Methodology, Tools, and Guidelines on Forecast-Based Financing (FBF) for Mongolia

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Acronym

ALAGaC/	Administration of Land Affairs, Geodesy, and Cartography
ALAMGaC	Agency for Land Administration and Management, Geodesy, and Cartography
AWS	Automatic Weather Station
5W	Who will do what, where, when, and how
BTS	Base transceiver station
CRVA	climate risk and vulnerability assessment
CSV Excel file	comma-separated values
CAP	Common Alerting Protocol
CBO/CSO	Community-based organizations / Community services organizations
IBFWS	Impact-based Forecast and Warning Services
CRVA	Climate Risk and Vulnerability Assessment
DIMA	National Rangeland Monitoring Database
EM-DAT	Emergency Events Database
DCPC	Data Collection and Processing Center
DTM/DEM	Digital Terrain Models (DTM)/ Digital Elevation Models (DEM)
EAP	early action protocol
EOC	Emergency Operations Center
FAO	Food and Agriculture Organization
AM/FM Radio	Amplitude Modulation/Frequency Modulation
FBF	forecast based Financing
FGD	Focus Group Discussion
GIS	Geographic Information System
GPS	Global Positioning System
HCT	Humanitarian Country Team
HPC	high processing po computing
IBF	impact-based forecasting
ICS	Incidence Command System
ICT	Information and Communication Technology
IFRC	International Federation of Red Cross and Red
IM	Information Management
IP	Internet Protocol
I-NGOs	International /National Non-Governmental Organization
IRIMHE	Information and Research Institute of Meteorology, Hydrology, and Environment
IVR	Interactive Voice Response
KII	Key Informant Interviews
KML/KMZ	Keyhole Markup Language
LEMA	Local Emergency Management Agency
L & D	Loss and Damage
MET	Ministry of Environment and Tourism
MIS	Management Information System
MHEWS	multi-hazard early warning system
MODIS	Moderate Resolution Imaging Spectroradiometer
MoED	Ministry of Economy and Development
MOU	Memorandum of understanding
MoFALI	Ministry of Food, Agriculture, and Light Industry
MRCS	Mongolian Red Cross Society

NAMEM	National Agency Meteorology and the Environmental Monitoring
NEC	National Emergency Commission
NEMA	National Emergency Management Agency
NMHS	National Meteorological and Hydrological Services
NOAA	National Oceanic and Atmospheric Administration
ODBC/JDBC	Open Database Connectivity/ Java Database Connectivity
PDNA	post-disaster damage, loss and needs assessment
NSO	National statistics office
PIU	Project Implementation Unit
PSTN	Public switched telephone network
RIMES	Regional Integrated Early Warning System for Africa and Asia
R & D	Research & Development
SMS	Short Message/Messaging Service
SEC	State Emergency Commission
SME	Small and Medium Enterprise
SoD	standing orders on disaster
SOP	Standard Operating Procedures
TWG	Technical Working Group
WCS	Web Coverage Services
WMS	Web Map Service
WFS	Web Feature Service
WPS	Web programming service
UHF	Ultra-high frequency
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
VHF	Very high frequency
WFP	UN World Food Program
WMO	World Meteorological Organization

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1.0 Introduction: FBF

Forecast-based Financing (FBF) is a risk-financing mechanism that uses credible forecasts and early warnings to anticipate weather- and climate-related emergencies that may affect high-value elements and generate Loss and Damage (L&D). It enables pre-agreed, early actions to be implemented in advance to reduce impacts and minimize L&D. FBF relies on precision forecasting, effective early warning, and clearly defined Early Action Protocols (EAPs).

In Mongolia's context, the FBF trigger should be automated through an integrated system that combines weather warning, alerting, multi-hazard early warning, and Impact-Based Forecasting (IBF) within the meteorological agency. Because extreme events evolve through lead times spanning hours to weeks and often produce cascading effects the integrated IBF-FBF design requires an ICT-enabled architecture: geospatial tools, a database of ground-level exposed elements, automated impact calculations for medium-to-high value assets, and categorization of elements likely to be affected. This architecture should support rapid spatiotemporal estimation of anticipatory L&D aligned to forecast thresholds and issued warnings.

An IBF-integrated FBF system should also operationalize the national disaster management organization (NDMO) to activate EAPs and forecast-based humanitarian early action, enabling the timely mobilization of disaster risk financing, such as CERF, UN-track funds, national emergency response funds, and other response financing windows to reduce L&D during climate crises. Under normal conditions, the same framework can support risk-informed financing decisions for slow-onset hazards by enabling both ex-ante and ex-post financing strategies for climate risk reduction.

Overall, multi-modal risk financing and fiscal mobilization for FBF, disaster emergency preparedness, contingency mobilization, response, and climate crisis management require evidence-based, decision-support tools that quantify needs before crises occur. Without such tools, response is delayed by bureaucratic processes that constrain the rapid delivery of life-saving humanitarian assistance.
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1.1 Rationale: Forecast-based financing (FBF) facility

Risk-informed local development planning and finance decision-making in normal circumstances entails a concerted effort, which involves the inclusive participation of all relevant stakeholders (including governments and duty-bearers, stakeholders, donors, I-NGOs, sector departments, financial institutions, insurers, credit operators, vulnerable communities, etc.) and a shared consensus. The rollout of climate and disaster risk financing instruments is urgently needed to enable governments and the humanitarian sector to strengthen Safety Nets for the most vulnerable and provide more timely financing and assistance. Compounding hydrometeorological hazards, geological hazards induced by extreme weather events, financial crises, and pandemics, are increasingly challenging governments' abilities to manage climate risks, limiting their ability to effectively respond to climate extremes for boosting the local economy.

Due to global climate perturbation, extreme weather events are impending as the fastest onset with higher intensities & frequencies, and significantly causing loss and damage to the climate frontlines. Improved access to weather information services is now highly demanded by the climate frontlines. Robust observation mechanisms, precision level numerical weather predictions, weather warnings, and multi-hazard early warning systems are indispensable tools for making informed decisions effective at the critical juncture of humanitarian preparedness and response planning at the advent of hazardous impending weather being forecasted over the shortest lead time to prepare for the frontline community for strengthening the withstanding capacity against the impending triggers/hazards that could potentially turn into a disaster and loss and damage are highly likely.

The robust ICT-enabled FBF mechanism is the output of service delivery, which involves multiple and recurring processes in the background. The FBF process is invoked when national meteorological and hydrological services (NMHS) issue impact forecasts (triggers) through impact-based forecast platforms, such as thresholds of impacts, levels of early warnings, special alerts, and calculated anticipatory loss and damage associated with impending hazardous events.

The FBF mechanism enables the humanitarian program cycle to access humanitarian funding for early action informed by the impact-based forecast (IBF) on impending extreme weather effects, impact levels, risks, vulnerabilities, losses, and damages likely to occur. The goal of FBF is to anticipate disasters, prevent their impact whenever possible, and minimize human suffering and losses.

1.2 Development of a centralized dashboard for the FBF decision-making process.

- **Centralized, decision-ready dashboard:** Establish a centralized, informed dashboard to visualize impending multi-hazards, historical and persistent hazard trends, and hazardous weather events, and to map which high-value elements (cities, townships, settlements, built infrastructure, and basic/key/critical service delivery facilities) are likely to be impacted. The dashboard should also identify the appropriate Early Action Protocols (EAPs) for each extreme event, specify required early action planning to address crises rapidly, and quantify the inclusive risk-financing needs required for early mobilization and preparedness to minimize impact levels and Loss and Damage (L&D).
- **Enable rapid, inclusive early action planning through IBF-FBF integration:** An IBF-integrated FBF approach can support the NDMO to develop quick-turnaround, inclusive, and coordinated early action planning with stakeholders (sector departments, grassroots state and non-state actors, private sector, risk financiers, and climate-frontline communities). This includes sector-specific EAP development, humanitarian response planning, and sectoral climate action planning.
- **Support crisis-specific response planning and resource mobilization:** Provide hazard- and climate crisis-specific tools to enable timely, inclusive response planning, prioritization of actions, and coordinated resource mobilization aligned with forecast triggers and impact estimates.
- **Strengthen ex-ante and ex-post financing decision-making:** Use the IBF/FBF dashboard and informed tools to support ex-ante and ex-post financing mechanisms, including negotiation and coordination ("grand bargaining") with donors, financial institutions, and the private sector, as well as policy propagation, planning, and advocacy to optimize risk-finance mobilization internally and externally.
- **Facilitate donor engagement on targeted needs and optimal use of risk finance:** Provide evidence-based tools to support "grand bargaining" with donors by clarifying niche demands, demonstrating anticipated benefits, and defining optimal allocation and use of risk-financing resources.
- **Enable mixed-mode and co-financing modalities for slow/medium-onset crises:** Support blended and co-financing approaches suitable for slow- and medium-onset climate crises (e.g., drought, prolonged winter risk), ensuring predictable financing across the hazard lifecycle.
- **Optimize climate finance utilization for timely action:** Improve the efficiency, timeliness, and accountability of climate finance disbursement to support early action, response readiness, and implementation of prioritized climate risk reduction measures.

1.3 Objective :

The objective of Forecast-based Financing (FbF) is to enable timely, forecast-triggered allocation of financial resources to support early action informed by weather and climate risk. Key elements of FbF are agreed in advance, including clear forecast thresholds (triggers), pre-arranged and pre-allocated resources, and a defined set of early actions to be implemented once triggers are reached. Roles and responsibilities are formalized through the Early Action Protocol (EAP) and early warning-based early action planning, ensuring accountability, coordination, and full stakeholder commitment to implementation..

1.4 Overview of FBF

Forecast-based Financing (FBF) is proposed as a core mechanism to strengthen Mongolia's disaster emergency management and to comprehensively support humanitarian program cycles. Through an IBF-driven approach, FBF enables scenario-setting in advance, clarifying what consequences are likely from impending hazards before they interact with the ground. Because emergency risk management and critical financing decisions depend on rapid, credible situational overviews, the IBF-integrated FBF dashboard is designed to provide quick-turnaround, evidence-based decision support for impending extreme weather events.

Operationally, the IBF-FBF dashboard supports the timely execution of early warning and advisory-based early action, including early action planning, contingency planning, disaster preparedness planning, and rapid financing mobilization. These risk-informed tools (supplied by IBF outputs) are also essential to streamline bureaucratic processes and strengthen advocacy and "grand bargaining" with climate and humanitarian financing actors, enabling faster mobilization of risk finance ahead of escalating climate crises.

In addition, an informed FBF mechanism can improve policy and planning coherence among stakeholders by promoting inclusive, participatory, and coordinated multi-stakeholder engagement in risk financing and crisis response.

As climate emergencies increasingly shift toward faster-onset and higher-intensity patterns, traditional risk management approaches are becoming less effective. IBF-informed FBF introduces a modern methodology and set of tools intended to improve preparedness, accelerate decision-making, and reduce Loss and Damage under rapidly evolving climate risk conditions.

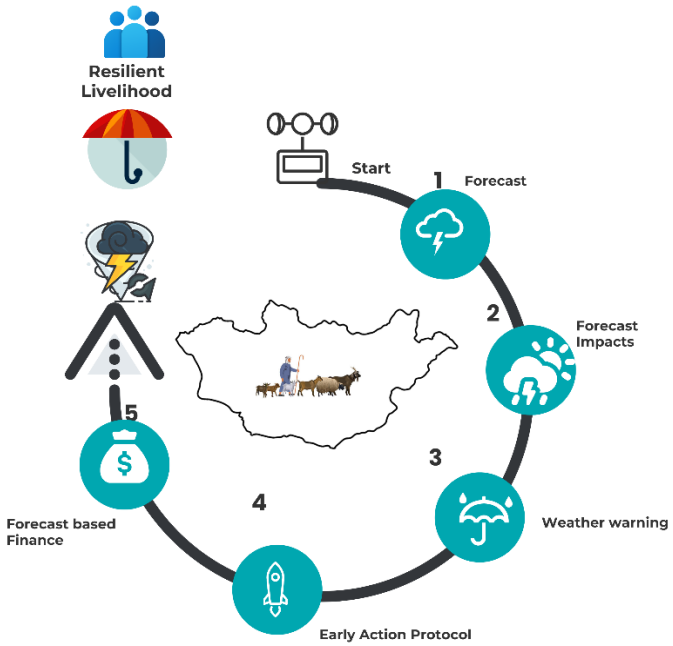

Figure 1: FBF work flow diagram

Traditional climate and multi-hazard risk financing has largely been limited to post-event relief and in-kind support mobilization. In contrast, an IBF-informed Forecast-based Financing (FBF) approach enables the humanitarian community to leverage financing instruments for anticipatory preparedness and contingency planning ahead of impending multi-hazards, while also strengthening post-disaster response planning. By translating forecast thresholds into likely consequences, the IBF-FBF process helps frontline communities prepare before hazards interact with the ground, thereby reducing expected Loss and Damage (L&D).

IBF-driven FBF also strengthens the humanitarian program cycle by addressing persistent operational challenges that arise before disasters strike, such as estimating the number of people likely to be affected, expected magnitude and severity, hazard threshold exceedance, and the likely trajectory of impacts. It supports structured assessment and quantification of anticipatory L&D, informs preparedness requirements for vulnerable groups, enables forecast-based early action planning and contingency preparation, and guides the timely pre-positioning of relief items and services close to at-risk communities. These measures are critical to minimizing L&D to the greatest extent possible.

A dashboard-enabled IBF system can further strengthen humanitarian decision-making by providing evidence-based, ICT-driven visualization and analytics that show where impact thresholds are expected to occur and how many exposed elements are likely to be affected under forecast conditions. This improves the ability of national and local governments to develop demand-driven contingency plans tailored to specific locations and target groups, prioritize pre-positioning of emergency relief (type and quantity), and plan complementary modalities such as cash grants and in-kind support with particular emphasis on reaching the most vulnerable and hard-to-access areas in time.

2.0 FBF Decision Support System (DSS)

An FbF Decision Support System (DSS) is the operational backbone that converts multi-hazard forecasts and early warnings into IBF impact analytics, applies the Impact Threshold Matrix to determine Watch / Warning -Alert / Trigger Met, and then auto-generates the activation package needed to release funds and execute SOP-bound early actions. The DSS must integrate data feeds (forecasts, CAP alerts, exposure/vulnerability layers, observations), run impact and confidence calculations, and provide a rules engine with version control and audit logs. It should produce standardized Impact Forecast Bulletins (human- and machine-readable), support fast-track financing workflows (budget ceilings, disbursement routes, named implementers), track delivery and "who does what where," and enable monitoring/verification to reduce basis risk over time.

1) FBF DSS Purposes

Mongolia's hazard environment is characterized by high spatiotemporal variability and strong place-based impacts shaped by regional Siberian and polar climatic patterns, landform, land cover, exposure patterns, and hydrometeorological regimes. In dzud years, livestock losses can be in the millions of head, with significant macroeconomic and livelihood consequences; recent assessments document substantial livestock mortality and measurable declines in the sector's contribution to GDP during the 2023-2024 dzud period.

In this context, the binding constraint is not forecast skill alone. Still, decision latency in financing approvals and operational mobilization often occurs after impacts are locked in, driving avoidable loss-and-damage (L&D). IBF-driven FbF is designed to move decisions and financing upstream by linking impact thresholds to pre-authorized rapid disbursement and pre-agreed early actions, the core principle of anticipatory action and FbF.

2) The key elements to drive the FBF DSS:

- **Impact-Based Forecasting (IBF):** Converts hazard forecasts into expected impacts *who/what* is likely to be affected, *where* and *when* impacts may occur, expected *severity*, and an explicit *confidence/uncertainty* characterization.
- **Forecast-based Financing (FbF):** Enables pre-triggered early action by linking pre-agreed triggers to Early Action Protocols (EAPs) and pre-approved financing, allowing funds to be released quickly, transparently, and accountably.
- **IBF-driven FbF triggers:** Anchors triggering in impact likelihood and severity informed not only by meteorological thresholds but also by residual risks and contextual vulnerabilities and executes activation through codified SOPs and rapid financing pathways down to aimag/soum/community implementation level.

3) Institutional anchoring in Mongolia

A Mongolia-fit mechanism should formalize collaboration between:

- **NAMEM** (forecasting, monitoring, warning services; operational forecast production and dissemination).
- **NEMA** (national disaster protection coordination, with emergency management divisions across all 21 aimags and the capital; established under the Disaster Protection legal framework).
- **Ministry of Finance / central budget authorities** (risk-financing rules, budget windows, fiduciary controls, auditability).
- **Line ministries, sector departments, local governments(aimag/soum/bag governments)** (sector execution: livestock, water, health, roads, education; last-mile delivery).
- **National Statistics Office/data custodians** (indices and verification datasets; relevant for parametric components, consistent with Mongolia's index-based livestock insurance experience).

4) The operating model (end-to-end workflow)

- ❖ **Hazard forecast production (multi-range)**: nowcasting > short-range > medium-range, updated by hazard dynamics.
- ❖ **Impact analytics (IBF layer)**: overlay hazard forecasts with exposure/vulnerability and "local risk paradigm" modifiers (access, pasture condition, snow baseline, critical infrastructure, settlement/livestock density).
- ❖ **Impact Forecast Bulletin issuance** (standardized, decision-grade).
- ❖ **Trigger determination**: apply pre-agreed **impact thresholds** (and confidence rules) to generate: *Trigger Met / Watch / Not Met* status by aimag/soum.
- ❖ **FbF activation**: automatic/fast-track release of funds to named implementers , activation of SOP-bound early actions.
- ❖ **Monitoring, verification, and learning**: compare forecast/impact projections vs observed outcomes; refine thresholds and action packages to reduce basis risk.

5) Core product: Impact Forecast Bulletins (the trigger-grade evidence)

Impact Forecast Bulletins (IFBs) are the standardized, decision-grade outputs of the FbF DSS. They translate multi-hazard forecasts into localized, sector-relevant impact intelligence and provide the formal trigger evidence needed to activate pre-authorized financing and SOP-bound early actions. IFBs should be consistent across hazards and produced at high spatiotemporal resolution (aimag/soum lists plus geospatial hotspots) to support last-mile decision-making.

Minimum bulletin modules (standard across hazards)

- **Spatiotemporal forecast:** onset / peak / end timing; intensity ranges; exceedance probabilities (where available) and expected persistence.
- **Localized warnings:** affected administrative-unit lists plus geospatial hotspots; clear confidence/uncertainty statement and update cadence.
- **Impact outlook:** sector-specific impacts (e.g., livestock/herders, roads, water points, health risk groups, energy/communications) ranked by severity × likelihood, with affected elements summarized.
- **Local risk paradigm:** contextual amplifiers and buffers shaping local impacts (landscape/terrain exposure, residual vulnerabilities, accessibility constraints, pasture/snow baselines, critical infrastructure sensitivity).
- **Residual climatology & climate risk context:** anomaly framing relative to normal conditions and a compound-risk narrative (e.g., drought background , severe cold; repeated storms; cascading impacts).
- **Early action guidance:** time-bound actions (6h / 24h / 72h), responsible lead agency/implementer, coordination actors, and minimum service standards (including inclusion notes for hard-to-reach areas).
- **Trigger status:** explicit mapping to the FbF trigger table/Impact Threshold Matrix (trigger codes, thresholds exceeded, confidence-rule results, and activation type automatic vs technical validation).
- **CAP payload:** machine-readable alerting for multi-channel dissemination; CAP is a widely adopted all-hazards alert format that supports consistent warning messages across systems.

6) Trigger framework (what "activates" finance and action)

FbF activation should be governed by an Impact Threshold Matrix that triggers finance and early action based on expected impacts, not hazard intensity alone. The matrix should define triggers across key dimensions: hazard type, impact metrics (sector-relevant and mappable), geography (aimag/soum risk zones, basins, grazing units, corridors), time windows (0 -24h, 24 -72h, 3 -10d), confidence rules (ensemble agreement, persistence, nowcast confirmation), and activation type (automatic vs rapid technical validation). This structure enables clear, auditable trigger decisions and immediate execution through pre-authorized financing and SOP-bound early actions aligned to anticipatory action best practice.

7) Risk financing architecture (layered to match frequency and severity)

To ensure both speed and adequacy, Mongolia's IBF-driven FbF mechanism should use **risk-layering**:

Layer 1 Local readiness (high frequency / low severity)

- Small, fast, decentralized budgets (soum/aimag) for no-regret actions.

Layer 2 National Anticipatory Action Window (triggered)

- A dedicated budget window that releases funds upon trigger activation, enabling early action at scale.

Layer 3 Parametric / index-based shock finance (medium severity)

- Leverage Mongolia's demonstrated feasibility with index-based livestock insurance, which uses soum-level mortality indices and blends self-insurance, market insurance, and social protection elements.

Layer 4 Catastrophic backstop (low frequency / high severity)

- Emergency appropriations and external support, used when impacts exceed designed FbF capacity.

This structure keeps FbF focused on what it does best: time-critical anticipatory spending.

8) FbF Governance and accountability

- **Policy & Finance Steering Committee** (MoF-led; NAMEM, NEMA, line ministries): approves triggers, annual action menu, and financing rules.
- **Technical Trigger Committee** (NAMEM-led with NEMA/sector technical inputs): validates trigger status, issues activation notice using standardized bulletin evidence.
- **Fund Manager / Treasury mechanism**: executes rapid disbursement against pre-approved envelopes and implementation plans.
- **Implementers** (NEMA/line ministries/sector departments/Local Governments(aimag/soum/Bag) authorities/partners): deliver SOP actions and report on timeliness and coverage.
- **Independent assurance**: post-activation audit, after-action reviews, and trigger recalibration.
- **Access International Response funds e.g., UN -** Central Emergency Response Fund (CERF), other international donor funds .

9) Implementation roadmap (practical phasing)

Phase 1 (pilot, 6-12 months)

- Select 2-3 priority hazard streams (e.g., dzud , rapid onset snow storm, convective thunderstorm, dust storm, damaging wind, droughts) and 6-10 high-risk soums.
- Build trigger tables, action packages, costing, and CAP dissemination pipeline.
- Run a full seasonal cycle including simulation and at least one operational activation if conditions arise.

Phase 2 (scale, 12-24 months)

- Expand geography and hazards; integrate with national budget structures; strengthen verification and M&E.

Phase 3 (institutionalize, 24 months and beyond)

- Embed into public financial management, national early warning services, and sector planning; integrate parametric layers where robust.

10) What success looks like (measurable outcomes)

- Reduced time from forecast-to-decision and decision-to-disbursement (hours/days, not weeks).
- Increased coverage of early actions in high-risk soums before peak impacts.
- Reduced avoidable livestock loss, access disruption, and service interruption in triggered areas (validated post-event).
- Improved trust and compliance with warnings via consistent CAP-enabled communication.

1.5 Rationale of IFB-driven FBF.

1) What does "IBF-driven FbF" means in practice

- **Impact-based Forecasting (IBF)** is the operational capability that converts hydro-meteorological forecasts into expected impacts (who/what will be affected, where, when, and how severely) and produces decision-ready advisories.

- **Forecast-based Financing (FbF)** is the governance and financing mechanism that enables pre-agreed early actions to be funded and executed before a hazard peaks based on transparent forecast/impact thresholds and pre-authorized protocols.
- **IBF-driven FbF** therefore means: IBF provides the evidence and trigger logic; FbF provides the pre-positioned funds, mandates, and standard operating procedures (SOPs) to act on that evidence without delay.

2) Why is this integration necessary in Mongolia's operating context

Mongolia's climate and hazard regimes are characterized by high variability, rapid-onset changes, and short-lead-time impacts (minutes to hours to days). In such a setting, conventional emergency response pathways often dependent on sequential approvals through administrative channels tend to be too slow to mobilize resources at the point when early action would be most cost-effective and life-saving. The result is predictable: response arrives late, coping costs rise, and loss and damage increase.

An integrated IBF and FbF approach directly addresses the core bottleneck: it compresses the decision cycle by shifting critical decisions (what to do, who approves, how it is funded, and who implements) from the crisis window to the preparedness window.

3) The value proposition: from "forecasting hazards" to "financing decisions."

The integrated system is intended to function as an informed, tool-driven, evidence-based instrument that strengthens decision-making across government and partners by:

- **Translating forecasts into impacts** that stakeholders can interpret and act upon (e.g., sector-specific thresholds and geographically explicit advisories).
- **Establishing objective triggers** that are agreed in advance and grounded in risk, exposure, and vulnerability data.
- **Enabling anticipatory action** through pre-defined action plans and contingency measures linked to specific impact scenarios.
- **Pre-authorizing fund release and action execution**, reducing bureaucratic delays during time-critical windows.
- **Improving accountability and coordination** by clarifying roles, responsibilities, and decision rights across the value chain.

This turns early warning into early action, and early action into financed, mandated implementation at the point when it can still prevent harm rather than merely respond to it.

4) End-to-end workflow (operational logic)

A practical IBF based FbF workflow can be described in six linked stages:

- **Observe and predict (multi-source / hybrid observation):** Integrate station data, remote sensing, and relevant partner data streams to support short- to medium-range forecasting.
- **Model impacts (IBF layer):** Combine hazard forecasts with exposure and vulnerability information to generate impact scenarios and risk levels by area and sector.
- **Trigger decision thresholds:** Apply agreed impact thresholds (not only meteorological thresholds) to determine if anticipatory actions should be activated.
- **Activate early action protocols (FbF layer):** Implement pre-agreed SOPs tied to each trigger level (who does what, where, within what time).
- **Release financing automatically or fast-track:** Disburse funds through pre-arranged channels and fiduciary controls to local implementers.
- **Monitor, learn, and recalibrate:** Track outcomes, verify triggers versus observed impacts, and update thresholds, actions, and financing rules.

5) What must be "pre-agreed" for the system to work

For IBF-driven FbF to remove planning and decision barriers, the following must be established upfront:

- **Impact thresholds and triggers:** Clear, interpretable, and sector-relevant.
- **SOPs and decision rights:** Who can authorize actions and funds at national and sub-national levels.
- **Menu of early actions:** Practical, locally executable, and time-bound (hours-days), with minimum implementation standards.

- ❖ **Financing architecture:** Pre-positioned funds, rapid disbursement modalities, and reporting requirements proportionate to urgency.
- ❖ **Coordination mechanism:** A coherent structure linking NMHS/forecasting entities, disaster management agencies, line ministries, and local authorities.

5) Intended outcome

IBF and concurrent FbF are designed to reduce avoidable losses by enabling local actors and institutions to access financing, plan early action, and mobilize resources before the hazard peaks thereby improving preparedness, protecting livelihoods, and saving lives through a faster, more objective, and more accountable decision cycle.
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1.6 IBF-driven forecast-based risk financing (FBF) mechanism for Mongolia.

1) Purpose

Mongolia's hazard landscape is defined by high spatiotemporal variability and strong place-based impacts driven by landform, land cover, exposure patterns, and hydrometeorological regimes. In dzud years, livestock losses can reach the millions, generating major livelihood shocks and macroeconomic consequences; recent assessments indicate substantial livestock mortality and a measurable decline in the livestock sector's contribution to GDP during the 2023-2024 dzud period.

In this context, the principal constraint is not forecast skill alone, but decision latency: financing approvals and operational mobilization frequently occur after impacts are already unavoidable, resulting in preventable loss and damage (L&D). An IBF-driven FbF mechanism is intended to shift decisions and financing upstream by linking impact thresholds to pre-authorized rapid disbursement and pre-agreed early actions the central logic of anticipatory action and forecast-based financing.

2) Functional definition

- Impact-Based Forecasting (IBF): Translates hazard forecasts into expected impacts *who* and *what* is likely to be affected, *where* and *when* impacts may occur, *how* impacts may manifest, and *how severe* they may be together with an explicit confidence/uncertainty characterization.
- Forecast-based Financing (FbF): A risk-financing and operational mechanism that enables early action before impacts peak by linking pre-agreed triggers to Early Action Protocols (EAPs) and pre-approved financing, allowing funds to be released rapidly, transparently, and accountably.
- IBF-driven FbF: An integrated approach in which triggering is anchored in impact likelihood and severity (not meteorological thresholds alone), and activation is executed through codified SOPs and rapid financing pathways that translate triggers into timely implementation at national, aimag, soum, bag, and community levels.

3) Institutional anchoring in Mongolia (recommended roles).

A Mongolia-fit IBF-driven FbF mechanism should be institutionally anchored through formalized collaboration across five core actor groups. NAMEM provides the technical backbone multi-hazard monitoring, operational forecasting, warning dissemination, and IBF-based impact analytics that generate trigger assessments and activation packages. NEMA leads operational coordination under the Disaster Protection framework, activating EAPs and managing national-to-subnational implementation across the 21 aimags and the capital, including escalation to response when needed. Ministry of Finance/central budget authorities, sector ministries, and aimag/soum governments establish the risk-financing rules and budget windows, ensuring rapid release, fiduciary controls, and auditability. Line ministries, sector departments, local governments, and private sector/value chain operators execute sector early actions and last-mile delivery across priority systems (livestock, agriculture, water, health/WASH, transport/communications, education, logistics). Finally, the National Statistics Office and other data custodians provide official datasets and verification/indices to support impact validation and any parametric components, consistent with Mongolia's index-based livestock insurance experience.

4) The operating model (end-to-end workflow)

- Hazard forecast production (multi-range): Generate and update hazard forecasts across time scales nowcasting , short-range , medium-range, adjusted to hazard dynamics and updated forecasting cycles.
- Impact analytics (IBF layer): Convert hazard forecasts into expected impacts by overlaying forecasts with exposure and vulnerability data and applying “local risk paradigm” modifiers such as access constraints, pasture condition, snow baseline, critical infrastructure exposure, and settlement/livestock density.
- Impact Forecast Bulletin issuance (standardized, decision-grade): Produce and disseminate a standardized bulletin that summarizes expected impacts, affected locations/populations/assets, time windows, severity tiers, and confidence, with map products suitable for operational decision-making.
- Trigger determination: Apply pre-agreed impact thresholds and confidence rules to classify the operational posture and decision outcome (e.g., Watch / Warning-Alert / Trigger Met), including geographic targeting and recommended action bundles.
- FbF activation: Upon trigger confirmation, execute automatic or fast-track release of funds to named implementers and activate SOPs/Standing Orders on Disaster (SoD) for anticipatory early actions across the designated national-to-local implementation structure.
- Monitoring, verification, and learning: Monitor implementation and outcomes; compare forecasted hazards/impacts to observed conditions and impacts; document timeliness and effectiveness; and refine impact models, thresholds, and action packages to reduce basis risk and improve performance over time.

5) Core product: Impact Forecast Bulletins (the trigger-grade evidence)

- Impact Forecast Bulletins (IFBs) are the core “trigger-grade” products for IBF-driven FbF, translating multi-hazard forecasts into localized, sector-relevant impact intelligence and explicitly stating FbF trigger status. To be operationally credible, IFBs should be standardized across hazards, issued at high spatiotemporal resolution (aimag/soum lists plus geospatial hotspots), time-bound to action windows, and produced in both human- and machine-readable formats with clear audit metadata.
- Each bulletin should minimally include: (i) spatiotemporal forecast information (onset/peak/end, intensity, exceedance where available); (ii) localized warnings with confidence/uncertainty; (iii) ranked sector impact outlooks; (iv) “local risk paradigm” modifiers (access, baselines, infrastructure, vulnerability); (v) residual climatology and compound-risk context; (vi) SOP-linked early action guidance by time window and responsible actor; (vii) explicit mapping to the FbF trigger matrix (codes/thresholds and activation type); and (viii) a CAP payload to enable consistent, multi-channel dissemination and system interoperability.

6) Trigger framework (what “activates” finance and action)

Triggers should be designed as an Impact Threshold Matrix (Localized magnitude/intensity thresholds to trigger hazards/disasters, national Weather warning thresholds/CAP/meteorological thresholds, and corresponding risk/rankings for vulnerable elements).

Trigger matrix dimensions :

Mongolia’s Forecast-based Financing (FbF) should be activated through an Impact Threshold Matrix that links national meteorological/CAP warning thresholds and Impact-Based Forecasting (IBF) outputs to pre-authorized financing and SOP-bound early actions. The trigger framework should be multi-dimensional covering hazard type, impact metrics (sector-relevant and mappable), geography (aimag/soum, basins, grazing units, corridors), time windows (0 -24h, 24 -72h, 3 -10d), confidence rules (ensemble agreement, persistence, nowcast confirmation), and activation type (automatic vs rapid technical validation).

Operationally, triggers should be tiered into readiness (watch), early action activation, and escalation/transition to response, ensuring that actions and financing match available lead time and event severity. Each Tier-1 trigger should automatically produce an activation package maps, targeted action bundles, budget ceilings, disbursement routes, and reporting requirements so that finance and implementation begin immediately, minimizing decision latency and reducing avoidable loss and damage.

7) Risk financing architecture (layered to match frequency and severity)

To ensure both speed and adequacy, Mongolia's IBF-driven FbF mechanism should adopt a risk-layering architecture that aligns financing instruments with event frequency, severity, and lead time. This structure keeps FbF focused on what it does best: time-critical, rules-based anticipatory spending, while reserving larger shock and disaster instruments for higher-loss tail events.

Layer 1: Local readiness (high frequency / low severity)

Instrument: Small, fast, decentralized readiness budgets managed at soum/aimag level.
Purpose: Finance no-regret preparedness and readiness actions such as local logistics arrangements, targeted pre-positioning, risk communication, and rapid access measures for hard-to-reach areas.
Design features:

- Pre-defined eligible cost lists and budget ceilings
- Delegated authority for rapid approval and release
- Simple documentation and rapid reconciliation (standard templates, light-touch audit trail)

Layer 2: National Anticipatory Action Window (triggered)

- **Instrument:** dedicated national FbF budget window
- **Activation:** automatic or rapid-validated release upon impact-based trigger activation
- **Purpose:** finance EAP implementation at scale, including sector-led early actions across prioritized risk hotspots
- **Design features:** pre-authorized ceilings by hazard/zone, clear disbursement channels, SOP-based implementation and reporting

Layer 3: Parametric / index-based shock finance (medium severity)

- **Instrument:** parametric or index-linked financing mechanisms
- **Rationale:** build on Mongolia's demonstrated feasibility with index-based livestock insurance, which uses soum-level mortality indices and blends self-insurance, market insurance, and social protection elements
- **Purpose**: provide rapid liquidity for moderate-to-severe shocks, complementing FbF when impacts exceed Layer 2 funding envelopes but remain below catastrophic levels
- **Design features:** clear index/trigger governance, payout transparency, integration with response and recovery pathways

Layer 4: Catastrophic backstop (low frequency / high severity)

- **Instrument:** emergency appropriations and external support (e.g., large-scale humanitarian/sovereign response financing)
- **Trigger condition:** events that exceed designed FbF capacity or generate systemic impacts
- **Purpose:** finance large-scale response, relief, and recovery, including extraordinary logistics and reconstruction needs
- **Design features:** surge procedures, inter-agency coordination, and safeguards to protect fiscal stability and accountability

8) Governance and accountability (minimum viable arrangement)

- **Policy & Finance Steering Committee** (MoF-led; NAMEM, NEMA, line ministries): approves triggers, annual action menu, and financing rules.
- **Technical Trigger Committee** (NAMEM-led with NEMA/sector technical inputs): validates trigger status, issues activation notice using standardized bulletin evidence.
- **Fund Manager / Treasury mechanism**: executes rapid disbursement against pre-approved envelopes and implementation plans.
- **Implementers** (NEMA/line ministries/aimag-soum authorities/partners): deliver SOP actions and report on timeliness and coverage.
- **Independent assurance**: post-activation audit, after-action reviews, and trigger recalibration.

9) Implementation roadmap (practical phasing)

Phase 1: Pilot (6 -12 months)

- **Scope the pilot:** Select 2 -3 priority hazard streams (e.g., dzud; rapid-onset winter storms/snow storms; flood; dust/wind; damaging winds; convective thunderstorms) and 6 -10 high-risk soums.

- **Build the operational package:** Develop and validate trigger tables, EAP action bundles, unit costs/costing models, financing release steps, and a CAP-enabled dissemination pipeline linked to the Impact Forecast Bulletin workflow.
- **Run a full seasonal cycle:** Conduct end-to-end testing across one season, including table-top and field simulations, and execute at least one operational activation if trigger conditions occur.

Phase 2: Scale (12 -24 months)

- **Expand coverage:** Increase the number of soums/aimags and add additional hazards and sectors based on pilot results.
- **Integrate financing at scale:** Align triggers and activation packages with national budget structures and delegated subnational financing, improving speed, auditability, and predictability.
- **Strengthen verification and M&E:** Improve exposure/vulnerability datasets, verification protocols, basis-risk management, and standardized performance monitoring (timeliness, coverage, effectiveness, equity).

Phase 3: Institutionalize (24 months and beyond)

- **Embed in core systems:** Integrate IBF-driven FbF into public financial management, national early warning services, and sector planning and SOPs across government levels.
- **Add robust risk-layering instruments:** Introduce or strengthen parametric/index-based layers where technical and governance conditions are mature, and formalize replenishment and sustainability mechanisms.

10) Measurable outcomes

Success for Mongolia's IBF-driven FbF is evidenced by faster end-to-end decision and financing cycles, wider and earlier delivery of anticipatory actions, and validated reductions in avoidable impacts. Practically, this means forecast-to-decision and decision-to-disbursement timelines shorten to hours/days rather than weeks, and a higher proportion of high-risk soums receive EAP actions before peak impacts within defined lead-time windows. Post-event verification should show reduced avoidable livestock losses, fewer/shorter access disruptions, and reduced service interruptions in activated areas. Finally, consistent CAP-enabled warning communication should improve reach, trust, and compliance with official warnings and recommended protective actions.

1.6.1 FbF operating context

Mongolia's climate risk profile is characterized by high interannual variability and strong spatiotemporal gradients in impact, driven by landscape, land cover, and hydro-meteorological dynamics. Priority hazards commonly addressed by national agencies and partners include dzud (cold-season extremes), cold waves and blizzards, droughts, floods, dust storms, strong winds, and heavy precipitation.

In this context, the binding constraint is not solely forecast skill, nor even the timeliness and precision required to trigger early action that can protect livestock assets and rural livelihoods of macroeconomic significance. The central constraint is decision latency the elapsed time between (i) a credible forecast signal of impending impacts and (ii) formal approval, disbursement, procurement, and field mobilization often exceeding the effective lead time for preventive action. When financing and operational mobilization occur only after impacts are already locked in, avoidable losses and escalating loss and damage (L&D) become inevitable.

Impact-Based Forecasting (IBF) -driven Forecast-based Financing (FbF) is designed to shift this decision point upstream by linking impact thresholds to pre-authorized rapid disbursement and pre-agreed Early Action Protocols (EAPs). By coupling trigger mechanisms with pre-approved funding pathways and standard operating procedures (SOPs) at national and sub-national levels, IBF-driven FbF enables timely, accountable, and scalable anticipatory action. The operating logic is: forecast > impact model > trigger threshold > automatic release of funds > SOP-defined early actions > reduced losses and L&D, ensuring action occurs before a crisis peaks rather than after impacts materialize.

Optional refinements to strengthen the section

a) Make the logic chain explicit
Add one sentence to clearly express the information-to-action pathway: "The operating logic is: forecast, impact model, trigger threshold, automatic release of funds, SOP-defined early actions, reduced losses, and loss-and-damage (L&D)."

b) Specify what "decision latency" means operationally

If the audience is implementation-focused, define the term in practical, time-bound language: "Decision latency refers to the elapsed time between (i) a credible forecast signal of impending impacts and (ii) formal approval, disbursement, procurement, and field mobilization often exceeding the effective lead time for preventive livestock protection and other anticipatory.

c) Reduce repetition by assigning roles to IBF vs FbF

A clear distinction strengthens the narrative:

- **Impact-Based Forecasting (IBF) provides** impact-relevant signals and thresholds translating hazard forecasts into expected impacts (who/what, where, when, severity, confidence), rather than relying on meteorological thresholds alone.
- **Forecast-based Financing (FbF)** provides the pre-arranged governance, SOPs, and financing pathways that convert those triggers into rapid, accountable early action.

Suggested sentence to insert:

- **"**IBF improves *what* is triggered (impacts), while FbF improves *how fast* action is authorized and delivered (rules and financing)."

d) **What "IBF-driven FbF" :**

- **Impact-Based Forecasting (IBF):** Converts hazard forecasts into expected impacts who/what is likely to be affected, where and when impacts may occur, expected severity, and confidence producing decision-ready risk information.
- **Forecast-based Financing (FbF):** Provides the rules, mandates, SOPs, and pre-arranged financing needed to implement early actions before a hazard peaks, based on predefined triggers.
- **IBF-driven FbF:** IBF "drives" FbF when activation triggers are tied to impact likelihood and severity (not meteorological thresholds alone) and when financing is released through pre-agreed protocols that translate triggers into rapid action at national and sub-national levels.

1.6.2 Institutional anchoring and roles in Mongolia

A practical architecture builds on existing mandates:

- **NAMEM (meteorology/environment monitoring):** forecast production, monitoring, and warning services; technical inputs for short- to medium-range forecast operations.
- **NEMA (disaster protection and emergency management):** disaster protection coordination with reach to provinces and the capital's emergency management divisions.
- **MoF / central finance authorities:** approval of risk financing instruments, budget rules, fiduciary controls, and integration into public financial management.
- **Line ministries and local governments:** sector-specific early actions (livestock, water, health, roads, education), implementation and monitoring at aimag/soum level.
- **NSO / data custodians:** exposure and vulnerability datasets where applicable; verification datasets for parametric indices.

1.6.3 Core mechanism design (end-to-end workflow)

Step A Multi-hazard IBF production

Multi-hazard IBF production combines short- to medium-range hazard forecasts with geospatial exposure and vulnerability overlays (settlements, livestock density, infrastructure, critical services) and an impact model/scenario library (impact functions by hazard and sector) to estimate localized impact likelihood and severity. The core output is the Impact Forecast Bulletin (IFB) a standardized, decision-grade product that delivers high spatiotemporal resolution forecasts, localized warnings (including CAP), local risk paradigm modifiers, residual climatology/climate-risk context, and time-bound recommended early actions. IFBs provide the trigger-grade evidence needed to translate forecasts into timely anticipatory action and financing under IBF-driven FbF.

1) Product intent and audiences

The product's intent is to deliver decision-grade, trigger-ready risk intelligence that converts multi-hazard forecasts into localized impacts, priorities, and actionable guidance supporting timely activation of SOP-bound early actions and, where applicable, FbF finance release. Primary users include government crisis management (National EOC, NEMA, aimag/soum units), NAMEM operational forecasting and hydrology/environment units, line ministries and productive sectors (livestock, water, roads/transport, health, education), humanitarian/DRR partners and local responders, and frontline communities through localized derivative products. Decision use centers on situation awareness (what/where/when), risk prioritization (who/what is exposed), trigger validation against impact thresholds for early action/finance release, and implementation guidance (what to do now within defined time windows).

2) Spatiotemporal design requirements

Spatiotemporal design requirements for IBF/FbF products are: (i) spatial granularity that reports by aimag > soum > bag and by operational risk zones (river basins, grazing units, road corridors, urban neighborhoods), with geocoded polygons to support CAP dissemination and mapping; (ii) temporal granularity that tracks risk across the event lifecycle nowcast (minutes -hours) for rapid hazards, short range (6 -72h) for operational early actions, and extended short/medium range (3 -10d) for preparedness and contingency posture; and (iii) an update cycle that is hazard-dependent (more frequent for convective storms/wind/dust; less frequent for drought) and always includes a clear next update time.

3) Standard bulletin structure (recommended template)

3.a Header block (metadata)

The bulletin Header block should provide the essential metadata needed for operational use and auditability: a clear bulletin title (multi-hazard or hazard-specific), issue time (local), valid period and lead-time window, areas covered (aimag/soum list plus map reference), a concise confidence/uncertainty statement (qualitative plus ensemble notes), version control (bulletin ID, v1/v2…, update schedule and next update time), and data sources (key observations and models used). Optional additions that strengthen traceability include trigger table reference codes, current posture (Watch/Warning -Alert/Trigger Met), and distribution channels.

3.b Executive summary (decision page)

The executive summary (decision page) should be a one-page, decision-grade snapshot containing: 3-5 key messages (timing, hotspots, severity, likely impacts), a clear risk level map (overall and hazard-specific if needed), an explicit trigger status statement (Trigger met / Watch / Not met) identifying the relevant trigger code(s) and affected admin units, and concise priority action guidance listing the top time-bound actions by sector with responsible leads. This format supports rapid situation awareness, trigger validation, and immediate operational prioritization.

3.c Hazard forecast (localized and quantified)

The hazard forecast module should provide localized, quantified information for each hazard stream, including onset/peak/end timing (local), expected intensity ranges (with exceedance probabilities where available), and a clear depiction of threshold exceedance by area via both administrative-unit lists and map layers/polygons. It should also flag compound and cascading hazard interactions (e.g., snow , wind; freeze thaw , flooding; drought , heat , fire risk) to support decision-making and trigger interpretation.

3.d Impact outlook (the IBF core)

The Impact Outlook is the IBF core of the bulletin and should communicate expected impacts in operational terms: who/what is at risk (livestock, herder households, critical roads, water points, health risk groups, power/communications, crops where relevant), where impacts will concentrate (geospatial hotspots with a ranked top 5 -10 soums), when the greatest impacts are expected (defined time windows), how severe impacts are (standard tiers: Minor/Moderate/Major/Severe with brief justification), and confidence expressed as a clear likelihood-of-impact statement (e.g., "High likelihood of widespread grazing access loss").

3.e Local risk paradigm (contextual risk drivers)

The Local risk paradigm module explains localized impact differences by explicitly documenting contextual risk drivers: exposure patterns (livestock density, settlements, road corridors, critical facilities), vulnerability modifiers (pasture condition, snow baseline, water availability, poverty/remoteness, market access, shelter capacity), coping capacity (preparedness levels, stockpiles, access constraints), and clear impact amplifiers vs buffers (e.g., prior drought increasing dzud sensitivity). This improves credibility, targeting, and action feasibility by showing why impacts may be higher or lower in specific locations.

3.f Residual climatology and climate risk framing

The Residual climatology and climate risk framing module should provide brief, decision-relevant context by stating anomalies versus climatology (e.g., temperature departures, precipitation deficits), classifying event rarity (unusual/upper-tail/rare-extreme), and summarizing residual or compound risk (how background conditions amplify impacts). Seasonal outlooks should be referenced only as a context layer, not as a trigger unless explicitly adopted in the trigger framework.

3.g Recommended early actions (linked to FbF)

Recommended early actions for FbF should be defined as operational, pre-costed action packages that can be activated immediately when triggers are met. Each package should specify actions by sector and implementation level (national/aimag/soum/community), map actions to timing windows (within 6h / 24h / 72h), and include clear minimum service standards that define completion ("done"). To enable rapid delivery, packages should also include logistics notes (access routes, fuel, distribution points, hard-to-reach contingencies). Finally, each package must be FbF-aligned with an Action Package ID, an indicative budget envelope (with unit-cost basis), and a named implementing lead so it can be automatically pulled into the activation package by the DSS.

3.h CAP-compliant warning payload (for dissemination)

The CAP-compliant warning payload should be included in the bulletin (or attached as machine-readable output) to support interoperable, multi-channel dissemination. At minimum it should specify event type, urgency/severity/certainty, effective/onset/expiry times, and geography via area polygons plus administrative geocodes (aimag/soum codes). It must also include public-facing headline, description, and instructions, and maintain message lineage through references to prior messages and clear update reasons to ensure consistency, traceability, and reliable warning updates.

3.i Attachments / map set

The bulletin should include a standard attachment/map set to support decision-making and targeting: risk maps (hazard intensity/threshold exceedance, IBF impact level, and hotspot rankings), a timeline/time-series graphic showing impact evolution across the event lifecycle, and exposure overlay maps (livestock density, settlements, roads/critical links). Where uncertainty is material, add an optional confidence map or ensemble spread summary to communicate spatial variability in forecast/impact confidence.

3.j Monitoring and verification (continuous improvement)

The Monitoring and verification module should provide: (i) a concise snapshot of latest observed conditions, (ii) clear changes since the last bulletin (track, intensity, hotspots, confidence), (iii) an outlook on anticipated changes paired with an explicit confidence note, and (iv) a post-event verification note specifying which datasets will be used to validate forecasts, impacts, and performance (e.g., NAMEM observations, NEMA logs, sector admin data, NSO indices, remote-sensing proxies). This enables continuous improvement, reduces basis risk, and strengthens trigger and action-package calibration over time.

4) Minimum "data fields" to standardize across all bulletins

To enable consistent, automated triggering in the FbF DSS, all Impact Forecast Bulletins should standardize a minimum set of mandatory fields: admin unit IDs and polygon references, hazard type(s), valid period, hazard and impact severity categories, likelihood/confidence category, a concise impact statement (sector , magnitude), explicit trigger status (met/watch/not met) with trigger code(s), recommended action package codes, and the distribution channels used (CAP, SMS, radio, web, app). Standardizing these fields ensures interoperability, auditability, and reliable activation of finance and early actions.

5) Practical note on localization

To make Impact Forecast Bulletins usable at the frontline, supplement the main bulletin with localized, low-burden derivatives: soum-specific one-paragraph summaries for priority soums (timing, likely impacts, severity, confidence, key actions, trigger status), plain Mongolian public instructions aligned to CAP fields (headline/description/instructions), and local derivative products tailored to delivery channels short SMS scripts, 30 -60 second radio scripts, and one-page posters. All derivatives should be version-linked to the bulletin ID to ensure consistency and traceable updates.

Step B Triggering logic (decision rules)

Triggering logic should be codified as impact-threshold decision rules (e.g., grazing access failure risk, inundation affecting critical roads, dust exposure above health thresholds) rather than hazard intensity alone. Each trigger rule must be explicitly mapped to its lead-time window, confidence requirement, pre-defined action package, budget envelope, and named implementing entity. This makes trigger decisions auditable and executable, enabling the DSS to output Watch/Trigger Met/Not Met and automatically generate the activation package needed for rapid financing and early action.

Step C FbF activation and fund release

When an impact-based trigger is met, the system issues an activation decision and executes a pre-authorized fund release protocol (automatic or time-bounded validation as defined in the trigger matrix). Funds are disbursed through agreed channels to named national and/or aimag/soum implementers against predefined ceilings and eligible cost lines linked to the relevant action package IDs. Disbursement immediately activates SOP/EAP-bound early actions that must be delivered within defined minimum service standards, with implementation and expenditures tracked for accountability.

Step D: Monitoring, verification, and learning

Monitoring, verification, and learning should (i) verify performance by comparing forecasted vs observed hazards/impacts and tracking action timeliness and cost-avoidance proxies, and (ii) calibrate the system by refining thresholds, confidence rules, impact models, and early action menus to reduce basis risk and improve usefulness. These learning loops should also inform the risk-financing architecture, ensuring financing remains layered to match severity and lead time local readiness (Layer 1), triggered national anticipatory action (Layer 2), parametric/index-based shock finance (Layer 3), and catastrophic backstop financing (Layer 4).

A Mongolia-fit financing stack should combine speed for frequent moderate events and capacity for rare severe shocks:

Layer 1 - Routine/local preparedness budgets (high frequency, low severity)

- Small, rapidly accessible allocations for local readiness and “no-regret” actions.

Layer 2 - National Anticipatory Action Window (forecast/impact-triggered)

- A dedicated budget line or contingency window designed for **pre-disaster** spending upon trigger activation.
- Optimized for hours-to-days decisions and early action packages.

Layer 3 - Parametric / contingent instruments (medium-to-high severity)

- Parametric covers can be linked to hazard/impact indices where robust verification exists.
- Mongolia has relevant experience with **index-based livestock insurance**, which uses livestock mortality indices at soum/county level and blends self-insurance, market insurance, and social protection elements.
- This provides a practical precedent for scaling index/parametric approaches while IBF-driven FbF covers the *anticipatory* window.

Layer 4 - Exceptional financing (catastrophic, low frequency)

Exceptional financing (catastrophic, low frequency): Budget reallocations, emergency appropriations, and external assistance serve as a backstop for extreme events, not the primary mechanism for routine response and early action.

Early actions should be pre-costed, locally deliverable, and time-bound (e.g., within 6h/24h/72h) and linked to EAP action package IDs. Illustrative actions include: for dzud/cold waves/blizzards, pre-position hay/fodder, provide veterinary support, winterize shelter/fuel, deliver targeted cash/vouchers, and prepare priority road clearance; for

drought/heatwaves, ready water trucking, apply pasture management measures, provide livelihood protection cash, and prioritize critical water points; for floods/intense rainfall, pre-position evacuation/rescue assets, protect key roads/bridges, deploy temporary barriers, and support early evacuation; and for dust storms/strong winds, issue health advisories, distribute protective items to high-risk groups, provide operational guidance for transport/schools, and secure exposed assets. Governance: the minimum viable decision setup

To reduce bureaucratic delay while preserving accountability: To minimize bureaucratic delay while maintaining accountability, governance should be split across four functions: a National Steering Committee (MoF, NAMEM, NEMA, key line ministries) to approve trigger policy, annual action menus, and fund rules; a NAMEM-led Technical Trigger Committee to apply/validate triggers and issue activation notices; implementing agencies (NEMA, line ministries, local governments) to execute SOP/EAP actions with streamlined reporting; and an independent M&E function to run audits and after-action reviews that refine thresholds and reduce basis risk over time.

6) What the integrated system delivers to government strategies

An integrated IBF-driven FbF system supports government climate crisis management end-to-end across policy, planning, programming, implementation, and monitoring by producing standardized multi-hazard impact outlooks, enabling transparent trigger-based activation, accelerating sub-national delivery through pre-arranged finance, strengthening coordination across agencies and partners, and generating measurable reductions in avoidable losses through earlier, targeted action.

7) Suggested outputs for a proposal/strategy document (ready-to-insert structure)

A clean, proposal-ready structure for an IBF-driven FbF/FbF DSS concept note includes nine sections: (1) context and problem statement emphasizing decision latency and climate variability; (2) objectives focused on anticipatory action, faster finance, and reduced L&D; (3) system design covering IBF workflow, trigger logic, and SOP/EAP activation; (4) risk financing architecture with layered instruments and disbursement rules; (5) governance and institutional roles (NAMEM/NEMA/MoF/local and committees); (6) pre-costed early action packages by hazard/sector; (7) required data and tools (impact models, exposure/vulnerability, CAP/IFBs, verification); (8) accountability through M&E, audits, and learning loops to reduce basis risk; and (9) sustainability and scale through PFM integration, capacity building, and partner coordination.

2.0 Stakeholder Partnership Coordination and Engagement

2.1 Core objective:

Stakeholder Partnership Coordination and Engagement

2.1.1 Core objective

1. **Ensure inclusive stakeholder participation** across state institutions, non-state actors, and development partners in the co-design of risk-informed early action protocols and the overall strategy for Impact-Based Forecasting (IBF)-informed Forecast-based Financing (FbF).

2. **Support sector ministries and departments** to develop and operationalize risk-informed interventions, and to strengthen inclusive budgeting and financing for improved preparedness and response across multiple hazards and different-onset extreme weather events (rapid- and slow-onset).

3. **Establish an integrated and inclusive financing mechanism** that is explicitly guided by:
   - IBF outputs and multi-hazard early warnings,
   - anticipated and persistent risks, and mapped vulnerabilities, and
   - evidence-based risk financing modalities.

This mechanism will optimize the use of risk finance by reducing overlap and duplication, strengthening complementarity across actors, and ensuring equitable prioritization of hard-to-reach areas alongside high-risk populations and livelihoods.

Alternative version (more concise, more "programmatic")

2.1.2 objective

1. Enable meaningful and inclusive participation of government, non-state stakeholders, and development partners in the design and validation of risk-informed early action protocols and IBF-informed FbF arrangements.
2. Build the capacity of sector ministries and technical departments to define hazard- and sector-specific interventions and to embed these into inclusive budgeting and financing processes for multi-hazard preparedness.
3. Operationalize an integrated financing mechanism informed by IBF and multi-hazard early warnings, risk and vulnerability analysis, and evidence-based risk financing modalities minimizing duplication, maximizing efficiency, and maintaining deliberate focus on hard-to-reach areas.

Optional add-on: suggested outputs (if we need them for a logframe)

- Multi-stakeholder coordination platform established (or strengthened) with agreed TORs and meeting cadence.
- Early action protocols co-developed/updated for priority hazards and sectors, with roles and SOPs validated.
- Sector ministries supported to integrate risk-informed interventions into annual/medium-term plans and budgets.
- Integrated risk financing framework designed, including trigger governance, disbursement pathways, and safeguards against overlap.
- Targeting approach agreed that includes criteria to prioritize hard-to-reach locations and vulnerable groups.

2.2 FBF Framework approach:

Addressing the impending multi-hazards (slow-onset, medium-onset, and rapid-onset) risks and vulnerabilities, Mongolia needs a multi-modal risk-financing mechanism to address different types of multi-hazards. To detect diverse, rapidly changing weather phenomena, an impact forecasting and integrated impact-based forecasting (IBF) methodology is already being proposed. Back-to-back IBF informed FBF intended to inform emergency hazard management agencies,

humanitarian actors, and sector departments about how to develop early warning-based early action plans (contingency & preparedness) to act before disasters to minimize the socio-economic costs of impending weather and climate hazards.

Multi-stakeholders, vulnerable sectors, relevant organizations, frontline herders, vulnerable communities, and individuals can make critical decisions to ensure resources and supplies are in place to take early action and respond as soon as it is safe to do so. IBF-supported FBF plays an important role in facilitating the Red Cross Red Crescent running Forecast-based finance, Mobilization, early action planning, and preparedness.

It is, however, a critical job over the very shortest lead-time to understand the anticipatory impacts, loss & damage, and scalability of impending extreme weather event(s), turning to multi-hazard(s) just forecast. IBF-supported FBF can play an important role in overcoming the difficulties relating to the anticipatory estimation of L & D, formulation of early warning-based early actions, detailed early action protocol (EAP), and contingencies for preparedness the forecast-based financing mechanism is essential for mitigating risk and vulnerabilities.

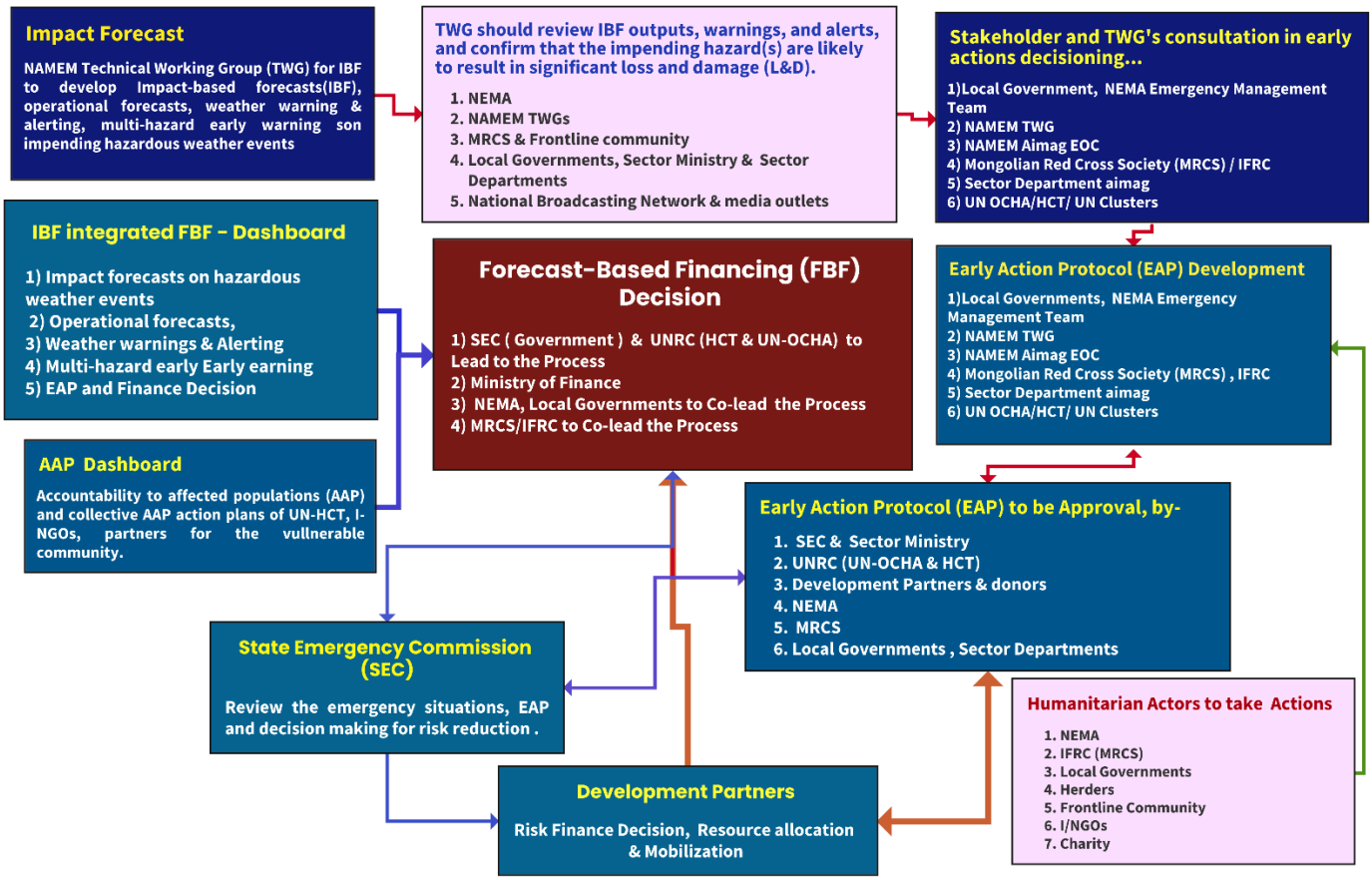

Figure 2: FBF decisions framework - governed by the partnership and functional coordination process of Mongolia (Source: Z M Sajjadul Islam, UNDP-GCF)

Below is a structured interpretation of the IBF-driven FbF Decision Support System (DSS) diagram, followed by (i) cleaned/standardized box text that can be pasted back into the figure, (ii) a recommended logic/flow (so the arrows read unambiguously), and (iii) a Mermaid flowchart we can use to redraw it cleanly.

1. **Technical generation of decision evidence (IBF)**
- NAMEM-led TWGs produce impact forecasts, localized warnings/alerts, and multi-hazard early warning inputs.
2. **Multi-stakeholder situation review and anticipatory risk estimation**
- Relevant technical and operational stakeholders review the IBF outputs, estimate potential impacts and L&D, and create a common operational picture.
3. **Early warning, EAP design, and approval (policy/coordination)**
- Coordination bodies translate the situation review into Early Action Protocols (EAPs), then route them for formal approval.
4. **Financing, implementation, and accountability**

- The FbF DSS aligns decision authority (SEC/UNRC/HCT), financing (MoF and partners), and implementers (NEMA, MRCS/IFRC, local government, etc.), with dashboards (IBF-FbF and AAP) providing tracking, accountability, and learning.

A) Impact Forecast (IBF)

NAMEM Technical Working Group(s) (TWGs) develop and issue:

- Impact-based forecasts (IBF)
- Operational weather forecasts
- Localized warnings and alerts
- Multi-hazard early warning products for impending hazardous events

B) Situation Review and Anticipatory L&D Estimation

Step B (Situation Review and anticipatory loss-and-damage estimation) convenes relevant stakeholders and TWGs to review IBF outputs and impending hazards and to estimate likely L&D. The core participants include NEMA, NAMEM TWGs, MRCS/IFRC and frontline community representatives, local governments and sector ministries/departments, and national broadcasting/media outlets.

C) Early Warning and Anticipatory Early Action Coordination

Coordinated readiness and early action planning led by:

1. Local government / NEMA emergency management teams
2. NAMEM TWGs
3. NAMEM Aimag EOC
4. MRCS / IFRC
5. Sector departments (aimag/soum)
6. UN OCHA / HCT / UN Clusters

D) EAP Development

Joint development of EAPs (triggers, actions, targeting, budgets, SOPs) by:

1. Local government / NEMA emergency management teams
2. NAMEM TWGs
3. NAMEM Aimag EOC
4. MRCS / IFRC
5. Sector departments (aimag/soum)
6. UN OCHA / HCT / UN Clusters

E) EAP Approval 01 (Authorities / Partners)

EAPs to be approved by:

1. State Emergency Commission (SEC) & relevant sector ministry
2. UNRC (UN OCHA & HCT coordination)
3. Development partners and donors
4. NEMA
5. MRCS
6. Local governments and sector departments

F) Forecast-Based Financing (FbF) Decision Support System (DSS)

Governance and decision platform to operationalize triggers, approvals, and fund release:

1. SEC (Government) and UNRC (HCT / UN-OCHA) to lead the process
2. Ministry of Finance
3. NEMA and local governments to co-lead operational activation
4. MRCS / IFRC to co-lead implementation support

G) IBF-integrated FbF Dashboard

1. Impact forecasts for hazardous events
2. Operational forecasts
3. Weather warnings and alerts
4. Multi-hazard early warning status
5. EAP status and financing decisions

H) AAP Dashboard

Accountability to Affected Populations (AAP) feedback and collective action tracking for UN-HCT, I/NGOs, and partners supporting vulnerable communities.

I) State Emergency Commission (SEC)

Reviews emergency situations and EAPs, and makes decisions for risk reduction and anticipatory response.

J) Development Partners

Risk financing decisions, resource allocation, and mobilization to enable early actions.

K) Humanitarian Actors to Take Actions

Humanitarian / Local Actors Implement Early Actions

1. NEMA
2. IFRC / MRCS
3. Local governments
4. Herders
5. Frontline communities
6. I/NGOs
7. Charity / community-based support

Implement the following figure text fixes for clarity and consistency: replace “early Early earning” with “Early warning”; replace “anticipatory L & D” with “Anticipatory loss-and-damage (L&D)”; standardize UN OCHA (use one form consistently); and replace “Sector Department aimag” with “Sector departments (aimag/soum)”.

Recommended arrow logic (to remove ambiguity)

The recommended arrow logic clarifies an end-to-end, defensible workflow: IBF impact forecast > situation review with anticipatory L&D estimation > early warning and anticipatory action coordination > EAP development > EAP approval > FbF DSS decision with MoF/partners fund release > implementation of early actions > dashboards capturing performance, finance tracking, and feedback. This sequencing makes the FbF DSS (Step 6) the explicit convergence point where trigger status, validation, approvals, and financing come together to enable rapid action.

The Mermaid redraw was cleaned for consistency and to make the FbF DSS the explicit convergence point for trigger status/validation, decision, authorization, and fund release. Text hygiene fixes were applied (e.g., “anticipatory loss-and-damage (L&D)”, consistent casing, consistent MRCS/IFRC references), and the fund release step was integrated into the DSS decision node to remove ambiguity while preserving your overall end-to-end logic and feedback loops back to situation review.

1) Trigger Table format

Structure: hazard × impact threshold × confidence rule × action package × budget envelope × implemented

1.1 Trigger Table (master schema)

Use the table below as the "single source of truth" for activation logic. In the DSS, each row becomes a rule object with a unique Trigger Code.

Trigger Code	Hazard	Geographic Unit	Lead Time Window	Impact Threshold (Impact-based)	Confidence Rule (Decision criteria)	Trigger Status Logic	Action Package ID	Budget Envelope (ceiling and unit cost basis)	Implementer (Lead / Support)	Minimum Service Standard	Verification Data (post-event)
TRG-___	___	Aimag / Soum / Basin / Corridor	0-24h / 24-72h / 3-10d	___	___	Met / Watch / Not Met	ACT-___	BDT ___ / max ___; unit costs ref. ___	Lead: ___; Support: ___	___	___
TRG-___	___	___	___	___	___	___	ACT-___	___	___	___	___

Field notes (how to fill consistently):

- **Impact Threshold:** define *what impact* must be likely, *where*, and *how severe*. Avoid purely meteorological thresholds unless used as a supporting condition.
- **Confidence Rule:** specify probability, persistence, ensemble agreement, and/or nowcast confirmation requirements.
- **Budget Envelope:** include (i) ceiling per soum/aimag, (ii) unit-cost library reference, and (iii) eligible cost categories.
- **Minimum Service Standard:** the operational "definition of done" for the action package (coverage, timeliness, quality).
- **Verification Data:** objective sources to validate whether trigger and action e appropriate (obs, remote sensing, admin reports, mortality/road closure records).

1.2 Trigger Table (illustrative starter rows for Mongolia)

These are **examples** to demonstrate how impact triggers can be written. We can keep, modify, or replace them.

Recommendation: In Mongolia, start with 3-5 hazards and 8-15 triggers total, then expand after one full seasonal cycle of verification and recalibration.

Trigger Code	Hazard	Geographic Unit	Lead Time Window	Impact Threshold (Impact-based)	Confidence Rule	Trigger Status Logic	Action Package ID	Budget Envelope	Implementer (Lead / Support)	Minimum Service Standard	Verification Data
TRG-DZUD-01	Dzud risk (cold , snow , wind; grazing access failure)	Soum (with bag targeting)	3-10d (escalates to 24-72h)	**High likelihood of widespread grazing access constraint** (e.g., snow crusting/depth and wind chill conditions leading to severe pasture inaccessibility) affecting priority livestock zones	Ensemble agreement ≥ X% AND persistence ≥ 2 consecutive runs; upgraded if nowcast confirms rapid deterioration	Met if threshold , confidence satisfied for ≥ N bags or ≥ N% livestock exposure	ACT-DZUD-01	Ceiling per soum; unit-cost refs for fodder, fuel, veterinary kits, cash/voucher	Lead: Emergency management; Support: Livestock/agri services, local govt, partners	Fodder/cash delivered to ≥ X% targeted herder HH within Y hours; veterinary outreach initiated	Snow depth/cover (obs/RS), temperature/wind obs, road accessibility reports, livestock morbidity/mortality reports
TRG-FLD-01	Flood / intense rainfall impacts	Basin and soum	0-72h	**Expected inundation impacting settlements / critical roads** (e.g., modeled flood extent intersects settlement/road buffers above threshold)	Prob(inundation) ≥ X%; nowcast rainfall confirmation required within 0-6h window	Met if impact footprint intersects ≥ N critical assets OR ≥ N households	ACT-FLD-01	Ceiling per/Ger/ corridor/ soum; logistics and evacuation support unit costs	Lead: Emergency mgmt; Support: Roads/transport, health, local govt	Pre-positioning complete within Y hours; evacuation support readiness activated	Rainfall obs, river gauge, satellite flood extent, road closure logs, displacement figures
TRG-DRT-01	Drought / water stress impacts	Soum / grazing unit	3-10d to seasonal context	**High risk of water point failure / pasture stress** leading to livestock productivity loss or forced movements	Threshold requires anomaly persistence ≥ N weeks plus short-range confirmation; confidence tied to multi-indicator agreement	Met if water stress index , exposure > threshold and persists	ACT-DRT-01	Water trucking/cash ceilings; unit costs for water delivery and targeting	Lead: Local govt; Support: water services, livestock/agri, partners	Water delivered to ≥ X priority points; cash/vouchers issued to eligible HH	Water point monitoring, soil moisture proxies, pasture condition indicators, admin logs
TRG-DST-01	Dust storm / extreme wind health and livelihood impacts	Urban district , soum	0-24h / 24-72h	**Expected hazardous exposure** (e.g., dust/wind conditions likely to exceed health risk thresholds affecting vulnerable groups and transport safety)	Nowcast confirmation required; exceedance probability ≥ X% for ≥ N hours	Met if risk persists > N hours or covers high-density zones	ACT-DST-01	Health protection , communications , contingency ceilings	Lead: Health/EOC; Support: education, transport, local govt	Public guidance issued within 1 hour; protective distribution to high-risk groups within Y hours	Air quality, visibility, wind obs, health facility syndromic indicators, school/transport disruption logs

1.3 Action Package library (required companion index)

The Trigger Table will not function without an indexed action library.

1) Action Package fields (minimum):

Minimum Action Package fields ensure packages are trigger-ready, pre-costable, and auditable: ID/title, linked trigger codes, a clear objective (loss prevented/reduced), targeting rules (eligibility and geographic prioritization), inputs and logistics (cash/voucher/in-kind/service), implementation timeline (6h/24h/72h), unit cost assumptions and budget ceiling, implementer roles (lead/support with accountability notes), minimum service standards (coverage, timeliness, quality), and monitoring fields specifying what is reported, by whom, and when.

2) Impact Forecast Bulletin template

Goal: a decision-grade bulletin that supports (i) situational awareness, (ii) trigger determination, (iii) early action tasking, and (iv) CAP dissemination.

2.1 Bulletin cover page (mandatory)

Document control

- Bulletin Title: “Impact Forecast Bulletin - [Hazard / Multi-hazard]”
- Issue Date/Time (Local): ___
- Validity Period: Start ___ / End ___
- Update Frequency and Next Update Time: ___
- Issuing Authority: ___
- Version: v___ (include change log)

Geographic scope

- Coverage: national / list of aimags / list of soums
- Reference layers used: admin boundaries version ___; risk zones version ___

2.2 Executive summary (one page)

Key messages (3-5 bullets):

- What is expected (hazard , impact)
- Where the hotspots are (top 5-10 soums/corridors)
- When the peak risk window occurs
- Confidence level and major uncertainties
- Trigger status summary and recommended actions

Trigger dashboard

- Trigger met: ___ (list Trigger Codes , areas)
- Trigger watch: ___
- Not met: ___

Priority actions (by sector)

- Livestock/herders: ___
- Roads/transport: ___
- Health/education: ___
- Water/services: ___

2.3 Current conditions and observations (situational context)

Observed conditions (last 6-24 hours):

- Key observations (temperature, wind, snow, rainfall, river levels, visibility/air quality)
- Notable anomalies vs seasonal baseline (brief)
- Known impacts already occurring (if any)

Data quality/latency note:

- Any missing stations/products, confidence implications

2.4 Hazard forecast (spatiotemporal, high-resolution)

For each hazard (repeat subsections as needed):

Hazard: [name]

- Forecast window: ___
- Onset / Peak / End: ___
- Intensity range (with units): ___
- Threshold exceedance: where and for how long (include probability if available)
- Compound hazard interactions: ___

Uncertainty statement

- Key drivers, ensemble spread, scenario alternatives

2.5 Impact outlook (IBF core)

Impact hotspots (ranked table)

- Aimag | Soum | Impact severity | Likelihood | Primary exposed assets (livestock/roads/settlements/etc.) | Timing window

Sector impact narratives (short, decision-focused)

- Livestock & herder livelihoods: expected impacts, why, where
- Transport & critical infrastructure: expected disruption/closure risk
- Health: risk groups and exposure pattern
- Water & essential services: expected stress/failure risks
- Other productive sectors as relevant

Local risk paradigm (contextual modifiers)

- Exposure drivers (density, corridors, critical facilities)
- Vulnerability drivers (pasture condition, snow baseline, remoteness, access constraints)
- Coping capacity notes (local readiness, stockpiles, constraints)

Residual climatology / climate risk context (brief)

- Anomalies vs baseline (temperature/precipitation/snow)
- Compounding risks (e.g., drought baseline increasing dzud sensitivity)

2.6 Trigger determination (explicit, auditable)

Trigger summary table

- Trigger Code | Area(s) | Threshold met? | Confidence rule met? | Trigger status | Validity window | Notes

Decision traceability (required fields)

- Forecast run IDs / model cycle time
- Key input datasets used (observations , exposure layers)
- Rule set version (Trigger Table version)
- Analyst/validator sign-off (name/title or unit)

2.7 Recommended early actions (linked to FbF)

By triggered area (operational tasking)

- Area: Aimag/Soum/Bag
- Trigger Code(s): ___
- Action Package(s): ___
- Implementer: Lead ___ / Support ___
- Timeline: within 6h / 24h / 72h
- Minimum service standard: ___
- Resource note: indicative quantities and constraints

By sector (summary)

- Livestock: ___
- Roads: ___
- Health: ___
- Water/services: ___

2.8 Financing activation note (for internal decision-makers)

- Financing pathway: (e.g., anticipatory action window / contingency line)
- Eligible cost categories: ___
- Ceiling(s) by area/action package: ___
- Disbursement instructions reference: SOP-FIN-___
- Reporting requirements (rapid template): RPT-___ due within ___ hours/days

2.9 CAP block (Common Alerting Protocol payload)

Include a CAP-compliant block (machine-readable in the system; shown below as a field template). Each triggered warning area should have an info , area entry.

CAP - Alert (header)

- identifier: ___
- sender: ___
- sent: ___ (ISO timestamp)
- status: Actual / Exercise / Test
- msgType: Alert / Update / Cancel
- scope: Public / Restricted
- references: (if update) ___

CAP - Info (per hazard/language as needed)

- language: mn / en (as applicable)
- category: Met / Safety / Health / Transport / etc.
- event: ___ (e.g., Blizzard, Extreme Cold, Flood)
- urgency: Immediate / Expected / Future
- severity: Extreme / Severe / Moderate / Minor
- certainty: Observed / Likely / Possible
- effective: ___
- onset: ___
- expires: ___
- headline: ___
- description: ___ (public-facing, concise)
- instruction: ___ (what people should do)
- contact: ___
- web: ___ (optional)

CAP - Area (per polygon/admin unit)

- area Description: Aimag/Soum/Bag names
- geocode: admin codes (aimag/soum codes)
- polygon: lat/long list (if used)
- altitude / ceiling: optional

2.10 Annexes (recommended)

- Annex A: hotspot table (full)
- Annex B: map pack (below)
- Annex C: technical appendix (models, datasets, assumptions)
- Annex D: change log vs previous bulletin

2.11 Requirements of GIS DSS maps

Include these as standard layers; the DSS should generate them automatically.

1. **Hazard intensity map** (continuous field; highest resolution available)
2. **Threshold exceedance probability map** (if ensembles available)
3. **Impact severity map** (IBF output; categorical)
4. **Impact hotspot ranking map** (top soums/bags highlighted)
5. **Exposure overlay map** (livestock density / settlements / critical infrastructure)
6. **Access and constraints map** (roads, closures risk, remoteness, logistics nodes)
7. **Confidence/uncertainty map** (ensemble spread or confidence class)
8. **Trigger activation map** (Met/Watch/Not Met by admin unit)
9. **Recommended action coverage map** (areas and target groups for action packages)

2.3 Team composition for the Forecast-based financing (FBF) decision and inclusive functional process :

Below is a consolidated, "programme-ready" team composition and functional structure for an IBF-driven Forecast-based Financing (FbF) decision and inclusive operational process in Mongolia. Retaining all listed entities, removing duplicates, and organizing membership by governance tier and process stage so it can be inserted directly into concept notes and SOPs.

1) Governance and decision authorities

A. Lead decision authority

State Emergency Commission (SEC), Prime Minister's Office (PMO)

- Leads national-level emergency decision-making and endorsement of anticipatory actions and activation decisions where required.

B. Co-leading coordination authority (humanitarian system)

UN Resident Coordinator (UNRC) co-leading with:

- **UN OCHA** (coordination support)
- **Humanitarian Country Team (HCT)**
- **UN Clusters / UN Agencies**

Role: ensures humanitarian coordination, alignment with cluster readiness/response capacity, and (where applicable) activation pathways with partners and donors.

2) Executive decision-making members (national level)

A. Government core (policy , finance , sector execution)

- **Cabinet Secretariat** (whole-of-government coordination; co-lead role alongside MoF and sector ministries as applicable)
- **Ministry of Finance (MoF)** (risk financing governance, fiduciary rules, release modalities, and alignment with national budget/contingency instruments)
- **Ministry of Food, Agriculture and Light Industry** (livestock/agriculture risk management; dzud-related anticipatory actions)
- **Ministry of Environment and Tourism (MET)** (environment/climate-risk coordination; linkages to climate frameworks)
- **Ministry of Economy and Development** (development planning; recovery/resilience investment alignment)
- **Environment/Green Development portfolio entities** (as applicable under current GoM structure):
    - Ministry of Environment and Green Development (MEGD)
    - Central government administration authority responsible for the environment and green development
    - National Climate Committee (NCC) led by MEGD
    - Designated National Authority (DNA) of planning
    - CDM Bureau (MET/NAMA)
    - Renewable Energy Centre

- **National Implementing Entity (NIM)** (as applicable for climate finance programming and implementation linkages)

C. Disaster management / first responder system

- **National Emergency Management Agency (NEMA)** and functional departments, including:
    - National Center for Emergency and Disaster Relief (NCEDR)
    - **Military/first responder functions** (earthquakes, wildfires/forest fires, disease outbreaks, snow/dust storms, severe winters)

D. Red Cross / Red Crescent Movement (operational , humanitarian implementation)

- **Mongolian Red Cross Society (MRCS)** (on behalf of/in coordination with IFRC)

3) Process-stage team composition (who participates where)

The table below maps process steps (a-g) into an operationally clear decision chain.

Process stage	Purpose / output	Lead	Core members (minimum)
(a) FbF decision leadership	Strategic decision authority, activation governance	**SEC/PMO** (lead) , **UNRC/OCHA/HCT/Clusters** (co-lead)	SEC/PMO; UNRC; OCHA; HCT; Clusters
(b) Executive decision-making	Financing authorization, sector alignment and implementation readiness	**Cabinet Secretariat and MoF** (co-lead)	MoF; sector ministries (food/agri; environment; economy/development; green development/climate entities); NEMA/NCEDR; NAMEM; MRCS/IFRC
(c) EAP development	Draft Early Action Protocols (triggers, actions, targeting, costing, SOPs)	**Aimag/Soum governments , NEMA (LEMA)** (lead locally) , **NAMEM TWG** (technical lead)	Aimag Governor; Soum Governor; LEMA (NEMA EMT); NAMEM IBF TWG (HQ); NAMEM Aimag EOC; sector departments (aimag/soum); MRCS EOC; UN OCHA/HCT/Clusters; FAO EWEA; local stakeholders/value-chain and logistics operators
(d) EAP pre-approval	Technical and operational validation prior to activation	**NEMA EMT** (lead) , **NAMEM TWGs** (technical co-lead)	NEMA EMT; NAMEM TWGs; NAMEM Aimag EOC; MRCS/IFRC; sector departments (aimag); UN OCHA/HCT/Clusters; local financing institutions (government banks, private banks e.g., Khan Bank SMEs as applicable)
(e) Formulation of anticipatory early action (with IBF)	Convert forecasts into "taskable" early actions and contingency posture	**Aimag/Soum governments and LEMA**	Aimag Governor; Soum Governor; LEMA; NAMEM TWGs (HQ); NAMEM Aimag EOC; sector departments (aimag/soum/bag); MRCS EOC; UN OCHA/HCT/Clusters; stakeholders/value-chain/logistics operators
(f) Review of impact forecasts and local consequences	Situation review, local validation, consequence framing, dissemination	**NEMA and NAMEM** (co-lead)	NEMA; MRCS; NAMEM; sector ministry; sector departments; national broadcasting network
(g) External partners (optional support layer)	Reinforcement capacity, technical cooperation, surge support, financing	Depends on partnership	Bilateral/multilateral emergency agencies; ICDO/ADRC/ADPC/RIMES/IFCAA; WB/ADB; NGOs (Mercy Corps, WV, Save the Children); JICA/KOICA/TICA/SDC/USAID; others

4) Recommended functional teams inside the FbF DSS (to make it operational)

To run consistently, the mechanism benefits from four standing "cells" (these can be virtual, but roles should be named):

1. **Technical Trigger & IBF Cell (NAMEM-led TWGs)**
- Maintains trigger tables, validates forecast confidence, issues Impact Forecast Bulletins and trigger status.
2. **EAP & Operations Cell (NEMA , local governments , MRCS/IFRC)**
- Maintains EAP templates, readiness SOPs, logistics planning, and implementation tasking.
3. **Risk Financing & Fiduciary Cell (MoF , Cabinet Secretariat , implementing finance agents)**
- Maintains budget envelopes, ceilings, disbursement routes, compliance templates, and audit trails.
4. **Coordination, Accountability & Communications Cell (UNRC/OCHA/HCT , media , AAP focal points)**
- Harmonizes inter-agency coordination, cluster tasking, public communication, and AAP feedback loops.

5) Practical clean-up recommendations (to strengthen annex)

- **Separate "decision authority" from "technical validation."** SEC/PMO and UNRC/HCT lead decisions; NAMEM TWGs validate triggers; NEMA/LEMA validate operational feasibility.

- **Consolidate environment/green development entities** under a single "Environment/Green Development portfolio" line in the annex, and list subordinate bodies beneath it.
- **Treat banks/SMEs as enabling partners** under the **financing execution layer** (they should not be in the approval chain unless formally mandated).

a) Leading the FBF decision-making Process :

1) The State Emergency Commission (SEC) of the Prime Minister's Office (PMO)
2) Co-leading the GOM the UN Residence Coordinator (UNRC) with United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Humanitarian Country Team(HCT), UN Clusters (UN Agencies)

b) Other executive members of the decision-making processes;

- Ministries of Finance (MoF), responsibilities for climate change engagement
- Ministry of Food, Agriculture, and Light Industry
- Ministry of Environment and Tourism
- Ministry of Economy and Development
- Ministry of Environment and Green Development (MEGD), Economic Development (MED), and
- The central government administration authority responsible for environment and green development (MEGD)
- National Implementing Entity (NIM)
- Inter-disciplinary and inter-sectoral National Climate Committee /NCC/ now led by the MEGD,
- Designed the National Authority (DNA) of Planning
- Clean Development Mechanism (CDM) Bureau - MET/NAMA
- Renewable Energy Centre

c) **Co-Leading FBF decision-making Process: Cabinet Secretariat, Ministry of Finance,** and other relevant sector ministries. Following government departments and stakeholders to support the process;

- National Emergency Management Agency (NEMA) and functional departments - National Center for Emergency and Disaster Relief (NCEDR), the military serves as first responders for earthquakes, wildfires, forest fires, contagious diseases, snow and dust storms, and severe winters.
- Mongolian Red Cross Society (MRCS) on behalf of the International Federation of Red Cross and Red Crescent Societies(IFRC).

d) Early Action Protocol Development :

- Aimag Governor
- Soum Governor
- Local Emergency Management Agency (LEMA) of NEMA at aimag/soum level (NEMA Emergency Management Team)
- UN OCHA/HCT/UN Clusters
- FAO's Early Warning Early Action (EWEA)
- Mongolian Red Cross Society (MRCS) - EOC
- Sector Department at aimag /soum level
- NAMEM IBF designated Technical Working Group (TWG) at HQ level
- NAMEM Aimag EOC, Local Governments at the local level (Aimag, Soum, Bag)
- Sector Department
- Stakeholders, Value chain Operators, and Logistic Operators at the Local level

e) Early Action Protocol (EAP Pre-Approval) :

- NEMA Emergency Management Team
- NAMEM TWGs
- NAMEM Aimag EOC
- Mongolian Red Cross Society (MRCS) , IFRC
- Sector Department aimag

- UN OCHA/HCT/UN Clusters
- Local Financing intuitions e.g Government Banks, Private Banks(Khan Bank), Small and medium enterprises(SME)

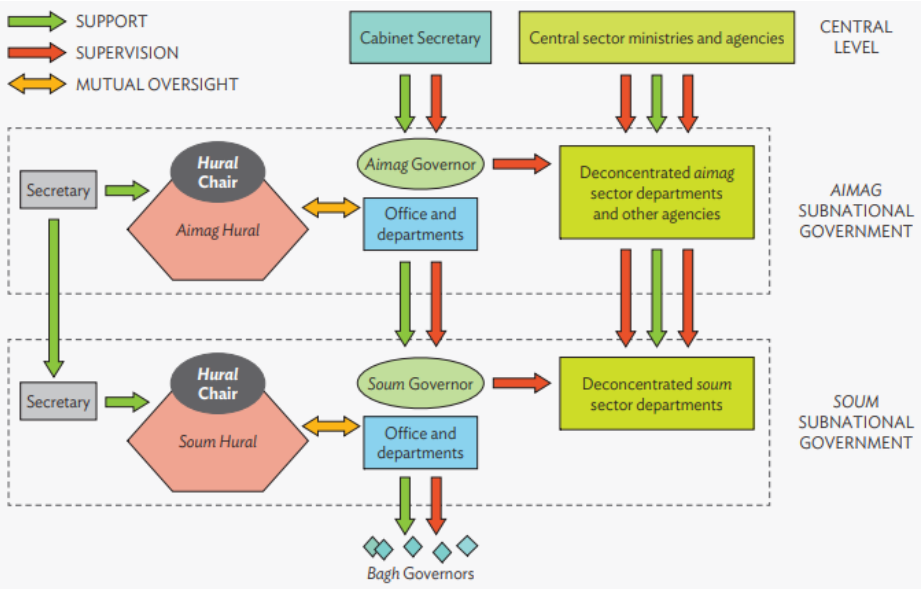

Figure 3: Schematic View of local governments in Mongolia (Source: 2021-August, ADB [1])

f) Formulation of Anticipatory Early Action along with IBF :

- Aimag Governor
- Soum Governor
- Local Emergency Management Agency (LEMA) of NEMA at aimag/soum level (NEMA Emergency Management Team)
- UN OCHA/HCT/UN Clusters
- Mongolian Red Cross Society (MRCS) - EOC
- Sector Department at aimag /soum/bag level
- NAMEM IBF designated several technical working Groups (TWG) at the HQ level
- NAMEM Aimag EOC, Local Governments at the local level(Aimag, Soum, Bag)
- Sector Department
- Stakeholders, Value Chain Operators, and Logistics Operators at the Local level

g) Review of Impact Forecast on impending hazardous weather events and consequential situations at the local level:

- NEMA
- MRCS
- NAMEM
- Sector Ministry
- Sector Department
- National Broadcasting Network

h) Other partners:

1) Bilateral and multilateral cooperation

- The Ministry of the Russian Federation for Affairs for Civil Defense, Emergencies, and Elimination of Consequences of Natural Disasters
- Federal Agency for State Reserve, Russian Federation

[1] https://www.adb.org/sites/default/files/publication/726896/decentralization-governance-economic-development-mongolia.pdf

- Ministry of Emergency Management, People's Republic of China
- China Earthquake Administration
- State Forestry Administration, People's Republic of China
- Ministry of Interior and Safety, Republic of Korea
- National Fire Agency, Republic of Korea
- State Committee of Emergency and Disaster Management of the Democratic People's Republic of Korea
- General Directorate for Civil Defense and Crises Management, French Republic
- Directorate for Disaster Management, Republic of Hungary
- Ministry of Emergency Situations, Republic of Kyrgyzstan
- Ministry of Internal Affairs of the Republic of Kazakhstan
- Other potential partners

2) Other International Organizations.

- International Civil Defense Organization (ICDO)
- Asian Disaster Reduction Center (ADRC)
- Asian Disaster Preparedness Center (ADPC)
- RIMES
- International Fire Chiefs' Association of Asia (IFCAA)
- World Bank (WB)
- Asian Development Bank (ADB)
- Mercy Corps
- World Vision (WV)
- Save the Children
- Japan International Cooperation Agency (JICA)
- Korea International Cooperation Agency (KOICA)
- Turkish International Cooperation Agency (TICA)
- Swiss Agency for Development and Cooperation (SDC)
- United States Agency for International Development (USAID)
- Other potential partners/donors

2.4 Functions of leading partners for the FBF Process

1) Functional Responsibilities of Partners (slow- medium onset hazards) :

- **Strategic review and financing advocacy (SEC):**
  The State Emergency Commission (SEC) should review IBF outputs and the corresponding Early Action Plan (EAP) alongside available budget options, and convene policy/strategy dialogue with donors and the UN Resident Coordinator system (HCT and clusters) to advocate for timely financing for impending high-impact hazards.
- **Policy and strategy formulation for slow-onset risks:**
  Develop sector policies and strategies for slow-to-medium-onset, high-impact hazards, including drought, prolonged winter hazards, water stress, desertification, deforestation, and degradation of pasture biomass/rangelands.
- **Risk-informed local development planning and budgeting:**
  Institutionalize risk-informed local development planning and budgeting, including resource mobilization strategies to meet financing requirements from both **internal** (government) and **external** (donors/partners) sources.
- **Standing Orders on Disasters and stakeholder tasking (SoD/5W):**
  Develop Standing Orders on Disasters (SoD) and define stakeholder responsibilities using a 5W structure who does what, where, when, and how covering all actors under SEC and NEMA-led disaster emergency management arrangements.
- **SOPs for operationalizing FbF and preparedness:**
  Formulate Standard Operating Procedures (SOPs to operationalize the FbF framework, including preparedness actions, trigger-based activation, coordination, communications, and reporting.

- **Inclusive climate risk-informed planning and resource mobilization:**
  Guide local governments to adopt inclusive, climate risk-informed planning and budgeting processes and define strategies for resource mobilization (internal and external) to sustain anticipatory actions.

2) Functional Responsibilities for the occurrence of rapid onset hazards and induced disasters.

- **Rapid review and approval of EAP activation:**
  Continuously review operational forecasts, warnings/alerts, and the Early Action Protocol (EAP), including proposed anticipatory actions, and ensure **fast-track validation and approval** for activation when thresholds are met.
- **Prepare an IBF/FBF-informed emergency preparedness and response plan:**
  Formulate and operationalize a disaster emergency preparedness and response plan guided by IBF and FbF tools, including trigger-based escalation, coordination arrangements, resource pre-positioning, and communication protocols.
- **Establish local-level SoD and SOPs for humanitarian action:**
  Develop and implement aimag-, soum-, and bag-specific **Standing Orders on Disasters (SoD)** and **Standard Operating Procedures (SOPs)** to ensure clear roles, responsibilities, decision pathways, and coordinated humanitarian action during rapid-onset emergencies.

3) Mandating partners /stakeholders to project and scheme designing according to policy, plans, SOD, SOP

Standing Orders on Disasters (SoD) formally define and mandate the roles, responsibilities, and required actions of disaster risk management (DRM) institutions, participating sectors, and stakeholders both during normal periods and throughout disaster onset and response. Complementary Standard Operating Procedures (SOPs), structured through a 5W framework (who does what, where, when, and how), operationalize these mandates by specifying coordinated tasks, workflows, decision pathways, and accountability arrangements. Together, SoD and SOPs ensure that all actors design and implement projects and schemes in a consistent, efficient, and interoperable manner across the DRM system.

4) Develop FBF framework/SOP - based on the following stages of disaster management cycles at aimag level.

Develop an aimag-level FbF framework and SOP that aligns roles and responsibilities, triggers, early actions, coordination, and financing across the full disaster management cycle. The SOP should be organized into the following stages:

1. Prevention and risk reduction (normal time)
2. Preparedness and readiness
3. Anticipation and early action (pre-impact activation)
4. Response (during impact and immediate aftermath)
5. Early recovery and rehabilitation
6. Monitoring, evaluation, and learning

1) Prevention and risk reduction (normal time)

2) Preparedness and readiness

- **Define triggers and thresholds (IBF color codes):**

  Establish aimag-specific hazard triggers and impact thresholds using the IBF color-coded alert system, including clear activation criteria, geographic scope (aimag/soum/bag), and lead-time expectations.

- **Prepare the aimag-level EAP:**
  Develop an aimag-level Early Action Protocol (EAP) that specifies pre-agreed early actions, implementation responsibilities, operational timelines, and unit-costed budgets linked to each trigger level.

- **Plan pre-positioning and logistics:**
  Prepare and maintain pre-positioning plans for critical supplies and services relief items, fodder/feed, veterinary inputs, fuel, and transport/logistics capacity covering storage locations, transport routes, and surge arrangements.

- **Conduct training, drills, and platform readiness checks:**
  Implement routine trainings and simulation drills on SOPs, CAP alert issuance and dissemination, platform use (IBF/FBF dashboards, GeoNode), and 5W coordination to ensure roles, procedures, and communication pathways are fully understood and operational.

3) Anticipation and early action (pre-impact activation)

- **Continuous forecast and risk monitoring:**
  Maintain continuous monitoring of IBF products operational forecasts, watches, warnings, alerts and relevant seasonal indices through the IBF/FBF platform, with defined update frequency and escalation rules.
- **Trigger-based activation with fast-track approval:**
  When predefined thresholds are reached, activate the EAP through a rapid approval mechanism, ensuring timely authorization, notification, and documentation of the trigger evidence and decision rationale.
- **Implement anticipatory actions with targeted modalities:**
  Deploy anticipatory actions cash-based support, in-kind assistance, and logistics facilitation prioritized for high-risk soums/bags and the most vulnerable herders, based on exposure, vulnerability, and coping-capacity criteria.
- **Risk communication and CAP dissemination:**
  Issue coordinated risk communication products and Common Alerting Protocol (CAP) alerts using agreed dissemination channels (e.g., IBF platform, mobile networks, radio/TV, community networks), ensuring clear guidance on protective actions and expected impacts.

4) Response (during impact and immediate aftermath)

- **Activate EOC/ICS coordination and life-saving operations:**

  Activate the aimag Emergency Operations Center (EOC) and Incident Command System (ICS) arrangements to coordinate rapid, life-saving response actions, including search and rescue support, emergency sheltering, medical referral, livestock protection measures, and critical logistics.

- **Maintain real-time situational awareness and reporting:**
  Continuously capture and validate event situation reports using crowdsourcing channels, high-density AWS observations, and partner reporting. Update the IBF/FBF geospatial platform with geotagged photos/videos, key attributes, and incident layers; refresh dashboards and operational maps for decision support.

- **Scale and retarget resources based on evolving impacts:**
  Mobilize additional resources as impacts evolve and adjust targeting to reflect real-time severity, affected population/livestock concentrations, access constraints, and supply chain limitations. Apply escalation rules and reallocate assets to the highest priority locations.

- **Document L&D, service disruption, and urgent needs:**
  Record loss and damage (physical and financial), service disruptions, and urgent needs in a structured format to support response coordination, funding justification, rehabilitation planning, and post-event assessment processes.

5) Early recovery and rehabilitation

- **Conduct rapid assessments and update L&D evidence:**
  Implement rapid multi-sector assessments (including livestock and livelihoods), and update loss-and-damage (L&D) estimates and damage registers using verified field reports, geospatial evidence, and administrative records.
- **Deliver targeted recovery support for livelihoods and critical services:**
  Implement priority recovery measures to restore functionality and reduce secondary losses, including fodder restocking**,** veterinary campaigns and disease control**,** restoration of water access points**, and** repair of livestock shelters and critical community infrastructure**.**
- **Align recovery with social protection and sector rehabilitation programmes:**
  Integrate early recovery actions with existing **social protection mechanisms** (cash transfers, subsidies, targeted assistance) and relevant sectoral rehabilitation programmes to ensure coherence, avoid duplication, and enable sustained recovery and resilience building.

6) Monitoring, evaluation, and learning

- **Monitor trigger performance and operational effectiveness:**
  Track how well triggers performed (accuracy, lead time, false alarms/misses) and assess early action and response performance, including **timeliness**, **coverage**, **targeting quality**, and **outcomes** for affected people, livestock, and critical services.
- **Conduct after-action reviews and update operational tools:**
  Carry out structured after-action reviews (AARs) with implementing partners and local authorities, then update EAP triggers**,** early action menus**,** costing assumptions, and SOP workflows based on evidence, lessons learned, and stakeholder feedback.
- **Maintain and curate an evidence base for continuous improvement:**
  Systematically maintain dashboards, situation reports, maps, datasets, and decision logs within the IBF/FBF platform to support continuous improvement, institutional memory, accountability, and future **preparedness and financing advocacy**.

a) Mandating & accountability of local stakeholders for disaster preparedness planning, budgeting, and resource mobilization strategy at Aimag, Soum, Bag level

Evidence-based pre-disaster needs assessment (livestock focus):
Review the livestock sector risk-repository database and risk atlas to conduct a comprehensive pre-disaster needs assessment. This should identify priority risk areas and exposed elements, and estimate anticipatory loss and damage (L&D)

b) **Mandating & accountability of local stakeholders during a disaster emergency**

- **Daily coordination, situation reporting, and mapping:**

  Local stakeholders should work closely with humanitarian actors to produce daily situation reports and operational maps, integrating IBF/FBF platform updates, EOC/ICS information, and verified field observations.

- **Daily anticipatory L&D and needs estimation:**

  On a daily basis, local stakeholders should estimate anticipated loss and damage (L&D) and immediate humanitarian needs by maintaining direct communication with herders, vulnerable groups, and relevant sector departments. This process should quantify (where feasible) expected impacts for the day such as livestock morbidity/mortality risk, pasture/grazing disruption, shelter damage, and service interruptions and translate

these findings into prioritized, costed requirements for rapid support (cash assistance, in-kind inputs, and logistics/transport) to protect lives and critical assets.

c) Supporting Post-disaster rehabilitation :

- **Comprehensive loss-and-damage reporting and verification:**
  Conduct detailed, sector-wise situation reporting that documents verified loss and damage for herders and vulnerable communities, including livestock losses, livelihood and productive asset losses, physical infrastructure damage, and financial impacts (including standing crop losses where relevant). Ensure reports are georeferenced where possible and consolidated into standardized damage registers to support analysis and transparency.
- **Financing advocacy for rehabilitation and recovery:**
  Use the consolidated evidence base (damage registers, maps, quantified L&D, and needs estimates) to develop rehabilitation-focused funding justifications and advocate for financing from government mechanisms and external partners to restore livelihoods, rebuild critical assets, and strengthen resilience against recurrent hazards.

3.0 Risk Finance Planning & decision-making dashboard

Mongolia's climate risks and vulnerabilities are seasonally diverse, highly uncertain, and often rapid onset. Under normal circumstances, multi-hazard and climate risk-financing decisions tend to move through time-consuming government channels and are rarely supported by an ICT-enabled, evidence-based dashboard (e.g., GIS-informed datasets) that enables coordinated, inclusive, and participatory decision-making at local level. In addition, risk-financing partners often operate in parallel, resulting in fragmented assessments and isolated funding decisions.

An integrated IBF-FbF dashboard-based mechanism provides a practical solution for faster, better-informed decisions. Mainstreaming risk assessment, impact forecasting, and risk financing into a single integrated workflow enables a coherent approach to coordination, information exchange, and collective decision-making.

The dashboard should be designed to ensure inclusive participation and shared ownership among state and non-state actors, financing instruments, project developers, sector ministries and departments, local governments (aimag/soum/bag), humanitarian partners, and vulnerable communities. This integrated approach would substantially reduce operational frictions such as duplication, overlap, and repeated funding and support equitable coverage across Mongolia so that no one is left behind.

Inputs to the dashboard should be drawn from summarized outputs of each component of the IBF and corresponding FbF processes, enabling decision-makers to assess impending and ongoing risks at a glance, visualize scenarios, align action plans and protocols, and identify gaps requiring rapid intervention.

Ultimately, the integrated dashboard enables scientifically grounded, trigger-based decisions linking early warning information, EAPs, and early actions to financing so stakeholders can determine when, where, how much, and how resources should be mobilized and funds released to frontline communities to implement timely, effective action.

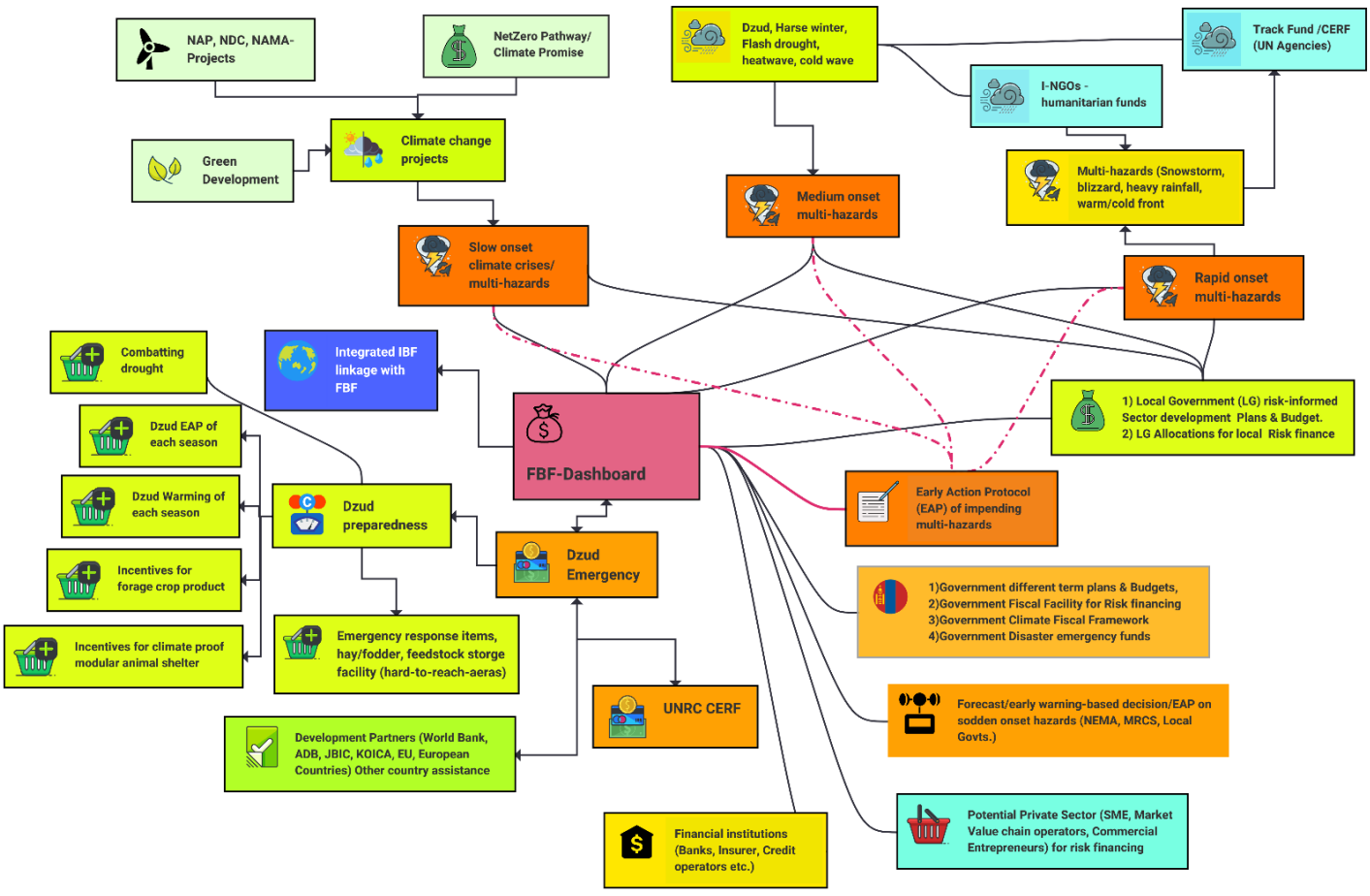

Figure 2: integrated and inclusive, risk-informed risk-financing decision-making dashboard (Source: Z M Sajjadul Islam, UNDP-GCF)

The dashboard and FbF online information management system are designed to strengthen EAP planning and support the development of sector-specific contingencies for impending multi-hazard and disaster risks. By consolidating IBF outputs, baseline risk information, and financing instruments in a single platform, the dashboard enables timely allocation decisions, rapid fund disbursement, and in appropriate cases automatic activation of anticipatory actions before disaster impacts occur.

In addition, the dashboard establishes a risk communication strategy that enables faster and more reliable decision-making and action planning. By supporting early, coordinated measures such as mobilizing emergency relief suppliers, pre-positioning response items, and deploying life-saving assistance the system can reduce potential damage costs and minimize loss and damage, particularly for rapid-onset hazards.

Intended benefits include:

- **Inclusive, participatory local-level planning and risk financing:** Support local response planning and financing decisions with transparent, shared evidence.
- **Engagement of stakeholders and vulnerable communities:** Enable meaningful participation of frontline communities in planning and decision-making.
- **Faster decision-making on anticipatory L&D scenarios and EAPs:** Accelerate scenario setting and EAP development at local levels.
- **Mobilization of inclusive risk finance from diverse sources:** Facilitate financing contributions from donors, private sector actors, local entrepreneurs, value-chain operators, charities, NGOs, SMEs, insurers, credit operators, and market actors.
- **Identification of financing sources (internal/external):** Systematically map available and potential funding streams.
- **Enhanced advocacy and "grand bargaining" capacity:** Strengthen negotiation and advocacy for optimized risk finance mobilization.
- **Concerted, stakeholder-agreed decision-making:** Enable coordinated planning and decisions to avert climate crises.
- **Top-down and bottom-up functionality:** Integrate national-to-local and local-to-national workflows for risk assessment, early warning, L&D estimation, and EAP activation.

3.1 IBF Driven FBF decision-making mechanism

Mongolia's macro-, meso-, and micro-scale weather systems further intensified by climate change are increasingly producing rapid-onset hazardous conditions with significant impacts across the landscape. The FbF mechanism is therefore intended not only to address forecast extreme events that may trigger immediate humanitarian emergencies, but also to strengthen Mongolia's broader paradigm of forecast-based weather and climate risk financing.

Climate change has amplified the intensity and spatiotemporal variability of hazardous weather, with impacts emerging at hourly and diurnal scales. In Mongolia, microclimatic disturbances are becoming more frequent and severe often described as experiencing "four seasons in a single day" which increases risks to lives, livelihoods, and assets. Addressing this reality requires inclusive, ICT-enabled, risk-informed climate information services that support timely and shared decision-making.

A key priority is to diagnose and define the entry-level strategies that actors can apply for risk-informed planning and budgeting to manage spatiotemporal weather- and climate-related hazards. In this context, early decision and early action protocol-based planning, combined with inclusive financing arrangements, becomes strategically essential for ensuring that frontline communities are prepared and that escalating crises can be averted despite uncertainty.

Effective climate risk-informed decision-making across different hazard onset types depends on timely, coordinated efforts among stakeholders. When supported by an ICT dashboard for emergency risk financing, this approach enables a coherent and consistent mechanism for anticipating impacts, preparing emergency actions, and mobilizing inclusive resources to manage climate-related uncertainty and reduce loss and damage.

3.2 Dashboard based tailormade informed tools for integrated early action planning (EAP) and risk financing

The Government of Mongolia has developed several long-term national policies and programmes to strengthen climate and disaster risk reduction and advance green development. These include the long-term development strategy Vision 2050, implemented in three phases (2020-2030, 2031-2040, and 2041-2050). In 2015, the government approved the National Programme of Community Participatory Disaster Risk Reduction, which aims to engage communities in reducing disaster risks through improved knowledge, education, and training, promotion of a safe-living culture, and enhanced resilience to climate change. In 2016, the Mongolian Sustainable Development Vision 2030 was adopted to build national capacity. In addition, NEMA developed the Mid-Term Strategy to Implement the Sendai Framework for Disaster Risk Reduction in Mongolia (2017-2030), which emphasizes preventive risk reduction through mitigation and preparedness.

To operationalize these national priorities, dashboard-based, tailor-made informed tools under the FbF framework are required to support policy formulation, planning, programme design, implementation, and localization at both national and sub-national levels. These tools should enable evidence-based decision-making by integrating IBF outputs, baseline risk and vulnerability data, early action protocols, and financing options into a single platform that supports timely, coordinated action.

1) Tailormade IBF informed tools for Supporting Mid-term Plans/Policy/Strategies relating to climate crisis

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
• **Implementation of the National Adaptation Plan (NAP):** Support NAP execution through risk-informed planning, sub-national localization, and integration of IBF/FbF evidence into sectoral and local development plans and budgets. • **National Action Programme on Climate Change:** Enable implementation and localization of the national climate action programme by linking climate risk information, impact forecasts, early action planning, and financing instruments to prioritized interventions and investment decisions.	**Risk-informed GIS maps, repositories, and hydrometeorological information services for priority areas** • **Sustainable pasture management and ecological vulnerability:** Develop risk-informed GIS layers and a consolidated repository to support rangeland governance, pasture productivity monitoring, pasture degradation mapping, and identification of ecologically vulnerable areas. • **Irrigated cropland and climate-smart soil management:** Produce GIS datasets and advisories for irrigated croplands to reduce soil moisture loss, improve irrigation efficiency, and decrease soil carbon emissions through climate-smart land and water management practices. • **Water availability and river-basin ecosystem protection:** Maintain geospatial data and hydrometeorological services to assess and protect water resources by identifying runoff-formation zones, safeguarding native ecosystems within river basins, and mapping upstream-downstream water security risks. • **Reservoirs for glacier and meltwater harvesting:** Develop GIS maps and planning repositories identifying suitable sites for reservoirs and water-storage infrastructure that can capture glacier melt and seasonal runoff for drought buffering and dry-season supply. • **Drainage networks, river streams, and flow monitoring:** Provide GIS layers and operational hydrometeorological services on drainage systems, river networks, streamflow regimes, and flood-prone corridors to support forecasting, risk analysis, and infrastructure planning. • **Forest resources and climate risk:** Maintain forest-resource GIS inventories and risk layers (e.g., wildfire exposure, drought stress, degradation hotspots) to guide protection, restoration, and sustainable forest management.	• **Demand-driven operational IBF for priority sectors (to support FbF):** Provide sector-specific operational IBF products on short- and medium-range time horizons to inform triggers, targeting, and activation of FbF actions. • **Sectoral impact forecasts:** Produce impact forecasts tailored to priority sectors, translating hazard intensity into expected impacts on exposed elements, services, and livelihoods. • **Early warning for NAP elements and climate-vulnerable sectors:** Deliver early warnings linked to NAP priorities, including risk communication products that support anticipatory planning and protection of climate-sensitive assets and populations. • **Climate information services and tailor-made decision-support tools:** Develop sector-relevant climate information services (maps, dashboards, indices, advisories) that enable routine planning, preparedness, and investment prioritization. • **Sector-specific adaptation programme planning and implementation (national and local):** Support national and aimag/soum/bag planning desks with evidence for adaptation programme design, inclusive budgeting, project development, and implementation sequencing. • **Dashboard-based risk financing decision instrument:** Operationalize a dashboard that enables national and aimag governments to mobilize and allocate risk finance aligned to prioritized actions, trigger thresholds, and verified risk/impact evidence. • **Stakeholder engagement in risk finance decision-making:** Embed structured engagement of key stakeholders (government, humanitarian actors, private sector, finance institutions, communities) to ensure coordinated decisions, transparency, and accountability.

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
	• **NAP localization and project design (site selection and investment targeting):** Provide risk-informed GIS tools and hydrometeorological information services to support NAP localization by identifying priority areas and feasible sites for implementation, including ecosystem-based adaptation (EbA), nature-based solutions (NbS), water security investments, disaster risk reduction measures, and interventions addressing forest degradation and deforestation.	• **Support for low-regret/no-regret and locally led adaptation solutions:** Provide planning guidance and evidence to design low-regret/no-regret measures, win-win adaptation options, nature-based solutions, and locally led interventions. • **Integrated IBF interface for warnings and MHEWS:** Ensure IBF is integrated with climate information services, weather warnings/alerts, and a multi-hazard early warning system for end-to-end service delivery. • **Coherent planning solution for the NAP process:** Provide an integrated platform and workflow that connects risk information, adaptation priorities, financing, and implementation tracking for NAP localization. • **Tailor-made services for NAP cost-benefit analysis and option appraisal:** Generate datasets and analytical tools to evaluate priority adaptation options, including cost-benefit, feasibility, and impact metrics. • **Tailor-made services for assessing long-term adaptation finance needs:** Support estimation of financial requirements for long-term adaptation planning, including sectoral costing and investment pipelines. • **Tailor-made services for adaptation resource mobilization strategies:** Provide information products to identify funding sources, financing instruments, and sequencing strategies to mobilize adaptation resources. • **Design a monitoring and evaluation framework for NAP:** Develop an M&E framework with indicators, baselines, targets, and reporting structures to track adaptation progress and outcomes. • **Establish NAP monitoring and review systems:** Institutionalize monitoring and periodic review mechanisms supported by dashboard reporting to enable learning, accountability, and continuous improvement.
• **NDC implementation and localization:** Provide risk-informed climate and weather intelligence to support implementation of the Nationally Determined Contribution (NDC) at national and sub-national levels, including prioritization of sector actions, integration into aimag/soum development plans, and alignment of financing with NDC targets. • **NDC tracking:** Establish dashboard-enabled tracking of NDC progress using agreed indicators, geospatial evidence, and sector reporting linking outputs and outcomes (e.g., resilience gains, risk reduction, emissions-relevant co-benefits where applicable) to	• Tailor-made risk-informed tools for NDC-linked risk financing: • Develop dashboard-enabled tools that support risk-financing decisions for NDC implementation, including alignment with NDC-related policies, action plans, programmes, and partnership frameworks. Provide technical knowledge on priority NDC projects and produce practical deliverables such as guidelines, training materials, analytical reports, and sector assessments to strengthen project design and investment readiness. • NDC information management, database development, and public awareness: • Support development of a structured NDC database and information-sharing system, interfaced with a public-facing website, to communicate Mongolia's NDC objectives, implementation status, financing needs, and	• **FBF dashboard-based, tailor-made risk-informed tools for NDC data and climate information management:** Establish a dashboard-enabled information repository that consolidates **NDC target data**, relevant climate and risk datasets, and implementation metadata. Integrate this repository into the FbF website through a role-based login portal where government institutions, implementing partners, and donors can upload, access, and exchange information and coordinate NDC-related activities in Mongolia. • **IBF-integrated FBF platform for NDC activity sharing, coordination, and tracking:** Use the integrated IBF-FbF platform as a shared system for NDC activity data sharing and storage to strengthen coordination. Key functions should include:

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
implementation milestones, budgets, and financing flows.	results in a clear and accessible manner. Include functions for awareness raising, data visualization, and periodic updates. • Stakeholder engagement through an interactive Partnership Plan: • Enable an interactive Partnership Plan module that allows stakeholders to collaborate on project design and implementation, share project summaries, documentation, progress updates, and lessons learned, and exchange information on climate-related initiatives being implemented at national and provincial levels including relevant projects beyond the Partnership Plan's formal scope. • Repository of climate-relevant policies and resources: • Establish and maintain a curated repository of climate-relevant policies, strategies, technical guidance, and reference materials, drawing on both national and international sources, to support consistent planning, compliance, learning, and project development.	• **Activity and stakeholder mapping** through an interactive Partnership Plan (who is doing what, where, when, and how). • **Implementation tracking and monitoring**, including milestones, budgets, financing flows, outputs/outcomes, and geospatial tagging where feasible. • **Progress reporting and dashboard visualization** to support oversight, gap identification, and evidence-based decision-making.
Anchoring government risk financing instruments	Anchoring government planning, budgeting and financing functionaries and related government information portals (E-Mongolia) with FBF information dashboard for rapid decision support during disaster emergency resource mobilizations.	• Dashboard for a public risk finance management system • Risk-informed tools for climate policy and public financial management: • Integrate risk analytics into climate policy implementation and public finance management, including fiscal policy instruments, budget tagging, and risk-informed expenditure planning. • Rapid action planning and budgeting for sudden-onset events: • Enable fast-track planning and budgeting workflows for rapid-onset extreme weather events and disasters, linking IBF thresholds to pre-costed actions and rapid disbursement pathways. • Accountability to affected populations (AAP) and collective tracking: • Support AAP by enabling the UN-HCT, I/NGOs, and partners to develop collective AAP action plans and track implementation through dashboard-based task management, monitoring, and evaluation (M&E), including coverage, timeliness, feedback loops, and grievance response tracking where applicable. • Alignment of climate trust funds with risk mitigation priorities: • Provide tools to align climate trust funds (government, donors, entrepreneurs, banks, and financial institutions) with risk mitigation and preparedness interventions, ensuring transparent allocation logic and duplication control. • Integrated resource mobilization for adaptation and mitigation: • Support coordinated mobilization of finance for adaptation and mitigation, including nature-based solutions (with adaptation and mitigation co-benefits), ecosystem-based adaptation, and locally led solutions linking investment pipelines to risk evidence, expected outcomes, and financing instruments.

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
Building disaster-resilient infrastructure	Risk-informed GIS maps, repositories, and hydrometeorological information services should be developed and maintained to support planning, design, and site selection for disaster-resilient infrastructure and essential utility services. These tools should enable identification of priority locations and resilient design requirements by integrating hazard, exposure, vulnerability, and operational performance data. Key components include: • **Multi-hazard hazard layers and return-period maps:** Flood/flash flood, landslide, snowstorm/blizzard, extreme cold/wind chill, heat, drought, wildfire, and (where relevant) seismic layers, with probabilistic/return-period representations for engineering use. • **Critical infrastructure and utility asset inventory (GIS):** Geolocated databases of roads, bridges, culverts, po plants and substations, transmission/distribution lines, heating networks, water supply intakes, treatment plants, pumping stations, sewage/drainage systems, dams/canals, and emergency facilities linked to condition and service-criticality attributes. • **Exposure and vulnerability repositories for built assets:** Asset typologies, design standards, fragility functions (where available), maintenance status, redundancy, and interdependencies (e.g., po-water coupling), supporting infrastructure vulnerability indexing. • **Hydrometeorological and hydrological decision layers:** Rainfall intensity-duration-frequency (IDF) curves, snow load and wind load zones, freeze-thaw and permafrost/soil-ice conditions, river discharge regimes, drainage capacity, water-level monitoring, and catchment runoff characteristics. • **Site suitability and constraint mapping for resilient investment:** Multi-criteria GIS/MCDA layers combining hazards, topography/DEM, soil stability, land use/land cover, protected areas, access routes, population/service demand, and lifecycle cost considerations to support site screening and prioritization. • **Design-support products and standards alignment:** Map-based guidance for selecting design parameters (e.g., drainage sizing, flood protection elevations, snow/wind load assumptions, freeze protection), aligned with national codes and sector standards. • **Implementation prioritization and budgeting tools:** Risk-ranked investment pipeline maps showing where resilient upgrades yield the highest avoided losses, service continuity benefits, and co-benefits for vulnerable populations. • **Operational monitoring and update services:** Integration with IBF/early warning outputs to support asset protection actions during events and to update repositories post-event using	Disaster-resilient infrastructure is recognized within Mongolia's implementation of the Sendai Framework. However, there is limited evidence that climate change adaptation and disaster risk reduction are being explicitly and systematically mainstreamed into infrastructure development policy and planning documents. An integrated **IBF-FbF** approach is intended to address this gap by providing risk-informed data, impact forecasts, and trigger-based financing mechanisms that strengthen climate- and disaster-resilient infrastructure planning, design, and investment decision-making.

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
	damage reports, remote sensing, and field verification.	
• **Policy and strategy support for a green fiscal framework:** Provide risk- and climate-informed analytical tools to support development of a green fiscal framework, including climate budget tagging, risk-informed public expenditure planning, and alignment of fiscal instruments with adaptation and mitigation priorities. • **Informed tools for Vision 2050 implementation:** Develop dashboard-enabled evidence products (GIS layers, risk atlases, climate scenarios, sector indicators) to support planning, localization, and investment prioritization under Mongolia's long-term development strategy Vision 2050. • **Dashboard-based tools for banks and financial institutions to plan Net Zero programmes:** Provide decision-support dashboards that help financial institutions identify, prioritize, and budget Net Zero-aligned programmes and interventions, using climate risk, exposure, and transition-relevant indicators to guide portfolio planning. • **Tools for climate risk and sustainable finance:** Establish tools that integrate climate risk analytics with sustainable finance frameworks, supporting risk screening, disclosure-aligned reporting, and targeting of resilient and low-carbon investments. • **Informed planning for bankable climate actions:** Support pipeline development by generating data products and appraisal tools (risk screening, cost-benefit and avoided-loss analysis, feasibility indicators) to strengthen the design of bankable climate actions and investment proposals. • **Tools for regulatory financing bodies and policy decisions:** Provide informed tools for regulators and financing authorities to support policy decisions, including standards for climate risk consideration, incentive structures, and guidance for prioritizing and sequencing financing across adaptation and mitigation agendas.	Risk-informed GIS maps, repositories, and hydrometeorological information services should be established to enable risk-informed policy development, planning, programming, project/scheme design, and inclusive budgeting. Core service components include: • **National-subnational risk data repository (GIS-enabled):** Centralized, regularly updated datasets on hazards, exposure, vulnerability, and coping capacity organized for national, aimag, soum, and bag decision-making. • **Multi-hazard risk mapping and atlases:** Standardized GIS layers and risk atlases covering key hazards (dzud, drought, flood/flash flood, snowstorm/blizzard, extreme cold/heat, wildfire, landslide) with severity/return-period information to support policy and investment prioritization. • **Hydrometeorological information services for planning horizons:** Climate normals and trends, seasonal outlooks, operational forecasts, extremes indices, and early warning products translated into decision-relevant indicators for sector planning and budgeting cycles. • **Sector-specific risk layers and decision tools:** Tailored GIS products for priority sectors (livestock, crop agriculture, water resources, land/soil, transport, energy, health, urban services), including sensitivity and impact thresholds for identifying high-risk assets and populations. • **Project and scheme design support (site selection and feasibility):** GIS-based multi-criteria analysis (MCDA) combining hazard risk, service demand, environmental constraints, access, and cost considerations to identify priority sites and design parameters for resilient interventions. • **Inclusive budgeting and resource allocation tools:** Budget-support outputs that link risk rankings and impact scenarios to costed interventions, enabling transparent targeting of resources to vulnerable populations and high-risk locations, and reducing duplication across funding sources. • **Monitoring, evaluation, and learning (MEL) evidence base:** Dashboards and geospatial reporting to track implementation, coverage, outcomes, and risk reduction benefits supporting accountability and iterative improvement of policies, programmes, and budgets.	An **integrated IBF and dashboard-enabled FbF system** can support long-term planning and strategy by linking climate-risk intelligence to investment prioritization, budgeting, and implementation tracking across national and sub-national levels. Key functions include: • **Long-term risk intelligence for strategic planning:** Consolidate climate trends, hazard frequency/severity projections, and multi-hazard risk atlases to inform Vision 2050, NAP/NDC implementation, sector strategies, and spatial development planning. • **Risk-informed investment prioritization and pipelines:** Use GIS-based exposure and vulnerability layers to rank high-risk locations, critical assets, and vulnerable groups, generating a prioritized pipeline of "no/low-regret" resilience investments and adaptation options. • **Costing, scenario analysis, and financing strategies:** Translate risk scenarios and anticipated loss-and-damage (L&D) into costed intervention packages, estimate long-term financing needs, and map internal/external financing instruments to priority programmes. • **Policy-to-budget alignment:** Support risk-informed public finance management by linking policy objectives to budget lines, contingency funds, and climate finance mechanisms, including climate budget tagging and tracking of allocations. • **Programme design and localization support:** Provide decision-support tools for designing and localizing sector programmes (e.g., pasture management, water security, resilient infrastructure, health preparedness), including site selection and sequencing based on risk evidence. • **Monitoring, evaluation, and learning dashboards:** Track implementation progress, geographic coverage, results, and avoided losses; integrate post-event data to refine risk models, update indices, and improve future planning assumptions. • **Governance and coordination enablement:** Embed stakeholder mapping (5W), role-based access, and shared operating procedures so government, partners, and financiers can coordinate strategies, reduce duplication, and improve accountability.
Integrated IBF-informed tools and a Multi-Hazard Early Warning System (MHEWS) to enable full implementation of the Sendai Framework (2017-2030): Deploy an integrated suite of IBF	**Risk-informed GIS maps and repositories, hydrometeorological information services, and integrated IBF-MHEWS products to support Sendai Framework implementation (2017-2030):** Establish and operationalize a national-to-local system that combines (i) risk-informed GIS	An IBF-integrated FbF dashboard would serve as a high-value decision-support tool to enable rapid, evidence-based action before extreme weather and multi-hazards occur. By translating impact forecasts into clear triggers and priority actions, the dashboard can support:

Mid-term Plans/Policy/Strategy	Tailormade IBF informed tools to support the integrated IBF & FBF process	FBF dashboard-driven supports
decision-support tools combined with an operational MHEWS to strengthen Sendai-aligned risk governance and reduce disaster losses. This includes: • **Multi-hazard monitoring and early warning:** End-to-end hazard detection, forecasting, warning, and alerting for priority hazards (dzud, drought, flood/flash flood, blizzard/snowstorm, extreme cold/heat, wildfire, landslide), including impact-based warning products. • **Risk-informed exposure and vulnerability integration:** GIS-enabled risk atlases and baseline repositories to translate hazards into expected impacts on people, livelihoods, infrastructure, and critical services. • **Standardized alerting and last-mile dissemination:** Common Alerting Protocol (CAP), multi-channel dissemination, and last-mile communication workflows that reach vulnerable communities and sector users. • **Operational coordination and decision support:** Dashboards for EOC/ICS operations, situation reporting, and partner coordination (5W), enabling timely, coordinated preparedness and response. • **Preparedness planning and anticipatory action readiness:** Tools to support contingency planning, early action protocols (EAPs), pre-positioning, and readiness measures linked to forecast thresholds. • **Monitoring, evaluation, and learning:** Systems to track warning performance, action timeliness, outcomes, and post-event loss-and-damage evidence to continuously improve risk reduction and preparedness capacities.	datasets and repositories, (ii) hydrometeorological and climate information services, and (iii) impact-based forecasting (IBF) with warning/alerting products to protect climate frontlines, vulnerable sectors, high-value elements, and development priorities thereby reinforcing Mongolia's commitment to full-scale implementation of the Sendai Framework (2017-2030). Core service deliverables include: ○ **Risk-informed GIS risk repositories:** Multi-hazard risk atlases and baseline repositories integrating hazard layers with exposure, vulnerability, and coping-capacity indicators at aimag/soum/bag scales. ○ **Hydrometeorological information services:** Climate normals, trends, extremes indices, seasonal outlooks, operational short-range forecasts, and sector-relevant decision indicators. ○ **IBF products and operational impact analysis:** Impact forecasts that translate hazard thresholds into expected consequences for people, livestock, infrastructure, and services, including anticipatory loss-and-damage (L&D) scenarios. ○ **Warning, watch, advisory, and alerting services:** Standardized warning categories and products (watch/warning/advisory) linked to defined thresholds and communicated with clear action guidance. ○ **Multi-hazard early warning system (MHEWS):** End-to-end detection, forecasting, risk communication, and last-mile dissemination, including Common Alerting Protocol (CAP) integration and multi-channel delivery (radio, SMS/IVR, apps, social media, community networks). ○ **Operational coordination and situation reporting:** Dashboards and geospatial portals for EOC/ICS coordination, real-time situational updates, partner 5W mapping, and post-event impact documentation. ○ **Sectoral and development planning support:** Tailor-made tools and services to inform sector plans, infrastructure siting/design, risk-informed budgeting, and climate-resilient development investments aligned with Sendai targets.	• **Quick decision-making and fast-track approvals** linked to predefined impact thresholds and risk levels. • **Early Action Protocols (EAPs) and contingency planning**, including pre-agreed actions, roles, and implementation timelines. • **Pre-positioning of relief and life-saving supplies** (cash, in-kind items, fodder, veterinary inputs, fuel, shelter materials) in **hard-to-reach areas** ahead of forecast impacts. • **Coordinated response activation**, using shared situational awareness, 5W mapping, and real-time updates from partners and communities. • **Inclusive, participatory engagement**, ensuring government, humanitarian actors, sector agencies, local authorities, and vulnerable communities contribute to planning, validation, and implementation of early actions. .

Source : Government Planning Documents [2]

2) Supporting Index-based weather insurance : Sectoral Development, Weather Index-Based Crop Insurance Scheme (WIBCIS)

- **Identify climate-proof sectoral activities and inputs:**
  Support selection of climate-resilient livelihood and production activities, including climate-tolerant crop varieties and seedling/sapling options, aligned with local agroecological conditions and hazard profiles.
- **Provide tailored risk information services and operational IBF:**
  Deliver demand-driven climate and weather risk information services supported by operational IBF so farmers

[2] www.cabinet.gov.mn , https://www.unescap.org/sites/default/d8files/event-documents/Mongolia%20-%20Climate%20Change%20and%20Disaster%20Risk%20Profile.pdf , https://www.adaptation-undp.org/mongolia-achieves-milestone-national-adaptation-planning , https://cabinet.gov.mn/wp-content/uploads/2050_VISION_LONG-TERM-DEVELOPMENT-POLICY.pdf

and institutions can anticipate shocks, plan timely risk-reduction measures, and reduce avoidable losses during extreme events.

- **Develop timely Early Action Protocols (EAPs) for risk mitigation:**
  Use forecast and index signals to define trigger-based early actions (e.g., irrigation scheduling, drainage protection, protective harvesting, input pre-positioning, fodder planning), enabling timely crisis mitigation and continuity of production.
- **Design WIBCIS products and parameters:**
  Develop Weather Index-Based Crop Insurance Schemes by:
  - ❖ selecting relevant indices (e.g., rainfall deficit/excess, heat stress days, frost events, hail proxies, drought indices),
  - ❖ defining thresholds and pawet structures,
  - ❖ determining coverage periods aligned with crop phenology and regional calendars, and
  - ❖ establishing transparent, verifiable data sources (stations, satellite, modeled grids).

- **Promote climate-tolerant agriculture and sustainable practices:**
  Integrate WIBCIS with climate-smart agricultural practices (soil moisture conservation, drought-tolerant cropping, sustainable irrigation, improved rangeland/pasture management) and link risk finance to adoption incentives where feasible.

- **Extend risk-transfer approaches to livestock and value chains (where applicable):**
  Complement crop insurance with risk-transfer and preparedness options for livestock husbandry and associated value chains (input supply, storage, processing, transport), using IBF-informed triggers and contingency measures to reduce loss and disruption.

3) Supporting National Agricultural Insurance Scheme:

- **Develop a robust, simple nationwide approach for WIBI adoption:**
  Establish a practical and scalable methodology to mainstream weather index-based crop insurance across Mongolia, ensuring it is easy to understand, administratively feasible, and aligned with key crop risks and regional agro-climatic conditions.
- **Review and adopt best insurance practices:**
  Benchmark and adapt proven practices from both private insurers and public schemes covering product design, index selection, basis-risk reduction, claims/pawet processes, distribution models, and consumer protection standards.
- **Pilot, refine, and scale improved schemes:**
  Design structured pilots for new or improved products, test them in representative agro-ecological zones, and scale up based on documented evidence and lessons learned (including farmer feedback, pawet performance, affordability, and operational feasibility).
- **Establish strong monitoring, evaluation, and learning systems:**
  Develop and institutionalize monitoring and learning mechanisms to track performance (e.g., trigger accuracy, basis risk, uptake, timeliness of pawets, livelihood outcomes), conduct periodic reviews, and continuously improve product design and implementation.

4) Supporting Index-based insurance: Weather index-based insurance

- **Define a clear value proposition and bundle services:**
  Develop an attractive value proposition for clients by offering index insurance as part of an integrated service package (e.g., IBF-based advisories, climate-smart agronomic guidance, early action support, access to inputs/credit, and risk-reduction training), rather than as a standalone product.
- **Build capacity and strengthen stakeholder ownership:**
  Strengthen technical and operational capacity of implementing stakeholders (government entities, insurers, regulators, delivery partners, cooperatives, financial institutions) and promote ownership through defined roles, SOPs, and shared accountability for product rollout, servicing, and improvements.

- **Increase client awareness and trust in index products:**
  Implement structured awareness and financial literacy efforts so clients understand how indices work, what triggers pawets, product limitations (including basis risk), and how insurance complements other risk-management practices. Use local communication channels and trusted intermediaries.

- **Enable access to international risk-transfer markets:**
  Establish pathways for risk layering and transfer through international markets (e.g., reinsurance, regional risk pools, catastrophe bonds where feasible), supported by transparent data standards, actuarial documentation, and credible governance arrangements to improve scheme sustainability and scalability.

5) Supporting existing Climate Fiscal Frameworks :

- **FBF-informed tools to strengthen climate fiscal policy-making and localization:**
  Deploy dashboard-enabled FbF tools that support CFF principles and instruments for climate fiscal policy formulation, implementation, and localization specifically for NAP, NDC, NAMA, and green development commitments by linking risk evidence, priorities, and financing decisions.
- **Support disaster management planning and budgeting frameworks:**
  Integrate IBF risk intelligence and impact thresholds into DRM planning and budgeting frameworks, enabling pre-costed preparedness actions, contingency budgeting, and fast-track activation for different-onset hazards.
- **National/central government risk-informed planning and budgeting:**
  Provide national planning desks with risk-informed analytics (risk maps, loss-and-damage scenarios, sector vulnerability profiles) to guide development planning, public investment selection, and budget allocations consistent with climate and disaster risk realities.
- **Climate change budgetary framework enhancement:**
  Strengthen the climate change budgetary framework through tools such as climate budget tagging, tracking of climate-related expenditures, alignment of budget lines with adaptation/mitigation outcomes, and reporting against national commitments.
- **Local climate fiscal frameworks supported by IBF-FBF dashboards and stakeholder engagement:**
  Establish IBF-FBF dashboard-driven local climate fiscal frameworks that enable inclusive decision-making, transparent prioritization, and coordinated financing at aimag/soum/bag levels supported by defined roles, SOPs, and stakeholder participation.
- **Local government risk-informed development planning and budgeting system:**
  Institutionalize a local government system that embeds risk assessment, impact forecasting, and early action planning into routine development planning and budgeting ensuring targeted investments for resilience, reduced duplication, and improved accountability to vulnerable communities.

6) Informed FBF tools for supporting policy, advocacy on risk financing

Effective weather- and climate-emergency risk financing depends on clear, pre-agreed early actions, credible impact-based evidence, and an articulated strategy for internal and external financial inclusion to reduce climate change-induced risks. FbF-informed tools should therefore enable the following:

- **Optimize the use of climate finance for interventions:**
  Provide decision-support tools that link risk evidence and forecast/impact thresholds to costed intervention packages, enabling climate finance to be allocated efficiently to the highest-risk locations, sectors, and vulnerable groups.
- **Support optimal mobilization of resources for mitigation and adaptation:**
  Use financing dashboards and investment pipeline tools to identify financing gaps, match priority actions to appropriate instruments, and coordinate domestic and international resources across mitigation

7) Climate finance readiness

- **Dashboard-based IBF-FbF tools for strategic climate risk management and fiscal alignment:**
  Use an integrated IBF-FbF dashboard to support government climate risk management planning, including alignment of the Climate Fiscal Framework (CFF) and budgetary provisions for risk financing (ex-ante and ex-post).

- **Embed the IBF-FbF dashboard into government planning and budgeting systems:**
  Anchor the dashboard with cabinet secretariats and local government planning/budgeting workflows so decision-making boards can continuously track the status of national and subnational development plans, budgets, and financing commitments in relation to climate risks.
- **Technical advice to re-align plans and budgets for risk-informed development:**
  Enable FbF stakeholders to advise on revising annual and five-year development plans, fiscal plans, and budget processes to:
  - ❖ mainstream climate risk-informed development planning,
  - ❖ define allocable budget envelopes for ex-ante and ex-post risk financing, and
  - ❖ identify budget top-ups to strengthen ongoing climate risk mitigation schemes.
- **Cabinet-level advisories on climate risks to infrastructure development:**
  Provide advisory support to cabinet secretariats to ensure climate risk considerations are integrated into rural and urban infrastructure development (siting, standards, investment prioritization, and resilience requirements).
- **Risk ranking and prioritization of local assets for inclusion in annual programmes:**
  Through the IBF-FbF dashboard, support cabinet secretariats in reviewing how many local (aimag/soum/bag) sectoral elements (Annexure 1), livelihood assets, basin infrastructures and services, value chains, and high-value elements are exposed and vulnerable to climate risks then rank risks and prioritize investments for inclusion in annual development programmes.
- **Link environmental and emissions data for mitigation planning:**
  Connect the Environmental Information Center (EIC) database with the IBF dashboard to identify and quantify emissions sources (enterprises, industries, open mining, local heating systems, small/independent coal-fired plants) and inform mitigation policy and financing priorities.
- **Wind resource assessment and wind po investment readiness:**
  Support nationwide wind resource assessment by establishing wind-monitoring capacity (including use of station anemometers), producing a wind regime and wind potential atlas, and advising the energy sector on policy and financing approaches to scale wind po deployment.
- **Drought and desertification assessment and green development programming:**
  Develop drought/desertification atlases and planning tools to support green development strategies, including social afforestation, agroforestry, cover cropping, and soil-health improvements, and strengthen agricultural extension for combating land degradation.
- **Support Net Zero and climate-resilient development strategies:**
  Provide data-driven inputs and decision-support tools to strengthen government strategies for green, low-emission, Net Zero, and climate-resilient development pathways.

a) Financial Planning :

- **Assess needs, priorities, and investment barriers:**
  Conduct a structured assessment of sector and geographic needs, rank priorities based on risk and expected impacts, and identify key barriers to investment (e.g., data gaps, institutional capacity constraints, access/logistics, affordability, policy constraints, and procurement limitations).
- **Identify the policy mix and financing sources:**
  Define an appropriate policy package (regulatory, fiscal, incentive-based, and programmatic measures) and map feasible financing sources domestic and external such as public budgets, contingency funds, climate funds, donor instruments, insurance/reinsurance, credit lines, and private-sector financing.

b) Accessing Finance(internal , External):

- **Directly access finance:**
  Establish pathways for eligible institutions to directly access domestic budgets and external climate/disaster finance instruments (e.g., national contingency funds, climate funds, donor windows), including meeting fiduciary, safeguards, and reporting requirements.
- **Blend and combine finance:**
  Structure blended finance packages that combine public funding, concessional finance, grants, loans, guarantees, insurance/reinsurance, and private capital to reduce risk, lo costs, and scale priority interventions.
- **Formulate project-, programme-, and sector-wide approaches to accessing finance:**
  Develop financing strategies at three levels:
  - **Project level:** bankable proposals with clear results, costs, and implementation readiness.
  - **Programme level:** multi-year portfolios aligned with national priorities (e.g., livestock resilience, water security, disaster-resilient infrastructure).
  - **Sector-wide approaches:** coordinated investment plans and financing frameworks that align policies, budgets, and partner contributions under a single results architecture.

c) **Delivering Finance**

- **Implement and execute projects, programmes, and sector-wide approaches:**
  Establish execution arrangements that enable timely disbursement and delivery (implementation plans, procurement and financial management systems, clear roles/SOPs, milestone-based budgeting, and results tracking) for project , programme, and sector-wide financing.
- **Build local supply of expertise and skills:**
  Strengthen national and subnational capacity to design, implement, and manage climate and disaster-risk investments covering technical expertise (risk analytics, engineering standards, GIS/IBF use), fiduciary functions (procurement, FM, safeguards), and operational delivery (EOC/ICS readiness, last-mile implementation).
- **Coordinate implementation:**
  Use integrated coordination mechanisms (e.g., IBF-FbF dashboard/5W mapping, inter-agency tasking, and regular review forums) to align stakeholders, prevent duplication, ensure geographic and sector coverage, and maintain accountability during implementation.

  - ❖ Implement and execute project, program, sector-wide approaches
  - ❖ Build local supply of expertise and skills
  - ❖ Coordinate implementation

d) Monitor, report, and verify (MRV)

- Monitor, report, and verify financial flows and results:
  Establish an MRV system to track end-to-end finance flows (commitments, allocations, disbursements, and expenditures) and verify outputs and outcomes against agreed indicators. This should include geotagged reporting where feasible, audit/compliance checks, and routine performance reviews aligned with national reporting needs and donor requirements.

- Allocate performance-based climate-resilient grants to local stakeholders:
  Design and apply a transparent performance-based grant mechanism for aimag/soum/bag stakeholders, linking allocations to measurable resilience results (e.g., timely early action activation, risk-reduction investments delivered, coverage of vulnerable groups, maintenance of risk repositories, functioning SOPs/EAPs, and demonstrated reductions in loss-and-damage).

8) Decision support for Adaptation Financing:

IBF-supported, ICT-enabled decision tools can provide risk screening, impact-based meteorological information services, MIS-driven risk interpretation, and quick-turnaround analytics to strengthen early action planning and adaptation investment decisions. Key functions include:

- **Local prioritization of adaptation investments (aimag/soum/bag):**
  Use locally assessed climate risks and vulnerabilities captured in repositories and risk atlases to identify priority locations and select adaptation projects/schemes that are viable and implementable at sub-national level.
- **Climate-zone and geography-based CRVA and adaptation options:**
  Develop CRVA profiles by climate zone and geographic context to identify and rank appropriate adaptation options, ensuring interventions match localized hazard regimes, exposure patterns, and coping capacities.
- **Resource mapping for adaptation siting and design:**
  Map hydrological, environmental, and ecological resource regions, including floodplains, watersheds, rangelands, and arable lands suitable for crop and forage production supporting site selection for agriculture, forage cropping, and ecology-based adaptation investments.
- **Translate CRVA into a pipeline of viable schemes:**
  Based on CRVA outputs, determine how many adaptation schemes are feasible given local resources, institutional capacity, and ecological constraints then convert these into an investment pipeline with clear prioritization and sequencing.
- **Identify viable agricultural adaptation packages:**
  Use CRVA to identify which agricultural adaptation schemes (e.g., drought-resilient cropping, improved irrigation efficiency, fodder production and conservation, soil-moisture retention practices) are viable in each locality based on ecology and resource availability.
- **Support drought and desertification combatting initiatives:**
  Apply IBF-FbF informed tools to strengthen planning, project selection, and intervention design for integrated drought/desertification responses such as social afforestation, agroforestry, pasture rehabilitation, and ecosystem-based pasture development guided by risk evidence and expected resilience benefits.

9) FBF Informed tools to support green development pathways :

FbF-informed tools can operationalize a climate resilience pathway that advances the national vision through three interconnected outcomes: resilient people and livelihoods, resilient businesses and economies, and resilient environmental systems. The tools should enable climate risk to be embedded in decision-making and improve the availability, quality, and accessibility of finance for prioritized local interventions across the following impact areas:

- **Climate risk and vulnerability assessment, disclosure, and monitoring:**
  Establish standardized CRVA workflows, geospatial risk repositories, and dashboards for continuous risk disclosure and monitoring to inform planning, budgeting, and investment screening.
- **IBF-integrated early warning systems and FbF-informed early action tools:**
  Link impact-based forecasts to trigger thresholds, EAP activation, and rapid decision support for anticipatory actions (cash/in-kind/logistics), including CAP-enabled dissemination for last-mile coverage.
- **Multi-hazard preparedness, contingency planning, and emergency response:**
  Provide planning modules for contingency development, 5W coordination, pre-positioning logistics, EOC/ICS readiness, situation reporting, and adaptive targeting during events.
- **Climate risk governance and capacity building (central, sectoral, local):**
  Support governance strengthening through defined SOPs/SoD, institutional roles, training packages, and performance monitoring for climate-risk-informed public administration.
- **Nature-based solutions (NbS) for risk reduction:**
  Use risk analytics and ecosystem mapping to prioritize, site, and cost NbS interventions (pasture rehabilitation, afforestation, watershed protection, soil restoration) and integrate them into financing pipelines.
- **Climate-proofing infrastructure and services:**
  Provide screening tools, risk-informed design standards, and investment prioritization for resilient infrastructure and basic services (energy, water, transport, drainage, heating systems), aligned with hazard and exposure realities.
- **Risk transfer instruments: insurance and social protection:**
  Integrate index insurance, scalable safety nets, and shock-responsive social protection with IBF triggers to support timely pawets and targeted assistance.
- **Knowledge sharing and best-practice exchange:**
  Maintain repositories of methodologies, lessons learned, event after-action reviews, and standard tools to institutionalize learning and continuous improvement.

- **Facilitating volume, quality, and access to public and private finance:**
  Enable pipeline development, investment tagging, blended finance structuring, partner coordination, and transparent tracking of commitments, allocations, and results to improve financing efficiency and reduce duplication.

10) Advisory support for Public risk finance management:

- **Integrate the FbF dashboard with the Ministry of Finance MIS:**
  Anchor the FbF dashboard within the Ministry of Finance Management Information System (MIS) to enable dashboard-based, evidence-driven risk-financing planning linking risk analytics, impact forecasts, EAP triggers, and budget execution tracking in one workflow.
- **Use FbF-informed tools to strengthen financial resilience policy and decision processes:**
  Apply integrated tools to support the development of financial resilience policies and operational best practices, including risk-informed fiscal rules, contingency financing protocols, trigger-based release mechanisms, and improved governance for climate and disaster risk finance decisions.
- **Provide advisory support on budget adequacy and equitable allocation:**
  Advise the cabinet secretariat and Ministry of Finance on sizing and allocating budgets to ensure essential, equitable financing for urgent climate risks prioritizing vulnerable regions, high-risk sectors, and last-mile populations based on evidence from CRVA and IBF outputs.
- **Advise on balanced ex-ante and ex-post budgeting for climate action goals:**
  Support equitable budgeting that balances **ex-ante** financing (preparedness, anticipatory action, risk reduction) and **ex-post** financing (response, rehabilitation, recovery), ensuring both are aligned to climate action objectives and structured for rapid activation when triggers are met.

11) Facilitating coordination and Accountability to Affected Populations (AAP) for risk finance management

- Use the FbF dashboard as a shared coordination and transparency platform:
  Configure the FbF dashboard to provide UN-HCT, I/NGOs, government, and non-state stakeholders with a common operational picture of: prioritized risks, triggered actions, financed interventions, geographic coverage, targeted populations, delivery status, and gaps supporting coordinated implementation and reducing duplication.
- Anchor an AAP module/dashboard to track collective commitments and delivery:
  Integrate an AAP-focused dashboard layer that captures collective AAP action plans and enables stakeholders to register, manage, and track AAP commitments and activities through a dashboard-driven workflow.
- Enable dashboard-driven AAP management, monitoring, and evaluation:
  Operationalize AAP through embedded management and M&E functions, such as:
  - ❖tracking feedback and complaint mechanisms (channel, volume, response time, resolution rate),
  - ❖monitoring community engagement activities and two-way communication,
  - ❖verifying whether assistance is appropriate, timely, and accessible,
  - ❖tracking inclusion metrics (vulnerable groups, gender/age/disability disaggregation), and
  - ❖documenting corrective actions taken based on community feedback.
- Strengthen accountability and learning across partners:
  Use the dashboard to support routine performance reviews, after-action learning, and evidence-based adjustments to targeting, assistance modalities, and risk financing decisions ensuring affected populations' priorities are reflected in financing and operational choices.

4.0 Forecast based Financing (FBF) Process

Accelerating global climate disruption is reshaping regional and local weather systems, with hazardous events increasingly characterized by rapid onset. Mongolia's landlocked climate is exceptionally diverse and extreme, with high spatiotemporal variability (hourly/diurnal shifts) that disproportionately affects livelihoods. This context requires Mongolia to transition from traditional forecasting to an integrated system that combines impact forecasting, warnings, alerting, and multi-hazard early warning. Priority climate-vulnerable sectors include livestock and agriculture, water, agroecology and soils, pasture and biomass, tourism, environment and forests, transport and communications, and urban settlements.

Given Mongolia's precarious hazard environment marked by multiple hazard onsets and recurrent high-impact hydrometeorological risks there is a clear need to develop and operationalize a demand-driven Impact-Based Forecasting (IBF) platform, paired with a corresponding Forecast-based Financing (FbF) mechanism. IBF-supported FbF can provide the informed tools required to mechanize risk-financing processes so that vulnerable sectors and exposed elements are better prepared to cope with climate crises.

Traditional humanitarian financing models focused on pre-disaster preparedness support through cash and in-kind assistancenremain important, but are insufficient to address the full complexity of Mongolia's climate risk landscape. Effective risk financing must be inclusive and systemic, engaging climate-frontline communities alongside government and non-government actors, the banking sector, green development authorities, financiers, credit operators, insurers, and other stakeholders across the full value chain from risk assessment and intervention design to financial inclusion and delivery.

An ICT-enabled, integrated IBF-based climate and weather information service should serve as the primary input to a coherent FbF process supporting stakeholder-concerted early action planning and aligned financing strategies. The integrated IBF-FbF methodology is intended to operate in a coordinated, multi-dimensional manner so that climate- and weather-induced response needs are addressed in a timely and structured way. Through dashboard-based informed tools, stakeholders can access real-time decision support and enable rapid, evidence-based decisions. In this way, a dashboard-driven online FbF decision-support system can facilitate sectoral climate risk financing and provide a practical, scalable solution for improving climate risk financing decision-making in Mongolia.

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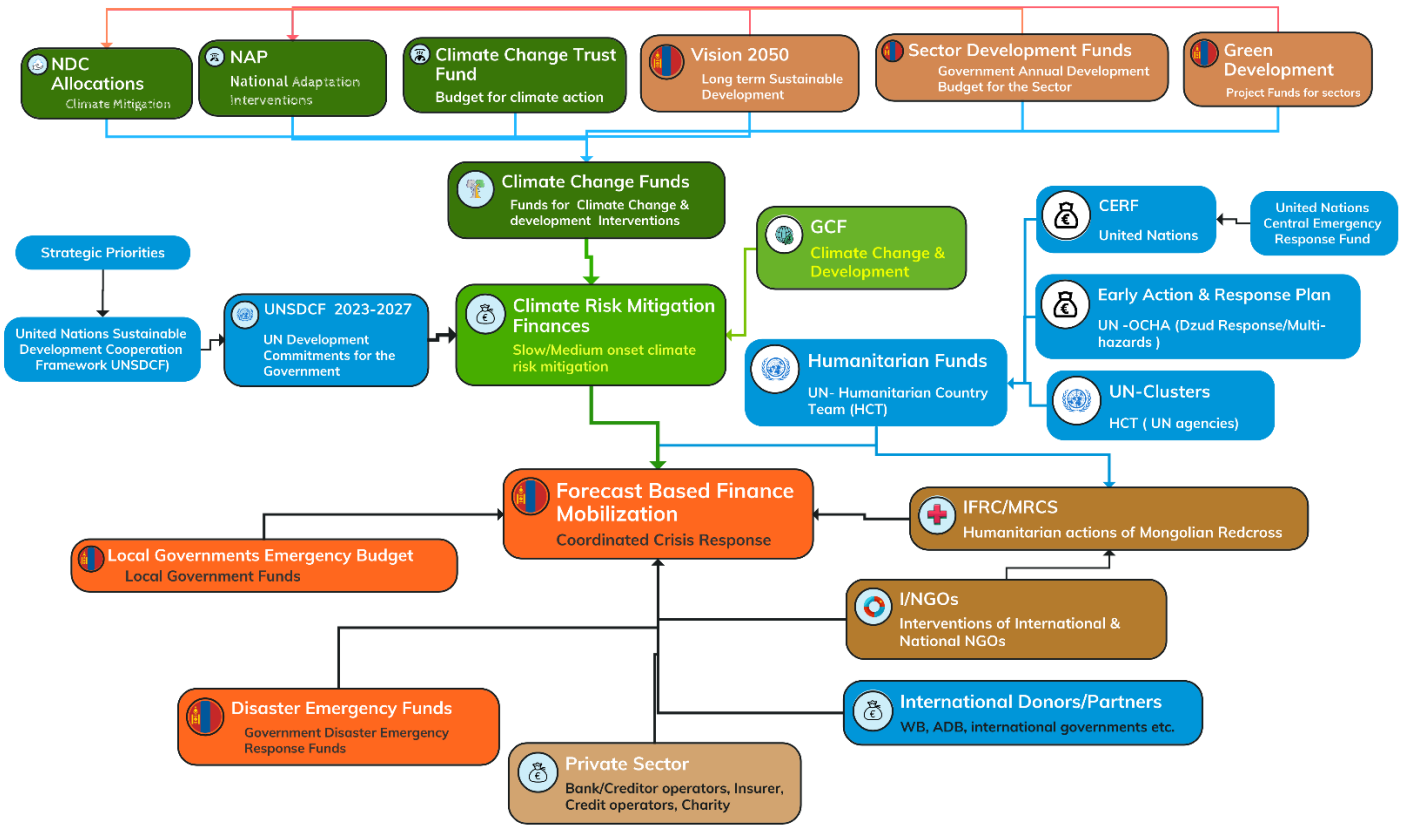

Figure 4: Coordinated Crisis response financing mechanism(Source: Z M Sajjadul Islam, UNDP-GCF).

4.1 FBF framework approach

- **Bridge information and decision-support gaps:**
  The FbF methodology should be operationalized to close key gaps in information access and decision-support tools, enabling a multi-dimensional, inclusive risk-financing mechanism that can mobilize funds before climate impacts materialize on the ground.
- **Position the IBF-FbF dashboard as the core decision instrument:**
  Establish an IBF-supported, dashboard-driven FbF system to guide comprehensive risk-reduction planning, contingency budgeting, and timely risk-finance mobilization.
- **Enable an evidence-based partnership and advocacy model:**
  Use a partnership approach to strengthen state and non-state actors' collective advocacy and bargaining po for mobilizing finance to address forecast high-impact weather and expected loss and damage affecting vulnerable communities, sectors, critical infrastructure, and basic services.
- **Facilitate stakeholder interplay around anticipatory loss-and-damage:**
  Design the integrated IBF-FbF platform to connect stakeholders, risk financiers, the humanitarian community, HCT, and sector departments providing a shared, anticipatory picture of likely impacts at the last mile.
- **Link IBF triggers to EAPs, contingencies, and allocable finance:**
  Ensure IBF-driven FbF tools support early action planning, contingency development, and determination of allocable risk finance based on response scale, modality (cash/in-kind/logistics), and targeted vulnerable groups thereby strengthening the humanitarian programme cycle and People-in-Need planning.
- **Provide partnership and consensus tools using a 5W model:**
  Embed informed tools that help partners reach operational consensus using a structured 5W approach (who does what, where, when, and how) for coordinated planning and implementation.
- **Strengthen nexus and public-private partnerships for risk financing:**
  Build stronger humanitarian-development-government linkages and public-private partnerships for disaster risk financing and vulnerability-focused international cooperation, leveraging fiscal mobilization and strengthening national DRM capacity and social, health, and economic well-being.
- **Systematically flag recurrent risk drivers and financing triggers:**
  Use the integrated IBF-FbF system to routinely identify recurring climate risk drivers and define triggers that mechanize timely financing decisions and early action activation.
- **Advance tools and capacity for IBF-driven DRM strategy:**
  Apply a combined methodology, toolset, and capacity-building approach to embed IBF-driven decision-making across disaster risk management institutions and workflows.
- **Optimize resource allocation through demand-driven contingencies:**
  Improve coherence and efficiency of resource allocation by tying financing decisions to demand-driven, hazard-specific contingencies and preparedness requirements.
- **Enhance government capacity for financing advocacy and full-cycle coordination:**
  Strengthen government capacity for grand bargaining, policy dialogue, and financing advocacy, while institutionalizing coordination mechanisms across the full disaster cycle from preparedness to response, rehabilitation, and build-back-better so resilience can be improved through timely mobilization of finance, resources, and interventions.

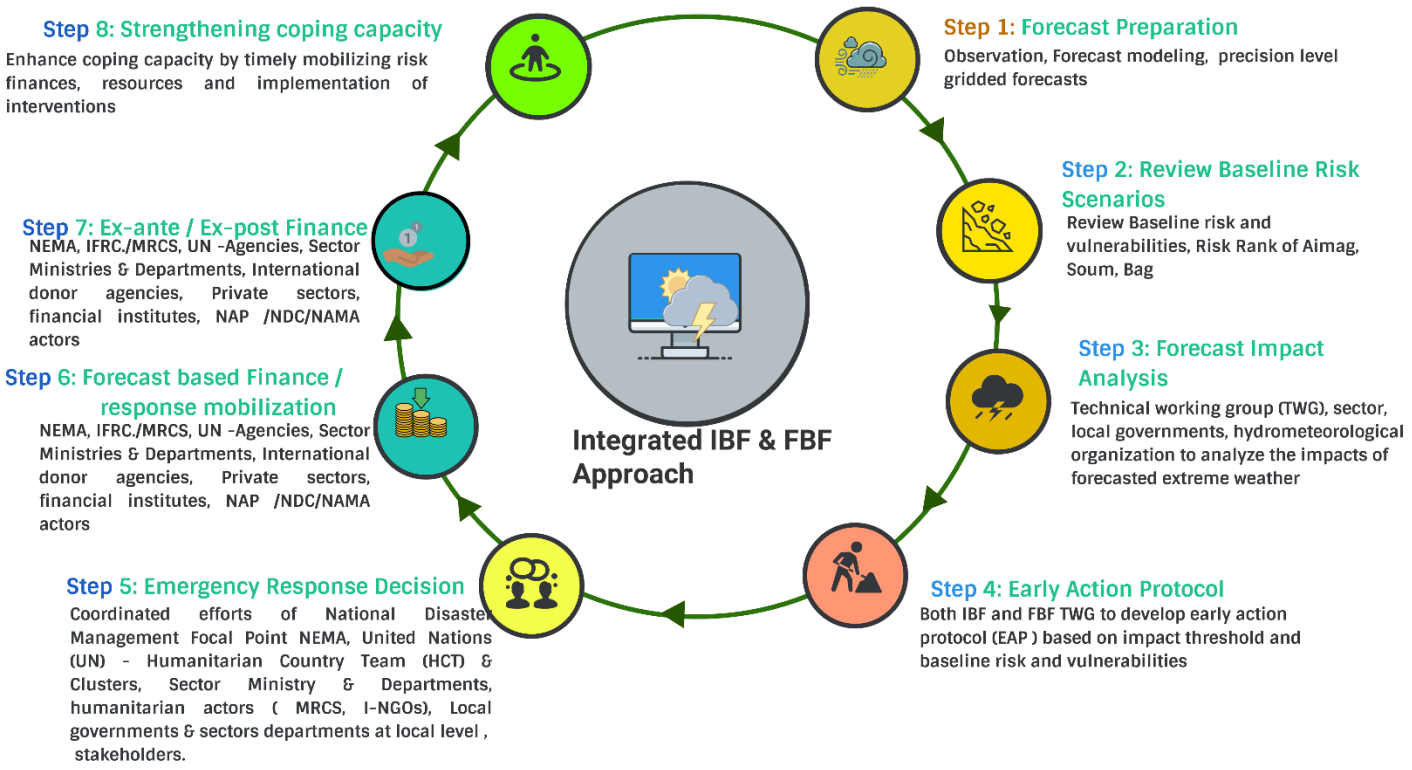

Figure 5: Integrated IFB and FBF approach (Source: Z M Sajjadul Islam, UNDP-GCF)

4.2 IBF integrated FBF for removing barriers on meteorological information services and informed tools:

- **Deploy integrated IBF, MHEWS, and CAP-enabled alerting to support anticipatory response:** Implement an integrated IBF platform linked to multi-hazard early warning systems and Common Alerting Protocol (CAP) dissemination to reliably inform the humanitarian programme cycle, vulnerable sector ministries/departments, and local government stakeholders. This should enable stakeholders to determine, in advance, the appropriate response modalities (financing, relief, in-kind support, logistics) and the resources that must be mobilized to forecast hotspots where extreme weather is likely to trigger multi-hazards.

- **Enable evidence-based SoD/SOP planning and 5W coordination to reduce inefficiency:** Provide tools and evidence products to support inclusive development and operationalization of Standing Orders on Disasters (SoD) and SOPs structured through a 5W framework (who does what, where, when, and how). This strengthens intervention optimization, improves utilization of humanitarian capacity, minimizes duplication and overlap, and supports equitable coverage across all affected and at-risk areas.

- **Integrate sector IMS with the IBF risk repository and real-time operational products:** Use the IBF platform to anchor sector/department Information Management Systems (IMS) to a shared risk repository, including risk and vulnerability rankings by element, sector, and administrative unit (bag/soum/aimag). Provide stakeholders with continuous access to up-to-date impact forecasts, situation updates, current loss-and-damage typologies and figures, and People-in-Need (PIN) profiles ensuring a clear operational picture and defining immediate resource mobilization requirements.

- **Improve predictability and manageability of multi-hazard escalation across different hazard onsets:** With robust IBF implementation and corresponding FbF decision tools, diagnosing, forecasting, warning, and alerting across rapid-, medium-, and slow-onset weather phenomena and their escalation into multi-hazard conditions and disaster incidents becomes more systematic, timely, and operationally manageable.

- **Establish a structured ICT backbone for quality IBF production and full-cycle programme management:** Develop a robust ICT architecture that supports high-quality IBF production and FbF-informed tools for averting multi-hazard disaster risk and climate crises. The system should also enable end-to-end programme functions, including intervention planning, inclusive budgeting, early action planning, project implementation, monitoring and evaluation, and results reporting.

4.3 IBF integrated FBF approach for DRR

- **Mainstream climate risk financing and multi-hazard response:**
  Deploy integrated IBF and corresponding FbF tools to institutionalize climate risk financing and strengthen humanitarian response planning, enabling more effective preparedness and response for multi-hazard events.
- **Enable risk-informed bottom-up and top-down planning:**
  Mainstream evidence-based, risk-informed development planning that connects bottom-up processes (bag > soum/aimag > national) with top-down policy and investment decision-making supporting DRR, climate change adaptation (CCA), and resilience-building interventions.
- **Inform programme cycles and financiers with actionable needs and priorities:**
  Provide timely decision intelligence to humanitarian programme cycles, climate risk management programmes, and risk financiers on immediate needs, operational priorities, and resource mobilization requirements strengthening coping capacity for frontline communities, sectors, and exposed elements.
- **Strengthen partnerships and align with national development and climate agendas:**
  Build integrated partnerships for risk financing and stakeholder engagement that link humanitarian action with sector preparedness and localization of NAP, NDC, green development strategies, and NAMA delivering "win-win" outcomes across development and resilience objectives.
- **Support policy, strategy, and investment design with inclusive financing frameworks:**
  Provide targeted support for policy formulation, strategy development, project/scheme design, action planning, and inclusive financing and budgeting frameworks enabling stakeholders to identify needs and priorities, diagnose investment barriers, and select appropriate policy mixes and financing sources, including private-sector participation.
- **Build capacity to access and blend finance through public-private modalities:**
  Enhance stakeholders' capacity to access finance directly and to blend and combine financing streams using public-private partnership arrangements, improving scalability and sustainability of DRR and CCA investments.
- **Improve governance, accountability, and performance-based financing effectiveness:**
  Optimize the risk-financing mechanism through stronger management, audit, and monitoring competencies, and strengthen the ability to harmonize and allocate performance-based grants rewarding effective implementers, including local stakeholders and vulnerable herders/communities, based on measurable results.

4.4 FBF risk consideration approach & Readiness for Climate Risk Finance Mobilization

The IBF approach together with the corresponding FbF strategy strengthens government and stakeholder readiness by providing practical guidance, strategic options, and informed tools for planning and preparedness. This support is intended to improve coordination for impending hazards and disasters, advance climate change adaptation (CCA) and resilience-building efforts, and enable timely mobilization of climate risk finance.

For effective risk and investment prioritization, decision-makers require structured tools that describe the different risk and vulnerability sets, clarify how risks translate into impacts, and define how to rank and select priority actions. The referenced diagram illustrates a bottom-up approach for identifying and selecting key risk drivers starting from local conditions and evidence and using them to prioritize risks for financing and intervention design.

1) Forecast-based risk Consideration Process & financing modality:

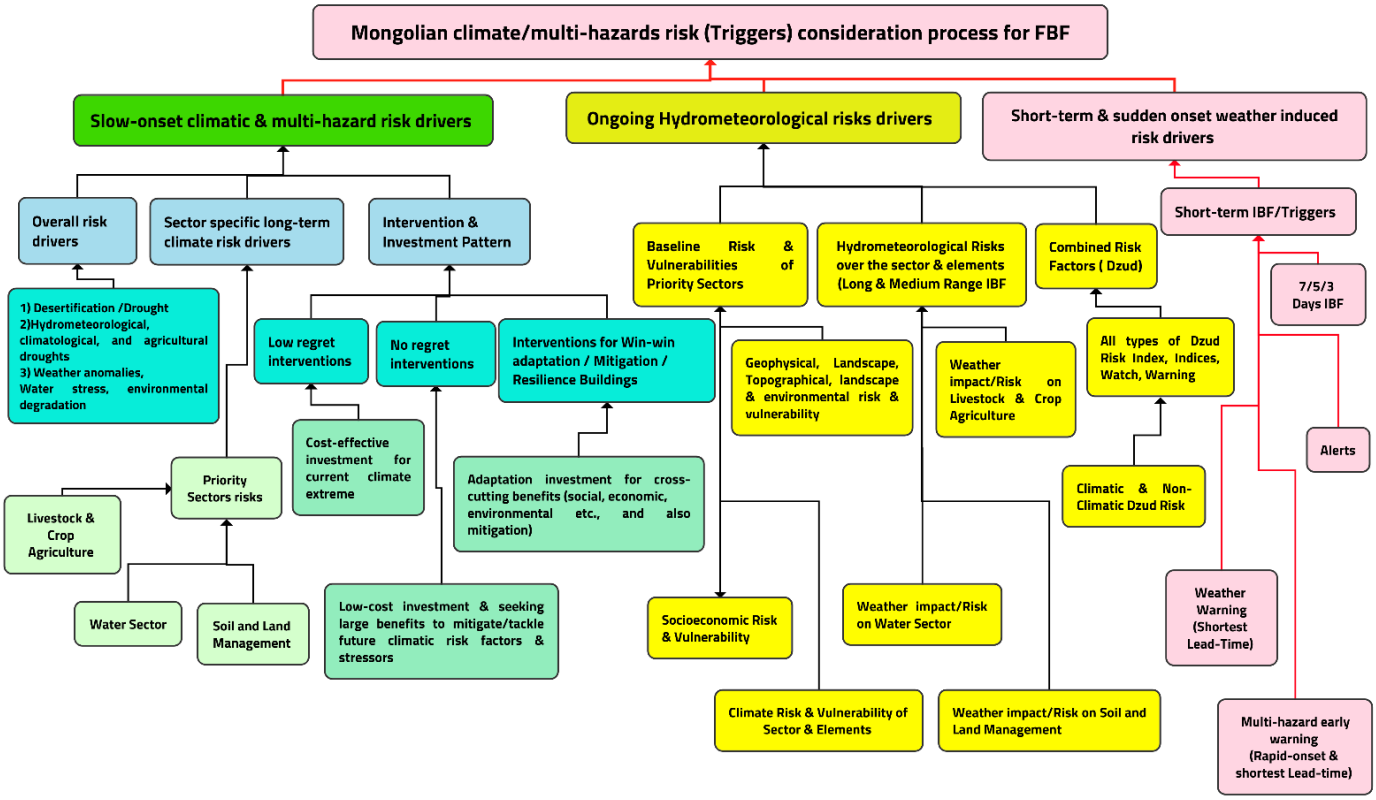

Figure 6 : Forecast based risk Consideration Process & financing modality(Source: Z M Sajjadul Islam, UNDP-GCF)

The methodological approach for determining climate-crisis financing modalities separates risk financing into ex-ante and ex-post pathways and classifies hazards into three onset categories: (a) rapid/sudden onset extreme weather and hazards, (b) medium-onset hazards, and (c) slow-onset hazards.

Within this paradigm, green- and yellow-shaded interventions represent preparedness and risk-reduction actions that should be financed through ex-ante mechanisms (pre-arranged funding activated before impacts occur). In contrast, pink-shaded rapid-onset, warning-triggered risks where hazardous weather is already imminent and impacts on elements are expected should be addressed through ex-post financing, enabling immediate mobilization of resources in response to precision-level forecasts and imminent impact warnings

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a) Arranging Ex-ante financing :

- **Define ex-ante financing ("before the event"):** Ex-ante interventions are investments made ahead of hazards to reduce expected losses and improve returns on resilience-building measures. For example, to address combined dzud drivers, ex-ante financing should support preparedness by incentivizing herders and farmers to expand forage cultivation, improve irrigation to reduce migration and overgrazing, and adopt climate-resilient modular livestock shelters and hay-storage facilities to withstand severe dzud conditions.
- **Expand livestock water access to reduce mobility pressure:** Finance the installation and maintenance of livestock drinking-water access points to reduce long-distance migration and associated exposure risks.
- **Support climate-resilient food production and green development:** Allocate ex-ante financing for sustainable crop agriculture, agroforestry for food security, protected/greenhouse structures for year-round production, and broader green development priorities.
- **Invest in water harvesting, retention, and irrigation infrastructure:** Fund rainwater harvesting and retention systems, artificial/drip irrigation, and drainage infrastructure to support cover cropping, improve soil health, and strengthen irrigation performance.

- **Upgrade observation and forecasting capacity:** Invest in hybrid observation systems (automated , crowdsourced and conventional) to improve prediction accuracy and strengthen risk assessment for high-value elements (e.g., urban settlements, croplands, fodder areas, industrial/mining zones).
- **Scale nature-based and regenerative practices:** Finance agroforestry, social forestry, cover cropping for soil health, and homestead-based agriculture as resilience and livelihood-support measures.
- **Strengthen value chains and market systems:** Support upgrades in crop-agriculture and livestock value chains (inputs, storage, processing, logistics, market access) to reduce climate sensitivity and improve recovery capacity.
- **Improve surface-water management:** Invest in integrated surface-water management, including water harvesting and retention measures that stabilize supply during climate stress periods.

b) Mobilization of the Ex-post financing:

Ex-post financing is activated when hazardous events are imminent and forecast with sufficient confidence to justify immediate preparedness measures that reduce anticipated loss and damage (L&D). When IBF tools provide precision forecasts and timely impact estimates for rapid-onset hazards, humanitarian actors gain the critical lead time needed to organize protection, preparedness, and response actions before impacts peak.

An IBF-integrated FbF dashboard should be configured to automatically flag impending weather emergencies such as convective and heavy rainfall, severe flash floods, snowstorms, tornadoes, thunderstorms, and cold-/warm-front-driven sudden-onset storms. Once an event is forecast and expected impacts are quantified, rapid mobilization of ex-post financing becomes essential to strengthen frontline readiness and minimize severe human and livestock losses.

Core functions of ex-post financing for emergency management include:

- Rapid fund tracking and allocation: Track, authorize, and disburse funds immediately after disaster onset to enable swift activation of emergency response operations and early rehabilitation activities.
- Life-saving emergency supplies and services: Finance and deploy essential supplies and critical services needed for immediate life-saving interventions and urgent humanitarian support.

5.0 Methodology for Developing Early Action Protocol (EAP)

An Early Action Protocol (EAP) is required to translate forecasts (across different hazard onsets) into real-time, decision-ready impact information and to define the critical lead time needed for timely preventive action. Developing an EAP is a high-priority task that depends on integrating multiple indicators and datasets across risk, exposure, and vulnerability workstreams. The EAP approach was first applied for forecast-based financing to support herder households affected by cold waves and snowfall .

1) Define the purpose and decision context

The EAP should specify:

- The hazard(s) covered (e.g., cold waves, snowfall, blizzards, floods) and the onset type (rapid vs. slow).
- The operational decisions the EAP will enable (preparedness, protection of livelihoods, emergency logistics).
- The required lead time for each early action to be feasible.

2) Integrate forecasts with risk datasets to anticipate impacts

The EAP should enable timely early action when:

- Forecasts are combined with baseline risk datasets (exposure, vulnerability, sensitivity, coping capacity), and
- The combined information indicates a high probability that a hazardous event will occur and severely impact people, assets, and livelihoods.

3) Establish triggers and thresholds for activation

Develop clear, measurable triggers that define when early actions are activated. These triggers should be:

- Forecast- and impact-based (e.g., probability/threshold exceedance, color-coded impact classes).
- Spatially and temporally explicit (where and when).
- Linked directly to expected impacts on priority groups and assets.

4) Define a multi-stakeholder action plan

A simplified EAP should articulate a multi-stakeholder plan for early action ahead of weather- and non-weather-related hazards, including:

- **Who** is responsible for activation and implementation.
- **What** actions will be undertaken by the sector.
- **Where** actions will be delivered (targeting based on vulnerability and exposure).
- **When** actions will occur (aligned with forecast lead time).
- **How** actions will be delivered (delivery modalities and logistics).

5) Link the protocol to fast-track financing

The EAP should function as a practical mechanism to operationalize fast-track emergency funding, detailing:

- Which budget/fund is activated (e.g., forecast-based financing windows, emergency contingency funds).
- How much funding is required per trigger level and action package.
- How funds will be released, spent, tracked, and reported.

6) Position the simplified EAP within the broader financing landscape

A simplified EAP should be framed as a complementary ex-ante financing option:

- It complements existing mechanisms such as longer-term EAPs (e.g., five-year frameworks) and short-term emergency instruments like DREF for imminent events (often 1-4 months).
- It does not replace a full EAP; rather, it provides a medium-term alternative (e.g., two-year horizon) to bridge planning and operational financing needs.

7) Use IBF-FbF as the core operational methodology

An integrated Impact-Based Forecasting (IBF) and Forecast-based Financing (FbF) approach provides the most robust methodology for anticipatory action planning and capacity strengthening by:

- Converting forecasts into impact scenarios using exposure and vulnerability data.
- Establishing objective triggers for early action.
- Enabling rapid mobilization of flexible funding (e.g., DREF-aligned financing) to implement early actions before impacts peak.

5.1 Define types of EAP and Functions:

Given the context of climate change impacts, evolving weather regimes, the rapid emergence of extreme events, and the tendency of hazardous weather to escalate into multi-hazards and landscape-driven disasters, risk patterns in Mongolia can be anomalous, repetitive, recurrent, incremental, short-lived, and characterized by different onset dynamics. As a result, Early Action Protocols (EAPs) must be differentiated by hazard type, onset speed, persistence, and impact pathways, and their functions should be adapted accordingly.

Types of EAPs (by onset and hazard dynamics)

- **Rapid-onset EAPs (hours to days):**
  Designed for sudden events such as blizzards, snow squalls, convective storms, flash floods, hailstorms, and cold-front storms.
  Function: Trigger immediate protective actions, fast dissemination (CAP), temporary relocation/sheltering, emergency logistics, and rapid deployment of supplies.
- **Short-range operational EAPs (1-7/10 days):**
  Designed for events with short lead-time predictability such as severe cold spells, heavy snowfall episodes, winter storms, and multi-day wind and snow conditions.
  Function: Enable pre-positioning of fodder/feed, veterinary readiness, water-point management, movement advisories, activation of local EOCs, and anticipatory financing.
- **Seasonal/slow-onset EAPs (weeks to months):**
  Designed for drought, pasture degradation, water scarcity, and cumulative Dzud conditions building over a season.
  Function: Support early livelihood protection measures, pasture and water planning, destocking strategies, fodder supply planning, market and price stabilization actions, and scaled social protection.
- **Compound and cascading hazard EAPs (multi-hazard):**
  Designed for situations where multiple hazards occur concurrently or sequentially (e.g., drought followed by heavy snow and extreme cold; freeze-thaw leading to icing and grazing barriers; rainfall floods triggering landslides).
  Function: Coordinate cross-sector actions, manage multiple triggers, prioritize vulnerable areas, synchronize common alerting, and manage integrated response packages.
- **Sector-specific EAPs (livestock/agriculture/water/urban services):**
  Designed around a single priority sector's exposure and vulnerability profile even when the hazard is common.
  Function: Translate hazard thresholds into sector-specific actions, ensure tailored advisories, define specialized triggers (e.g., non-grazing days, fodder shortage, water-point freeze), and clarify responsibilities.

Core EAP Functions (common across all types)

- **Trigger definition and activation rules:** Establish threshold-based triggers and decision pathways (who activates, when, and at what alert level).
- **Action packages mapped to thresholds:** Pre-agree actions for each alert level (Yellow/Orange/Red/Magenta) with timelines and minimum standards.
- **Financing linkage:** Define how early actions are funded (FbF windows, contingency funds, CERF/DREF mechanisms) and how funds are released rapidly.
- **Roles and coordination:** Assign stakeholder responsibilities across NMHS, DRM, sector agencies, local government, and humanitarian partners, supported by SOPs and 5W plans.
- **Risk communication and CAP dissemination:** Ensure consistent, authoritative, multi-channel alerting and last-mile messaging.
- **Monitoring and learning:** Track implementation, outcomes, and forecast performance to refine triggers, thresholds, and action packages over time.

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a) EAP for addressing rapid onset extreme weather events (Convective heavy rainfall, flash flooding, thunderstorm, snowstorm, warm front, cold front, damaging winds, etc.) Lead time: 15 minutes to an hour(s)

Considerations :

Hazards: convective heavy rainfall, flash flooding, thunderstorms, snowstorms, warm/cold-front storms, damaging winds, etc.

Lead time: 15 minutes to 1 hour

Key considerations and operational requirements

- **Impact-based forecasting for very short lead times (IBF):**
  Establish the capability to detect and predict rapid-onset hazards using statistical and dynamical downscaling, customized nowcasting algorithms, and other programmed models. Produce operational IBF outputs special warnings, hotspot alerts, and rapid briefings to inform immediate preliminary early actions.
- **Rapid impact-area delineation through the IBF geospatial platform:**
  Use core IBF tools to delineate spatial impact extents immediately after forecast issuance and disseminate these through the IBF geospatial platform using standardized alert levels:
  - **Magenta:** Extremely high impact
  - **Red:** Very high impact
  - **Orange:** Moderate to high impact
  - **Yellow:** Medium to moderate impact
- **Integrated IBF-FbF dissemination and last-mile reach:**
  Ensure rapid warning delivery through national broadcast media and the web-based geospatial platform (watch/warning maps) so remote and vulnerable communities receive alerts in time to undertake preparedness and limited pre-positioning within the 15-60 minute window.
- **Early action definition by IBF/FBF technical partners:**
  Pre-define feasible actions for short lead times (what can realistically be done before impacts occur) and operationalize a hybrid observation system (AWS and crowdsourcing) to capture live weather conditions and evolving incidents.
- **Primary responder designation under SoD and SOP:**
  Clarify who leads response according to Standing Orders on Disasters (SoD) and SOPs. Aimag EOCs should remain on alert for situation updates, while local governments activate stakeholder coordination using a defined 5W framework and deploy emergency support teams (field technicians, community actors, herders, DRM volunteers).
- **Trigger points and pre-positioning logic (IBF-FbF):**
  Define service trigger points and identify where limited relief items can be staged. Incorporate background checks of similar historical events to guide response prioritization and expected impact patterns.
- **Immediate IBF operational functions ("rapid impact intelligence"):**
  Conduct rapid spatiotemporal impact interpretation and produce initial anticipatory loss-and-damage (L&D) estimates. Disseminate time-critical guidance through live radio or interactive broadcasts, and systematically capture event conditions, early impacts, and evolving L&D figures to support evidence-based response and potential flash appeals.
- **Escalation and humanitarian coordination (SEC / UN-HCT):**
  Enable timely escalation and flash-appeal consideration based on the forecasted and observed scalability, intensity, spatial extent, and damage patterns produced by the IBF-FbF workflow.
- **Event situation reporting and live data capture:**
  Produce real-time situation reports throughout the event. The geospatial IBF platform should support uploading and mapping live updates, including response actions, L&D figures, geotagged photos/videos, and EOC field reports, enabling rapid operational coordination during the incident.

c) **EAP for medium onset and combined weather** factors for example extreme cold temperature, Severe winter conditions, strong winds, damaging winds, season-specific incidence of dzud, flash-drought) lead-time (6-12 hours to daily/weekly)

Considerations:

- **IBF Preparations:** Statistical and dynamical downscaling Model analysis, detect impending extreme weather conditions by running forecasting model, conducting dynamical downscaling for tracking & predicting hazardous events, operational forecasts on watch and warning.

- **Disseminate IBF:** Prepare combined IBF forecasts from multiple sources, e.g. NWP analytics, down-scale models, high-resolution gridded forecasts, routinely issued operational forecasts for the vulnerable sectors/high-value elements, etc.
- **The delineating impact area of the extent with the geospatial platform** soon after the forecast is issued anticipatory calculations and estimates the level of the impact by analyzing elements falling under each threshold.
    - Extremely high -Magenta-coded alerts
    - Very high- red coded alerts,
    - Moderate to high - orange coded alerts,
    - Medium to moderate - yellow coded alerts
- IBF & FBF: Activate weather warnings dissemination protocol by using national broadcast media(Radio/TV), the web-based geospatial platform with warning /watch maps so that the issues can be disseminated to the remote vulnerable areas (over electric mass media) undertake preparedness, pre-positioning response items early over the lead-time.
- IBF/FBF technical partners to define early actions: How to respond early over the lead-time before hazard impend, how to capture live news/events/weather conditions by using the IBF hybrid(crowdsource) observation system.
- Who will be the primary responder according to SoD and SOP: EOC of aimag to remain alerted for providing updates, Local governments to engage stakeholders with defined 5W SOP and deploying and activating team for emergency supports (Local government field level technical experts/actors, herders, community, disaster emergency management volunteers)
- IBF/FBF: What type of response will be required to respond to the situation: Defining contingency for the whole preparedness and response.
- Develop sector-specific contingency plan: Sector departments to prepare their contingency plan by using IBF risk repository informed tools, risk atlas, sectoral information management system, defining risk raking of the elements, estimating finances required for the preparedness, response, etc.
- SEC / UN-HCT to timely propagate flash-appeal for the funds based on scalability, intensity, and extendibility, the damaging pattern of impending hazards forecasted by the IBF and FBF team.
- Early warning-based early action plans - so that disaster emergency funding is timely and effectively utilized.
- IBF & FBF team to develop event situation report over the ongoing events(Geospatial IBF platform to capture live actions, L & D figures, picture/video of from the ground, the live radio show from assessing impact so quickly and event situation reporting (aimag EOC) on the fly.

d) EAP for slow onset(prolonged) and combined weather

Hazards: prolonged drought (meteorological, hydrological, agricultural), desertification, season-specific Dzud and combined Dzud, soil-health degradation, and other cumulative climate stressors

Lead time: monthly, seasonal, annual, multi-year (10-30 years)

Key considerations and operational requirements

1) IBF preparedness and system set-up (data, products, and teams)

- **Establish SOPs and dedicated technical teams:**
  Develop Standard Operating Procedures (SOPs) and organize teams responsible for end-to-end management of observed and modeled datasets data calibration, assimilation, and processing from the hybrid observation system (station , automated and crowdsourced).
  Produce and regularly update climate and hazard outlook products on daily, weekly, decadal, bi-monthly, monthly, seasonal, and annual cycles.
- **Develop indicators/indices and modeling workflows:**
  Create and operationalize algorithms, indicators, and indices (including statistical modeling) to analyze hazards, trends, recurrence, anomalies, and slow-building risk conditions.
  Publish parameter-specific distributions through GIS-based maps and dashboards.
- **Build a national weather-climate repository:**
  Maintain a comprehensive repository of weather and climate patterns, event trends, sector-relevant outlooks, and high-value-element guidance accessible to IBF/FBF teams, SEC, and other mandated stakeholders.
  This repository should support:
    - Sector and element-specific **risk/exposure/vulnerability** assessment

- Forecast verification and model re-analysis
- Multi-hazard risk assessment and historical baselining

2) Enable multi-sector planning, NAP/NDC localization, and resilience investment

- **Use the repository as an input to multi-sector planning:**
  Ensure the repository (maps and risk-informed tools) feeds planning processes for priority sectors, including:
  - Sustainable agriculture (crop and livestock systems)
  - Integrated water resource management
  - Soil and land management
  - Environmental and rangeland management
  - Forest management
  - Drought, desertification, and Dzud risk management
- **Support NAP and NDC localization and long-term programming:**
  Link outputs to national adaptation and mitigation priorities, including NDC-aligned investments and programming (e.g., solar PV, wind po, biomass energy, micro/mini/large hydro, net-zero pathways, and GHG reduction actions).
  Produce long-range forecasts on hazards and trends to inform 10-30-year resilience planning and budgeting.

3) Translate slow-onset risk into sector-specific IBF advisories and EAPs

- **Prepare sector-specific IBF watches/warnings/advisories:**
  Generate combined, sector-focused advisories (watch/warning) that support preparedness, adaptation measures, and resilience-building actions over longer lead times.
- **Develop EAPs that reduce risk and vulnerability:**
  Build EAPs around preventive and protective actions that are feasible at monthly/seasonal horizons (e.g., fodder planning, rangeland protection measures, water-point management, livelihood protection, market interventions)

4) Impact delineation, threshold mapping, and targeting

- **Use the geospatial platform for impact-area delineation:**
  After forecast issuance, delineate impacted areas and estimate expected impacts by analyzing the elements that fall under each threshold class:
  - **Red:** High impact
  - **Orange:** Moderate impact
  - **Yellow:** Low/medium impact
- **Target actions using exposure and vulnerability layers:**
  Use element inventories and vulnerability profiles to prioritize geographic areas, herder groups, and sector assets most likely to experience significant loss and damage.

e) Dissemination, coordination, and mandated roles (SoD/SOP)

- **Activate dissemination protocols for planning and budgeting:**
  Use the web-based geospatial platform to issue warning/watch/advisory maps and ensure products reach target audiences for risk-informed planning, contingency budgeting, and early mobilization of resources.
- **Define stakeholders mandated by SoD and SOP:**
  Clarify roles across national and sub-national actors. Aimag EOCs should generate IBF GIS products at aimag/soum/bag levels and coordinate with sector departments and partners.

6) Contingency design and anticipatory financing linkage

- **Develop contingency arrangements for adaptation and resilience:**
  Use IBF/FBF outputs to define contingencies and action packages for preparedness, adaptation, and resilience-building linked to thresholds and staged financing.
- **Ensure early warning-based early action funding is timely:**
  Structure the EAP so that disaster-related funding and anticipatory financing are released and used effectively before impacts peak.

7) Situation reporting and iterative monitoring during prolonged events

- **Maintain event situation reports for slow-onset crises:**
  Throughout prolonged drought/Dzud/desertification conditions, produce periodic situation reports with mapped evidence and trend monitoring.

  The IBF geospatial platform should capture:
  - Actions taken and coverage
  - Emerging impacts and loss-and-damage indicators
  - Field evidence (geotagged photos/videos where available)
  - Local EOC updates and sector feedback

5.2 Team composition for developing EAP and early warning based early actions :

EAP development and activation should be led jointly by the **IBF** and **FbF** teams, with a defined operational structure that connects forecast production, impact analysis, financing decisions, and last-mile implementation. The figure referenced (Figure 7) should reflect the following functional composition:

1) IBF technical core (forecast and impact production)

- **Forecast Division (NMHS):** operational forecasters, meteorologists, nowcasting specialists; responsible for short-range forecasts, warnings, and uncertainty communication.
- **Climate/Seasonal Unit:** long-range and seasonal outlooks; drought/Dzud-relevant climate indicators.
- **Hydrology and Flood Forecasting Unit:** river/runoff monitoring, flood models, flash flood guidance, hydromet thresholds.
- **Agrometeorology and Livestock/Agri Impact Analysts:** sector translation of hazards into livestock/crop impacts, thresholds, and advisories.
- **Observation and Data Assimilation Team:** AWS/station networks, crowdsourcing feeds, calibration/assimilation, data QA/QC, near-real-time ingestion.
- **GIS/Remote Sensing and Risk Analytics Team:** GeoNode/GeoServer management, GIS overlay analysis, exposure/vulnerability integration, impact mapping, L&D scenario estimation.

2) FbF and EAP design core (triggers, actions, and finance)

- **EAP Coordinator / Technical Lead:** oversees EAP drafting, trigger-action matrices, SOP integration, and partner alignment.
- **Trigger and Threshold Working Group:** defines hazard/impact triggers (color-coded thresholds, indices), spatial activation rules, and verification criteria.
- **Early Action Planning Team:** designs early action packages per trigger level (livestock, agriculture, water, health, shelter/logistics).
- **Anticipatory Financing and Budget Team:** defines financing sources, release procedures, costed action plans, and expenditure controls (government funds, CERF/DREF/FbF windows, donor/private sector).
- **5W and Coordination Unit:** maintains the 5W dashboard, partner mapping, coverage gaps, and assignment of responsibilities.

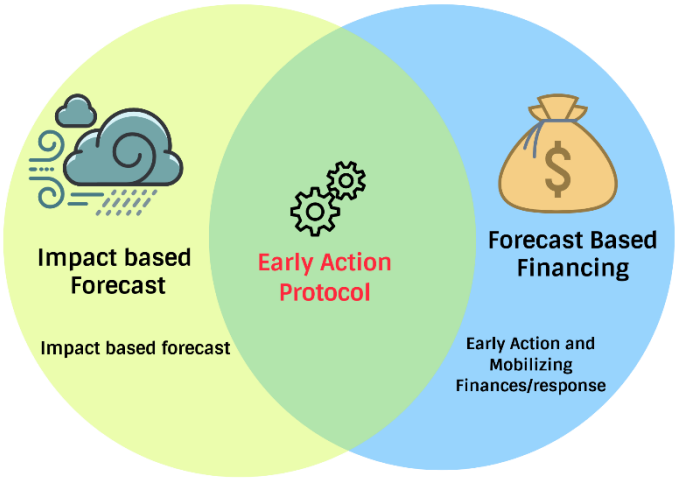

Figure 7: The operational strategy -EAP implementation.

2) Government command-and-control and coordination

- **National/Local EOC (NEMA/LEMA) Liaison:** ensures EAP activation aligns with SoD/SOPs and Incident Command System (ICS) procedures.
- **Sector Ministries/Departments Focal Points:** livestock/agriculture, water, health, transport, land/urban services responsible for sector readiness and implementation.
- **Local Government Coordination (aimag/soum/bag):** executes localized early actions, validates targeting, supports distributions and advisories, and provides situation updates.

4) Humanitarian and community implementation partners

- **MRCS/IFRC Operations Team:** field logistics, volunteer networks, last-mile dissemination, situational reporting, and relief delivery.
- **UN Agencies / INGOs / CBOs / CSOs:** technical support, surge capacity, distributions, protection and inclusion safeguards, and monitoring.
- **Community and Herder Networks:** community leaders, herder groups, veterinary technicians two-way reporting (hazard impacts, livestock condition) and rapid implementation of household-level actions.

5) Communications, dissemination, and accountability

- **Risk Communication and CAP Team:** CAP message development, multi-channel dissemination (SMS/IVR, radio/TV, social platforms), and rumor management.
- **Monitoring, Evaluation, and Learning (MEL):** monitors trigger performance, action coverage, outcomes, and conducts after-action reviews.
- **Information Management and Reporting:** produces situation reports, dashboards, mapping updates, and consolidates L&D evidence.

5.3 Steps of Developing EAP

Step 1: Complete baseline risk and vulnerability analysis

- **Build a comprehensive baseline repository:** Develop a detailed, sector- and element-level repository covering **risk, vulnerability, exposure, and sensitivity**, disaggregated by livelihood group and livestock-herding area. Apply clear risk-ranking criteria consistent with the IBF methodology.
- **Identify and rank priority hazards:** Identify the major hazards and rank them by expected **loss and damage (L&D)**, human and livestock tolls, frequency, intensity, and magnitude.
- **Prepare a multi-scale risk atlas (bag/soum/aimag):** Produce an atlas with indicators and maps for recurrent hazards (e.g., Dzud, drought, floods, snowstorms), including risk, vulnerability, exposure, and sensitivity analyses for priority sectors (livestock, crop agriculture, water, land/soil). Integrate **physical, geographic, socio-economic, and coping-capacity** layers.

- **Develop SOPs for risk management:** Establish Standard Operating Procedures (SOPs) for humanitarian and climate risk management for local governments, aligned with national systems and the IBF/FBF operational workflow.
- **Develop Standing Orders on Disasters (SoD):** Define Standing Orders on Disasters for local emergency management, specifying stakeholder roles, responsibilities, decision pathways, and escalation procedures.
- **Review risk-informed local development planning and budgeting:** Assess existing risk-informed Local Development Plans (LDPs), contingency budgeting practices, and ongoing interventions to identify gaps and align them with IBF/FBF triggers and early actions.
- **Review service-sector value chain operations:** Review value chains relevant to preparedness and response (e.g., fodder/feed supply, veterinary inputs, water access, transport/logistics, market infrastructure) to identify constraints, vulnerabilities, and leverage points for early action.

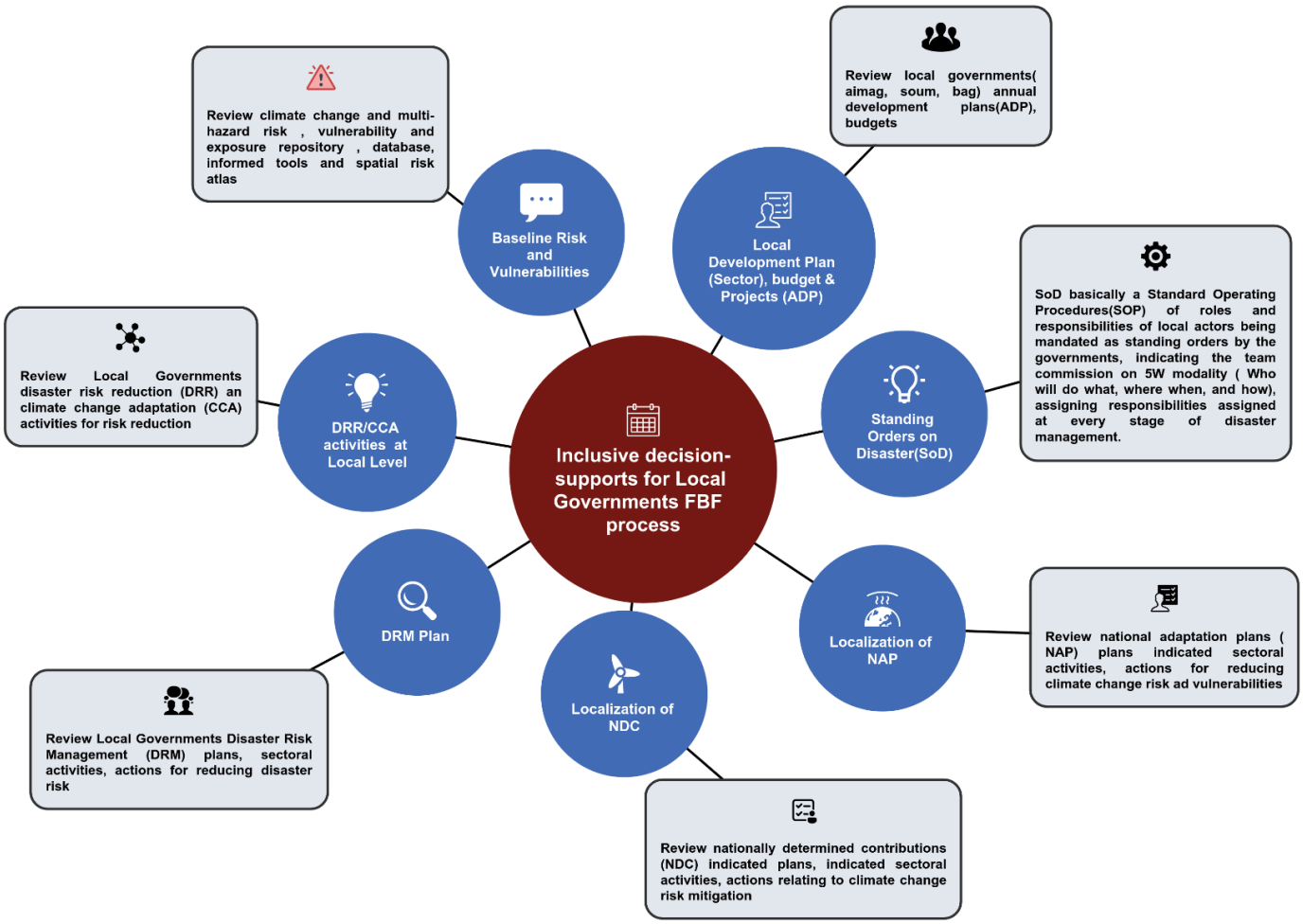

Figure 8: Local Government FbF Decision Support System (Source: Z M Sajjadul Islam, UNDP-GCF)

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

Review IBF outputs and assess the risk of impending hazards where they are likely to occur and which elements are expected to be affected using a 12-24 hour lead time. For each forecast scenario, estimate impacts on exposed elements by severity threshold, and quantify risk by integrating the forecasted hazard characteristics with baseline (persistent) exposure and vulnerability conditions.

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

- **Summarize element risk ranking and determine intervention type:** Using the outputs from the prior steps (baseline risk repository and IBF impact thresholds), consolidate the risk ranking of exposed elements and classify

the expected impact level. Based on this ranking, define the appropriate intervention type (e.g., advisories only, preparedness support, targeted early actions, or full emergency activation).

- **Define the required duration of support:** Specify how long support measures should remain active, aligned with the forecast horizon and expected impact persistence (e.g., immediate 24-72 hours, 7-10 days, or extended/seasonal support), including criteria for scaling up, extending, or deactivating assistance.

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

This step involves the IBF Technical Working Group (TWG) conducting desk-based analysis of forecast impacts using the IBF geospatial platform. The team reviews the impact forecasts, interprets threshold exceedance, and prepares anticipatory loss-and-damage (L&D) advisories and scenarios. These outputs serve as a primary input to the EAP, enabling precision-level impact forecasting and evidence-based early action planning.

Hypothesis for impact estimation

Impact estimation is derived by:

1. **Overlaying** the color-coded, threshold-based impact forecast for impending extreme weather events onto the relevant geographic area;
2. **Quantifying baseline exposure** by identifying physical elements (Annexure 1 of IBF) within the affected area and applying their risk and vulnerability rankings;
3. **Incorporating socio-economic vulnerability** by calculating the risk and vulnerability rankings of socio-economic elements and vulnerable populations; and
4. **Adjusting for coping capacity**, where higher coping capacity reduces expected impact.

Result: an estimate of which elements and locations are most at risk, and the severity level of anticipated impacts across the affected geographic areas.

Compact formula:

Impact Estimation (IE) Hypothesis IE = (Hazard intensity & duration from IBF thresholds) × (Exposure of elements in the impacted area) × (Vulnerability & sensitivity of those elements) ÷ (Coping capacity and preparedness),
producing expected impacts and anticipatory Loss & Damage (L&D) by location and sector.

Operational expression (GIS-based) $IE_i = f[H_i, E_i, V_i, S_i, C_i]$

Where, for each administrative unit / grid / polygon **i**:

- H_i **(Hazard/Trigger):** Color-coded IBF threshold layer (magenta/red/orange/yellow) and event duration/lead time (e.g., snowfall depth, wind speed, wind chill, rainfall intensity, flood depth).
- E_i **(Exposure):** Count/extent of elements within the impacted footprint (herder households, camps, livestock by type, pasture areas, roads, water points, utilities, crops, facilities).
- V_i **(Vulnerability):** Baseline vulnerability rank (sector/element CRVA indicators: poverty/remoteness, shelter quality, access to fodder/water, prior dzud impacts, disease risk, infrastructure fragility).
- S_i **(Sensitivity):** Element-specific sensitivity to the hazard (e.g., young animals to cold stress; wet snow to grazing obstruction; crops by growth stage to waterlogging/hail).
- C_i **(Coping capacity):** Protective capacity that reduces impact (fodder stocks, shelters, veterinary access, cash/liquidity, road accessibility, early action coverage, social protection).

Step 4: Develop anticipatory L & D scenario :

d) Impact checklist and severity indexing (based on the hypothesis):
Using the agreed impact-estimation hypothesis, generate a structured checklist that classifies expected impacts by impact level and severity index for all exposed elements. The checklist should quantify how many elements fall into very high, high, moderate, and low categories of risk, vulnerability, exposure, and sensitivity (and, where possible, identify the corresponding geographic distribution).

e) L&D scenario calculation in Excel (software-enabled):
Use the analytical outputs from the IBF platform/GIS tools to populate an Excel-based scenario model that calculates detailed **anticipatory L&D** results by sector, element type, and administrative unit (e.g., aimag/soum/bag). The spreadsheet should support multiple scenarios (e.g., orange/red/magenta thresholds; 24-72 hours; 7-10 days) and document assumptions, data sources, and uncertainty ranges.

f) Quantify financial and physical L&D and estimate required preparedness investment:
Estimate both **physical losses** (e.g., damaged assets, disrupted services, livestock morbidity/mortality, affected cropland/pasture) and **financial losses** (replacement costs, livelihood/income losses, response costs). Based on the scenario results, estimate the **investment required** for preparedness and resilience measures to reduce **risk, vulnerability, exposure, and sensitivity**, and to strengthen withstanding (coping) capacity.

Table : elements impact analysis.

Elements	Extremely High Risk (Magenta) (% / #)	Very High Risk (Red) (% / #)	Medium Risk (Orange) (% / #)	Low Risk (Yellow) (% / #)	Exposed (% / #)	Vulnerable (% / #)	L&D Area Likely (% / #)	Death Tolls Likely (% / #)

Notes for use

- **Elements:** List sector-specific assets/populations (e.g., herder households, livestock by type, gers/camps, roads/bridges, water points, cropland, pastureland, health facilities).
- **% / #:** Use either percentage of the element base (e.g., % of herder households) or absolute counts, but keep units consistent across the row.
- **Exposed vs. Vulnerable:**
  - *Exposed* = located within the hazard/threshold footprint.
  - *Vulnerable* = exposed elements with vulnerability attributes above an agreed threshold (e.g., poverty, remoteness, weak shelter, low fodder reserves).
- **L&D Area Likely:** Estimated area or number of element instances expected to experience measurable loss or damage (with assumptions documented).
- **Death Tolls Likely:** Only include where a defensible impact function exists (e.g., livestock mortality risk model); otherwise use “high/medium/low likelihood” with confidence.

Step 5: Develop a Contingency Plan

- **Formulate SOPs and a 5W operational plan:**
  Develop clear SOPs and an accompanying 5W plan (who does what, where, when, and how) that translates forecast triggers and impact thresholds into actionable tasks, coordination routines, escalation pathways, and reporting requirements.
- **Specify required resources to protect lives and property:**
  Identify the minimum resources needed to implement priority early actions and emergency measures (personnel, logistics, transport, shelter materials, fodder/feed, veterinary supplies, medicines, communications, fuel, and equipment), including pre-positioning needs and surge capacity.
- **Define People in Need (PIN) and prioritize interventions:**
  Quantify and profile **people in need (PIN)** and define targeting criteria based on the highest-risk elements (e.g., vulnerable herder households, remote communities, high-exposure livestock zones, critical infrastructure). Specify priority interventions and minimum service packages.
- **Identify rapid financing mechanisms and sources:**
  Map and document rapid funding channels and release procedures, including **internal sources** (aimag/local development funds, central government contingency funds, sector budget lines) and **external sources** (CERF,

DREF/FbF, donors, UN/INGO response funds, private sector support). Define authorization steps, disbursement timelines, and accountability controls.

- **Allocate interventions based on risk:**
  Establish a risk-based allocation framework that links intervention scale and modality to **impact thresholds, vulnerability levels, and geographic prioritization**, ensuring resources are directed first to the highest expected impacts and lowest coping capacity areas.

Step 6: Select early actions

Based on hazard category and onset type (rapid, medium, or slow onset), and considering intensity, magnitude, scalability, expected duration, and dissipation timeframe, the EAP team should define early actions that cover the full risk-management cycle. This step should produce the following:

- **Early action packages by risk category:** Develop a structured set of early action plans for each hazard/risk category, aligned with forecast lead time and impact thresholds, and scalable from localized incidents to multi-province emergencies.
- **Risk-category investment menu:** Prepare a menu of costed investment options linked to alert levels and triggers, including:
  - **Cash-based early actions** (e.g., cash for fodder purchase, emergency transport, livelihood protection)
  - **In-kind support** (e.g., hay/fodder, feed concentrates, veterinary supplies, shelter materials)
  - **Logistics support** (e.g., transport, fuel, warehousing, access facilitation)
  - **Relief and essential services support** (e.g., emergency kits, medicines, water access support)
- **Define delivery modalities and targeting:** Specify how early actions will be delivered and targeted (who qualifies, where, quantities, and timing), using vulnerability/exposure criteria and local access constraints.
- **Assign implementation responsibilities (5W execution plan):** Identify executing agencies/partners and define responsibilities using a 5W framework (who/what/where/when/how), including coordination arrangements, escalation pathways, and reporting requirements.
- **Link actions to resources and financing:** Map each early action package to required resources, funding sources, and release procedures so that activation is immediate once thresholds are met.

Step 7: Define the intervention process

- **Trigger-based activation and 5W execution:**
  Define how interventions are activated based on forecast thresholds and impact intensity. For each alert level, specify the 5W operational arrangements who leads and implements, what actions are executed, where they are delivered, when they start and end, and how they will be coordinated and reported.
- **Activity design, budgeting, and financing plan:**
  For each intervention package, detail the activity sequence, required inputs, unit costs, and total budgets. Identify probable funding sources and release mechanisms (e.g., local/central government contingency funds, FbF windows, CERF/DREF, partner resources, private sector support) and define authorization and disbursement procedures.
- **Monitoring and evaluation (M&E) during activation:**
  Develop an M&E plan that is triggered alongside interventions to track implementation progress and results in real time. Define indicators, reporting frequency, roles, data collection methods (including field verification and platform-based tracking), and after-action review requirements to capture lessons and improve future EAP activations.

Step 8: Event situation reporting.

Define a standardized event situation reporting process and operating guidelines for using IBF crowdsourcing networks and risk communication tools to capture and share real-time updates. This should enable partners to upload and access geotagged photos, videos, and structured text reports through the integrated IBF-FbF online platform, ensuring timely situational awareness and coordinated decision-making.

Key elements to specify include:

- **Reporting triggers and frequency** (routine updates vs. surge reporting during escalation)
- **Standard report format** (location, time, hazard type, impacts, L&D indicators, urgent needs)
- **Data quality and verification** (validation steps, duplicate handling, confidence tagging)
- **Information flow and responsibilities** (who submits, who reviews, who publishes)
- **Channels and tools** (mobile apps, Kobo, WhatsApp/Telegram groups, GeoNode inputs, CAP-linked updates)
- **Privacy and safeguarding** (consent, sensitive information handling, responsible media use)

.

Step 9: EAP approval and designation for risk finances

The IBF-FbF workflow is intended to operate through integrated web portals and geospatial platforms to enable timely, partially automated implementation. Under this arrangement, FbF process leaders and co-leaders, key stakeholders, and local governments should convene an online consultation and validation process to review, comment on, and finalize the EAP.

This approval step should also confirm the risk-financing package, including: (i) funds already available for rapid activation, (ii) financing sources and release procedures, and (iii) any additional resources required to implement emergency humanitarian programming ensuring frontline communities and vulnerable groups are adequately prepared for impending hazards.

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

Once the EAP is approved and institutional agreements are in place, humanitarian focal agencies NEMA, MRCS, the HCT, UN clusters, and I/NGOs should follow the EAP to monitor forecasts continuously and activate humanitarian actions accordingly.

A) Readiness actions before activation

- **Confirm activation readiness:** Ensure all designated stakeholders are prepared to activate EAP actions immediately when triggers are met.
- **Pre-position relief items and logistics:** Pre-position agreed supplies and establish distribution arrangements (warehousing, transport, access routes, fuel, and contingency routes).
- **Conduct required trainings and drills:** Deliver training on SOPs, CAP/risk communication, platform use, distribution protocols, safeguarding, and reporting.
- **Validate financing and procurement arrangements:** Confirm that risk-finance is accessible, procurement channels are ready, and authorization procedures are understood.
- **Clarify roles and responsibilities:** Ensure actors understand their responsibilities under SoD/SOPs and the 5W plan, including escalation and coordination lines.

B) Define the forecast monitoring and evaluation process (IBF/FBF platform-enabled)

- **Forecast products to monitor:** Establish routine monitoring of IBF outputs, including **operational forecasts**, **watches**, **warnings**, **alerts**, and **updates/nowcasts**.
- **Update frequency and escalation rules:** Define monitoring intervals (e.g., hourly for rapid-onset hazards; daily/decadal for slow-onset risks) and specify when forecast changes require escalation, scale-up, or stand-down decisions.
- **Trigger verification and logging:** Use the IBF-FbF platform to verify trigger conditions, record activation decisions, and maintain an audit trail of forecast evidence and decision rationale.
- **Performance tracking:** Monitor timeliness, accuracy, and usefulness of forecast updates relative to observed conditions (including AWS and crowdsourced ground truth).
- **Operational M&E:** Track implementation progress, coverage, and early outcomes of actions activated under the EAP, using platform dashboards and standardized reporting formats.

Step 11: Revise/re-submit FBF risk financing proposal.

FbF focal points and key stakeholders should conduct an online consultation and review to reassess the EAP and ensure that the associated risk-financing proposal remains aligned with the agreed triggers, early actions, budgets, and operational modalities. The revised draft EAP should then be uploaded to the integrated IBF-FbF online platform for rapid re-validation and final approval, enabling a quick turnaround for launching or scaling the humanitarian programme in advance of impending hazards.

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5.4 Developing EAP for managing season-specific and combined dzud risks

This EAP framework is designed to manage season-specific Dzud conditions (winter, spring, summer, autumn risk pathways) and combined Dzud risks that emerge from interacting climatic and non-climatic factors (e.g., drought followed by heavy snowfall and extreme cold; icing that blocks grazing; prolonged fodder scarcity; compounded vulnerability). The objective is to enhance resilience by ensuring that risk financing, resources, and interventions are mobilized early, based on forecast triggers and impact thresholds, and implemented through coordinated action across national and sub-national systems.

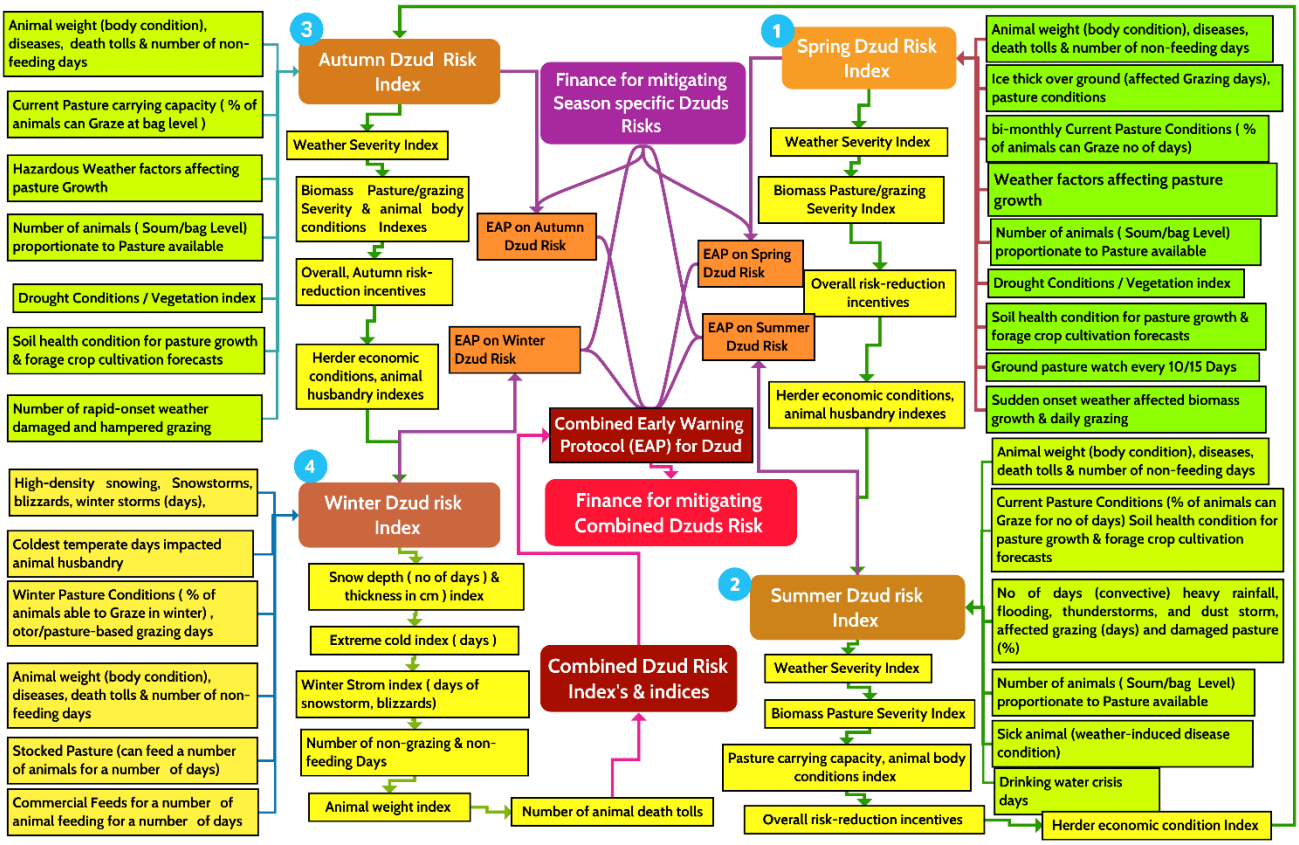


Figure 8: EAP for Dzud to enhance resilient capacity through timely mobilization of risk financing, resources, and interventions *(Source: Z M Sajjadul Islam, UNDP-GCF)*

Figure: Season-specific Dzud Risk Indices and Combined Dzud Early Warning Protocol (EAP)

What the diagram conveys (logic in plain language):

The framework builds four season-specific Dzud Risk Indices Spring (1), Summer (2), Autumn (3), Winter (4) each derived from a consistent set of weather severity, pasture/biomass and grazing severity, and livestock/herder condition indicators. Each seasonal index informs a corresponding seasonal EAP and season-specific risk financing. The outputs are then consolidated into a Combined Dzud Risk Index (and indices) that triggers a Combined Early Warning Protocol (EAP) for Dzud, supported by financing for mitigating combined Dzud risk.

1) Season-specific Dzud Risk Indices: common computation structure

Across all seasons, the workflow follows the same structure:

1. **Input indicators (field ,remote sensing and administrative data)**
2. **Weather Severity Index** (season-relevant meteorological anomalies and hazards)
3. **Biomass pasture / grazing severity index** (availability and access to grazing)
4. **Livestock and herder condition indices** (body condition, disease, non-feeding days, economic stress)
5. **Overall risk-reduction incentives** (decision layer linking risk level to early actions/finance)
6. **Seasonal EAP activation** (Spring/Summer/Autumn/Winter Dzud EAP)

2) Spring Dzud Risk Index (1): key indicator families

Typical spring-focused indicators in the diagram include:

- **Animal condition:** body condition/weight, disease, death tolls, number of non-feeding days
- **Grazing barriers: ice thickness over ground** (affecting grazing days), pasture conditions
- **Pasture monitoring:** bi-monthly pasture condition (% of animals that can graze; number of days), ground pasture watch every 10-15 days
- **Drivers of pasture growth:** weather factors affecting pasture growth, drought/vegetation index, soil health condition
- **Exposure pressure:** number of animals (soum/bag level) relative to available pasture
- **Rapid-onset disruptions:** sudden-onset weather affecting biomass growth and daily grazing

Outputs: Weather Severity Index > Biomass pasture/grazing severity index > Risk-reduction incentives > Herder economic & husbandry indices > **EAP on Spring Dzud Risk**

3) Summer Dzud Risk Index (2): key indicator families

Summer emphasizes convective hazards and water stress:

- **Animal condition:** body condition/weight, disease, death tolls, non-feeding days
- **Pasture stress:** pasture carrying capacity and pasture availability (% animals can graze)
- **Hazard-driven grazing disruption:** number of days with **heavy rainfall/flooding/thunderstorms/dust storms** affecting grazing and damaging pasture (%)
- **Health impacts:** sick animals (weather-induced conditions)
- **Water stress: drinking water crisis days**
- **Exposure pressure:** number of animals relative to pasture available

Outputs: Weather Severity Index > Biomass pasture severity index > Pasture carrying capacity & animal body condition index > Risk-reduction incentives > **EAP on Summer Dzud Risk**

4) Autumn Dzud Risk Index (3): key indicator families

Autumn focuses on pre-winter deterioration and grazing constraints:

- **Animal condition:** weight/body condition, disease, death tolls, non-feeding days
- **Current pasture carrying capacity** (% animals can graze at bag level)
- **Weather factors affecting pasture growth** and hazardous weather influences
- **Exposure pressure:** animals (soum/bag) proportional to pasture availability
- **Drought/vegetation index** and soil health implications
- **Rapid-onset weather impacts** that hamper grazing

Outputs: Weather Severity Index > Biomass pasture/grazing severity & animal body condition indices > Autumn risk-reduction incentives > Herder economic & husbandry indices > EAP on Autumn Dzud Risk

5) Winter Dzud Risk Index (4): key indicator families

Winter is explicitly index-heavy and hazard-specific:

- **Hazard intensity/duration:** high-density snowing, snowstorms, blizzards, winter storms (days)
- **Temperature stress:** coldest temperature days affecting husbandry
- **Grazing feasibility:** winter pasture conditions (% animals able to graze; pasture-based grazing days)
- **Feed buffers:** stocked pasture (days of feeding possible), commercial feeds (days)
- **Core winter indices (shown as sub-indices):**
    - Snow depth/thickness index (days/cm)
    - Extreme cold index (days)
    - Winter storm index (days of snowstorms/blizzards)
    - Number of non-grazing and non-feeding days
    - Animal weight index

Outputs: Winter Dzud Risk Index > Winter sub-indices > **EAP on Winter Dzud Risk**

6) Combined Dzud Risk Index and Combined EAP

How the combination works conceptually:

- Seasonal indices (Spring/Summer/Autumn/Winter) feed into a **Combined Dzud Risk Index (and indices)**.
- The diagram also highlights **"Number of animal death tolls"** as a critical severity outcome feeding the combined index.
- The combined index triggers the **Combined Early Warning Protocol (EAP) for Dzud**, which then links to **financing for mitigating combined Dzud risk**.

Practical interpretation:

- Season-specific EAPs manage **near-term, seasonal risk**.
- The combined EAP manages **compound/cascading risk**, where conditions across seasons reinforce one another (e.g., drought > pasture deficits > severe winter impacts).

Suggested "algorithm-style" operationalization (GIS-MCDA friendly)

1. **Standardize inputs** (bag/soum grid or administrative polygons): ingest meteorological anomalies, pasture/NDVI, drought indices, snow/ice metrics, livestock counts, animal health and mortality, water access stress, and socio-economic indicators.
2. **Normalize indicators** to a common scale (e.g., 0-1) and apply seasonal weights (MCDA).
3. **Compute sub-indices** (Weather Severity; Pasture/Biomass & Grazing Severity; Animal Condition; Herder Economic Stress).
4. **Compute each Seasonal Dzud Risk Index** as a weighted aggregation of sub-indices.
5. **Classify severity thresholds** (e.g., Yellow/Orange/Red/Magenta if desired) and generate maps.
6. **Trigger seasonal EAP actions and financing** using threshold rules (risk-reduction incentives layer).
7. **Compute Combined Dzud Risk Index** (e.g., weighted combination or "worst-season dominance" logic , mortality trend signal).
8. **Activate Combined Dzud EAP and financing** when combined thresholds are met; continuously update based on monitoring cadence (10-15 day pasture watch; seasonal outlooks; winter daily hazard indices).

Method Box: Dzud Risk Indexing and EAP Triggering (Inputs > Indices > Thresholds > EAP > Financing)

1) Inputs (bag/soum/aimag scale; updated seasonally and, where applicable, every 10-15 days)

- **Livestock condition:** animal weight/body condition, diseases, death tolls, number of non-feeding days.
- **Pasture and grazing status:** current pasture conditions and carrying capacity (% animals able to graze; grazing days), biomass/pasture productivity, grazing barriers (ice thickness), pasture damage.
- **Weather and hazard drivers:** season-specific anomalies and hazards (e.g., extreme cold days, snow depth/thickness, snowstorm/blizzard days; convective heavy rainfall/flooding/thunderstorm days; strong wind/dust storm days).
- **Drought and environment:** drought conditions/vegetation index (NDVI), soil health indicators affecting pasture growth and forage forecasts.
- **Exposure pressure:** number of animals (soum/bag level) proportional to pasture available.
- **Water stress:** drinking-water crisis days.
- **Socio-economic capacity:** herder economic conditions and animal husbandry capacity indices.

2) Indices (computed separately for each season, then consolidated)

Season-specific Dzud Risk Indices

- **Spring Dzud Risk Index:** Weather Severity Index, Biomass pasture/grazing severity, animal condition, grazing barriers (ice) and , pasture watch.
- **Summer Dzud Risk Index:** Weather Severity Index, Biomass pasture severity , pasture carrying capacity , hazard-disrupted grazing days (rain/flood/thunderstorm/dust) , water crisis and animal health.
- **Autumn Dzud Risk Index:** Weather Severity Index , biomass pasture/grazing severity, animal condition , drought/vegetation , pasture carrying capacity , rapid-onset weather impacts.
- **Winter Dzud Risk Index:** Snow depth/thickness, extreme cold days , winter storm/blizzard days , non-grazing/non-feeding days , animal weight, feed buffers (stocked/commercial feed days).

Combined Dzud Risk Index (and indices)

- Aggregates the four seasonal indices (and key outcome signals such as rising mortality/non-feeding days) into a single combined risk metric.

3) Thresholds (severity classification mapped to action level)

- Convert each seasonal index and the combined index into **risk tiers** (e.g., **Low / Medium / High / Very High / Extreme**) to determine escalating action intensity.
- Apply thresholds at **bag/soum/aimag** levels to identify priority locations and populations.

4) EAP Triggers (activation logic aligned with the diagram)

- When a **Seasonal Dzud Risk Index** crosses its threshold, trigger the corresponding **EAP on Spring/Summer/Autumn/Winter Dzud Risk** and implement risk-reduction incentives and early actions.
- When the **Combined Dzud Risk Index** crosses its threshold (or multiple seasons are simultaneously high), trigger the **Combined Early Warning Protocol (EAP) for Dzud**.

5) Financing (linked to seasonal and combined triggers)

- **Season-specific financing:** Release resources to mitigate **season-specific Dzud risks** when seasonal EAP triggers are reached.
- **Combined-risk financing:** Mobilize additional and scalable financing for **mitigating combined Dzud risk** when the combined EAP is triggered, enabling larger, multi-sector intervention packages and wider geographic coverage.

6.0 Early Warning and Early Action for the rapid onset events

Delivering high-precision impact forecasts for rapid-onset extreme weather such as snowstorms, blizzards, convective heavy rainfall, thunderstorms, and cold- and warm-front-induced storms is technically challenging, yet it is one of the

most urgent priorities for Mongolia due to the fast emergence of hazardous conditions. To address this, the proposed IBF observation system incorporates a hybrid monitoring approach so that these events can be detected earlier and forecast more reliably.

To enable timely early warning and early action, an integrated IBF-FbF online platform should be established to generate rapid forecasts and anticipatory impact estimates before activating early warning-based early action planning and response actions.

6.1 Early Warning and Early Action :

Step 1: Threshold-based risk screening (multi-hazard):
Analyze the color-coded impact-threshold maps for snowstorms, blizzards, convective heavy rainfall, thunderstorms, hailstorms, flash flooding, and cold/warm-front-induced storms affecting urban settlements. Activate the early action workflow when at least three provinces are classified as high risk and ≥20% of the affected area falls under red alert conditions.

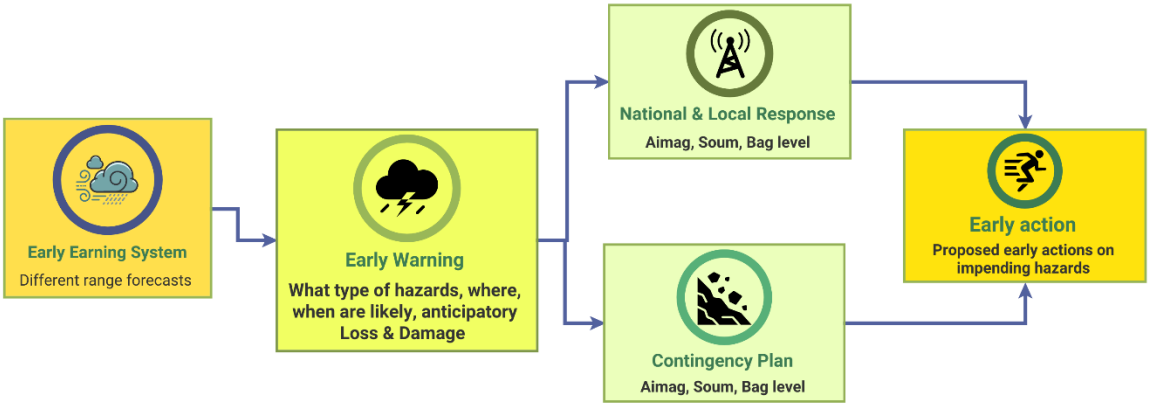
Step 2: Anticipatory impact and L&D estimation:
Conduct an anticipatory assessment of exposed elements and estimate likely impacts, including potential damage levels and the probability of human and livestock casualties, using exposure and vulnerability layers and historical impact functions.

Step 3: Immediate early action planning:
Develop rapid, practical early action plans to protect lives and property, specifying sector actions, target groups, triggers, timelines, and minimum preparedness measures aligned with the forecast lead time.

Step 4: Prioritize FbF actions and produce a 5W plan:
Prioritize Forecast-based Financing (FbF) actions and immediately prepare a 5W plan (who does what, where, when, and how), defining responsibilities, locations, start times, delivery modalities, and required resources for immediate implementation.

Step 5: Response plan design for timely delivery:
Prepare a coordinated response plan that ensures enabling components are in place for timely early action delivery ommand-and-control arrangements, logistics and access plans, communications and CAP dissemination, resource mobilization, monitoring/reporting, and contingency arrangements for disrupted conditions.

The diagram below illustrates the linear workflow of an early warning-based early action plan, led by national and/or local governments, with humanitarian and development partners working jointly to provide the required support and capacity strengthening. The key components include:



6.2 Developing Forecast based early Action :

Menu of the triggers Showing forecasts of different timelines and their probability levels

Triggers/IBF	Forecast lead-time	Very High probability	Medium to high probability	Low to Medium Probability	Early warning based early action and developing EAP
Extreme winter conditions	7-15 Days 0-7 Days 0-5 Days 0-3 Days	• Extreme cold temperature • High-density snowfall	Severe snowstorm	• Snowstorm • Winter storm	Early Action development for emergency preparedness and response planning
Damaging winds	0-7 Days 0-5 Days 0-3 Days	• ….m/s wind speed	….m/s wind speed	• ….m/s wind speed	Early Action development for emergency preparedness and response planning
Convective weather conditions	0-1 hour 0-6 hours 6-12 hours	• Severe thunderstorm • Danger level : Very heavy rainfall (> 70mm/hr) • Rainfall watch >50mm in 1 hr >70mm in 3 hr >90mm in 6 hr >110mm in 24 hr	• Heavy rainfall exceedance (30-70mm/hr) • Rainfall watch 30mm-40mm in 1 hr 40mm-50mm in 3 hr 50mm-60mm in 6 hr 70mm-80mm in 12 hr 80mm-90mm in 24 hr	• Rainfall exceedance (10-20mm/hr)	Immediate warning, operationalizing humanitarian action for saving lives and properties
Cold front	0-1hour 0-6 hours 6-12 hours	Severely Damaging Cold Strom	Moderately Damaging Cold Strom	Low-level Damaging Cold Strom	Immediate warning, operationalizing humanitarian action for saving lives and properties
Cold rain	0-1hour 0-6 hours 6-12 hours	Severely Damaging Cold rain	Moderately Damaging Cold rain	Low-level Damaging Cold rain	Immediate warning, operationalizing humanitarian action for saving lives and properties

6.3 Anticipatory Actions for Copping the Rapid Onset Hazards.

Forecast/trigger	Anticipatory actions to be carried out	Actors /stakeholders	Type of response
Very High probability of Extremely coldest temperate & Snowstorms	• Trigger and threshold review: Review IBF impact forecasts, warning categories, and threshold exceedance levels to determine whether early action triggers are met and to define the geographic and sectoral scope of activation. • Risk and scenario analysis: Assess the aggregated risk level (e.g., Dzud Watch/Warning, flood risk index) and develop best-case/most-likely/worst-case scenarios, including anticipated loss-and-damage implications and operational constraints. • Prioritize early actions by sector and vulnerability: Identify priority early actions for livestock, agriculture, water, health, and protection based on exposure and vulnerability profiles, with special	Local Government Administration	Immediate warning, operationalizing humanitarian action for saving lives and properties

Forecast/trigger	Anticipatory actions to be carried out	Actors /stakeholders	Type of response
	attention to hard-to-reach areas and the most vulnerable households. • Resource and stock assessment: Compile available resources and stocks across government, humanitarian actors, and partners (e.g., fodder, veterinary supplies, shelter materials, medicines, transport assets), using the FbF database and 5W information. • Financing and allocation decisions: Confirm funding sources and decision pathways (e.g., CERF, government contingency funds, FbF mechanisms, partner funding), define allocation priorities, and set disbursement timelines aligned with trigger activation. • Coordination and roles: Establish clear roles and responsibilities across NMHS, DRM authorities, sector ministries, HCT/OCHA coordination structures, MRCS/IFRC, I/NGOs, and local governments (aimag/soum/bag), including escalation and approval pathways. • Operational planning and logistics: Prepare operational delivery plans for early actions targeting lists, distribution routes, warehousing, transport, access clearances, and fallback options for disrupted roads and communications. • Risk communication and dissemination: Issue consistent, impact-based messages through CAP and multi-channel dissemination (SMS/IVR, radio, TV, social media, WhatsApp/Telegram groups), ensuring last-mile reach and feedback loops for situational updates. • Monitoring, reporting, and accountability: Define monitoring indicators (action completion, coverage, outcomes), reporting schedules, grievance mechanisms, and after-action review processes to refine thresholds, actions, and SOPs for future events.		
	The Humanitarian Country Team (HCT) and OCHA should review the IBF impact forecasts and trigger thresholds, assess the anticipatory early action plan available through the FbF platform, and determine appropriate CERF allocations to support preparedness and response operations. .	HCT NEMA	
	Conduct a consolidated assessment of available stocks and capacities across government and other stakeholders state and non-state actors, MRCS/IFRC, I-NGOs, CBOs/CSOs, and sector departments using the FbF database, sectoral resource inventories, and the 5W dataset to identify	NEMA/LEMA MRCS Sector Department	

Forecast/trigger	Anticipatory actions to be carried out	Actors /stakeholders	Type of response
	existing supplies, coverage gaps, and readiness for rapid deployment.		
	Review the **aggregated Dzud risk level** and assess the likelihood of escalation into an imminent disaster by monitoring the **Dzud watch and warning system** and using the designated web portals (e.g., dzud.ibf.gov.mn, fbf.gov.mn, and other approved platforms). Based on the **5W dashboard** within the Using the FbF platform, identify the required emergency relief and response package and define the initial priority actions needed for rapid activation and coordinated implementation.	NEMA/LEMA NAMEM MRCS Sector Department	
	Identify the emergency relief and response package, and define the initial priority actions, using the 5W dashboard of the FbF platform to determine who is doing what, where, when, and how, and to align gaps and resources for rapid, coordinated implementation.	NEMA/LEMA MRCS Sector Department	
	Prepare agency-specific contingency, preparedness, and response plans using the FbF platform, ensuring each plan is aligned with the agreed triggers and thresholds, priority actions, geographic targeting, available stocks and capacities, and the 5W coordination framework for rapid and coherent implementation.	NEMA/LEMA MRCS Sector Department	

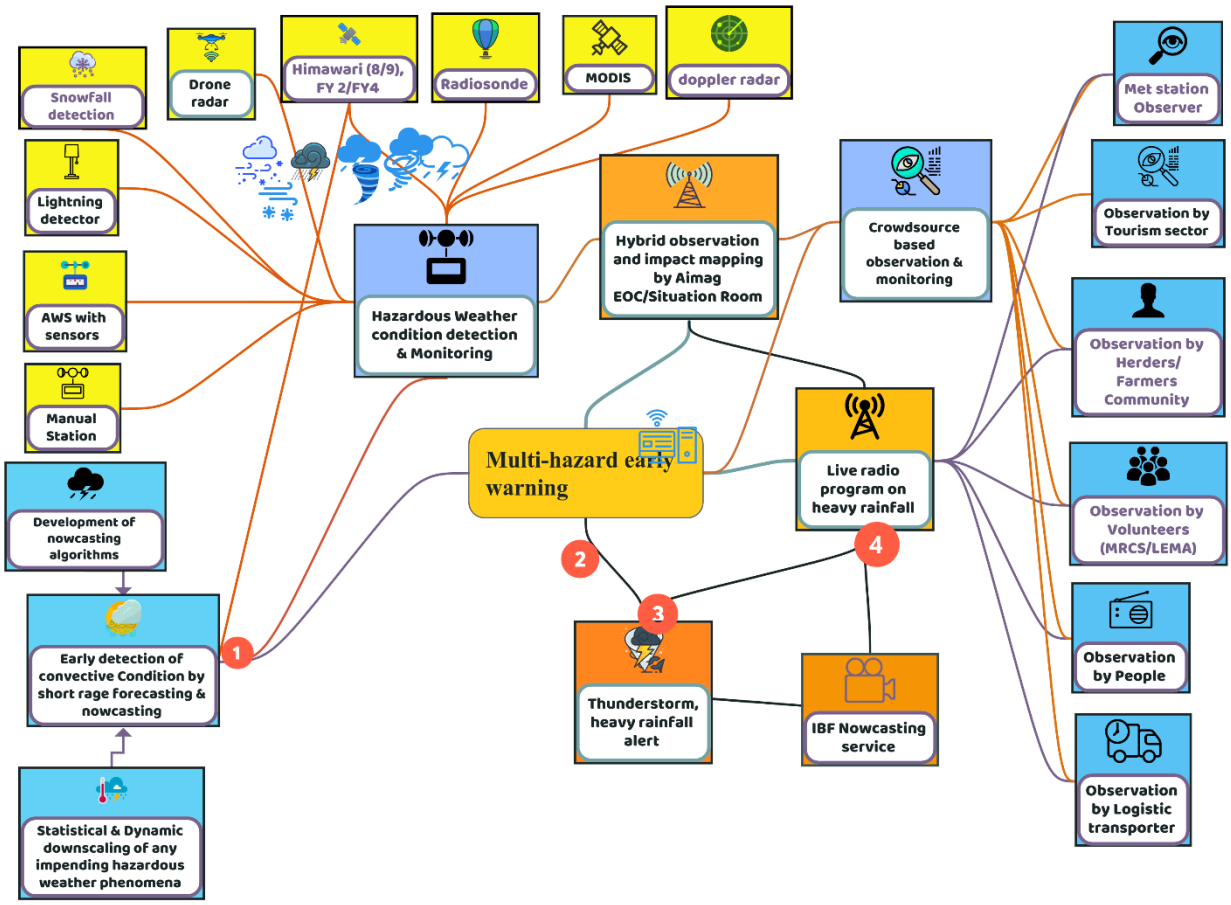


Figure 9: Rapid onset hazardous events earning system under the IBF process to inform the FBF actions (Source: Z M Sajjadul Islam, UNDP-GCF)

7.0 FBF strategy development for the vulnerable sectors

7.1 : IBF integrated informed FBF tool supporting long-term planning

Mid-term Plans/Policy/Strategy	**Informed tools to be supplied by IBF**	**The informed decision for FBF**
The National Action Programme on Climate Change (2011).	1) Sector-specific climate risk-informed tools e.g. Risk atlas, the database of the Climate Risk and Vulnerability (CRV) tools 2) Annual climatology of Mongolia(Observed data) 3) Annual weather outlook	• Informed tools to provide the way forward for adaptation, and mitigation decision-making. • FBF advisory/strategy for the sector based on the operational IBF
First National Action Plan - 2014-2016 Second National Action Plan - 2016-2018 Third National Action Plan - 2018-2020/2019-2021 A (NAP 4th working group) Action Plan for 2020-2024	1) Weather risk atlas, 2) Multi-hazard risk atlas, 3) Climate Risk and Vulnerability repository database, Aimag, Soum level GIS maps on the CRV 4) indicators and targets for monitoring and evaluation 5) Annual climatology of Mongolia(Observed data) 6) Annual weather outlook	Sector-specific FBF advisory/strategy for the sector- based on monthly, seasonal, yearly outlook, sector-level operational forecasts, etc.
GHG mitigations actions are the Sustainable Development Vision 2030 (2016), the	• Air quality forecast • Location of mining and industries and GHG/air quality data recorded by NAMEM	

Mid-term Plans/Policy/Strategy	Informed tools to be supplied by IBF	The informed decision for FBF
State Policy on Food and Agriculture (2016),	• Crop agriculture sector-specific Climate Risk and Vulnerability repository database, Aimag, Soum level GIS maps on the CRV. • Operational forecast for crop Agriculture, food security, livestock, duzd	Sector-specific FBF advisory/strategy different types of IBF
State Policy on Forest (2015), the	Climate risk data and atlas for measuring forest risk	Financing strategy for the sustainable Forest management
State Policy on Energy (2015), Mid-Term National Programme to Develop the State Policy on Energy for 2018 - 2023	1) Solar irradiance, radiation data 2) Location-specific sunshine days 3) Total precipitation days, spatiotemporal precipitation data, and the cumulative amount of precipitation(mm) on the day, week, decadal, monthly, seasonal, and yearly for measuring hydrological potentials for po generation 4) Wind speed data and geographical distribution of wind speed for supporting wind po programme	Sector-specific FBF advisory/strategy for harnessing renewable resources
Green Development Policy (2014), National Adaptation Plan (NAP) process	Good weather forecast and impact analysis for the green development sector and sub-sectors • Observed sunshine days, and solar irradiance data for harmonizing solar energy (PV electrification) • Observed wind data for wind resource mapping, wind energy program • Observed accumulation of precipitation time-series data for integrated water resource management, hydropo project • Wind speed data and geographical distribution of wind speed for supporting wind po program • Soil moisture, soil health, soil thawing, icing over the soil, etc. data for soil sector planning, crop agriculture, pasture condition, rangeland health data(types of otor pasture, planting type, etc., for agriculture and livestock sector planning.	IBF tools for the developing Strategy/way forward for the financing of projects/schemes for achieving green development.
National Program on Waste Management Improvement (2014)	Greenhouse gas emission data	• Financing strategy for the NetZero development, GHG reduction, NDC localization • Project/scheme design and implementation
NDC State Policy on Energy (2015);	• Observed sunshine days, and solar irradiance data for harmonizing solar energy (PV electrification) • Observed wind data for wind resource mapping, wind energy program • Observed accumulation of precipitation time-series data for integrated water resource management, hydropo project • Seasonal outlook for informing planning paradigm of harnessing sustainable emery	• Financing strategy for the NetZero strategy development, GHG reduction, NDC localization • Project/scheme design and implementation
The National Action Plan to Combat Desertification,	1) Drought watches Mongolia, advisory and anticipatory action plan for combat desertification. 2) Weather indicators for the agriculture, hydrological, and meteorological drought in Mongolia 3) SPEI indicators, drought indices	• Financing strategy based on the different range impact forecast on spatiotemporal resolution. • FBF for X-ante/x-post financing strategies for

Mid-term Plans/Policy/Strategy	Informed tools to be supplied by IBF	The informed decision for FBF
	4) Develop appropriate weather parameters, indicators, index, and indices for measuring desertification. 5) Operational Forecast on pasture biomass condition	sustainable pasture management
The National Biodiversity Action Plan,	• Weather indicators for the agriculture, hydrological, and meteorological drought in Mongolia • SPEI indicators, drought indices • Develop appropriate weather parameters, indicators, index, and indices for measuring desertification.	

Source: Government Planning Documents [3]

IBF and FBF tools to inform government policy planning, strategy development, and project design process.

- Government planning desk to access IBF and FBF tools for getting informed about persistent risks and vulnerabilities while developing risk-informed sectoral development plans and budgets annually.
- Access IBF and corresponding FBF through the online platform for support SEC, NEMA, and sector departments for EAP planning, providing informed decisions for different onset hazard risk financing.

Table: Inputs by the sector departments for EAP and action planning for the FBF process.

Analyze components of Forecast-based Financing (FbF)	FBF Advisories	Stakeholders
Thresholds of Impact Forecasts	• **Use the IBF platform for sector loss-and-damage analysis:** Access the IBF platform to review hazard, exposure, and vulnerability layers, and analyze sector-specific loss and damage outcomes, including impact trends, hotspots, and affected elements. • **Support EAP development and anticipatory planning:** Provide technical input to develop the Early Action Protocol (EAP), clearly outlining sector preparedness actions and specifying triggers, roles, timelines, and the associated anticipatory budgeting and finance allocation requirements.	Priority sector department
Planning anticipatory actions and guides for Early Action Protocols (EAPs)	• Develop threshold-based, sector-specific early action plans: Using IBF-issued warning categories and threshold intensities for extreme events (e.g., Dzud), support the design of sector-specific EAPs that define actions by impact level (e.g., Yellow/Orange/Red/Magenta) and specify triggers, timelines, responsibilities, and minimum response standards. • Define early action financing modalities: Propose appropriate financing approaches to activate immediately after early warning issuance, including cash-based early actions (e.g., cash for livestock preparedness and livelihood protection during severe Dzud), in-kind support (hay, fodder, vitamins, veterinary inputs), logistics support, and emergency relief items, aligned with forecast-based triggers.	

[3] www.cabinet.gov.mn , https://www.unescap.org/sites/default/d8files/event-documents/Mongolia%20-%20Climate%20Change%20and%20Disaster%20Risk%20Profile.pdf , https://www.adaptation-undp.org/mongolia-achieves-milestone-national-adaptation-planning, https://cabinet.gov.mn/wp-content/uploads/2050_VISION_LONG-TERM-DEVELOPMENT-POLICY.pdf

Analyze components of Forecast-based Financing (FbF)	FBF Advisories	Stakeholders
	• Issue livestock protection advisories and mobilization actions: Provide operational advisories and response actions to prevent livestock cold injury, support emergency sheltering, enable rapid feed supplementation, and activate emergency fodder stockpiling and distribution mechanisms. • Issue crop protection advisories and response actions: Provide advisories and strategies to protect standing crops, mitigate weather-related crop losses, and support timely mobilization of emergency response measures for agriculture. • Support flood risk EAPs and risk financing strategies: Develop flood-focused advisories, EAP action plans, and risk financing strategies tied to forecast thresholds, including actions for preparedness, response readiness, and early mobilization of resources. • Provide forecast-based multi-sector advisories: Deliver forecast-triggered advisories and recommended actions for priority sectors livestock, crop agriculture, water, soil, and land management ensuring guidance is practical, location-specific, and aligned with the IBF platform's impact forecasting outputs.	
Developing Early Action Protocols (EAPs)	• Provide structured guidance for EAP development: Support partners to develop standardized EAPs aligned with IBF outputs, ensuring each protocol clearly defines scope, target groups, operational workflows, and implementation arrangements. • Analyze and define core EAP components: Guide the design and validation of the key components triggers, early actions, and emergency financing mechanisms including how triggers are set (thresholds/probabilities), what actions are activated at each trigger level, and how funds are released and tracked. • Clarify stakeholder roles and responsibilities: Provide guidance on assigning clear roles and responsibilities across NMHS, DRM authorities, sector ministries, humanitarian partners, local governments, and community structures to ensure rapid decision-making and timely activation of early actions following warnings. • Guide national early recovery financing options: Advise on which national entities and mechanisms can finance early recovery (e.g., government contingency funds, sector budget lines, social protection mechanisms, disaster response funds), and how these can be linked to forecast-based triggers and EAP activation. • Guide forecast-based sector risk analysis and hazard selection: Provide methodological guidance on conducting forecast-based risk analysis for each sector integrating hazard likelihood/severity, exposure, vulnerability, and capacity and selecting the priority impending hazards the EAP should address based on expected impacts and feasibility of early action.	Priority sector department
Financing mechanism	Financing mechanism: Provide guidance on the financing mechanisms that are already in place to enable rapid action following IBF-issued emergency forecasts. This should include an assessment of available funding instruments, activation procedures, and disbursement timelines, as well	Priority sector department

Analyze components of Forecast-based Financing (FbF)	FBF Advisories	Stakeholders
	as identification of potential financing entities and stakeholders across state institutions, non-state actors (e.g., humanitarian organizations and NGOs), and the private sector that can mobilize resources for early action and emergency respons	
Level of Stakeholders Engagement	Following guidelines; • Local government response to FbF: Assess how aimag, soum, and bag authorities operationalize Forecast-based Financing (FbF) for emergency response, early recovery, and rehabilitation, including trigger use, decision pathways, and speed of fund release. • Local disaster management structures: Confirm whether functional disaster management committees (or equivalent DRM coordination bodies) exist at aimag/soum/bag levels, and document their membership, mandates, and operating procedures. • Standing orders on disasters (SoD) and planned activities: Identify and review the proposed activities under SoD at aimag, soum, and bag levels, including preparedness actions, early action measures, response tasks, and recovery responsibilities. • Local coordination mechanisms: Map the local coordination arrangements (EOC/Situation Room, ICS linkages, sector working groups, partner coordination), including information flow, meeting routines, and escalation pathways during emergencies. • Access to input support services during emergencies: Define how herders and smallholder farmers access critical inputs and support services (feed, fodder, veterinary services, shelter materials, water access support, transport/logistics) during emergencies, including eligibility, distribution channels, and grievance mechanisms. • Emergency supply chain and market access for remote groups: Evaluate whether remote herders/smallholder farmers can access the emergency value chain, including storage facilities, emergency product reserves, transport corridors, and market access mechanisms, and identify barriers and enabling measures to ensure equitable access	Priority sector department
Set up a FbF program during the rehabilitation phase	Provide the following advisories. FbF in rehabilitation phase - programme advisories • **Link IBF-FbF with Social Protection and livelihood recovery** ○ Establish formal linkages between IBF triggers and Social Protection mechanisms (e.g., targeted cash transfers, shock-responsive safety nets). ○ Align FbF early recovery packages with vulnerable-sector development plans and Income Generating Activities (IGAs), prioritizing herder households and climate-frontline communities. • **Promote climate-adaptive and resilient SMEs and private sector engagement** ○ Use IBF risk profiles to guide SME investment toward climate-resilient services (fodder production and storage,	Priority sector department

Analyze components of Forecast-based Financing (FbF)	FBF Advisories	Stakeholders
	veterinary supply chains, water services, cold-chain and transport, weather-indexed insurance). ○ Create incentive mechanisms (grants, blended finance, tax relief, preferential procurement) to scale resilient local enterprises. • **Support climate-resilient local development planning (last-tier local governments)** ○ Institutionalize IBF/FBF outputs (risk maps, seasonal outlooks, impact thresholds) into bag/soum/aimag development planning cycles and annual budgets. ○ Establish "forecast-informed planning" routines seasonal planning workshops, risk-informed public works planning, contingency budgeting, and maintenance of emergency reserves. • **Create climate-resilient market opportunities for remote herders and smallholders** ○ Improve market access through forecast-informed logistics planning, protected transport corridors, aggregation points, and emergency storage facilities. ○ Enable digital and cooperative-based market linkages (pricing information, demand signals, transport coordination, mobile payments). • **Promote weth entrepreneurship** ○ Develop targeted weth enterprise support aligned with climate-risk services (digital advisory services, rangeland monitoring support, fodder value chains, renewable energy solutions for remote areas, water-point services). ○ Integrate skills development, start-up finance, and mentoring, with priority for weth in high-risk soums. • **Strengthen local private sector contributions to agricultural GDP** ○ Promote private sector participation in agricultural value chains fodder/forage production, processing, storage, veterinary supply, transport, and market infrastructure. ○ Use IBF risk information to de-risk investments and prioritize resilient infrastructure and services. • **Promote sustainable smallholder subsistence farming** ○ Expand climate-smart practices guided by seasonal forecasts: drought-tolerant crops, adjusted planting windows, soil moisture conservation, water-efficient irrigation, and integrated pest/disease preparedness. ○ Couple advisories with access to inputs, extension services, and local demonstration plots. • **Promote agroforestry and afforestation** ○ Prioritize agroforestry systems that reduce wind erosion, stabilize soils, improve microclimates, and diversify income (shelterbelts, silvopastoral options). ○ Link IBF risk maps to identify suitable zones and establish forecast-informed planting and maintenance schedules. • **Contribute to combating desertification** ○ Use rangeland health monitoring, drought indicators, and grazing pressure data to guide rotational grazing, reseeding, resting regimes, and rehabilitation of degraded lands. ○ Integrate water-point management and pasture user group (PUG) governance strengthening as enabling measures.	

Analyze components of Forecast-based Financing (FbF)	FBF Advisories	Stakeholders
	• **Strengthen climate-resilient planning for vulnerable sectors** ○ Integrate IBF/FBF into sector plans (livestock, agriculture, water, health, transport, energy) through risk-informed standards, contingency planning, and service continuity protocols. ○ Establish sector-specific triggers and early recovery packages based on exposure and vulnerability. • **Support NAP and NDC localization** ○ Map IBF/FBF interventions to National Adaptation Plan (NAP) priorities and Nationally Determined Contribution (NDC) targets, translating national goals into soum/aimag-level actions and measurable indicators. • **Promote nature-based solutions (NbS) for climate resilience** ○ Scale NbS such as rangeland restoration, watershed protection, riparian buffers, erosion control, and climate-resilient shelterbelts. ○ Embed NbS actions into FbF-funded rehabilitation packages where they provide both risk reduction and livelihood co-benefits.	

7.2 IBF & FBF for tools for supporting National and Local Government risk-informed Development planning (aimag, soum, bag)

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
Ministry of Food, Agriculture, and Light Industry (MoFALI)	Agriculture	•Sustainable crop Production	• E-platform[4], • Statistical data on crop type	• Operational Impact forecasts for the crop type, time-series advisory on impact level, weather information services for loss and damage (L & D) of yields based on impending hazards of short-term impact forecast, Decadal - (two weeks) medium-range impact forecast and long-term outlook/IBF (monthly, seasonal etc.) • IBF for the high-value elements	IBF advisory, early action plan, early warning early action for information the financial planning and resource mobilization for preparedness and adaptation capacity of the of crops against impeding hazards being forecasted.
MoFALI	Agriculture	•Agriculture Irrigation Infrastructure development (agriculture and livestock)	• E-platform, • Statistical data • Administration of Land Affairs, Geodesy and Cartography (ALAGAC) geospatial land use coverage file /database on the waterbody, river, wetland irrigation deep tube well	Prepare operational forecast for the crop agriculture and livestock husbandry with advisory and warning for water resources required.	Prepare FBF advisory/contingency etc., based on the impact forecasts/triggers, the threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc. for strengthening preparedness for the impending hazards events.
MoFALI	Livestock	•Implement programs such as “State Policy towards Herders”, “Mongolian Herder” and “Increase Livestock”.	• E-platform, • Statistical data • Livestock Department Database[5] (Livestock, population, grazing areas • Livestock management and registration system[6] [7] • Herd database[8]	Prepare short-term operational forecast/ Impact forecast for the crop agriculture and livestock husbandry with advisory and warning , alerting for the elements of livestock sector/husbandry. 1) IBF operational forecast on Extreme Cold temperature, cold rain, snowstorm, high density snow, convective thunderstorm,/heavy rainfall/floods/water	Prepare FBF advisory/contingency etc., based on the impact forecasts/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc. for strengthening preparedness for

[4] https://e-mongolia.mn/home
[5] https://mn-prism-mng.web.app
[6] https://nlis-2.mofa.gov.mn/login
[7] https://livestock.mofa.gov.mn/login
[8] https://herd.mofa.gov.mn/login

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
			• Database[9] on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of household with few livestock) • Livestock breeding database [10] • Rangeland /biomass health monitor	logging, dust/haze storm for the livestock 2) Operational forecast for the rapidly developing weather conditions (cold front, convective thunderstorm, damaging winds, dust storm etc. for the livestock . 3) Good weather advisory for the livestock and sector 4) Special weather watch/advisory/warning 5) Multi-hazard early warning	the impending hazards events.
MoFALI	Livestock	• Reduce pasture deterioration and desertification through creation of the legal environment for pasture usage, protection and improvement.	• Database[11] on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of household with few livestock) • Rangeland health monitoring database • Biomass /vegetations index analytical GIS map and database of Agrometeorology	• Advisory/watch /warning on deviation of Pasture Vegetation, NDVI, Drought news (VHI) , Snow cover %, 10 days minimum temp, temp 10days average, precipitating in more than 10 days (mm) • Agrometeorology division and remote sensing research division (IRIMHE) having GIS analytics risk low resolution risk analysis. • Dzud risk map /monthly GIS maps / briefing • Monthly weather outlook, • 5days forecast(IBF)	Prepare FBF advisory/contingency etc., based on the impact forecasts/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc. for strengthening preparedness for the impending hazards events.

[9] http://fodder.mofa.gov.mn
[10] https://muz.gov.mn
[11] http://fodder.mofa.gov.mn

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
MoFALI	Livestock	• Sustainable livestock management(product value chain development, incentives, market access,	• Livestock management and registration system[12] [13] • Herd database[14] • Database[15] on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of household with few livestock) • Livestock breeding database [16] Rangeland /biomass health monitor	• IBF on extreme weather events • Operational forecasts for the livestock husbandry value chain	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Livestock	• Protect livestock from natural and climatic risks, ensure preparedness, create fodder reserves in soums, and establish a fodder storage network for herders.	• Database[17] on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of household with few livestock) • Livestock breeding database [18] Rangeland /biomass health monitor	• IBF/advisories/ anticipatory action planning on extreme weather events • Operational forecasts for the livestock husbandry value chain	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.

[12] https://nlis-2.mofa.gov.mn/login
[13] https://livestock.mofa.gov.mn/login
[14] https://herd.mofa.gov.mn/login
[15] http://fodder.mofa.gov.mn
[16] https://muz.gov.mn
[17] http://fodder.mofa.gov.mn
[18] https://muz.gov.mn

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
MoFALI	Livestock/Crop-Agriculture	• Food Production (Value chain development of livestock and agriculture outputs)	• Local government MIS on public utilities, Market place, enterprise, • E-platform, • Statistical data on Agricultural outputs • Livestock Department Database[19] (Livestock, population, grazing areas • Livestock management and registration system[20] [21]	• Operational forecasts, IBF advisory / watch / waring of the hazardous weather events over the forage crop cultivation , high growth grass cultivation (Napier), pasture status, carrying capacity, degradation etc.,	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Agriculture	• Small holder entrepreneurship development • SME for improving agricultural output value chain	• Credit facility , • invectives, and • market accessibility	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the crop-agricultural value chain	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Agriculture	• Green development programme /projects for low emission	• MET database on environmental management[22] • Land cover map • Land use map/database (ALAGAC)		
MoFALI	Livestock/ Agriculture	Development of sustainable crop production, enhance the sector productivity and competitiveness by increasing export and processing capacity, crop rotation and fodder production	• Land use map/database (ALAGAC) • Land cover map	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the crop-agricultural cycle	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Livestock/ Agriculture	Irrigation Infrastructure development (construction of wells, increase, protect, rehabilitate, and sustain	• Land use map/database (ALAGAC) • Water resource	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the livestock husbandry	FBF planning based on IBF-/triggers, threshold of impacts,

[19] https://mn-prism-mng.web.app ,
[20] https://nlis-2.mofa.gov.mn/login
[21] https://livestock.mofa.gov.mn/login
[22] https://eic.mn

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
		pastures, improve livestock quality and productivity, protect livestock gene pool, introduce biotechnological breakthroughs, promote intensive livestock sector and implement "Mongolian Livestock -II" program	database of Hydrological research division		anticipatory L & D , early action plan, early warning - early action etc.
MoFALI		breeding of endangered species of animals and plants and create their reserves for use		Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the livestock husbabdry	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Livestock/ Agriculture	Combat dust storms and desertification	Haze /Dust forecast by IRIMHE	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the livestock husbandry	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MoFALI	Livestock/ Agriculture	Climate-resilient livestock herding management and products value chain development	• E-platform, • Statistical data • Livestock Department Database (Livestock, population, grazing areas • Livestock management and registration system • Herd database • Database on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the livestock husbandry	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
			household with few livestock) • Livestock breeding database [23] Rangeland /biomass health monitor		
MoFALI	Livestock/ Agriculture	Small-scale herder resource management	• Statistical data • Livestock Department Database[24] (Livestock, population, grazing areas • Livestock management and registration system[25] [26] • Herd database[27] • Database[28] on hay stock, Grass stock, Feed stock, cash savings, Price of Grass, Poverty coverage areas (province) , no of people with disabilities, no of single-parent elderly households(province), No of household with few livestock) • Livestock breeding database [29] • Rangeland /biomass health monitor	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the livestock husbandry	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
Ministry of Environment, Tourism and Green Development (MET)	Water sector development	Construct new and renovate existing irrigation systems based upon hydro survey and research and promote the introduction of advanced irrigation techniques and	• Land use map/database (ALAGAC) • Water resource database of Hydrological	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Water sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan,

[23] https://muz.gov.mn
[24] https://mn-prism-mng.web.app
[25] https://nlis-2.mofa.gov.mn/login
[26] https://livestock.mofa.gov.mn/login
[27] https://herd.mofa.gov.mn/login
[28] http://fodder.mofa.gov.mn
[29] https://muz.gov.mn

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
		technologies and increase annually the size of irrigated land.	research division		early warning - early action etc.
MET	Water sector development	Integrated management of water resources	• Land use map/database (ALAGAC) • Water resource database of Hydrological research division	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Water sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MET	Water sector development	Rainwater harvesting and water retention for agriculture and livestock	Baseline climatic rainfall max/min data and impact map	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Water sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MET	Water sector development	Assessment of risk and vulnerable induced by the changing climate and extreme weather impacts on waterbody	Develop an integrated National Geo-database, introduce e-system and provide responsive public services.	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Water sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MET	Soil	National action Plan to Combat Desertification	Climate change and extreme weather impacts on water resources	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Soil sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MET	Soil	Reduce soil pollution in ger districts and tourism regions through implementation of "Eco Toilet" program	•WASH structures geolocation and database	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the WASH sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
MET	Environment	•Improve eco- tourism	•MET database on environmental management •Land cover map	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the WASH sector development	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D ,

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
			• Land use map/database (ALAGAC)		early action plan, early warning - early action etc.
MET	Green development	• Environmental protection and tourism development • Green development policy, planning, green economy • Eco-tourism development.	• MET database on environmental management[30] • Land cover map • Land use map/database (ALAGAC)	Operational forecasts, IBF advisory / watch / waring of the hazardous weather over the Environmental protection and tourism development	
MET		Tapping environmentally friendly Renewable resources potentials	• MET database on environmental management[31] • Land cover map • Land use map/database (ALAGAC) • Natural resources database (water, biomass, hydro resource potentials for micro hydro po generation • Baseline climatic mean on maximum wind speed regime for wind po generation, water pumping windmill • Baseline climatic mean on maximum sunshine days, solar irradiance data for harnessing solar energy (PV, thermal) • Solar PV based surface water irrigation for agriculture, livestock and	Operational forecasts, IBF advisory / watch / waring of tappable renewable resources	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.

[30] https://eic.mn
[31] https://eic.mn

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
			drinking water supply.		
Agency for Land administration, Management, Geodesy and Cartography	Urban Land Use and Spatial Planning	• Improve the legal environment for land management and urban development and classify city Rankings • Sustainable Urban development Management • Urban land use management • Improving urban utility services (water supply, sewage network	•Land use map/database (ALAGAC)	Operational forecasts, IBF advisory / watch / waring for the Urban Land Use and Spatial Planning	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
Agency for Land administration, Management, Geodesy and Cartography	Sustainable urban development	Urban Flood Management (flood ditches, storm water and groundwater drainage systems in stages)	•Land use map/database (ALAGAC) •Aimage wise urban planning map •Hydrological database •NEMA flood risk database •NAMEM hydrological forecasts	Operational forecasts, IBF advisory / watch / waring for the convective weather condition, thunderstorm, heavy rainfall, lightning, flash flood, river floods , water logging etc	FBF planning based on IBF-/triggers, threshold of impacts, anticipatory L & D , early action plan, early warning - early action etc.
Local Government	Regional, Local and Rural Development Planning[32]	• **Implement a nationwide decentralization policy:** Operationalize and enforce a national decentralization framework that strengthens sub-national governance, clarifies mandates, and improves local-level planning, budgeting, and service delivery. • **Update the regional development concept to support green growth and integration:** Revise the regional development concept to establish a foundation for green production and economic transformation promoting diversification, specialization, and		IBF advisory / watch / waring Climate outlook for the sector	FBF strategy for the sector Proposed climate services for planning and budget allocation.

[32] Approval of the Action Plan of the Government of Mongolia for 2020-2024. https://cabinet.gov.mn/wp-content/uploads/2020-2024_-ActionPlan_GOM_Eng_Edited_OE-2.pdf

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
		complementary regional value chains while advancing participation in regional economic integration. •			
Local Government	Aimag Government functions	• Medium-term development guidelines and planning: Prepare and implement the aimag's main medium-term development guidelines, policies, and planning frameworks, including prioritization of sector programmes and investment pipelines. • • General Local Development Fund (formula-based): Manage the General Local Development Fund allocated through a formula-based mechanism, including planning, budgeting, distribution, utilization, reporting, and oversight in line with approved procedures and accountability requirements.		IBF advisory / watch / waring Climate outlook for the sector	FBF strategy for the sector Proposed climate services for planning and budget allocation.
Local Government	Aimag Government functions	• **Aimag property and budget administration:** Authority over the use, possession, disposal, and oversight of aimag property, as well as comprehensive management of the		IBF advisory / watch / waring Climate outlook for the sector	FBF strategy for the sector Proposed climate services for planning and budget allocation.

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
		aimag budget, including planning, execution, reporting, and oversight. • **Local development fund and other funds management:** Responsibility for planning and allocating the aimag local development fund, and for establishing, spending, reporting on, and overseeing other dedicated funds. • **Food, agriculture, and production programme oversight:** Planning and management of aimag food, agriculture, and production programmes, including supervision and oversight of implementation. • **SME development fund management:** Administration and oversight of the aimag small and medium enterprise development fund, including governance of allocations and performance monitoring. • **Tourism policy and management:** Development, coordination, and oversight of aimag tourism policy and associated management functions. • **Hazardous and industrial waste management:** Regulation, planning, and oversight of hazardous and industrial waste management systems and services. • **Utility services planning and oversight:** Planning, operation, and oversight of utility service networks and related infrastructure, including electricity and heat distribution systems,			

Sector Ministry	Sector / Sub-Sector	Activities/Projects/ schemes being planned for the current fiscal year	Governments (national & local governments) are maintaining Databases/Repositories to support the planning process.	IBF tools for risk-informed sectoral planning	Forecast-based financing (FBF) tools
		freshwater supply, sewage and drainage systems, flood-control dams, canals, and associated facilitie			

Conclusion

An integrated Impact-Based Forecasting (IBF) and Forecast-based Financing (FbF) system provides Mongolia with a practical, end-to-end mechanism to shift from "predicting the weather" to "predicting impacts and acting early." By combining high-resolution forecasts with baseline risk and vulnerability data, the system enables threshold-based, color-coded warnings that translate hazards into expected consequences for people, livestock, infrastructure, and livelihoods.

FbF operationalizes this intelligence by linking agreed triggers to pre-defined Early Action Protocols (EAPs), clear stakeholder roles, and rapid financing modalities (ex-ante for preparedness and resilience; ex-post for imminent and ongoing emergencies). With strong governance, standardized SOPs, interoperable data platforms (e.g., GeoNode/GeoServer), and last-mile risk communication (CAP and community feedback channels), Mongolia can reduce decision latency, strengthen coordination, and measurably lower loss and damage from Dzud and other multi-hazard climate extremes.

Recommendations

1) Institutional governance and mandates

- Establish a national FbF governance structure led by the SEC with NAMEM/NEMA co-lead roles, and formalize partner participation through Standing Orders on Disasters (SoD) and SOPs based on the 5W framework.
- Define approval authority and fast-track decision rules for EAP activation at national and aimag levels, including delegated thresholds for rapid-onset emergencies.

2) Standardize triggers and thresholds (impact-based)

- Adopt harmonized, hazard-specific trigger matrices using IBF color-coded thresholds (e.g., magenta/red/orange/yellow) tied to *impact likelihood and severity*, not only meteorological values.
- Develop season-specific Dzud severity indices (winter/spring/autumn/summer) and a combined Dzud risk index using GIS-based MCDA to support consistent national and local triggering.

3) Build a national EAP library and action menus

- Develop a modular EAP library for:
    - rapid onset hazards (minutes-hours),
    - medium onset hazards (days-weeks), and
    - slow onset hazards (monthly-seasonal).
- For each EAP, pre-define: early actions, targeting logic, delivery channels, unit costs, procurement pathways, and minimum operational readiness requirements.

4) Pre-arrange financing windows and disbursement pathways

- Create a blended financing architecture with clear rules for:
    - **Ex-ante** financing (preparedness/resilience investments), and

    - **Ex-post** financing (imminent/ongoing emergency activation for life-saving response and early rehabilitation).
- Pre-authorize disbursement mechanisms (government funds, DREF/CERF pathways, donor contingency windows, insurance/social protection linkages) to avoid delays once triggers are met.

5) Strengthen baseline risk/vulnerability and exposure data systems

- Require sector agencies and partners to maintain updated CRVA repositories and geospatial risk atlases (bag/soum/aimag) that can be operationally used for impact estimation.
- Implement minimum data standards (formats, metadata, geocoding) and routine update cycles; prioritize herder-level vulnerability, livestock assets, pasture/biomass, water access, and infrastructure layers.

6) Operationalize the IBF-FbF dashboard as a decision engine

- Deploy an integrated dashboard that consolidates: forecasts, indices, thresholds, exposure/vulnerability layers, anticipatory L&D scenarios, EAP status, 5W plans, and financing readiness.
- Enable role-based access and audit trails for accountability, including tracking of allocations, actions implemented, and beneficiary coverage.

7) Improve last-mile risk communication and feedback

- Institutionalize CAP-based common alerting integrated with national TV/radio and community channels (WhatsApp/Telegram/Facebook groups, IVR/SMS/cell broadcast).
- Establish two-way reporting protocols (crowdsourcing and field teams) so situation updates and impact evidence continuously refine decisions and targeting.

8) Enhance observation and nowcasting for rapid-onset hazards

- Expand high-density AWS coverage in hotspot areas and integrate crowdsourced observations to support nowcasting and short-fuse warnings (storms, blizzards, flash floods).
- Automate data ingestion, QC, and forecasting workflows (scripts/cron jobs) to ensure 24/7 operational capability.

9) Implement monitoring, evaluation, and learning (MEL)

- Define performance indicators for: trigger accuracy, timeliness, action coverage, cost-efficiency, outcome impacts (reduced mortality/L&D), and partner compliance.
- Conduct after-action reviews after major events and update triggers, action menus, cost assumptions, and SOP workflows accordingly.

10) Align FbF with national planning and long-term resilience

- Integrate FbF evidence and risk data into local development planning, contingency budgeting, and climate fiscal frameworks.
- Link FbF to NAP/NDC localization by using risk-informed tools to prioritize low-regret measures, climate-proofing, nature-based solutions, and resilient livelihood investments.

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