estimation of returns from early selling, and minimizing the L&Ds..

Recommendations:

- CREWS initiative Capacity Building Support for the sector department in preparing forecasts (warning, alerting, and CAP) bulletins for the livestock sector and sectoral value chain.
- Develop a climate risk and vulnerable asset management methodology, tools, and guidelines for the livestock sector, and conduct risk assessments.
- MoLFR, FAO, WFP, INGOs, CSOs, and value chain operators need to research and analyze the links between early warning, early action, adaptive capacity in the livelihood sector, and disaster risk management.
- Promote the FAO Predictive Livestock Early Warning Information System (PLEWS) by utilizing analytics of normalized difference vegetation index data and models, as well as models for edible vegetation (based on high-resolution satellite imagery and ground truthing), surface water availability, and historical data.
- Linkage the FAO PLEWS with the Global Information and Early Warning System on Food and Agriculture (GIEWS) for Somalia and anchor both of the systems with an ICT-based online database management system, and geospatial interoperable NMHEWC, connecting smallholder farmers, vulnerable communities, value chain operators, state (sector department), and non-state actors for supporting the following;

Type of elements	Geo location(Lat/Long)	Exposure	Risk	Vulnerability	The type of weather forecast and warning are required	The type of impact forecast is required	Responsible entity for forecasting/IBF
Elements livestock sector	Crop-land specific geolocation to track the crop lands	Which external weather parameters are exposed to the Elements?	What are the risks of L&D due to extreme weather parameters?	Coping capacity of each element	Agrometeorological forecasts	Impact forecasts /Operational Forecasts of extreme weather events are likely to be impending	• MoLFR • SODMA • FAO • MoAI • WFP • INGOs • CSOs
Camael	Geolocation of permanent farming and grazing areas	Herders to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	

Type of elements	Geo location(Lat/Long)	Exposure	Risk	Vulnerability	The type of weather forecast and warning are required	The type of impact forecast is required	Responsible entity for forecasting/IBF
Goats	Geolocation of goats farm	Herders to send information via mobile apps	Farmers to send information via mobile apps	Farmers to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Sheep	Geolocation of the sheep farm	Herders to send information via mobile apps	Herders to send information via mobile apps	Herders to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Cows	Geolocation of the cattle farm & grazing areas	Herders to send information via mobile apps	Herders to send information via mobile apps	Herders to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Buffaloes	Geolocation of the buffalo farm & grazing areas	Herders to send information via mobile apps	Herders to send information via mobile apps	Herders to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Commercial poultry farms		Entrepreneur to send information via mobile apps	Entrepreneur to send information via mobile apps	Entrepreneur to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP Agrometeorological forecast (daily)	• Impact Forecasts	
Other varieties of livestock							
Value Chain elements	**Geological location of all value chain inputs, suppliers, and output markets**						
Input supplier depot		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Output wholesale market		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Storage facility/Processing industry		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	

Type of elements	Geo location(Lat/Long)	Exposure	Risk	Vulnerability	The type of weather forecast and warning are required	The type of impact forecast is required	Responsible entity for forecasting/IBF
Storage godown/CSD/Silos		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	
Certified Seeds Agency		Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	Value chain operators to send information via mobile apps	•Operational Forecasts •Weather Warning /CAP •Agrometeorological forecast (daily)	• Impact Forecasts	

e) Improving the Fisheries Sector impact forecasting

Challenges :

- Lack of inventories of fishing boats, fishermen, and weather warning recovery equipment. Lack of operational forecasts for deep-sea fishing.

Recommendations:

- CREWS initiative Capacity building Support for the sector department in preparing forecasts (warning, alerting, and CAP) bulletins for the fisheries sector.

f) Improving the health Sector multi-hazard early warning

Challenges :

- Lack of inventories, GIS maps on hospitals, clinics, primary health care centers, IDP healthcare points to map the sector's service delivery capabilities, Lack of assessment of extreme weather, multi-hazards impact on the public health sector
- Without an early warning system for impending extreme weather parameters (high temperatures, high winds, dust storms, heavy rainfall, flash flooding, etc.), weather-induced diseases and outbreaks are highly likely and can cause significant human tolls.

Recommendations:

g) WHO needs to deploy the Early Warning, Alert, and Response System (EWARS) to enhance disease outbreak detection, health disorder detection, disease surveillance, and reporting systems in the context of any extreme weather event, conflict, or natural disaster.

h) The UNDRR CREWS initiative supports the health sector and the NMHEWC in developing impact forecasts, preparing forecasts (including warnings, alerts, and CAPs), and publishing operational forecast bulletins on impending extreme weather events

Improving Common Alerting Protocol(CAP), Operational Forecasts, Impact forecasts for humanitarian sectors

Challenges :

- Siloed approach of humanitarian action planning and humanitarian actions being undertaken by the UN cluster system, INGOs, and CSOs.
- Humanitarian actors depend on regional and European forecasting windows for forecast-based anticipatory early action planning.
- Lack of systemic structures for hazard impact monitoring, event situation updates, tracking ripple effects of hazards, and consequential L&D inventorying
- Coordination of state, non-state actors, and CSOs for the collection of L&D data

Recommendations:

- Interoperable ICT online-driven NMHEWS needs to develop CAP, weather warning, forecast-based anticipatory action (AA)
- The UNDRR CREWS initiative supports enhancing core stakeholder capacity in developing impact forecasts, preparing forecasts (warnings, alerts, and CAPs), and operational forecast bulletins for impending extreme weather events, thereby supporting humanitarian action..

4.6 Establish hybrid observation network (AWS, Crowdsource)

Installation of hybrid observations system: The system includes automated weather stations, flood level monitoring, groundwater table & boreholes /drinking water point monitoring, surface water body monitoring, crop monitoring, livestock herders monitoring, productive sector's value chain (input, output, market system), crowd-sourced multi-hazard incident tracking, multi-hazard & disaster event situation update, Loss and damage monitoring, disaster hotspot tracking etc., .,

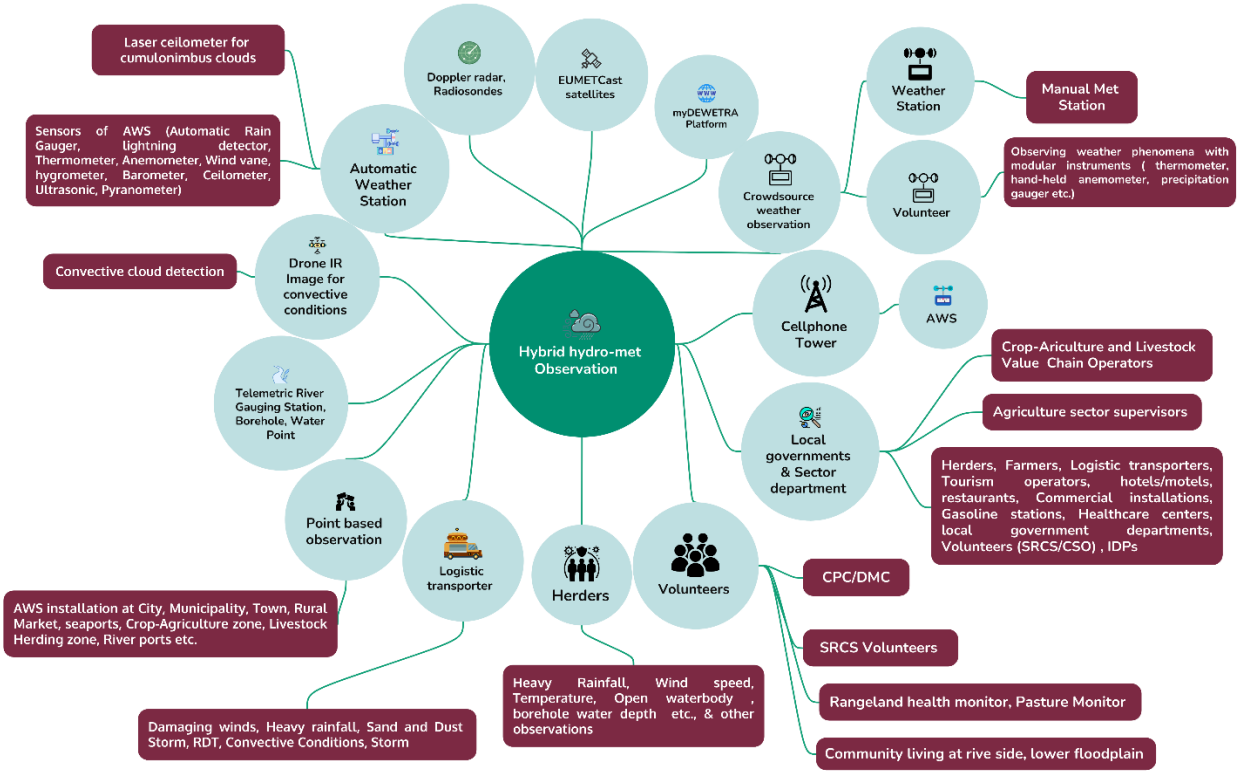


Figure 21 : Improving hybrid observation (Source : Z M Sajjadul Islam)

5.0 Pillar 3 Implementation Strategy (Warning dissemination and communication)

Risk communication and dissemination are the most critical components of the EW4ALL value chain process, which needs to be instrumental and functional at a robust level of system design, tools, and process to keep the frontline timely and sufficiently informed about the impending extreme weather events and induced multi-hazards that are highly likely to be impending and interact with the ground. It is good leverage that Somalia's cell phone penetration rate is significant, at 73 % of the Population.[2] The cell phones (*comprising 83% in urban areas, 72% in IDP camps, and 55% in rural areas*), being factored mainly by the Mobile money, an embedded financial opportunity in Somalia that enables foreign and local remitters with a convenient, affordable, and fast mobile money, which has been widely used. These imperatives and opportunities can be harmonized with policy and programmatic actions for creating communication & dissemination strategies of early warning information to the public alerts. The currently running SMS/IVR/cell broadcast services cover a limited extent, are not even user-friendly, and do not target multi-lingual audiences. The telecommunications regulator in Somalia (the NCA) is in a unique position to foster collaboration between warning dissemination organizations and information providers; since the NCA regulates the telecommunications sector, ICT sector, and broadcasting sector, it can manage and develop guidelines and regulations to support timely alert dissemination and communications.

Ensuring that IT systems, data storage, and sharing mechanisms are secured, resilient, and functional is expected to enhance NMHEWC's capabilities to send alert warnings during the onset of hazards. Accessing hazard and forecast information from various source organizations would allow NMHEWC to disseminate warnings through different communication channels (TV, radio, SMS, and social media), anticipating impending risk. Capacity strengthening and risk communication are as follows;

5.1 Indicative Challenges of Warning dissemination and communication

1) **Lack of terrestrial Broadcasting(AM Radio/Terrestrial TV):**

This is the only easily accessible broadcasting system from which a radio set can receive broadcasts at any last-mile geographical location in the country. Unfortunately, Somalia's Amplitude Modulation (AM) radio broadcasts were suspended due to political fragility and conflict-related issues. Therefore, the dispersedly located poor households in hard-to-reach areas cannot access AM Radio or FM radio due to FM radio broadcast limits. Thus, remote households need to rely on people-to-people transmission of warning messages; sometimes, local mosque-based Imams and community leaders play a role in disseminating bad weather alerts. The figure below shows that the remote household and sea fishing boats do not have access to the daily weather bulletin.

[2] MOBILE M ONEY E COSYSTEM IN S OMALIA SUMMARY, Altai Consulting for the World Bank, June 2017

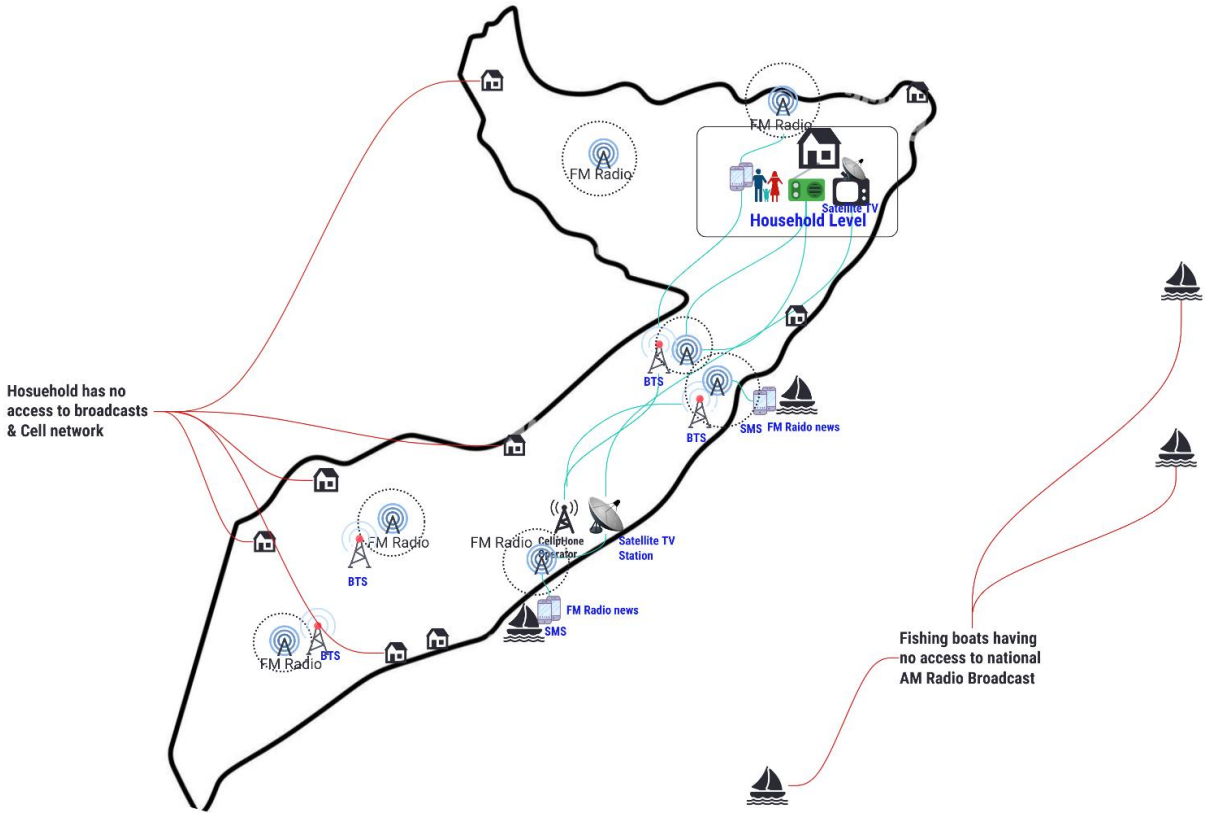


Figure 22 : Existing commercial FM radio services (Source : Z M Sajjadul Islam)

Recommendations :

The Somali federal government and state governments need to ensure that terrestrial TV and AM Radio broadcasts reach remote and hard-to-reach areas, where poor households are located. Until this barrier is overcome, the frontline community will remain isolated and unable to access weather alerts and warnings. At the outset, the NCA and the Ministry of Communication should hold cell phone operators accountable for continuing to provide free SMS, IVR, and Cell broadcast services during hazard emergencies. Additionally, national state control and private broadcasters should be encouraged or mandated to broadcast emergency weather bulletins and alerts on a regular basis to promote mass awareness

1) **Lack of a Broadcasting policy framework, accountability, mandates, and** standard operating procedures (SoP) on how broadcasters will access national weather forecasts and broadcast weather bulletins, and special weather warnings:

Since Somalia has yet to institutionalize the national meteorological agency (NMA) for full-fledged operational capability to give daily weather forecasts on essential climate variables (ECV), ironically, the only weekly/decadal rainfall forecast is being prepared by the MoEWR hydromet services, but the national broadcaster does not regularly pick up the broadcasts; instead, they do use third-party commercial forecasting tools (windy, Ventskey, Zoom Earth, etc.) and do broadcast weather on an ad hoc basis. Therefore, the climate frontline community cannot access specialized and precision-level forecasts and special weather bulletins due to the unavailability of an operational Standard Operating Procedure (SoP)..

Recommendation :

- The UNDRR-CREWS initiative needs to conduct an assessment of the quality, timeliness, spatial and temporal scale, and weather warming of existing forecasts, as well as the remarkable weather bulletin development capacity and bulletin quality. Simultaneously, it should develop a brief Standard Operating Procedure (SOP) for the broadcasts to ensure the EW4ALL value chain is maintained.
- NCA needs to develop a SoP on how to channel the risk/forecast communication, dissemination, and coordinate mechanisms on how the district/community level coordinates local CPC/DMC, CSOs, NGOs, and Mosque imam will communicate warning alerts to households during emergencies for evacuation and preparedness (Cyclone, flash flooding)
- Develop a SoP on promoting a social journalism mechanism led by the youth group, local journalists, youth journalists, and community volunteers through social networks (Facebook, YouTube, WhatsApp, Telegram, etc).

2) Lack of NCA MoU with broadcasters (government and private) :

The good leverage that Somalia has is that around 80% of the population has cell phones, falling under private FM radio services, and satellite TV services targeting the high-density settlements (cities and municipalities). Considering this broadcasting facility, the NCA needs to play a pivotal role in mandating cell phone and telecom operators, cable TV and satellite TV networks, as well as online and offline news outlets, to broadcast weather bulletins at regular intervals. Unfortunately, there are no MOUs or mandates for national broadcasters, telecom operators, and news agencies to provide daily weather forecasting and warnings.

Recommendations: NCA immediately needs to sign and approve the MOU & mandates with National State control and private TV and Community Radio broadcasters, Telecom company to supplement forecast bulletin dissemination, SMS, IVR, Cell Broadcasting

3) NCA needs to develop a Risk/Alert communication and dissemination system for urban dealers with cell phone, FM Radio, Internet, and Satellite TV access.

Organize a national hydrometeorological services technical working group to analyze forecasts, develop impact forecasts, and prepare CAP on sudden onset localized multi-hazard events that are highly likely to be impending, e.g., RDT-trigged heavy rainfall, tornadoes, nor'easters, etc. The CAP alerts must be on the spatial-temporal scale and be tracked and detected by the hybrid weather observation network. Local FM Radio, Satellite, and cable TV operators, social network providers, and the local CPC/DMC committee need to issue CAP for their locality to minimize the L&Ds.

5.2 Developing a Common Alerting Protocol(CAP) :

Event Situation Updates to NMHEWC for next action planning

NMHS to constantly monitor, detect, and Issue CAP

- Impending hazardous weather
- Promote an End-to-end early warning system: Mandating FV Radio and satellite TV broadcasters to organize a Live show on multiple hazards for the collection of event situations:

1) Mandating FV Radio, Satellite TV broadcasters to organize a Live show on multiple hazards for the collection of event situation :

Event situations can be collected for crowd sourcing by conducting live broadcasts on FM radio and satellite TV, allowing frontline stakeholders to participate in the live show and receive updates on the onset of hazard impacts and the trails of L&Ds happening across the locality. The remote vulnerable and victim household/stakeholder can participate in the shows via cell phone calls and send the updates on event situations to the broadcast room, and then broadcasters can immediately update about ground-level event situation updates to the interoperable NMHWEC (online database- Geoportal automated disaster alerts portal) and update the NCA and national broadcasters consortium for broader dissemination.

5.3 Interoperable risk communication and feedback system with NMHEWS (CREWS Initiative Support)

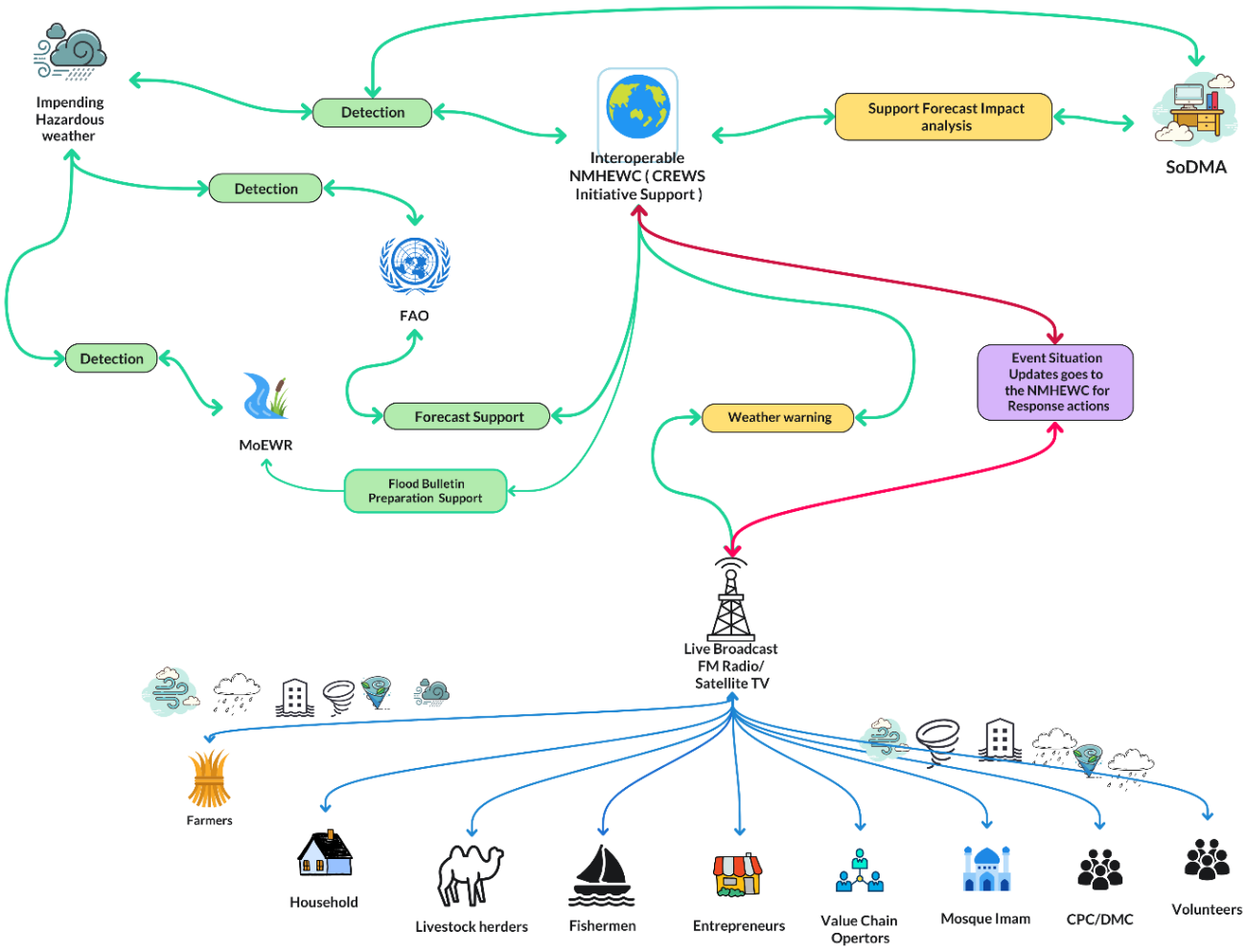


Figure 23: Live shows for capturing the ongoing event situation of the onset of disaster incidents on the ground (Source : Z M Sajjadul Islam)

5.4 Develop and disseminate a common alerting protocol (CAP) on imminent hazards, weather :

Developing the Common Alerting Protocol (CAP) is the tertiary step of an integrated forecasting and early warning system. Firstly, weather observation/detection, followed by forecasting, and then CAP development based on the cascading impacts of multi-hazards down to the community and household levels. The most decisive early action protocols, contingency mobilization, and forecast-based anticipatory action need to be developed based on the precision level of forecasting and the cascading impacts of impending and onset hazards on the elements on the ground.

NMHS needs to analyze numerical weather prediction (NWP) and operational forecasts and develop impact forecasts. Additionally, it should prepare a spatiotemporal scale CAP for sudden onset, localized multi-hazard events that are highly likely to be impending, such as RDT-identified heavy rainfall, tornadoes, nor'easters, etc. The CAP alerts must be on a spatial-temporal scale and tracked and detected by the hybrid weather observation network (technology and human-driven). The NMHS and NWP team must issue CAP for broadcasting through Local FM Radio, Satellite, and cable TV, as well as social network operators. The local CPC/DMC committee must also issue CAP for their locality to minimize the L&Ds..

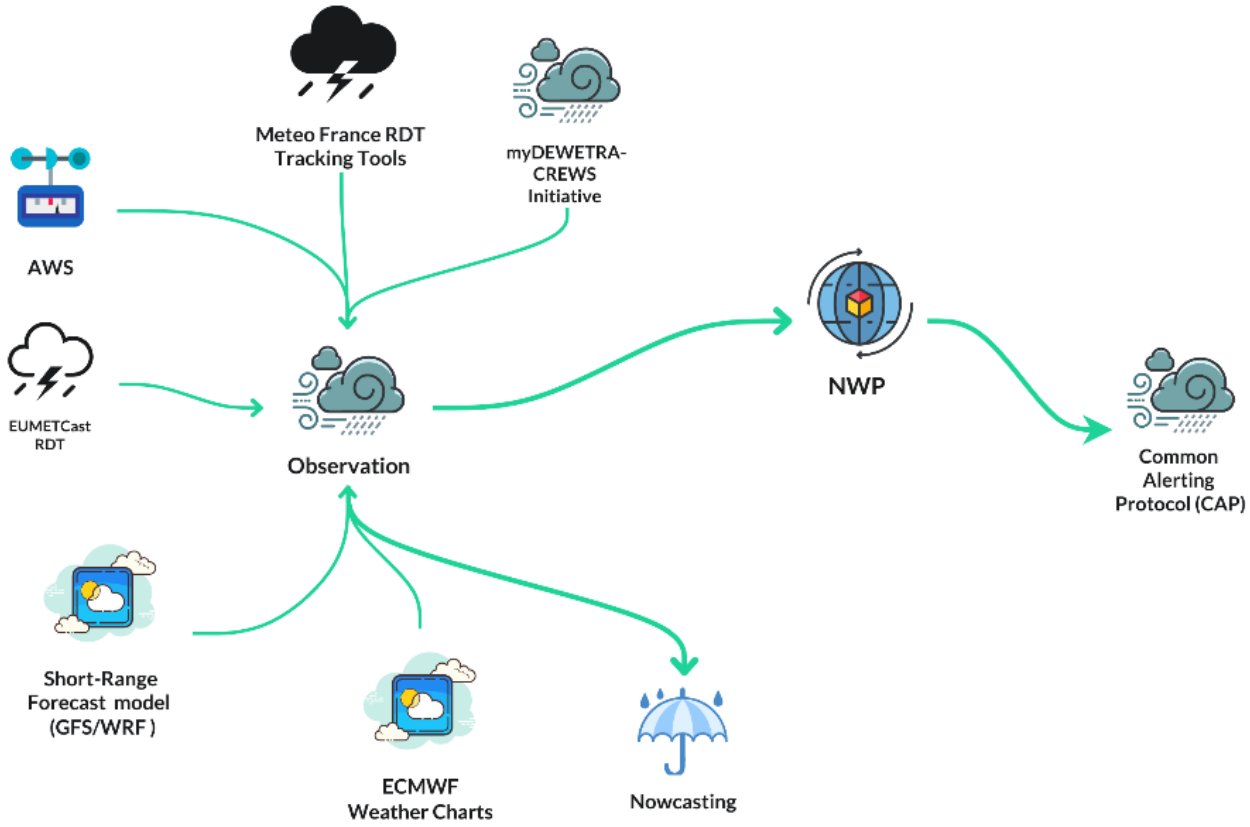


Figure 24: CAP Development Process (Source : Z M Sajjadul Islam)

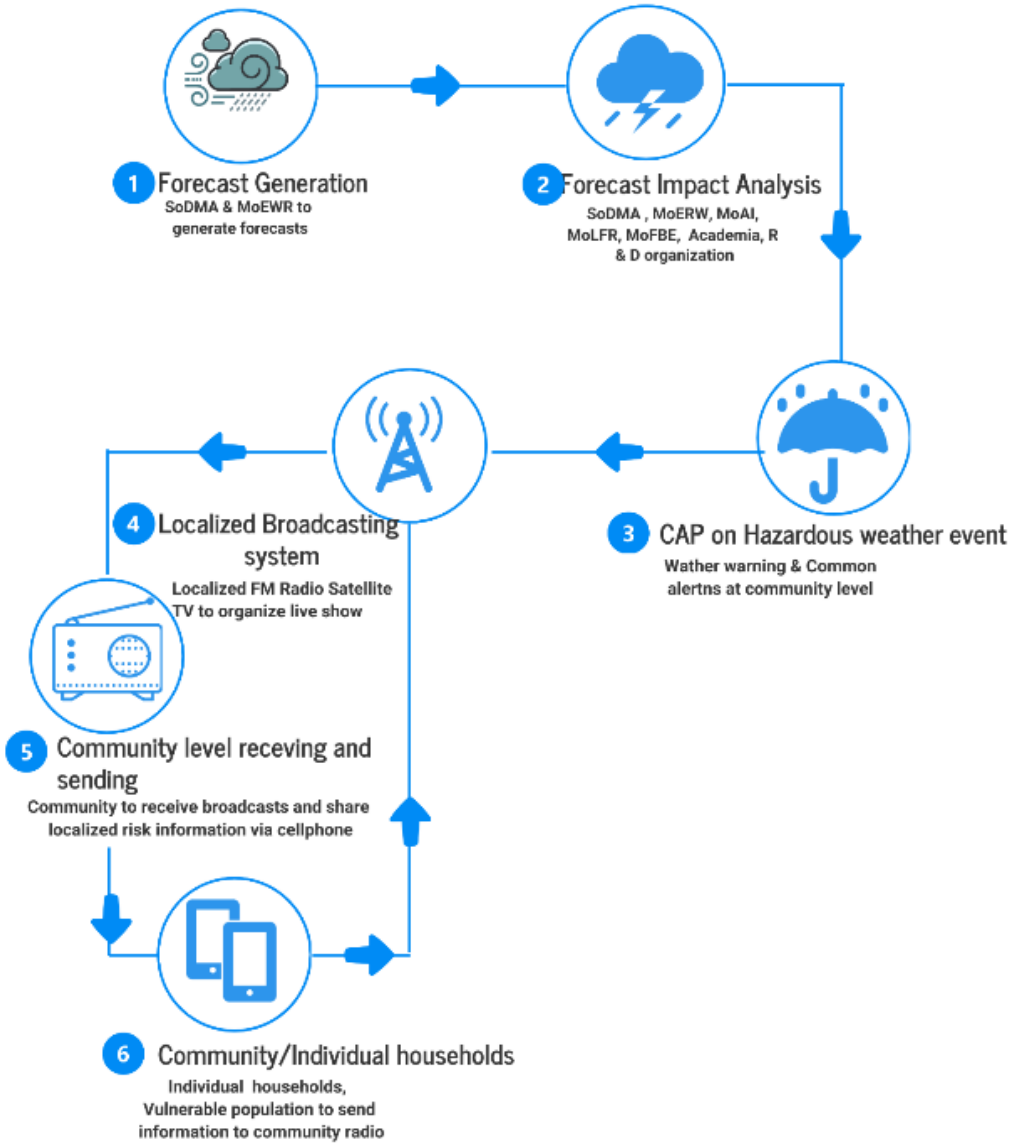


Figure 25: Event situation reporting(Source : Z M Sajjadul Islam)

Tools: Mobile and landline telephones, Internet (e-mail, Google, Facebook, Twitter, WhatsApp, smartphone apps, sirens (in-building or outdoor), radio/television broadcast and, cable television, emergency drone radio, amateur radio, satellite direct broadcast, and digital signage networks (highway signs, billboards, automobile and rail traffic control).

5.5 Improving terrestrial Broadcasting

NCA needs to undertake policy advocacy with the Ministry of Communication & Technology (MoCT) for resuming the AM Radio broadcasts(at the federal and state levels), mandating cell phone companies to extend the cellular BTS ranges so that remote communities and fishermen can access terrestrial broadcasts. Terrestrial AM Radio and TV can play a significant role in keeping households and populations in dispersed and hard-to-reach areas informed about multi-hazard risks, raising awareness, and providing timely access to weather bulletins, warnings, and alerts to minimize loss of life and damage..

Figure 26 : Expansion of terrestrial broadcasts(AM Radio/TV) beyond the national boundary (Source : Z M Sajjadul Islam)

5.6 Stakeholders' responsibility metrics on Risk Communication and Event Updates

Stakeholders/ Actors	**Sector Ministry & departments**	**Responsibilities during normal time**	**Duties during the impending multi-hazard EW is being issued**	**Duties at the event of multi-hazard incidents are taking place with high impacts**	**Duties at the event of a disaster have already started for L&Ds**	**Risk communication tools**
State Actors	NCA	Coordinate NMHEWC & national broadcasts for every day's Forecasts/bulletins are being broadcasted	Coordination of special weather bulletins with national broadcasters	Coordinate the national broadcasters' newsroom for organizing live shows for crowdsource audiences to report the current situation and incidents of L&DS	Coordinate the national broadcasters' newsroom for organizing live shows for crowdsource audiences to report the current situation and incidents of L&DS	
	SoDMA	Coordinate NCA & national broadcasts for every day's Forecasts/bulletins are being broadcast	Coordinate NCA & national broadcasters for special weather	Coordinate NCA , District administration, CPC/DMC for taking updates to national	Coordinate NCA, District administration, CPC/DMC for taking updates	

Stakeholders/ Actors	Sector Ministry & departments	Responsibilities during normal time	Duties during the impending multi-hazard EW is being issued	Duties at the event of multi-hazard incidents are taking place with high impacts	Duties at the event of a disaster have already started for L&Ds	Risk communication tools
			bulletins that are being broadcast	broadcasters for wider dissemination	on L&Ds to national broadcasters for wider dissemination, and update data with DesInventar. And Web-based NMHEWS for wider dissemination	
	MoEWR	Coordinate Interoperable NNMHEWC for processing for every day's Forecasts/bulletins so that NCA and broadcasters can access timely	• Coordinate Interoperable NNMHEWC to analyze hazardous forecasts and develop special weather bulletins. • Develop special bulletins on heavy rainfall and highly likely river flooding, flash floods, landslide etc.	• Coordinate Interoperable NNMHEWC and develop special bulletins on heavy rainfall and highly likely river flooding, flash floods, landslide etc.	Coordinate SoDMA, District administration, CPC/DMC, CSO consortium for taking updates on L&Ds	
	MoAI	Coordinate an Interoperable NNMHEWC so that regular agroclimatic forecasts and bulletins are broadcast, targeting the audiences of smallholder farmers, promoters, market players, rural households, CSOs, Stakeholders, entrepreneurs, value chain operators, etc.	Coordinate an Interoperable NNMHEWC so that special weather bulletins for the crop-agriculture sectoral elements are being broadcast to give wearing/alerts to to the target audiences	Coordinate all relevant stakeholders and ensure that L&Ds data is being sent via mobile apps to Interoperable NNMHEWC	Coordinate all relevant stakeholders and ensure that L&Ds data is being sent via mobile apps to Interoperable NNMHEWC	
	MoLFR	Coordinate an Interoperable NNMHEWC so that regular agroclimatic forecasts for the livestock value chain and bulletins are broadcast, targeting the audiences of livestock herders, smallholder	Coordinate an Interoperable NNMHEWC so that special weather bulletins for the livestock sectoral elements are being broadcast to give warnings/alerts to	Coordinate all relevant stakeholders and ensure that L&D's data is being sent via mobile apps to Interoperable NNMHEWC	Coordinate all relevant stakeholders and ensure that L&Ds data is being sent via mobile apps to Interoperable NNMHEWC	

Stakeholders/ Actors	Sector Ministry & departments	Responsibilities during normal time	Duties during the impending multi-hazard EW is being issued	Duties at the event of multi-hazard incidents are taking place with high impacts	Duties at the event of a disaster have already started for L&Ds	Risk communication tools
		farmers, livestock commercial herders, promoters, market players, rural households, CSOs, Stakeholders, entrepreneurs, value chain operators, etc.	the target audiences			
	MoH	Coordinate an interoperable NNMHEWC so that regular public health, WASH-related bulletins, value chain operators, etc., are being broadcast.	Coordinate an Interoperable NNMHEWC so that weather warnings for the public health, the WASH sector are being issued & broadcast	Coordinate all relevant stakeholders and ensure that L&D's data is being sent via mobile apps to the Interoperable NNMHEWC	Coordinate all relevant stakeholders and ensure that L&Ds data is being sent via mobile apps to Interoperable NNMHEWC.	
	MoFBE	Coordinate NCA & an interoperable NNMHEWC so that the sea-fishermen can access the Forecasts/bulletins from the fishing boats	Coordinate NCA & an interoperable NNMHEWC so tropical storm depression, stages of development, related special weather bulletins are being broadcast and communicated to the fishing boats	Coordinate fishing boats to follow storm warnings are being followed carefully, and offshore timely	Coordinate fishing boats to get updates on L&Ds	
Non-state actors	UN-HCT	Capacity development of stakeholders for improving risk communication	Supporting SoDMA, NCA for improving risk communication	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	
	UN Clusters	Capacity development of stakeholders for improving risk communication	Supporting SoDMA, NCA for improving risk communication	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	
	INGOs	Capacity development of stakeholders for improving risk communication	Supporting SoDMA, NCA for improving risk communication	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	Supporting SoDMA, NCA for incident tracking and collection of L&Ds information	
	Local NGOs/CSOs	Capacity building of local stakeholders,	Coordinate local administration, CPC/DMC,	Coordinate local administration, CPC/DMC,	Coordinate local administration,	

Stakeholders/ Actors	Sector Ministry & departments	Responsibilities during normal time	Duties during the impending multi-hazard EW is being issued	Duties at the event of multi-hazard incidents are taking place with high impacts	Duties at the event of a disaster have already started for L&Ds	Risk communication tools
		CPC/DMC, in end-to-end risk communication	community, mosque imam, and keep them updated about impending multi-hazards	community, mosque imam, and collect L & Ds information	CPC/DMC, community, mosque imam, and collect L & Ds information	
National broadcasters/ media outlets, Telecom Operators	FM Radio, Satellite TV, Cell phone operators, Fixed line companies, cable operators, national news outlets etc.	Coordinate NCA & an interoperable NNMHEWC for accessing daily weather bulletin and broadcasting/disseminating through an appropriate channel	Coordinate NCA & an interoperable NNMHEWC for accessing special weather bulletins, weather warnings, alerts, and broadcasting/disseminating through an appropriate channel	Conduct special live shows so that audiences can share incidents and L&D information to the newsroom.		

5.7 NCA Mandates National Broadcasters, News Outlets for dissemination

NCA needs to play an important role in devising the forecast bulletin broadcasting; the following diagram shows the mechanism of an effective forecast dissemination system.

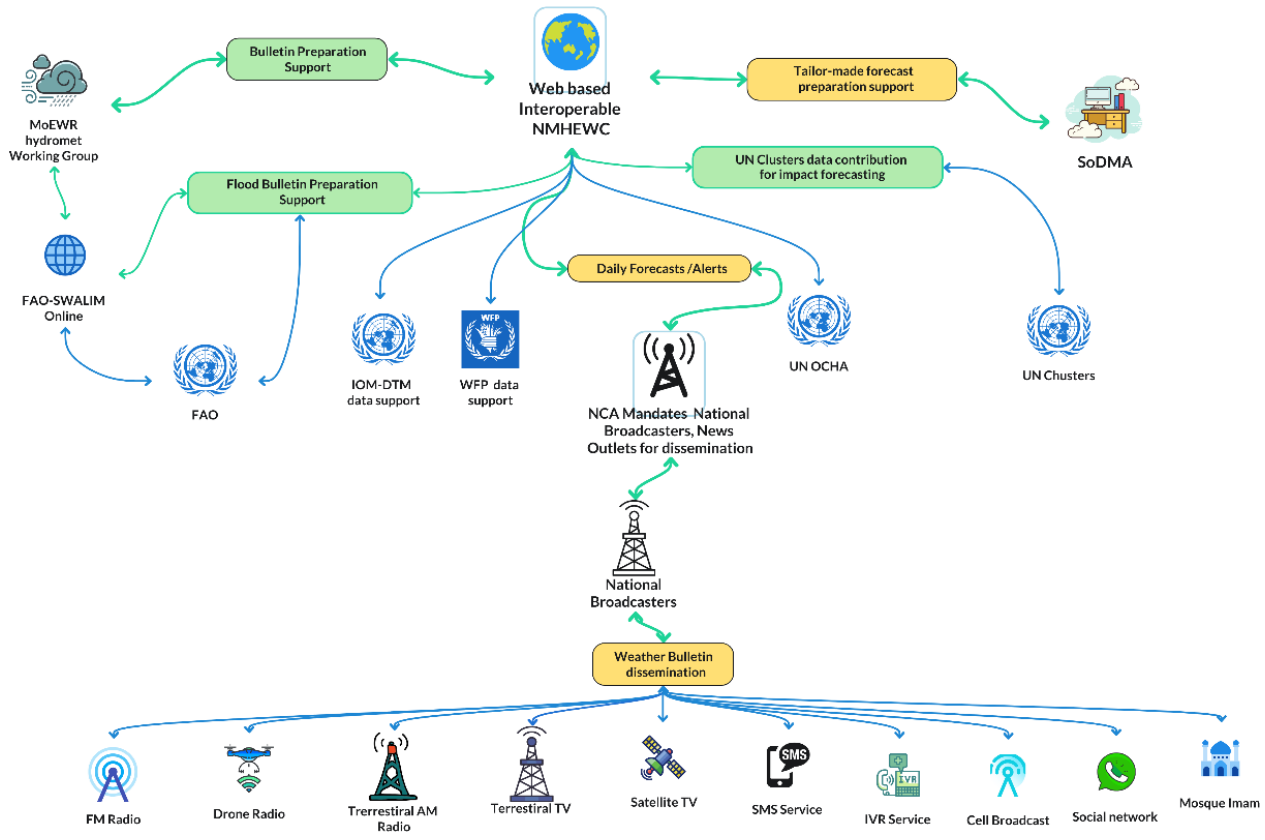


Figure 27: Proposed NCA-led national communication framework (Source : Z M Sajjadul Islam)

5.8 UN Clusters data contribution for impact forecasting

Standard Operating Procedures (SOPs) are defined as formal written guidelines or instructions for incident response. They generally have both operational and technical components and allow emergency response personnel to act in a coordinated manner across all disciplines in the event of an emergency. These detailed instructions or procedures promote a uniform and standardized response during emergency response operations. These SOPs should be aligned with the legislative and regulatory frameworks as well as with the specific policies and plans related to DRM.

5.9 Installation of hybrid surface observation and organize a Live radio/TV show during Hazard spells are going

Mandate Crowdsource information coordination and information gathering during weather emergencies: Developing crowdsource network (*WhatsApp, Telegram, Facebook, Kobo-toolbox, survey monkey, GPS logger, GPS essential*) connecting all vulnerable herders, community, stakeholders, enterprises, I-NGO projects, lead farmers, financing institutions, credit operators, insurance companies, etc., for collecting risk information, risk communication, event situation updates, etc.

- Tracking every multi-hazard on the ground, e.g., heavy rainfall, strong winds, thunderstorms, dust storms, heavy rain, etc., causes loss and damage.
- Conduct ground-level observations of slow-medium onset hazards, such as heat waves, droughts, etc.
- Activating hybrid observations for instantly tracking a flash drought, heatwave, hot spell, convective weather system /rapidly developing weather conditions (area of extent), dust storms, etc., monitoring,
- Provide modular weather instruments, such as thermometers, precipitation gauges, and handheld anemometers, to every ger volunteer.
- Setting up lighting detectors and other AWS sensors for high-value elements (city /municipality)
- Mandating crowdsourced volunteers to remain alerted to provide weather emergency information(to the network with geolocation) in given cases of extreme weather events is likely to impede or have just started.
- Provide geolocation of livestock access to drinking water in harsh weather conditions.

1) Establish Constant communication and monitoring of the herders/farmers/frontline community :

- Mandating cell phone companies to provide herders(volunteers) with a free internet hour every day to herders/emergency volunteers, remotely located MRCS, community volunteers, and another Android phone for sending emergency data/information to IBF for updates.

- **Mandate Herders/volunteers to provide quick updates of weather conditions to WhatsApp group: mandate** herders for Sending sample pictures of herd size and health conditions, forage conditions, camp side conditions (vulnerable to hazards - avalanche/floods/flash floods/landslide/debris fall/mudslide), landscape pictures of pastureland, the water access point for drinking water, etc.
- Organize group discussions with social network groups and ask herders for Sending pictures of multi-hazards anytime they face an emergency shelter.

a) Conducting a live radio show for the vulnerable community during disaster onset

- Coordinating with national AM radio or city/municipality-level AM radio broadcasts and organizing live radio talk shows to get situation and incident updates from remote communities.
- Support the national radio team in preparing broadcast advisories for herders, travelers, value chain operators, herders, farmers, etc.

b) Liaising with INGO/UN Agency, supported event situation updates

- INGO/UN Agency humanitarian network, sector network to feed event situation to MHEWS running CAP.
- Anchoring IGNO/UN Agency led emergency preparedness and response with IBF
- Green /Dry Pasture alert
- Forage crop failure (due to drought) & shortage alert

6.0 Pillar 4 : Improving Preparedness and Response Capabilities

6.1 The central objectives for improving Preparedness and response capabilities

- Improving multi-hazard informed disaster risk management (DRM) system at a local level
- Capacity building of DRM and DRR actors, risk-informed, forecast-based anticipatory action planning, and implementation
- Mechanizing and devising anticipatory actions based on spatiotemporal scale and precision level, early warning & alerts
- Improving the local level coordination mechanism of the Disaster Civil Protection Committee /Disaster Management Committee (DMC) emergency preparedness and lifesaving humanitarian response action plans with ICT tools(Apps) driven and interactive
- Implement ICT tools-driven interoperable NMHEWS online platform to ensure evidence-based actions and hold every stakeholder accountable under pillar 4, accountable for Preparedness and response actions
- Deployment of ICT tools-driven interoperable NMHEWS online platform to ensure all stakeholders, state(Government entities) , non-state (UN, INGOs, CSOs, Academia), in collective accountability to the affected population (AAP) for avoiding duplicity and overarching actions.
- Improving stakeholders' capacity in the assessment of post-disaster impacts, climate change impacts, L&Ds data collection, conducting PDNA, RPDNA at the local level
- Improving the informed disaster risk financing framework and forecast-based financing mechanism

6.2 Recommendations on a coherent sector-level actionable policy framework:

- **Improving Disaster Risk Management (DRM) Action Planning:** here are silo approaches to DRM planning (preparedness, contingency, response, recovery) planning and interventions at the federal level, member state level, and District level, and primarily being undertaken by the CSOs, UN agencies, and government level. Therefore, some degree of overarching intervention process and some hard-to-reach areas remain unattended. To overcome the silo approach of DRM planning and interventions, NMHEWC needs to deploy an online database connected with apps for tracking interventions and identifying people in need (PiN)..
- **Organizing District (City, Municipality) and community-level Civil Protection Committees (CPC) /Disaster Management Committees (DMC) and improving ICT tools based on the task management system. A structured** CPC needs support from the District administration, City and municipality local government, local INGOs, implementing partners, local NGOs, sector extension department, charity, Mosque Imam-led committee, community volunteers, youth clubs, etc. SoDMA-led NMHEWC needs to develop an online database and apps for governing each committee and performing all standing orders during disaster emergencies.
- Facilitate the implementation of the Somalia Recovery and Resilience Framework (RRF) action plans through the interoperable NMHEWS and by partnering with all stakeholders to support them in developing hazard-informed planning tools, thereby facilitating collective efforts to support RRF actions. Coordinating the local NGOs/CSOs, Local development committees, Local Community, sector extensions department, local stakeholders, entrepreneurs, and promoters to be part of the DRM and DRR process. Developing hazard risk-informed planning tools to support each city, municipality, and district-level government in developing DRM/DRR Planning. Supporting the local market value chain for their value chain level DRM/DRR planning
- Supporting climate-vulnerable sector stakeholders (e.g., crop agriculture, livestock, WASH, health, and fisheries) at the local level for hazard information scheme planning..

6.3 Improving Forecast-based Anticipatory Action Planning Capacity:

One of the key activities of Interoperability NMHEWS and Systemic structure function is to coordinate federal and state actors in forecast-based anticipatory action planning over an online platform.

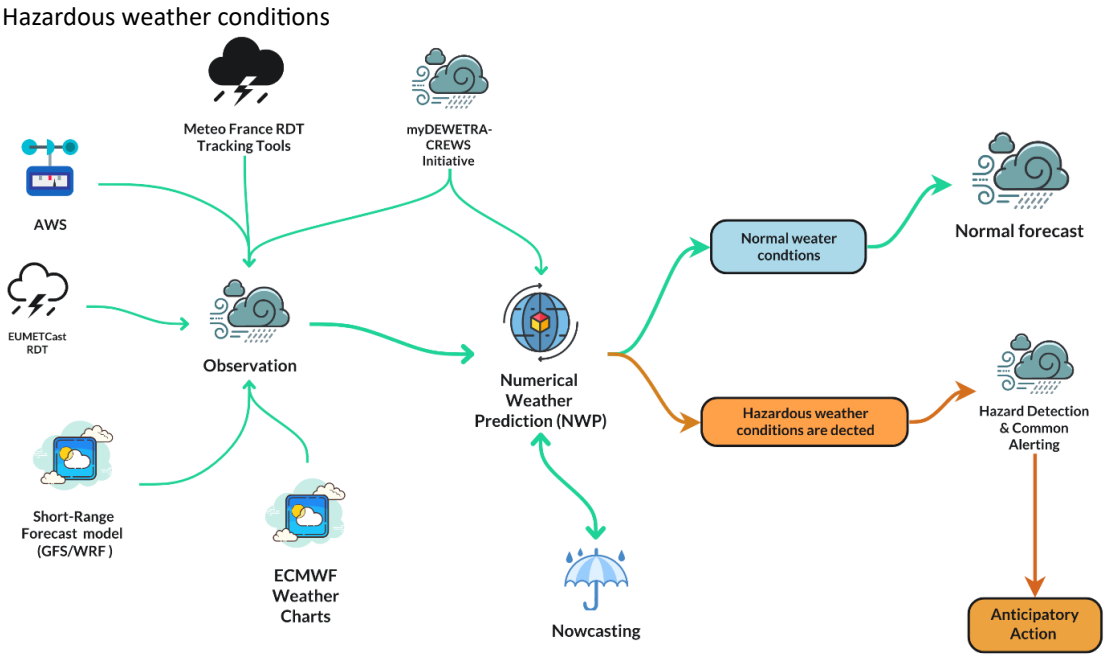


Figure 28 : Forecast-based Anticipatory Action Planning framework (Source : Z M Sajjadul Islam)

6.4 Implementation functional Civil Protection Committee(CPC)/Disaster management Committee(DMC) :

Somalia needs a Civil Protection Committee (CPC) (Annexure 1) to support risk assessment, enhance community risk awareness and risk perception, and facilitate end-to-end and community-based early warning systems. The CPC/DMC should be the key informant, and the committee should be connected to ICT tools and mobile apps for sending community-level L&D information, reporting on event situations that involve multiple hazards and turn into disaster events, and communicating community humanitarian needs and priorities, among other relevant information..

Currently, SoDMA and other sector departments conduct post-disaster L&D assessments with support from the Mosque Imam during Friday prayers, for enhancing multi-hazard risk knowledge. Every CPC stakeholder can play a significant role in local-level disaster risk management.

1) Send event situation update
2) Send local L&D updates
3) Local Disaster preparedness, response, and recovery plan

6.5 Hazard risk-informed Humanitarian actions

Humanitarian actors require time-critical impact forecasts for planning forecast-based, immediate, and anticipatory action, considering the scale, intensity, and scalability of impending multi-hazards that are likely to cause Loss and Damage (L&D) on the ground. ICT-based tools can play a vital role in enhancing risk information management, thereby facilitating humanitarian action. ICT-based georeferenced emergency management is required for conducting emergency preparedness and responses. IT apps based on the 5W (Who, What, Where, When, and How) framework for intervention planning, aiming to avoid overarching planning, duplication of actions, and governing hard-to-reach areas, while uniformly mobilizing humanitarian assistance at the last mile..

6.6 Improving the community-level volunteering network for emergency preparedness and Response mechanism

Recommendations :

- Coordination structure of SoDMA, the Somali Red Cross Society (SRCS), and INGOs to establish a local community-level volunteering network for emergency preparedness and response mechanisms.
- Capacity Building for Improving Volunteer Service Delivery.
- Mandate CSOs to work with the 5W matrix for effective disaster preparedness and response service deliveries, develop DRM strategies, and link NS response operations with recovery and community resilience work
- Establish a local community-level volunteering network for emergency preparedness and response mechanisms.
- Capacity Building for Improving Volunteer Service Delivery.
- Improve community capacity to DRR, CCA, NbS, NBA, LLA
- Develop a stakeholder coordination strategy to avoid overlapping local-level DRR, CCA, NbS, and climate resilience-building initiatives.
- Develop DRR, CCA, and NbS coordination structure for local level(District, Village, Community) coordination in interventions.
- Enhance stakeholder capacity in risk-informed and evidence-based DRR, CCA, and NbS interventions at the community level.
- Enhance local-level humanitarian and DRR interventions by INGOs, NGOs, CSOs, and local governments.
- Enhance community capacity in DRR, CCA, and NbS
- Enhance local government /SoDMA engagement in Humanitarian Response Planning and the intervention process.

Hazardous weather forecast bulletin

- Civil Protection Committee at the local level
- Civil Protection Committee action for the local level preparedness

6.7 Improving Last-Mile Disaster Preparedness Capacity

The last-mile preparedness depends on the precision level forecast being disseminated through real-time channels (Radio/TV) , the requirements of forecast-based localized anticipatory action planning, mobilization of CPC teams, household-level evacuations to safe ground/shelter.

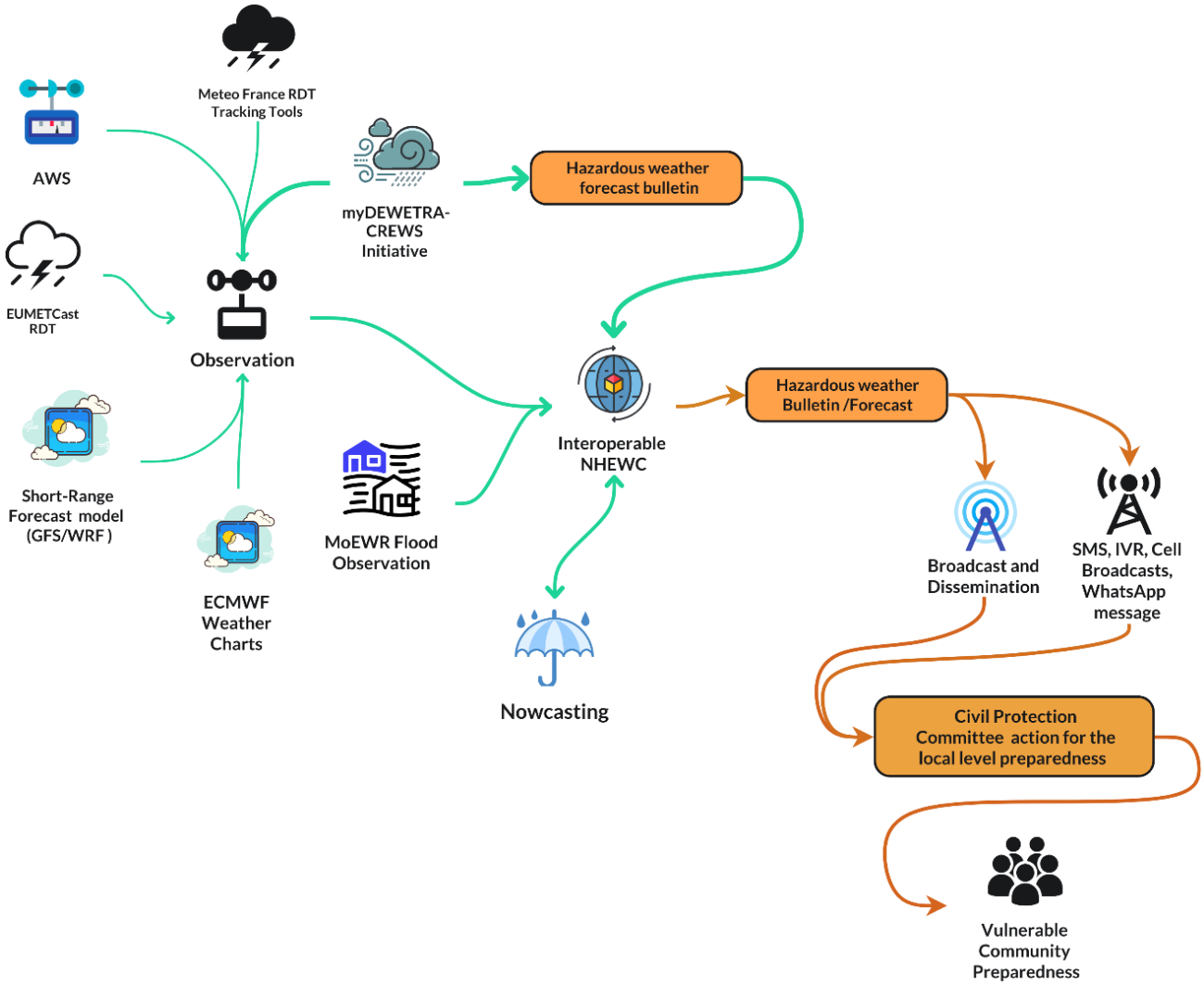


Figure 29 : Proposed Last-Mile Disaster Preparedness process (Source : Z M Sajjadul Islam)

The following are the simple steps forward in the Somalian context to enhance local level preparedness in the event of rapid & sudden onset of hazardous weather conditions that are impending.

Precision Level Forecasts	**Forecast Dissemination**	**Local Preparedness Support**	**Community Evacuation**
Flood, Tropical Cyclone, Localized RDT & heavy rainfall Forecast and Early Warning	• Local Broadcasters to broadcast special weather bulletins/Weather warnings • SMS Service • IVR, Cell Broadcasts (Toll-free) • WhatsApp Messages	•Anticipatory Action advisory based on localized vulnerability context (landscape topographical and elements specific). •SoDMA, Local administration, CSOs local sector extension department need to issue standing orders with engagement of CPC and the community themselves with 5 W workstream modality (Who will be doing what, when, where and how)	•Based on localized vulnerability context (landscape topographical and elements specific), determine the most vulnerable households to be evacuated

Recommendations :

- A joint capacity-building program needs to be conducted by the CSO consortium, UN Clusters, HCT actors, UN Agency, INGO-led implementing partners (IP), and SoDMA for the participants of CPC/DMC of City, Municipality, urban center, Town, Village, and community-level committees on topics such as evacuation drills, first aid, etc.
- Develop CPC/DMC level Preparedness Plan (with 5 W responsibilities, who will do what, where, when, and how)
- Establish an emergency shelter group/committee.
- Capacity development of CPC/DMC in forecast-based emergency preparedness and response, and conducting multi-stakeholder-led humanitarian action at the community and household level, improving Institutional Capacity in Developing Forecast-based Early Action Protocol (EAP) Development.
- Mandating local broadcasters and news outlets to enhance community risk knowledge on Flash drought, hydrological, meteorological, Fluvial flood, flash flood, transboundary catchment overflow flooding, landslide, cyclones, convective heavy rainfall, tornadoes, thunderstorms, diseases/outbreaks, Earthquake-induced coastal Tsunami, etc.)

6.8 Improving Community-based Early Warning Capacity

The community-based Early Warning is an end-to-end early warning system facilitated by the locally mechanized EWS system. It involves local broadcasters, CPC/DMC, local government administration and sector departments, local CSOs, local humanitarian action groups, the Somalia Red Cross Society, and others. The process can be triggered when hazardous weather is detected and forecasted at a precision level, with a corresponding spatiotemporal scale, identifying high-impact areas. Instantly, the local broadcasters, CPC, continue to broadcast special weather bulletins based on any changing conditions, and severe weather warnings/alerts are being circulated from the NMHEWC. While hazards have already interacted with the ground, broadcasters need to organize live shows, live broadcasts, and interactive discussions with CPC/DRMC and community/households, providing event situation updates, assessments of primary L&D, and humanitarian needs and priorities, among other information, and report back to NMHEWC.

The figure below shows the structure & process.

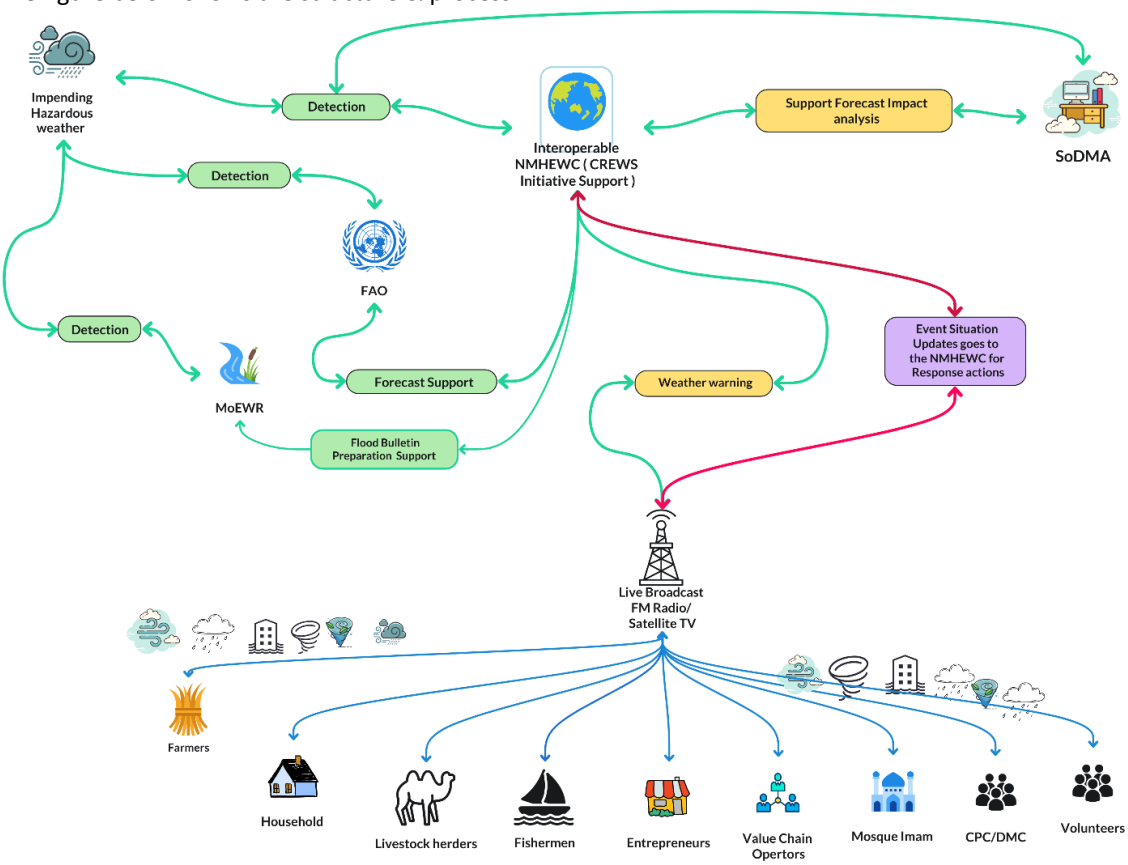


Figure 30 : Structure & process for improving Community-based Early Warning Capacity

Recommendations :

- Capacity-building program needs to be conducted by the CSO consortium, UN Clusters, HCT actors, UN Agency, INGO-led implementing partners (IP), and SoDMA for the participants of National and Local Broadcasters, News agency, CPC/DMC of City, Municipality, urban center, Town, Village, and community-level committees on topics such as evacuation drills, first aid, etc.
- Mandating local broadcasters and news outlets to enhance community risk knowledge on Flash drought, hydrological, meteorological, Fluvial flood, flash flood, transboundary catchment overflow flooding, landslide, cyclones, convective heavy rainfall, tornadoes, thunderstorms, diseases/outbreaks, Earthquake-induced coastal Tsunami, etc.).

6.9 How to develop Anticipatory Action (AA) Framework

Step 1: Complete risk Baseline risk and vulnerability analysis.

- Develop a detailed repository of elements, sectors, livelihoods, livestock herding area-wise risk, vulnerability, exposure, and sensitivity risk ranking.
- Identify the major hazards with ranking in terms of L&D, tools, frequency, intensity, and magnitude.
- Detailed atlas (State, Region, District) with indicators and Selection of recurrent hazards (Flash flood, drought, sand-dust storm, cyclone, heatwave etc.). Risk, vulnerability, exposure, sensitivity Analysis of the priority sectors (livestock and crop agriculture, water, land & soil). Detailed atlas preparation(Physical, geographical, socioeconomic, and, copping capacity) :
- Develop Standard Operating Procedures (Sop) for local governments regarding humanitarian and climate risk management.
- Develop Standing orders on disaster (SoD), actors/stakeholders for managing disaster emergencies at the local level.
- Review Risk-informed LDP & budgeting of local governments, ongoing interventions.
- Review the Value chain operations of the service sectors

Step 2: Review impact forecasts / different-term operational Forecasts (IBF)

Review the IBF and analyze the risk of impending hazards, where they are likely to occur, and how many elements are likely to impact with a lead time of 12 or 24 hours. Estimate the impacts of elements falling under the severity thresholds, calculate risk with an impending nature, and persistent risk and vulnerabilities.

Step 3: Define impact level by the impending extreme weather events induced hazard(s)

- From the above menu summarize the Risk ranking of the elements and define the intervention type
- Duration of support required.

Step 3 : Analyze the IBF anticipatory advisory on loss and damage.

This is the teamwork of the IBF sector represented by the technical working group(TWG)accessing the MHEWS over the geospatial platform and analysis of forecast impacts. However, this is the primary input for the EAP to have a precision level IBF and an anticipatory L&D scenario..

The hypothesis of impact estimation;

Impact estimation = Overlay Impact forecast color-coded threshold of impending extreme weather events over the geographical areas + calculate Baseline physical elements (CRVA elements) and their Risk & Vulnerability Ranks + Calculate socioeconomic Risk & Vulnerability and Ranks – coping capacity = estimated risk and vulnerability elements, geographical areas, and severity

Step 4: Develop an anticipatory L & D scenario :

a) Based on the hypotheses, calculate a checklist of impact levels and severity index for the elements likely to be impacted and damaged. A detailed checklist of how many elements is at very high, high, moderate & low risks, vulnerable, exposed, sensitive to hazards, etc.
b) Based on the software, an Excel sheet calculates the detailed L&D scenarios.
c) Calculating financial and physical loss and damage, as well as the size of investment, is required for preparedness and withstanding capacity, reducing risk, vulnerability, exposure, and sensitivity..

Table : elements impact analysis.

Elements	Extremely high risk (Magenta alerted areas) (% or number)	Very High risk (Red alerted areas) (% or number)	Medium Risk (Orange alerted areas) (% or number)	Low Risk (yellow alerted areas) (% or number)	Exposed	Vulnerable	L & D area likely (% or number)	Death tolls are likely (% or number)

Step 5: Develop a Contingency Plan

- Formulation of SOP with 5W activities
- Required resources for saving lives and properties.
- Detailing people in need (PIN) and priorities intervention for the high-risk ranking elements
- Rapid Funding mechanisms and probable sources to meet ,e.g., internal (local governments, central government) and external.
- Risk-based intervention allocation etc.

Step 6: Select early actions

Based on the category, type, impeding nature(Raid onset, medium onset, slow onset), intensity, magnitude, scalability, and duration to dissipate, the EAP team needs to develop early action plans for the whole cycle of risk management. Prepare risk category-wise investment menu, types of intervention (cash, in-kind, logistic, relief, etc) to be required for, executing group/stakeholders/partners of 5W action plan modality, etc.

Step 7: Define the intervention process

- Define intervention based on the threshold and impact intensity of the impending extreme weather events. Following the 5W process for involving the actors.
- Define activities, budgets, and probable funding sources.
- Develop an M&E plan while the intervention is triggered to capture the progress to date.

Step 8: Event situation reporting.

Defining the event situation reporting process and guidelines for utilizing IBF crowdsource networking and risk communication tools for updating situations with pictures, videos, contextual reporting, etc., so that IBF and forecast-based anticipatory action (AA) partners can get the updates through an online integrated IBF and forecast-based anticipatory action (AA) platform. .

Step 9: EAP approval and designation for risk finances

The entire IBF and FBF process is intended to be implemented through online integrated web portals and geospatial platforms to facilitate the automated process. The forecast-based anticipatory action (AA) process leaders, co-leaders, key stakeholders, and local governments to jointly organize a consultation process online for reviewing, commenting, and finalization of the EAP and inclusive risk finance readily available to mobilize and additional finances required to implement to emergency humanitarian program for getting font-line better prepared for the impending hazards..

Step 10: Define activities on how to conduct constant Monitoring forecasts and conduct humanitarian actions accordingly

The functional humanitarian focal agencies (INGOs, UN Clusters, SRCS, HCT, CSOs) are to be guided by the EAP and conduct humanitarian action accordingly. After EAP is approved and all agreements are in place, ensure that the relevant stakeholders are ready to activate, preposition the relief items for distribution, carry out necessary training, and confirm that financial and logistical arrangements are in place, as well as that roles and responsibilities are well understood by the engaged actors.

Define the monitoring and evaluation process for the forecast updates (IBF and operational IBF, warning, watch, alerts), which will be functioned by the IBF and the forecast-based anticipatory action (AA) platform.

6.10 Improve disaster risk financing system:

Building consensus among the federal government and member state government sector ministries for reforming the national annual fiscal budgetary allocation mechanism for funding disaster risk management actions at the local level. Federal government regional member states' deed to increase local revenue mobilization and increase budgetary allocation to implement disaster risk management activities. The government agencies at the national and state levels have inadequate technical capacity due to poor local risk governance mechanisms in place.

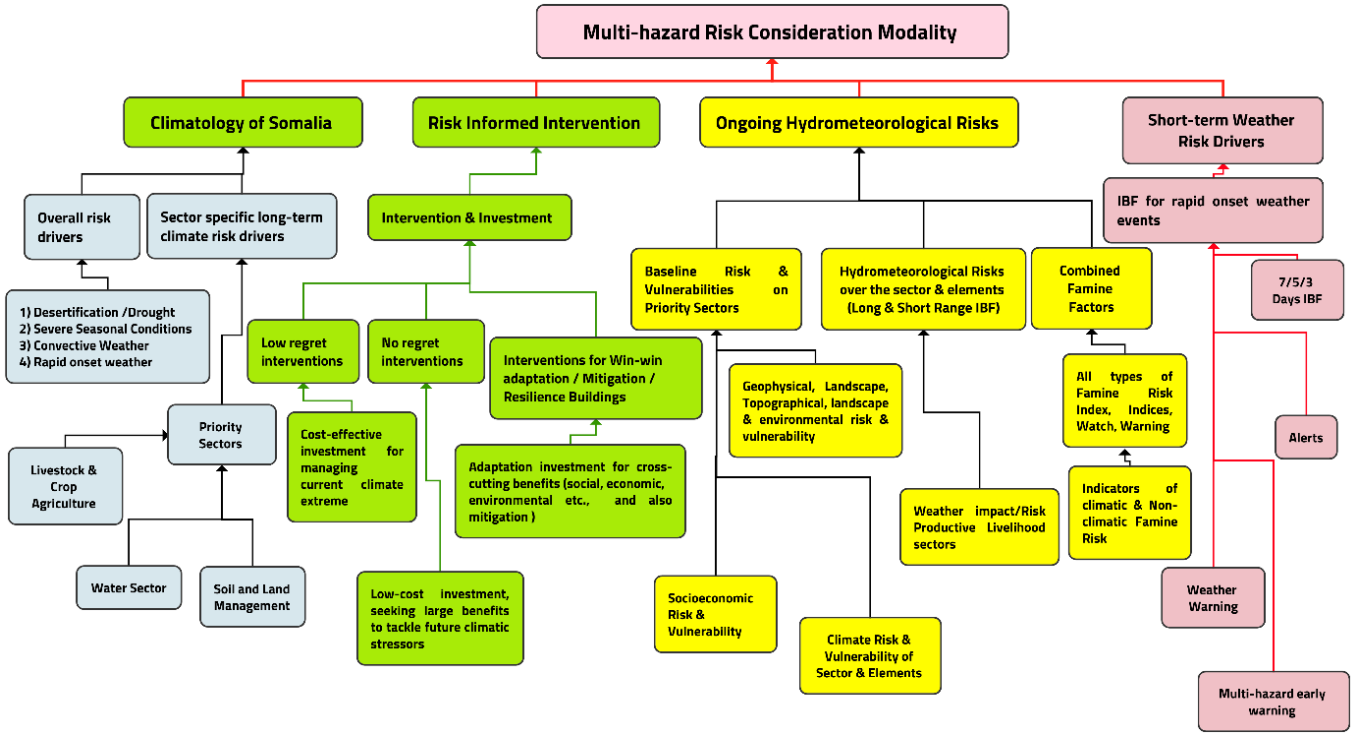


Figure 31: Proposed Disaster Risk Financing Framework (Source : Z M Sajjadul Islam)

6.11 Supporting the implementation of risk-informed DRM and DRR

- Capacity building for improving SoDMA and Local government-led stakeholders working in DRM, DRR, and CCA intervention.
- Develop a Forecast-based Risk Financing framework (Forecast-based anticipatory action) for supporting Forecast-based parametric risk insurance facility and early contingency preparations for the humanitarian action.
- Risk Informed Intervention: Somalia has a national disaster risk management policy (2020) and a Recovery and Resilience Framework (RRF), but still does not have a stakeholders' mandate actionable plan to translate policy into actions for effective DRM at the local level. Lack of standard operating procedures (SoP) , Lack of national budget allocated for funding disaster risk management actions, Inadequate hazard risk-informed DRM plans, Inadequate integration and coordination, the Local community empowerment is limited, and Lack of clear roles and responsibilities of state actors and SoDMA as well.
- Develop a Risk Transfer mechanism and a forecast-based anticipatory action (AA) framework and action plan, and supporting risk-informed tools for harmonizing the following fund-based interventions of the Adaptation Fund, the African Development Bank, the EU Fund, the European Bank for Reconstruction and Development, the Global Environment Facility(GEF), the Green Climate Fund (GCF), and INGO-led development interventions

6.12 Improve DRM Planning at the local level :

- Develop a Cyclone Preparedness Plan (CPP) to raise awareness at every coastal district and community level about the impending cyclones and storms that are being forecasted.
- Develop a Flood/flash flood/landslide/heavy rainfall Preparedness Plan to raise awareness among vulnerable communities about impending floods, heavy rainfall, and flash floods that are forecasted.

Recommendations:

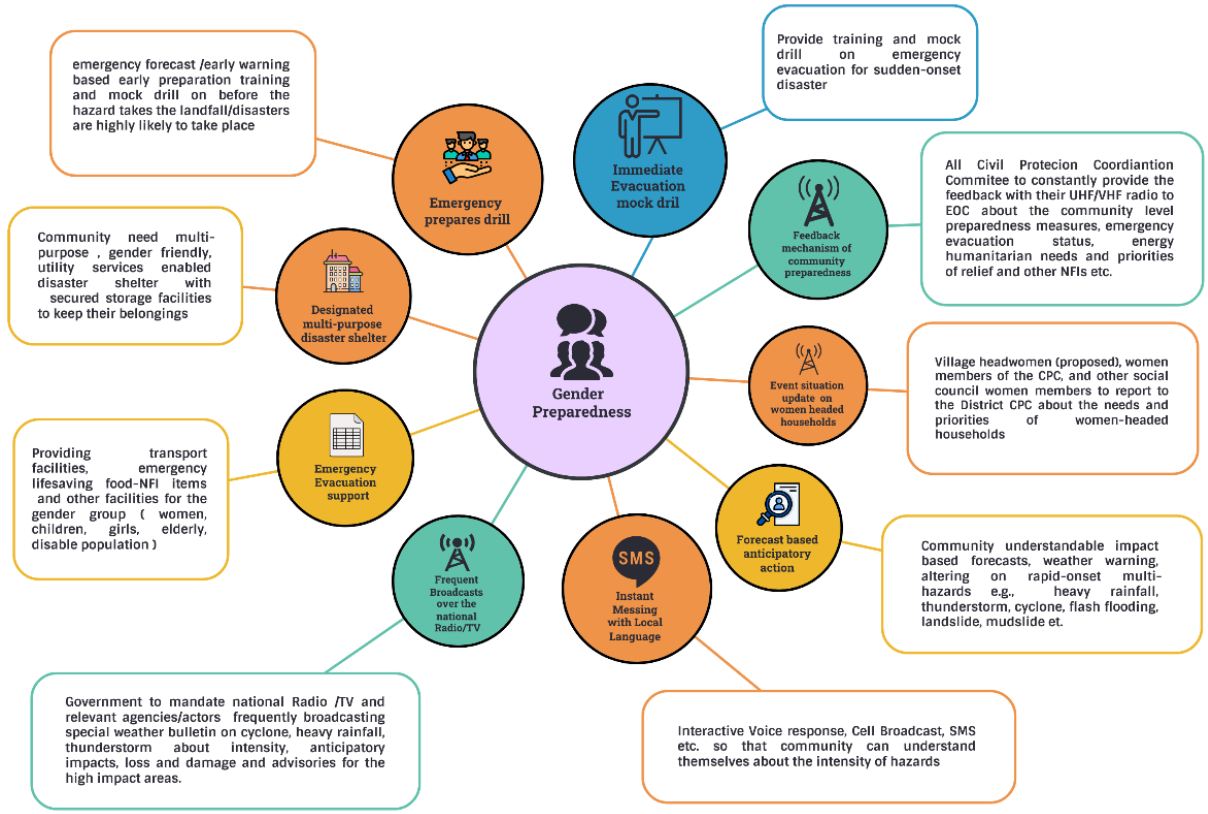
Improving Multi-hazard/Disaster Crisis Response Capacity – Undertake capacity building in Disaster emergency preparedness, response, and recovery planning. Initiate Institutional and stakeholder capacity building progarmme in Improving Institutional Capacity in Developing Forecast-based Early Action Protocol (EAP) Development, Improving stakeholder capacity in undertaking forecast-based anticipatory action (AA) planning and implementation capacity (Flash drought, hydrological, meteorological, Fluvial flood, flash flood, transboundary catchment overflow flooding, landslide, cyclone, convective heavy rainfall, tornadoes, thunderstorm, diseases/outbreaks, Earthquake-induced coastal Tsunami, etc.)

6.13 Gender responsive DRR framework :

- Village-level headwomen (proposed), women members of the CPC, and other social council women members to report to the District CPC about the needs and priorities of women-headed households
- The Gender in Humanitarian Action (GiHA) : Development of forecast-based GiHA protocol for women/single mothers and girls-headed households.
- Gender action plan in every sector department/cluster (government sector department, every sphere of local government
- Develop national risk financing framework (gender-focused) : The Ministry of Finance and Economic Affairs needs to develop a National risk financing framework and DRR budgetary allocation in every fiscal year's budget (with gender-based allocations
- Mandating Local authorities' planning and budgets: Local authorities' budgets are separate from the central Government budget; these are composed of local revenue
- Develop a forecast-based early action protocol, anticipatory loss and damage (L&D), and impacts level, and instantly broadcasts the messages so that every women-headed household is adequately warned /alerted.

National media outlets need to play a pivotal role (in the local language) by broadcasting a distance learning education program (radio/TV) for awareness

- Develop early warning-based anticipatory early actions advisories/bulletins for the women-headed households about what they need to do in the given early warnings and impending hazard conditions, so that they get well alerted and well prepared.
- Develop national risk financing framework (gender-focused) : The Ministry of Finance and Economic Affairs needs to develop a National risk financing framework and DRR budgetary allocation in every fiscal year's budget (with gender-based allocations)



(Source : Z M Sajjadul Islam)

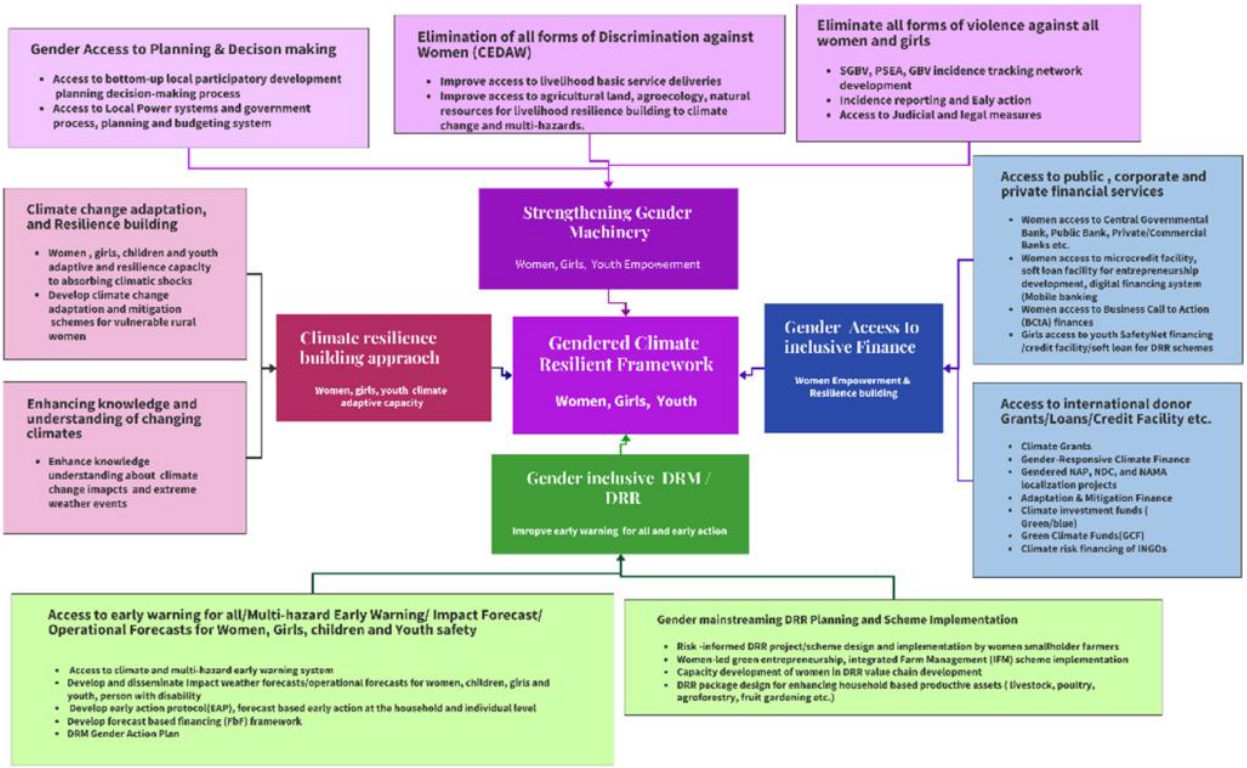


Figure 32: Gender responsive DRR framework (Source : Z M Sajjadul Islam)

a) **Inadequate city and municipality-level planning and budget allocations for implementing community-level DRM/DRR schemes. Urban councils** do not have a budget for financing DRM/DRR schemes for poor households

- Strengthen National DRM Framework
- Institutional Strengthening and Capacity Development
- Improving Cyclone and Flood Forecasting and Early Warning:
- Improved Methodology, ICT tools, and stakeholder coordination for Development SADD :
- Improving UN, Government, and multi-stakeholder coordination mechanisms in DRM and DRR Functionaries
- Community-level risk-informed gender development approach
- SGBV tracking network and dissemination system (Proposed)
- Improving stakeholders' capacity on post-disaster damage, loss, and needs assessment (PDNA), Joint needs assessment (JNA), Rapid Needs Assessments (RNA), etc., so that gendered impacts are being clearly screened and assessed
- Developing Gender in Humanitarian Action (GiHA) Roadmap and Planning
- Development of multi-stakeholder/agency-coordinated Gender in Humanitarian Action(GiHA) process
- Systematically maintain /update Disaster Risk Management Information System (DRMIS) at the country's central provincial, district, and TA/Administrative Post, Village level.

7.0 Way forward

Considering the looming threat of hydrometeorological risk and vulnerabilities in the Horn of Africa, the proposed Somalian EW4ALL full-scale implementation depends on strong institutional capacity and collaboration in weather & climate observation and precision-level hydrometeorological forecasting, an integrated early warning and alerting

system, ICT tools-driven risk management capacity, a partnership mechanism, and end-to-end risk communication and warning dissemination. Unfortunately, the Somalian fragmented central and member state-led paradoxical governance context, lack of a decentralized risk governance management system, and siloed approach to CSO DRM risk interventions pose a daunting challenge in accessing EW4ALL services.

Therefore, an ICT-driven climate and multi-hazard risk governance system can essentially bind all relevant stakeholders digitally /remotely, mandating them with ICT-driven strategic partnership and coordination, avoiding the looming governance fragility, and transforming them into ICT-enabled stakeholder-partnered, inclusive multi-hazard early warning systems and risk-informed local development will be leveraged to distantly connect the platform to the virtually centralized and decentralized functioned digital multi-hazard risk governance system.

However, overcoming the EW4ALL implantation challenges proposed ICT-driven DRM risk management system can unlock all fragmented governance paradoxes to create a digitally functioning and level playing platform with interconnectedness functional partnerships that hold all stakeholders, sectoral actors, local government entities, CSOs, and frontline communities accountable to the affected population (digitally) out of the box, and getting rid of already suffering from FCV paradigms of governance.

----------End ----------

[Send your comments to zmsajjad@yahoo.com WhatsApp: +88 01711 979179]

Annexure 1 : Civil Protection Committee(CPC) / Disaster Management Committee (DMC)

a) Municipality Civil Protection Committee(CPC) / Disaster Management Committee (DMC)

SL	Committee member	During normal time	Roles /responsibilities during a disaster emergency	Responsibilities for risk assessment	Responsibilities for L &D reporting
1)	Local administration				
2)	Local Government representatives				
3)	Municipal Governor/chairman				
4)	Sector departments at the urban level				
5)	Clan Leader				
6)	NGO Consortium Representative				
7)	Imam of the Mosque				
8)	Traditional Elder/Leader				
9)	Somalia Red Cross agency				
10)	NGOs/CSO				
11)	University/Academia				
12)	Technical educational institutes				
13)	Informal Governing Institutions and Authorities				
14)	Private Sector				
15)	Religious elder				
16)	Religious Leader				
17)	University Student as a representative				
18)	Women representative				
19)	Urban Community leader				
20)	Urban Women-led organization				
21)	CSO representative				
22)	Health worker				
23)	Commercial herders				
24)	Commercial smallholder farmers				
25)	Veterinary technician				
26)	Medical Representative				
27)	Cold storage operator				
28)	Market Player				
29)	Local Poultry dealers/farmers				
30)	Local Livestock Dealer				
31)	Vegetables gardener				
32)	Local traders				
33)	Mobile wallet operators /Agent				
34)	Food Processing entrepreneurs				
35)	boreholes committee				
36)	Urban Utility service Operator				
37)	WASH Service Providers				
38)	Urban Broadcasters				
39)	Urban News Agency				
40)	Urban Youth Group				
41)	Urban Transport and Logistics Operators				
42)	Port Authority				

SL	Committee member	During normal time	Roles /responsibilities during a disaster emergency	Responsibilities for risk assessment	Responsibilities for L &D reporting
43)	Fishermen Committee				

a) Village level Civil Protection (CPC)

SL	Committee member	During normal time	Roles /responsibilities during a disaster emergency	Responsibilities for risk assessment	Responsibilities for L &D reporting
1)	Traditional Elder/Leader				
2)	Clan Leader				
3)	Traditional Elder/Leader				
4)	Imam of the Mosque				
5)	Religious elder				
6)	Religious Leader				
7)	Agropastoralist				
8)	Pastoralists				
9)	Community leader				
10)	Village chief				
11)	Agropastoralist				
12)	Pastoralists				
13)	University Student representative				
14)	High School Youth representative				
15)	Secondary School Youth representative				
16)	Women representative				
17)	Community leader				
18)	CSO representative				
19)	Somalia Red Cross agency				
20)	Imam of the Mosque				
21)	Pastoralists				
22)	University Student representative				
23)	High School Youth representative				
24)	Secondary School Youth representative				
25)	Women representative				
26)	Representation of Women-Led Organization				
27)	Community leader				
28)	CSO representative				
29)	Somalia Red Cross agency				
30)	Women representative				
31)	Livestock herder				
32)	Farmers				
33)	Health worker				
34)	Family Planning technician				
35)	Veterinary technician				
36)	Medical Representative				
37)	Cold storage operator				
38)	Local fertilizer dealers				
39)	Local Poultry dealer/farmers				
40)	Local Livestock dealer				
41)	Fruit gender				
42)	Vegetables garden				
43)	Local traders				
44)	NGO worker				
45)	Village police				
46)	Private Sector service providers				

SL	Committee member	During normal time	Roles /responsibilities during a disaster emergency	Responsibilities for risk assessment	Responsibilities for L &D reporting
47)	Mobile Money Outlet				
48)	Fishermen				
49)	Redcross volunteers				

Annexure 2: Somali Civil Society Organizations (CSO)

List of civil society organizations participated in the UPR Report:

Mogadishu

1) Federation of Somali Journalists (FESOJ)
2) Marginalized and Minority Groups (MCA)
3) Humanitarian and Development Network / Cluster
4) Persons with Disability Cluster
5) Human Rights Cluster
6) Women and Child Cluster consisting of:
7) Northern Frontier Youth League (NoFYL)
8) WARDI Relief Organization
9) Somali Women and Child Care Association (SWCCA)
10) Women Empowerment Development Organization (WEDO)
11) Somali Young Feminist Network (SYFN)
12) Humanitarian Cluster
13) Ifrah Foundation
14) Somali Health and Development Initiative (SOHDI)
15) Somali Community Concern (SCC)
16) Action for Women and Children Concern (AWCC Somalia)
17) Women Pioneers for Peace and Life (HINNA)
18) HIWA
19) WOCCA
20) Save Somali Women and Children (SSWC)
21) Humanity & Inclusion Sustainable Advocates (HISA)
22) Community Aid Action
23) W (Women Empowerment Platform)
24) Women and Youth Development Association (SOYDA)
25) Witness Somalia
26) Somali Youth Cluster consisting of:
27) Somali Women Center for Equality and Inclusion (SWCEIN)
28) De Martino Hospital
29) Benadir Regional Administration
30) Midnimo Youth Organization
31) HYO Youth Organization
32) Hope Generation
33) National Generation
34) Somali Youth Vision
35) Hiraan Youth Organization
36) Bulay Students Union
37) Students Union
38) Daryeel Bulsho Organization
39) Medical Doctors Organaization

40) Youth life for Somalia
41) Hiran Aid Dev Foundation
42) Somali Youth Action Network
43) Somali Women and Child Development Organization (SWCDO)
44) Ururka Dhalinyarda Daryeel
45) Health Network
46) Sustainable Action Against Disaster
47) Aayotalis for Good Governance

Galmudug

1) Galmudug Civil Society Actors
2) Somalia Community Development Organization
3) Central Regions Disability Organization
4) Radio Gobolada Dhexe
5) Integrated Youth and Relief Development Organization
6) Gurad Legal Aid Association
7) SSWC
8) Towfiiq Umbrella Organization
9) IIDA

HirShabelle

1) HirShabelle Human Rights Center (SHRC)
2) Hiiran Women Empowerment Organization (HWEO)
3) Center for Protection, Relief & Development (CPRD)
4) Hiran Youth Organization (H.Y.O)
5) Middle Shabelle Youth Volunteers Corps (MISYVC)
6) Middle Shabelle Women Union Organization
7) Hiran Journalists Club (HJC)
8) Relief, Resilience and Protection (RRP)
9) Centre for Development & Child Rights
10) Somali Disability for Advocacy and Protection Network (SDAPN)
11) Somali Minority Groups Empowerment Network (SMGEN)
12) Ururka Haweenka Farlibaax (UHF) / Farlibaax Women's Organization (FWO)
13) Middle Shabelle Journalists Association / Ururka Suxufiyiinta Shabellehe Dhexe
14) Ururka Haweenka Gobalka Hiiraan / Hiiraan Woman's Association
15) Hiil Bulsho Inclusive Community Project (ICP)

Puntland

1) Puntland Non-State Actors
2) Office of Human Rights Defenders
3) Puntland Relief Aid and Development Organization
4) Gardafue Association Youth Action Network
5) Karado Network
6) Alnasar Women Network
7) Puntland Nabadoon's Association
8) MAP
9) Disability Centre
10) Minority Group NGO
11) Puntland Women Lawyers Association

South West State

1) Somali South West Non-State Actors
2) South West Human Rights Defender Network
3) Allamagan Relief & Rehabilitation for Disabled People Organization
4) Somali Children Welfare and Right Watch
5) South West Somali Journalist Association
6) Minoirty Groups
7) Kanava Youth Development Center
8) South Somali Youth Organization
9) ISHA Human Rights Organization
10) Southern Somali Intellectuals Council
11) Somali Community Action Group
12) BTSC Committee
13) Danwadaag Community Group
14) Irman Human Rights Organization
15) Bay Safe & Development Organization
16) Center for Education Research Peace & Development
17) Baidoa Women Development Organization
18) Bay Women Development Network
19) Bay Youth Council
20) Iftin Organization
21) Iniskoy Peace and Development Organization
22) Samakab Youth Development Organization
23) Somali Hope Line for Civil Society Organization
24) Ma'ani Vocational Training Center
25) Action for Peace & Development Organization
26) Somali Human Rights Association
27) Rural African Women Development
28) Khalif Huudow Human Rights Organization
29) Waleweyn Human Rights
30) Somali Sport Youth Development Organization
31) Ayub NGO

Jubaland

1) Jubaland Bar Association (JBA)
2) Somali Women Solidarity Organization (SWSO)
3) Return Elite Forum (Youth Group)
4) Juba Aid, Peace and Development Organization (JAPDO)
5) Northern Frontier Youth League (NFYL)
6) Somali Community Concern (SCC)
7) Jubaland Non-State Actors Association (JUNSAA)
8) Motherland Somalia
9) Wamo Relief and Rehabilitation Services (WRRS)
10) Jubaland Journalist's Association (JJA)
11) Wajir South Development Association (WASDA)
12) Somali Girls Umbrella for Development (SOGUD)
13) WAWDA