SOUTH ASIA HYDROMET FORUM

CLIMATE SERVICES WORKSHOP

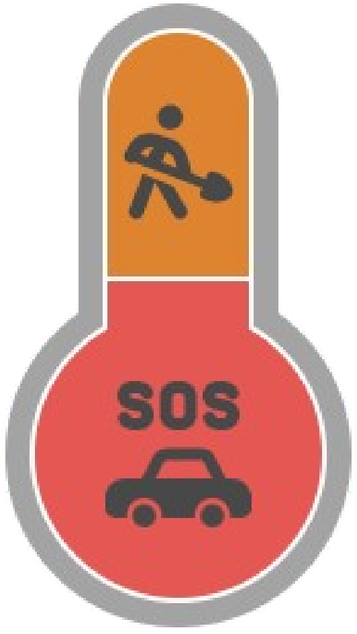
Application of S2S for Climate Services: Points to Ponder and Practical Examples

Raihanul Haque Khan
RIMES

Outline

- Reimagining the scope of Climate Information Services considering Sub-seasonal to Seasonal (S2S) Forecasts
- Examples Seasonal and Sub-seasonal Forecast application in Climate Services
- Points to Ponder for Application of S2S in Operational Climate Services.

Proactive



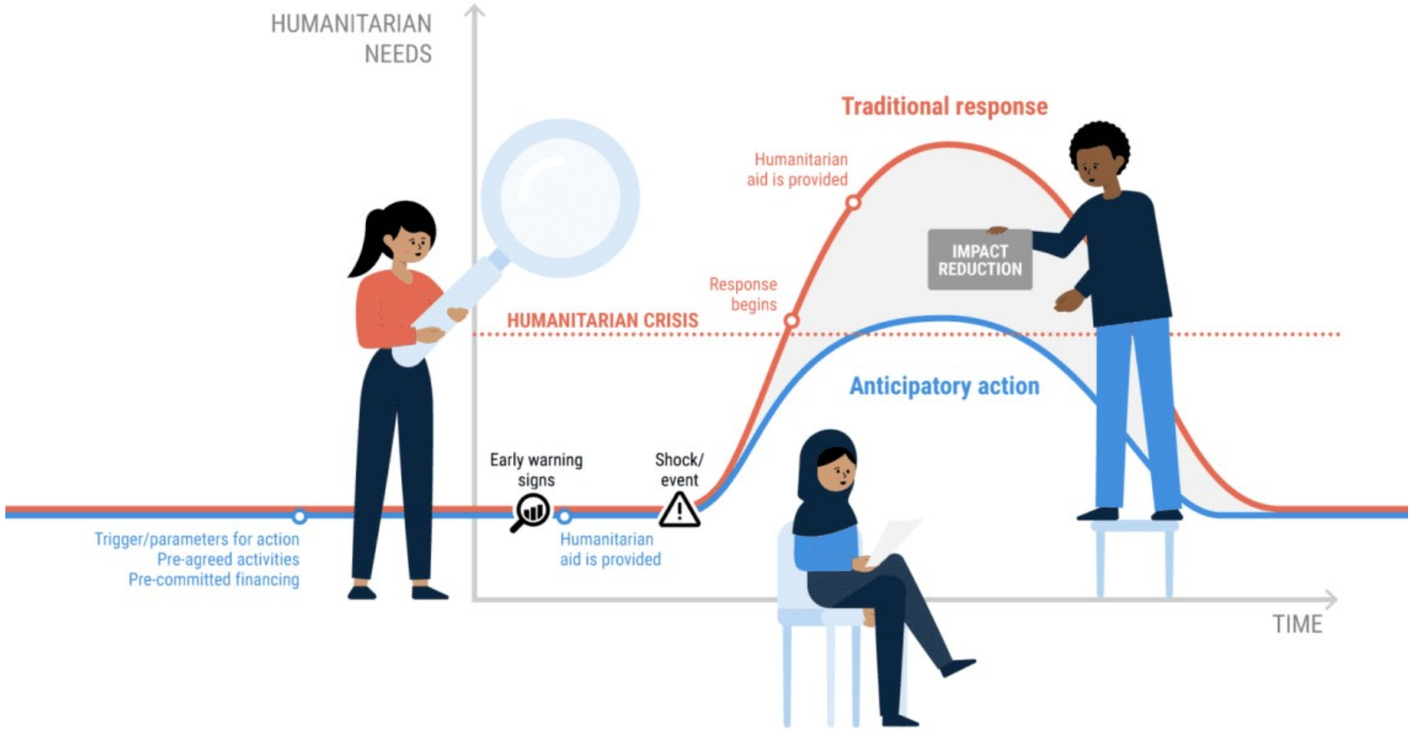
Reactive

Forecast-based action

Prepares before disaster strikes

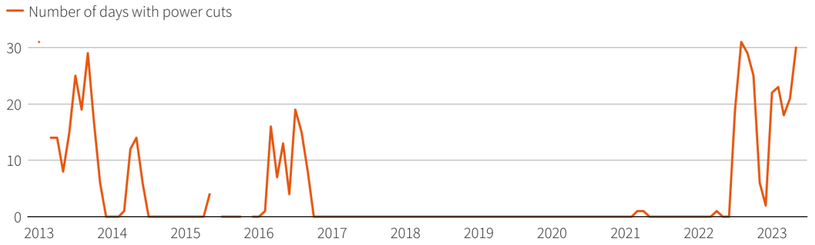
Post-event response

Reacts after disaster occurs

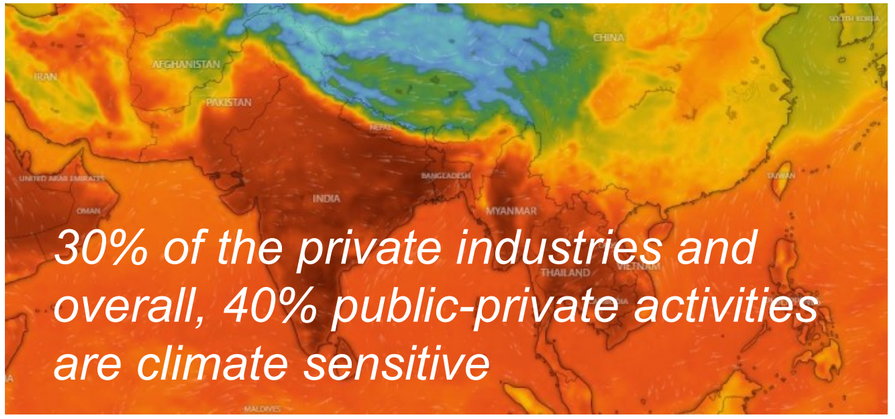


Bangladesh's worst electricity squeeze in a decade

In the twelve months ended December 2022, Bangladesh had enforced power cuts on 113 days. Five months into 2023, the country has already faced shortages on 114 days . With temperatures rising and peak demand season to come, officials say outages could continue



Note: All figures in number of days; Data for Feb 2013, July and December 2015 unavailable



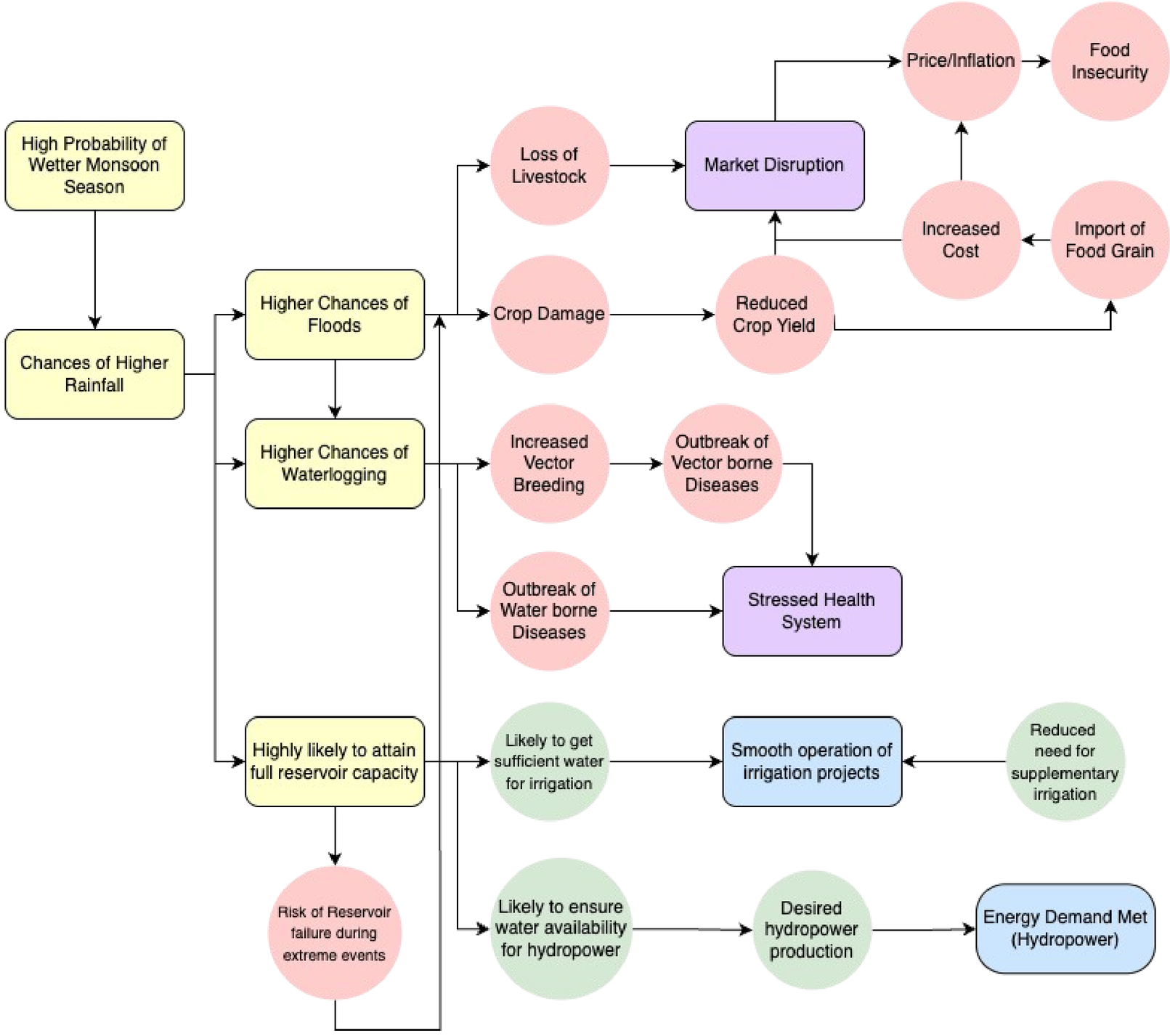
30% of the private industries and overall, 40% public-private activities are climate sensitive

Average Annual Loss from disasters: 1.5% - 7% of GDP in the AP region

Greater need for Climate Information Services (CIS)

Heatwaves & Aviation ?

The Causal Loop



Climate Service in the Transport Sector

Climatic events		Impact on Transport Sector
❑ **Heatwaves**		❑ road surfaces cracking, rutting or melting; ❑ rails buckling; and ❑ higher speeds required for aircraft to take off.
❑ **More frequent Cyclones or Storms** *(Can be associated with floods, and/or high winds.)*		❑ impassable roads and tracks; ❑ damage to roadside and lineside assets; ❑ cancellation and disruption of shipping and flights; and ❑ vehicles overturning on exposed roads and bridges.
❑ **Seal level rise/Surface water flood**		❑ impassable roads and tracks; and ❑ damage to roadside and lineside assets.
❑ **Increase in intense precipitation events**		❑ May impair air travel (e.g. turbulence), road circulation (hazardous driving conditions), and damage transport infrastructure through flooding. Further, events such as thunderstorms can temporarily shut down airport operations, creating system-wide disruptions.
❑ **Low temperatures and snow**		❑ hazardous driving conditions; ❑ disruption of access to ports; and ❑ icing of aircraft and railway overhead line equipment.

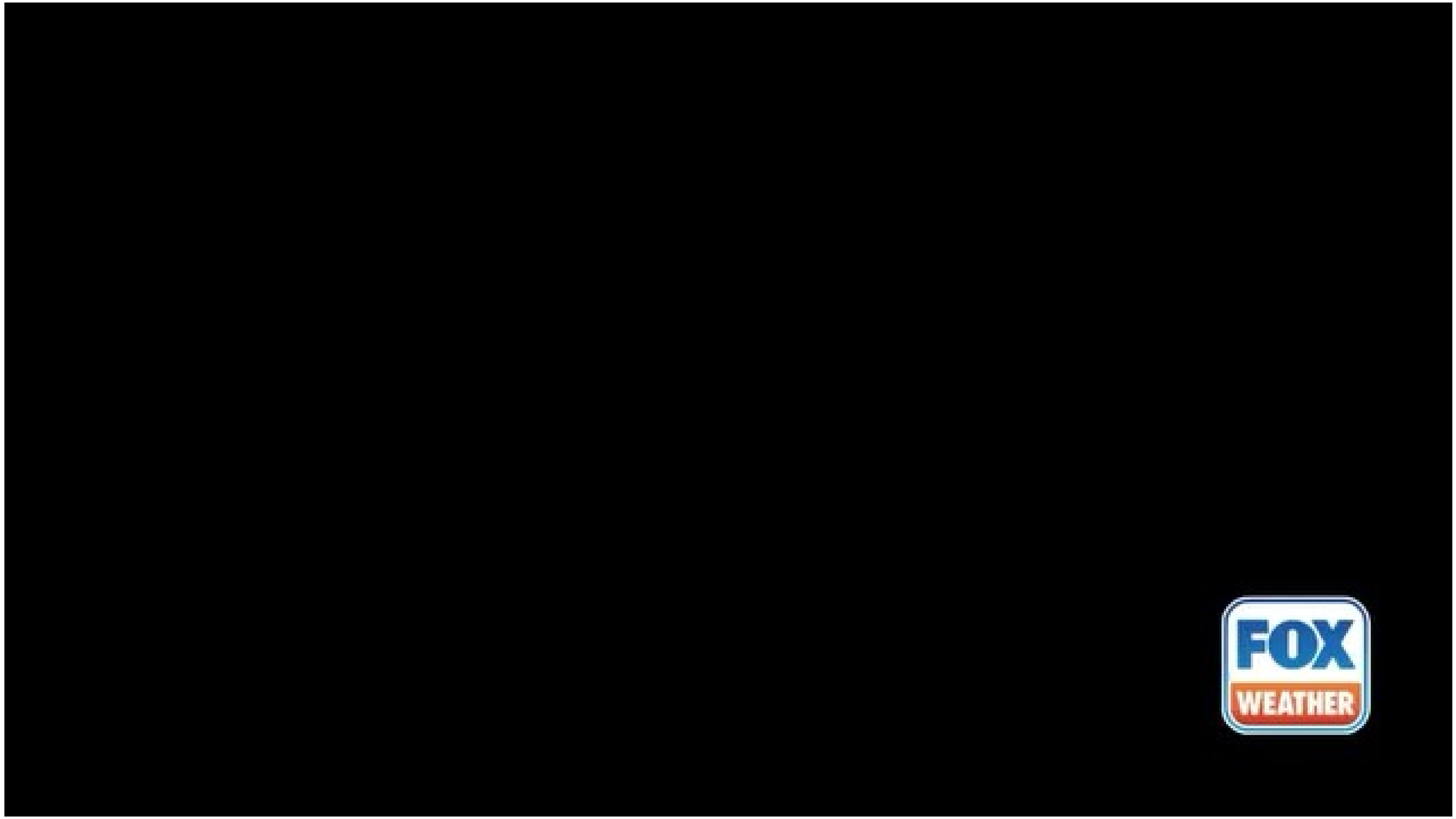
Case Study:
Tomorrow.io

How weather and climate security platforms empower Transport Logistics Provider to optimize their logistics

25%
Fewer
Shipping delays caused by weather

35%
Reduction
In wasted miles for more efficient operations

10%
In NPS
For better customer experiences


FOX
WEATHER


S2S
Not a Standalone Solution!

A Multi-hazard Multi-timescale Approach

Protective measures, Anticipatory Actions

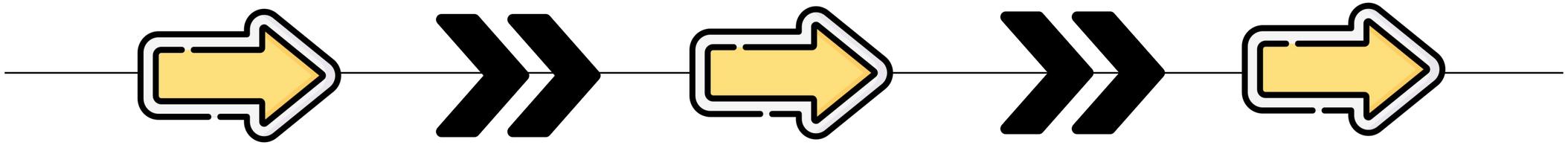
Safeguarding Livestock, harvesting, seeding, watering, insurance, health

Operational planning of water/electricity demand/supply

Seasonal Management and tactical Maintenance

Determining Energy potential

Sustainable Climate-proofing of infrastructure, IWRM, DRM



Short-term Forecasts

Sub-seasonal to Seasonal Outlooks

Long-term Projection

Application of Multi-timescale Climate Information for Agriculture

Weather forecasts 0-10 days

- Issue early warnings to farmers
- Evacuate livestock
- Protect grains and seeds and equipment
- Harvest crops earlier
- Issue index-based insurance payouts to farmers

Subseasonal-to-seasonal predictions - 2 weeks to 2 months

- Monitor agricultural output
- Adjust planting, irrigation, pesticide, fertilizer and harvesting schedules
- Support pastoralists - commercial destocking, vaccination, diagnosis and treatment of diseases, provide nutrition for core breeding animals
- Provide materials and support for protection of livelihoods assets (e.g. through elevated platforms/safe spaces to keep food, livestock, seeds and tools)
- Activate market systems to prevent food insecurity (support traders, lift export bans, utilize strategic grain reserves, adjust commodity pricing and product marketing)
- Pre-position grain and seed protection bags
- Provide cash transfers for fishing communities to safely store their nets, farmers to store farming equipment or to support evacuation of livestock e.g. ahead of an impending cyclone

Seasonal predictions - over 3 months

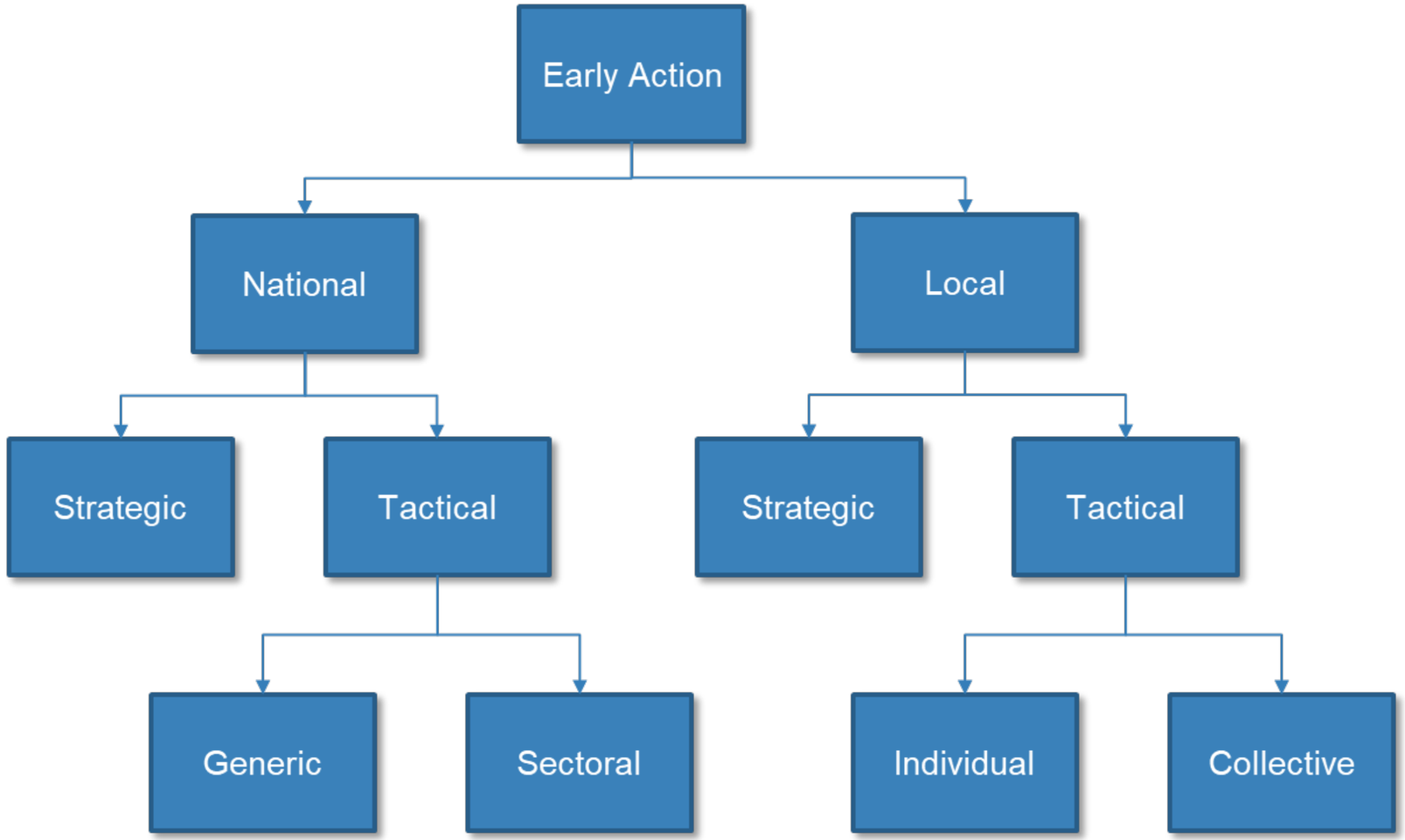
- Select flood/drought resistant crop varieties / crop diversification
- Plan use of pesticides and fertilizers, ploughing, tilling and irrigation scheduling to limit crop failure
- Ensure access to agricultural risk insurance
- Utilise nature-based solutions for protecting agricultural assets
- Develop contingency plans for crop failures

Potential S2S Forecast Application for Various Sectors

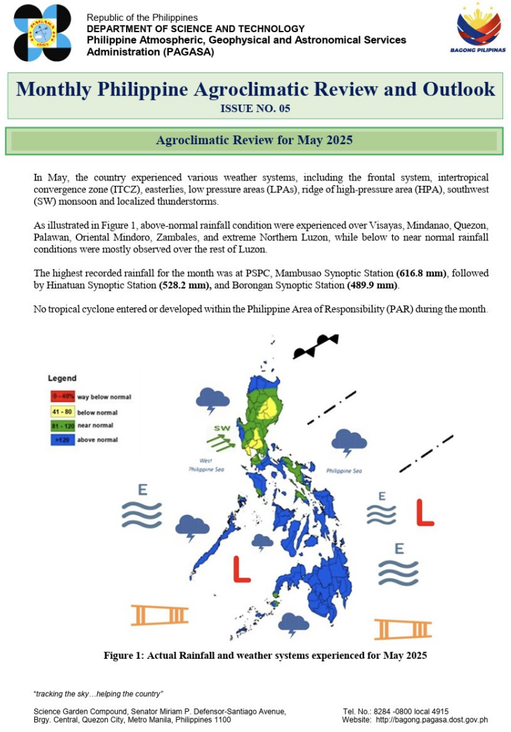
Health **(SDG 3)** 	• Activate heat health warning systems – including alerting decision makers and the general public to impending dangerous hot weather, advise individuals on how to avoid excessive heat exposure, spread awareness of symptoms of heat-related illnesses • Preposition medical supplies • Organize staffing of health centres • Prepare cooling centres
Water, Sanitation and Hygiene (WASH) **(SDG 6)** 	• Stock materials such as pesticides for mosquito fumigation, chlorine tablets for water purification • Provide or activate market access to non-food items such as soap, jerry cans, etc., to improve hygiene and water storage • Public information campaigns and community mobilization to minimize risk of disease outbreaks • Train community volunteers and hygiene motivators • Provide safe water and sanitation to shelters • Provide raised latrines and drainage in flood-prone areas • Revise water allocations and activate water conservation practices
Energy **(SDG 7)** 	• Prepare for increased utility demand using updated demand scenarios • Manage distribution, transmission and maintenance scheduling to minimize disruption to power availability • Adjust energy pricing and production to ensure power remains affordable

Sources: Adapted from: Brunet, G., and others (2010); FAO (2019); Oxfam (2016); Vitart, F., and Robertson, A. (2014); Weingärtner, L., and others (2019) and White, Christopher, J., and others (2017).

Forecast based Actions



Application of S2S for Agriculture in Philippines



Republic of the Philippines
DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

BAGONG PILIPINAS

Monthly Philippine Agroclimatic Review and Outlook

ISSUE NO. 05

Agroclimatic Review for May 2025

In May, the country experienced various weather systems, including the frontal system, intertropical convergence zone (ITCZ), easterlies, low pressure areas (LPAs), ridge of high-pressure area (HPA), southwest (SW) monsoon and localized thunderstorms.

As illustrated in Figure 1, above-normal rainfall condition were experienced over Visayas, Mindanao, Quezon, Palawan, Oriental Mindoro, Zambales, and extreme Northern Luzon, while below to near normal rainfall conditions were mostly observed over the rest of Luzon.

The highest recorded rainfall for the month was at PSPC, Mambusao Synoptic Station **(616.8 mm)**, followed by Hinatuan Synoptic Station **(528.2 mm),** and Borongan Synoptic Station **(489.9 mm)**.

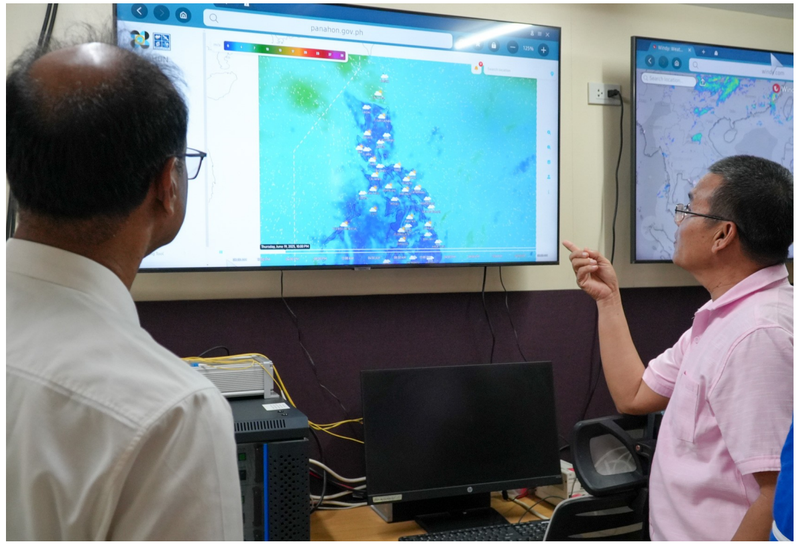
No tropical cyclone entered or developed within the Philippine Area of Responsibility (PAR) during the month.

Figure 1: Actual Rainfall and weather systems experienced for May 2025

"tracking the sky...helping the country"

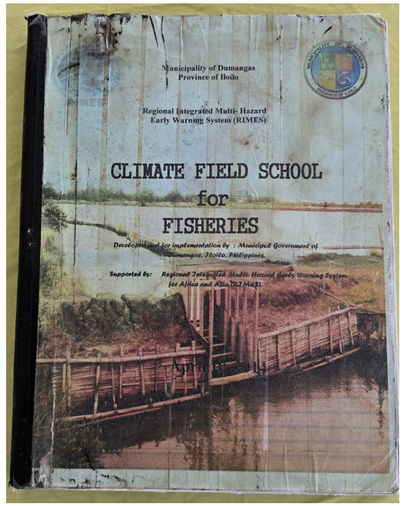
Science Garden Compound, Senator Miriam P. Defensor-Santiago Avenue, Brgy. Central, Quezon City, Metro Manila, Philippines 1100

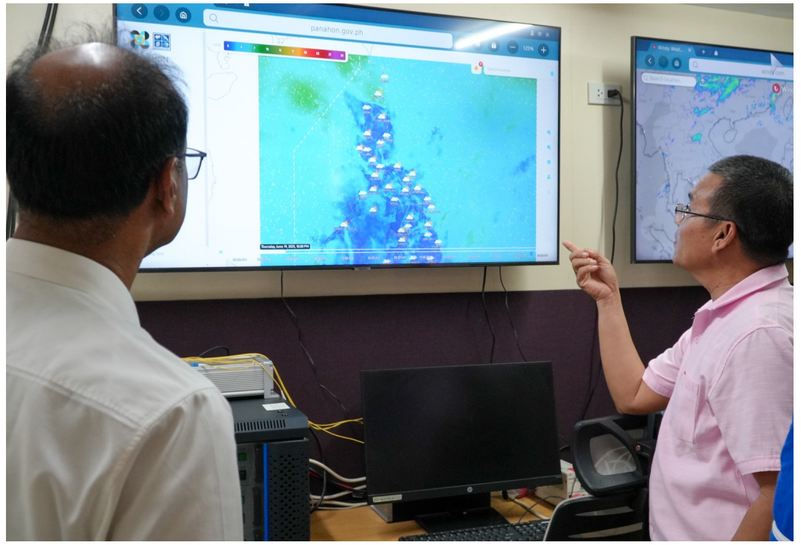
Tel. No.: 8284 -0800 local 4915
Website: http://bagong.pagasa.dost.gov.ph



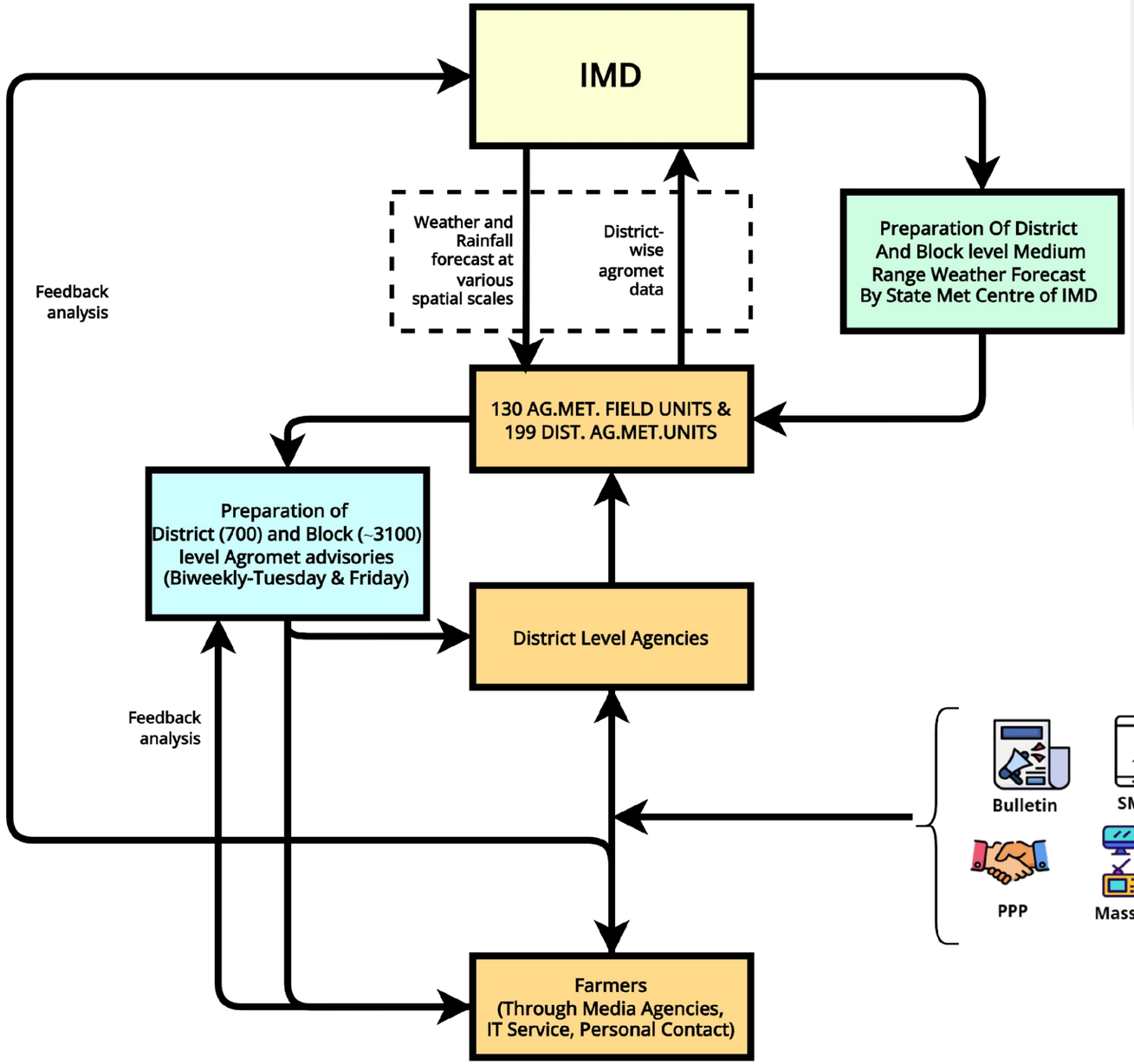
Application of S2S for Agriculture in Philippines

- Partnership between local municipalities and PAGASA for Climate Field School
- Agromet station is operated and maintained by Local government
- Sustained for more than 12 years and replicated in other provinces
- Reported 10 – 15% production increase





India: Agromet Advisory Service



98%

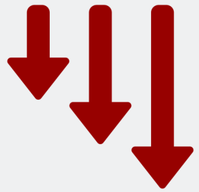
Farmers adopted at least 1 practice based on forecast and advisories

Additional $150 per household belonging to Below Poverty Line category in rain-fed areas

$1.6 Billion

Total income gain per annum in rain-fed districts.

Around 80% farmers reported reduced losses who received early warning



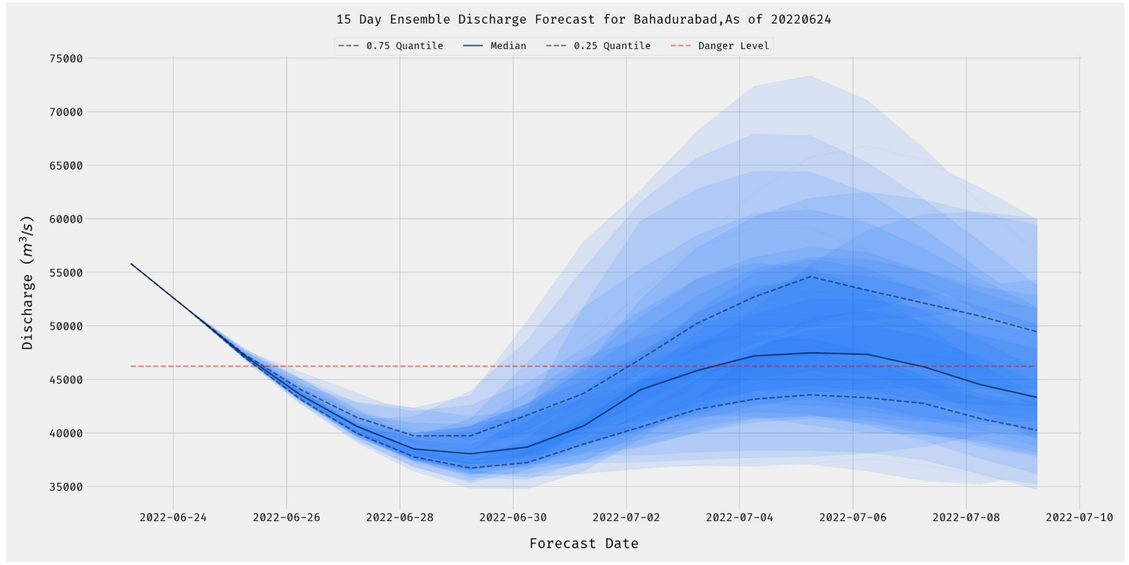
Economic Benefits

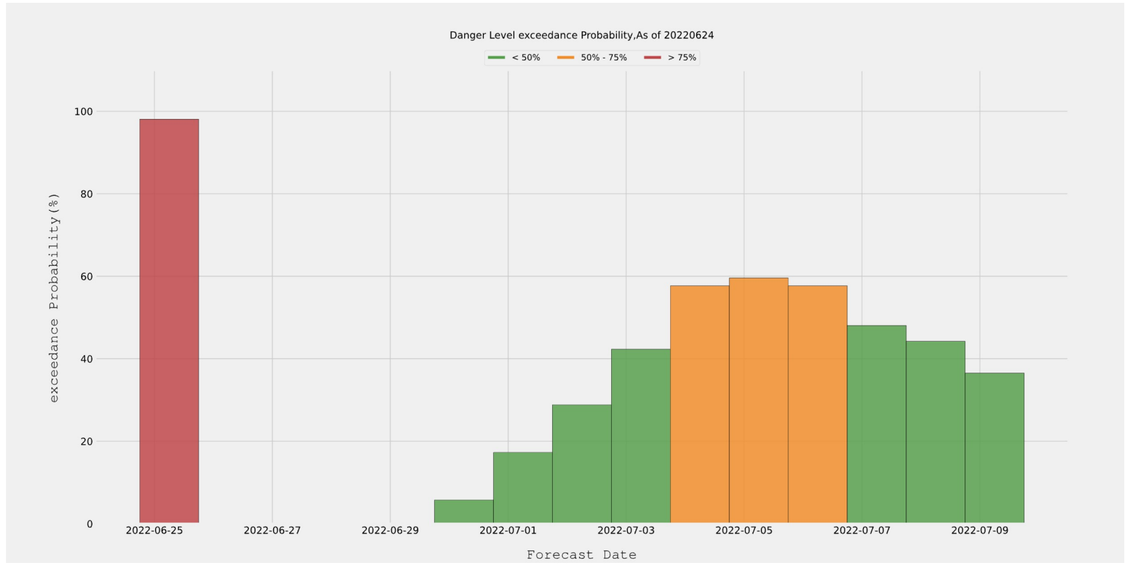
Study by National Centre for Applied Economic Research (NCAER), New Delhi conducted in year 2019 by. Salient findings- (interviewed 3,965 farmers across 121 districts of 11 states of India)

Application of Sub-Seasonal Flood Outlook in Bangladesh

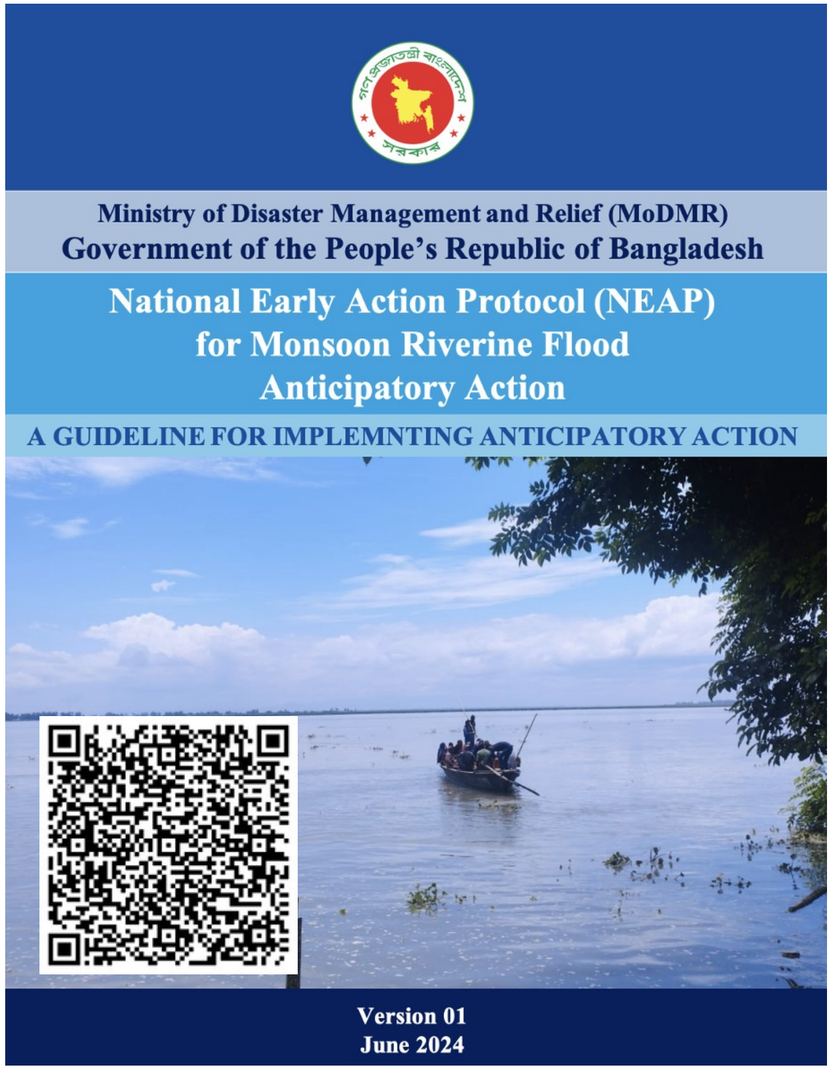
Mr. Mydul Islam, a resident of Notun Anantapur village of Hatia union, is the gauge reader of the newly installed gauge at Hatia under the SUFAL project. He generally tends to avoid engaging in any cultivation during the monsoon. Moreover, the loss and damage suffered during the 2020 monsoon flood generally drive him to avoid any sort of cultivation. During the monsoon of 2022, he was informed about the early flood through voice message from SUFAL project, and he followed the advisories as well. Later, he also found that there were very little to no chances of severe flooding for the remainder of monsoon in 2022. Having faith in the forecast, he initiated the cultivation of Aman on his 10 decimals of land and finally harvested the full crop at the end of the season. He mentioned that he couldn't harvest any crops during the monsoon for the last few years, but the availability of the forecast supported him in initiating cultivation. According to him, the information about the flood, whether it's coming or not, will greatly help the community by providing guidance on what to do.

Mr Mydul Islam
Hatia union,
Ulipur upazila,
Kurigram





Application of Sub-Seasonal Flood Outlook in Bangladesh

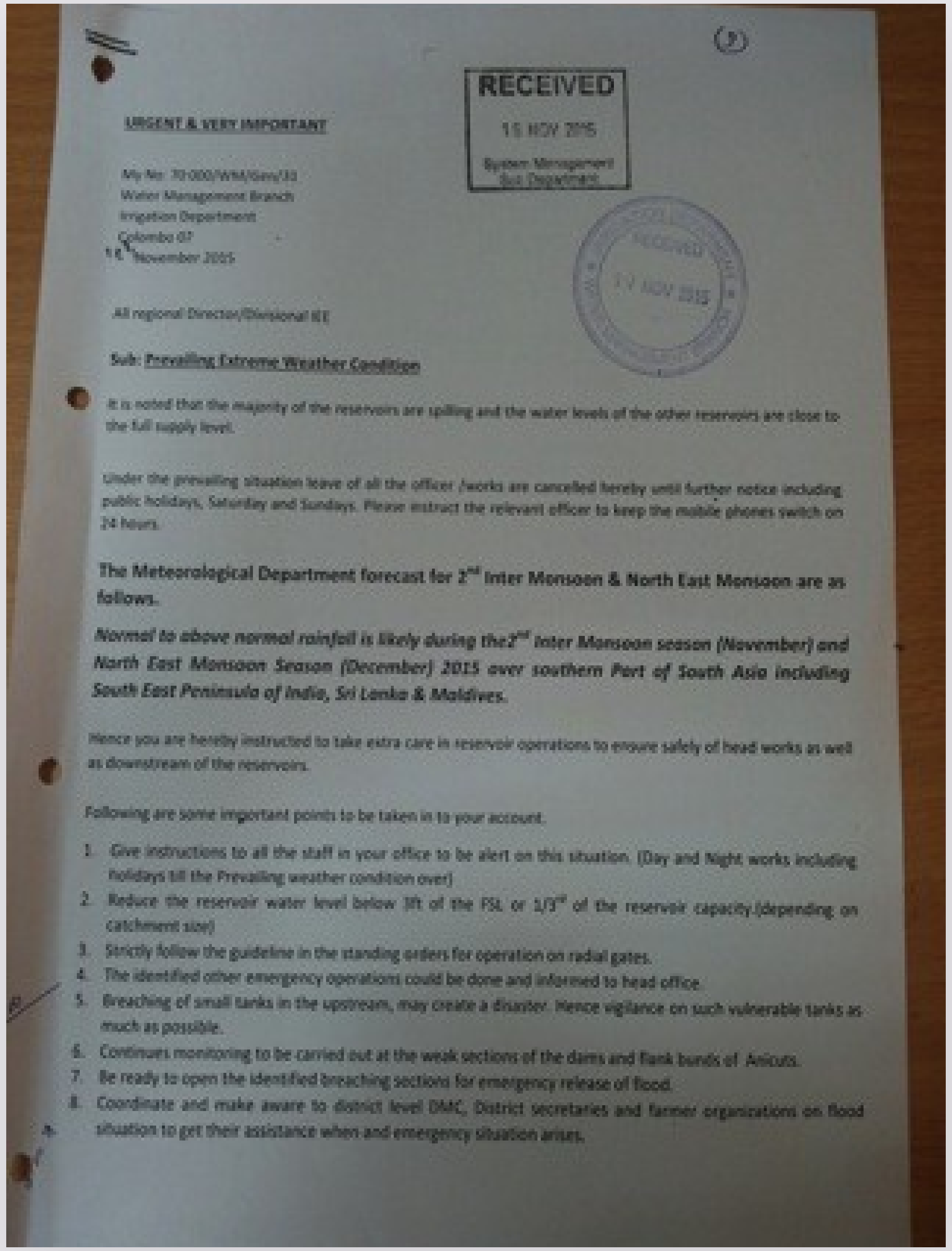


Scenario	Actions	Responsible Institutions
3. Current water level is within 1 m below DL. Forecast is indicating likely increase of water level and there is more than 75% probability of DL exceedance as per 10- and 15-days forecast.	Issue flood bulletin with scenario-based actions	FFWC, BWDB
	National FbF/A task force meeting; AA technical working group meeting, Inter-Ministerial Disaster Management Coordination Committee (IMDMCC) meeting	MoDMR, DDM
	MPCG will be disbursed if forecast for a location indicates high impact[3] for more than 3 days as per 5 days deterministic and or 10 days probabilistic water level forecast	MoDMR, DDM
	Early warning dissemination	DDM
	Disaster management committee meeting; Repairing evacuation routes; Shelter preparation/Preparation of evacuation points (repair rooms, WASH facilities, electric supply, with provisions for gender and special needs); Making arrangements for temporary shelter; Making a list of destitute and helpless families; Evacuate families at risk; Keep evacuation boats ready; Formation of volunteer teams, formation of women volunteer group; Distribution of temporary shelter kits for households evacuating from low-lying; Generator /solar power management; Arrange stock of dry food.	DMCs, LGED
	Installation/Repairing tube wells/latrines at shelters; Storage of emergency medicine supply; Formation of medical teams; Storage of water purification tablets.	UDMC, DPHE
	Issue special advisories including on crop harvesting, crop/ livestock/ fisheries management	DAE, DLS, DoF
	Arrange stock of livestock feed/fodder; Vaccination campaign for livestock	DLS, DMCs

Scenario	Actions	Responsible Institutions
4. Current water level is at or above DL but below DL+1m. Forecast is indicating that water level is likely to decrease during next few days as per 5,10 days forecast and may fall below DL	Follow flood forecasts to monitor development of a subsequent flood situation	All
	Provide instructions for repair of broken roads and embankments	UzDMC, BWDB
	Stockpiling of emergency medicine	DGHS, DPHE
	Provide special advisory for the farmers	DAE, DLS, DoF
5. Current water level is at or above DL but below DL+1m. Forecast is indicating that water level is likely to increase next few days during next as per 5,10 days forecast (*At this stage flood impact is likely to be severe)*	Disaster Management Committee meeting; Distribution of dry food and fodder; Make arrangement for hot meal distribution at the shelters; Rescue activities for people living in chars or low-lying areas; Distribution of dry food and fodder; Installation of temporary tube wells / latrines; Ensuring the safety of women and children in shelters; Installation of temporary mobile charging stations (solar); Dissemination of warning through loudspeakers, community radios etc.	DMCs
	Provision of emergency healthcare facilities at flood shelters and evacuation points	UDMC, DGHS
	Distribution of emergency medicine, dignity, and hygiene kits; Establishment of temporary health care center; Storage of disinfectants; Emergency medicine storage; Distribute water purification tablets; Provide special advisory from DPHE (use of purification tablets etc.)	DPHE, DGHS, UDMC
	Provide special advisory for the farmers	DAE, DLS, DoF
6. Current water level is more than 1m above DL. Forecast is indicating that water level is likely to decrease during next few days as per 5/10 days forecast, and water level may fall below DL during this period *(This scenario is likely after a flood peak)*	Follow flood forecasts to monitor development of a subsequent flood situation or possible worsening of flood situation	All
	Emergency medicine distribution; Water purification tablet distribution; Special advisory on health	DPHE
	Provide special advisory for the farmers	DAE, DLS, DoF

INSPIRE
UNITE
PROMOTE

Application of Seasonal Outlook in Sri Lanka



URGENT & VERY IMPORTANT

RECEIVED
15 NOV 2015
System Management Sub Department

My No: 70-000/WM/Gen/33
Water Management Branch
Irrigation Department
Colombo 07
14 November 2015

All regional Director/Divisional IEE

Sub: Prevailing Extreme Weather Condition

It is noted that the majority of the reservoirs are spilling and the water levels of the other reservoirs are close to the full supply level.

Under the prevailing situation leave of all the officer /works are cancelled hereby until further notice including public holidays, Saturday and Sundays. Please instruct the relevant officer to keep the mobile phones switch on 24 hours.

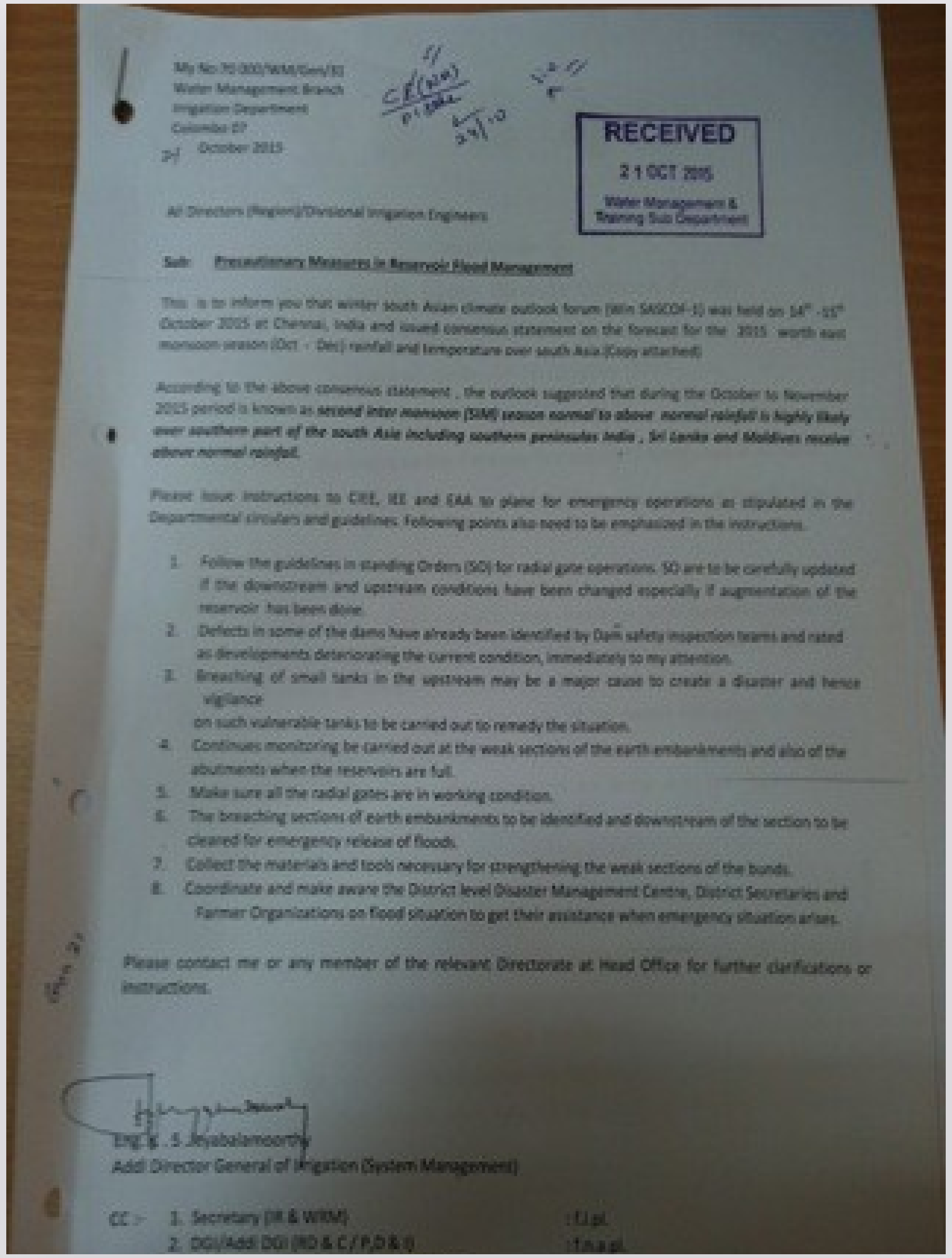
The Meteorological Department forecast for 2nd Inter Monsoon & North East Monsoon are as follows.

Normal to above normal rainfall is likely during the2nd Inter Monsoon season (November) and North East Monsoon Season (December) 2015 over southern Part of South Asia including South East Peninsula of India, Sri Lanka & Maldives.

Hence you are hereby instructed to take extra care in reservoir operations to ensure safely of head works as well as downstream of the reservoirs.

Following are some important points to be taken in to your account.

1. Give instructions to all the staff in your office to be alert on this situation. (Day and Night works including holidays till the Prevailing weather condition over)
2. Reduce the reservoir water level below 3ft of the FSL or 1/3rd of the reservoir capacity.(depending on catchment size)
3. Strictly follow the guideline in the standing orders for operation on radial gates.
4. The identified other emergency operations could be done and informed to head office.
5. Breaching of small tanks in the upstream, may create a disaster. Hence vigilance on such vulnerable tanks as much as possible.
6. Continues monitoring to be carried out at the weak sections of the dams and flank bunds of Anicuts.
7. Be ready to open the identified breaching sections for emergency release of flood.
8. Coordinate and make aware to district level DMC, District secretaries and farmer organizations on flood situation to get their assistance when and emergency situation arises.



My No:70-000/WM/Gen/33
Water Management Branch
Irrigation Department
Colombo 07
20 October 2015

RECEIVED
21 OCT 2015
Water Management & Training Sub Department

All Directors (Region)/Divisional Irrigation Engineers

Sub: Precautionary Measures in Reservoir Flood Management

This is to inform you that winter south Asian climate outlook forum (Win SASCOF-1) was held on 14th -15th October 2015 at Chennai, India and issued consensus statement on the forecast for the 2015 north east monsoon season (Oct - Dec) rainfall and temperature over south Asia (Copy attached)

According to the above consensus statement , the outlook suggested that during the October to November 2015 period is known as ***second inter monsoon (SIM) season normal to above normal rainfall is highly likely over southern part of the south Asia including southern peninsulas India , Sri Lanka and Maldives receive above normal rainfall.***

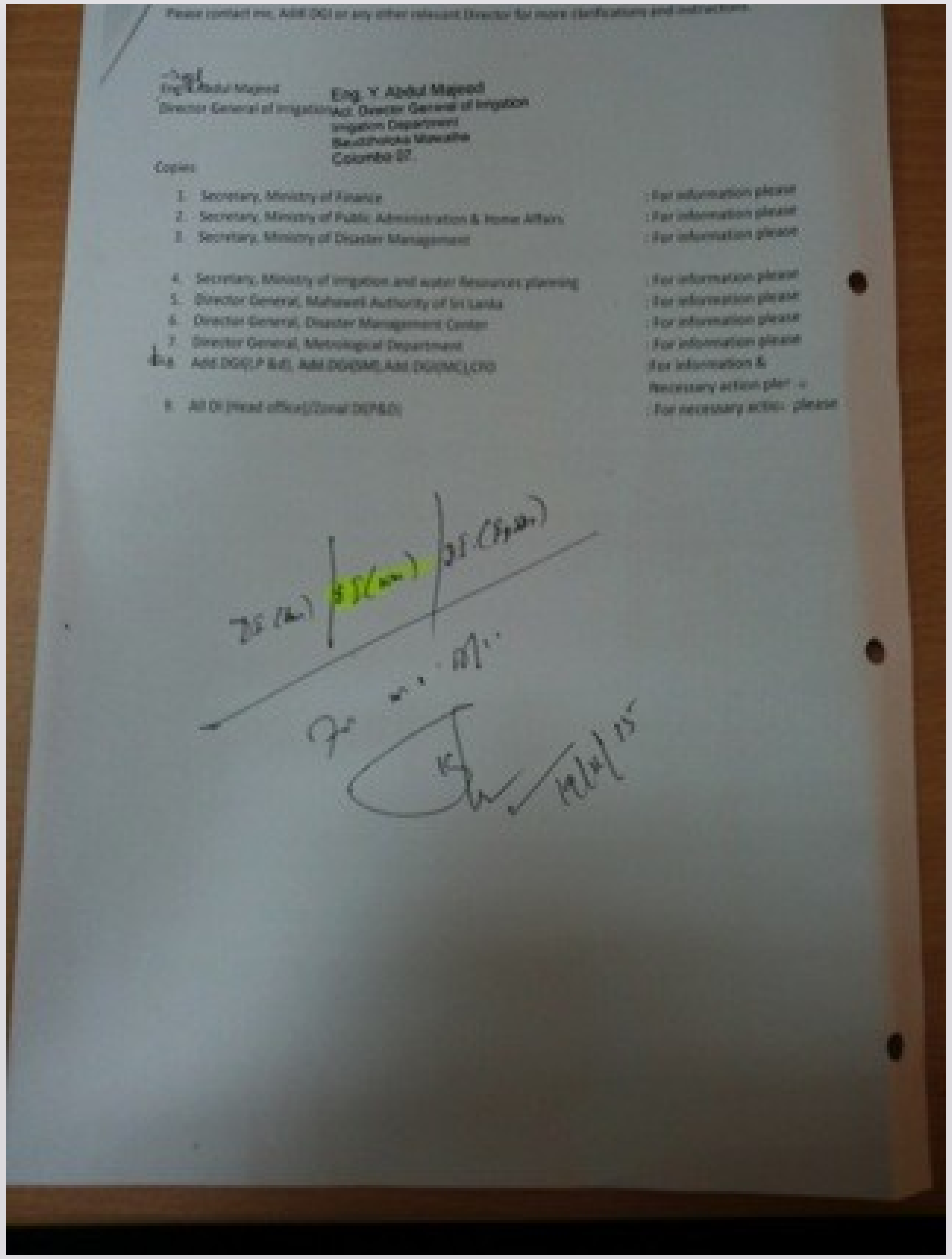
Please issue instructions to CIEE, IEE and EAA to plane for emergency operations as stipulated in the Departmental circulars and guidelines. Following points also need to be emphasized in the instructions.

1. Follow the guidelines in standing Orders (SO) for radial gate operations. SO are to be carefully updated if the downstream and upstream conditions have been changed especially if augmentation of the reservoir has been done.
2. Defects in some of the dams have already been identified by Dam safety inspection teams and rated as developments deteriorating the current condition, immediately to my attention.
3. Breaching of small tanks in the upstream may be a major cause to create a disaster and hence vigilance on such vulnerable tanks to be carried out to remedy the situation.
4. Continues monitoring be carried out at the weak sections of the earth embankments and also of the abutments when the reservoirs are full.
5. Make sure all the radial gates are in working condition.
6. The breaching sections of earth embankments to be identified and downstream of the section to be cleared for emergency release of floods.
7. Collect the materials and tools necessary for strengthening the weak sections of the bunds.
8. Coordinate and make aware the District level Disaster Management Centre, District Secretaries and Farmer Organizations on flood situation to get their assistance when emergency situation arises.

Please contact me or any member of the relevant Directorate at Head Office for further clarifications or instructions.

Eng. S. Jeyabalamoorthy
Addl Director General of Irrigation (System Management)

CC :- 1. Secretary (IR & WRM) : f.i.pl.
2. DGI/Addl DGI (RD & C / P,D & I) : f.n.a.pl.



Please contact me, Addl DGI or any other relevant Director for more clarifications and instructions.

Eng. Y. Abdul Majeed
Director General of Irrigation

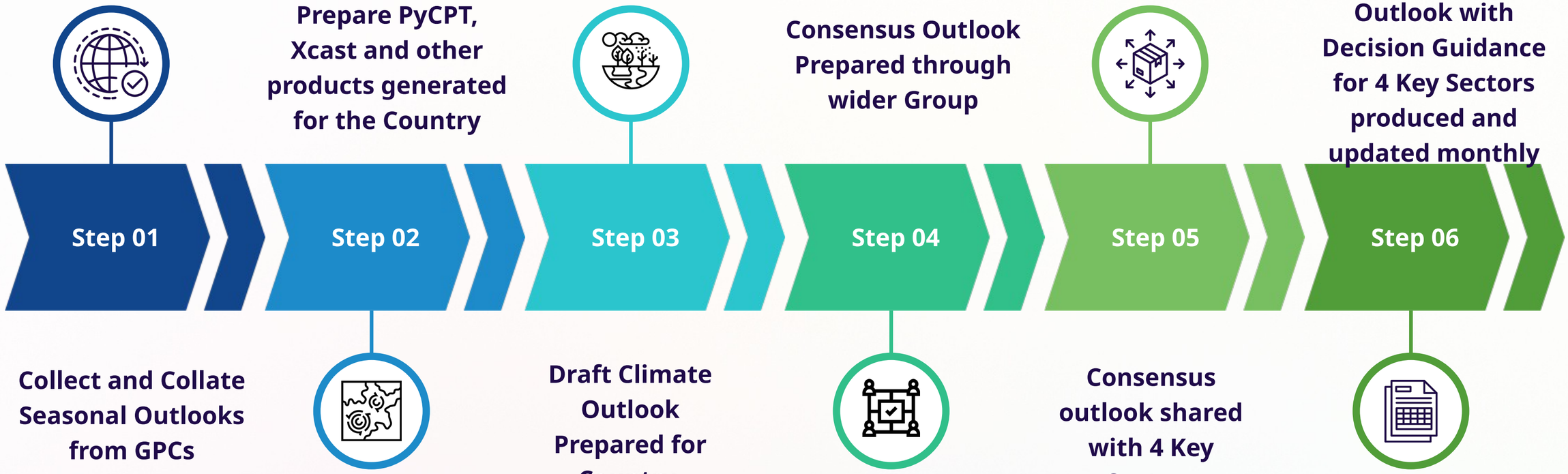
Eng. Y. Abdul Majeed
Act. Director General of Irrigation
Irrigation Department
Bauddhaloka Mawatha
Colombo 07

Copies

1. Secretary, Ministry of Finance	: For information please
2. Secretary, Ministry of Public Administration & Home Affairs	: For information please
3. Secretary, Ministry of Disaster Management	: For information please
4. Secretary, Ministry of Irrigation and water Resources planning	: For information please
5. Director General, Mahaweli Authority of Sri Lanka	: For information please
6. Director General, Disaster Management Center	: For information please
7. Director General, Metrological Department	: For information please
8. Add DGI(I,P &d), Add DGI(SM),Add DGI(MC),CFO	: For information & Necessary action plan
9. All DI (Head office)/Zonal DI(P&D)	: For necessary action please

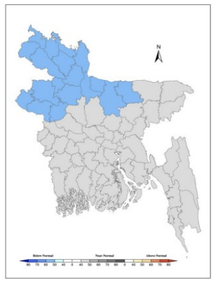
Institutional decision for regulating the release of water from reservoirs for reducing probability of flooding, guided by information of potential for above normal rainfall for October 2015 – February 2016. An assessment determined a saving of USD 41M through this decision

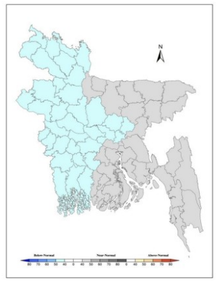
Co-production of Seasonal Flood Outlook in Bangladesh: Decision Guidance for Agriculture, Livestock, Water Resources and Health



The 2022 Summer Monsoon: Decision Guidance for Health Sector in Banglade

Summary





3

Maximum Temperature(JJAS) 2022

Considering the available climate model outputs, it is expected that the maximum temperature of JJAS is likely to be below normal (60-70%) over Rangpur, Rajshahi, and Mymensingh divisions (blue shaded area). Also analyzing the global model outputs, it is likely to be near normal (40-50%) maximum temperature over Mymensingh, Sylhet, Chittagong and Barisal divisions (grey shaded area) during this JJAS season. Overall, the country is highly likely to receive near normal to below normal maximum temperature.

Minimum Temperature(JJAS) 2022

Considering the available climate model outputs, it is expected that the minimum temperature of JJAS is likely to be below normal (40-50%) over Rangpur, Rajshahi, Khulna and western part of Dhaka division (light blue shaded area). Also analyzing the global model outputs, it is likely to be near normal (50-60%) minimum temperature over Mymensingh, Sylhet, Chittagong and Barisal divisions (grey shaded area) during this JJAS season. Overall, the country is highly likely to receive near normal to below normal minimum temperature.

1

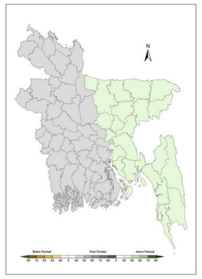
Rainfall (June), 2022

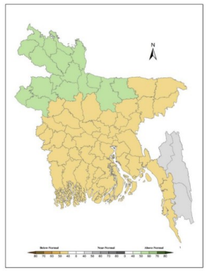
As per the available climate model outputs, above normal (40-50%) rainfall is expected over Chittagong, Mymensingh, Sylhet and eastern part of Dhaka divisions (light green shaded area) in the month of June. Apart from that near normal (50-60%) rainfall is expected to over Western part of Dhaka, Rangpur, Rajshahi, Khulna and Barisal divisions (gray shaded area). Overall, the whole country is expected to receive normal to above normal rainfall in the month of June.

Rainfall (Jun-Jul-Aug-Sep) 2022

As per the available climate model outputs, above normal (50-60%) rainfall is expected over Rangpur division and a few districts of Rajshahi and Mymensingh divisions (green shaded area). And the rest of the divisions (Rajshahi, Dhaka, Khulna, Barisal, and some districts of Chittagong), is expected to receive below normal (40-50%) rainfall. Overall, the whole country is highly likely to be normal to below normal rainfall during this season.

Summary



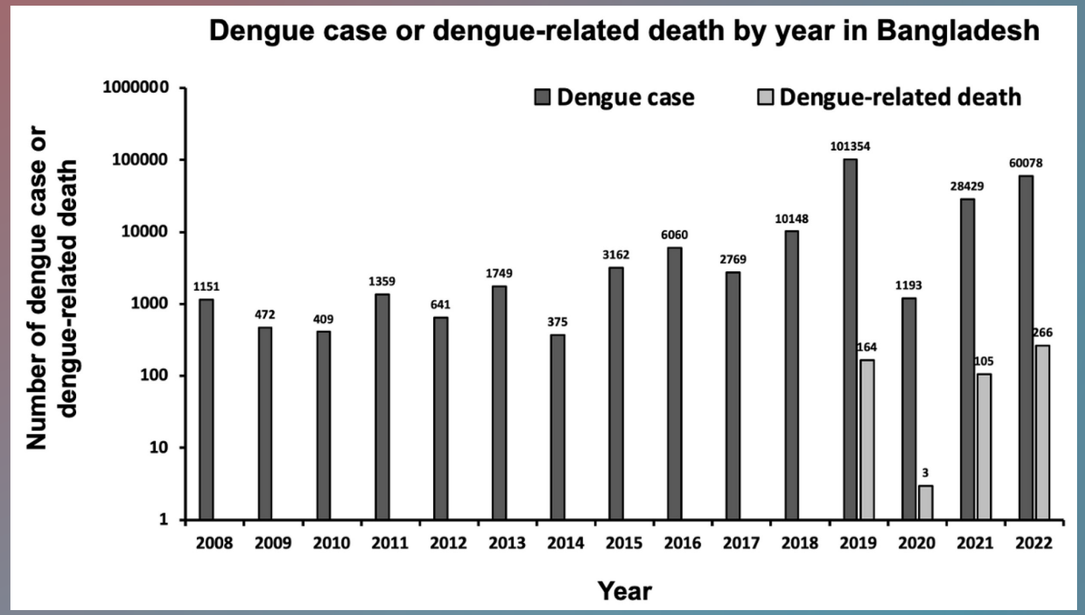


8

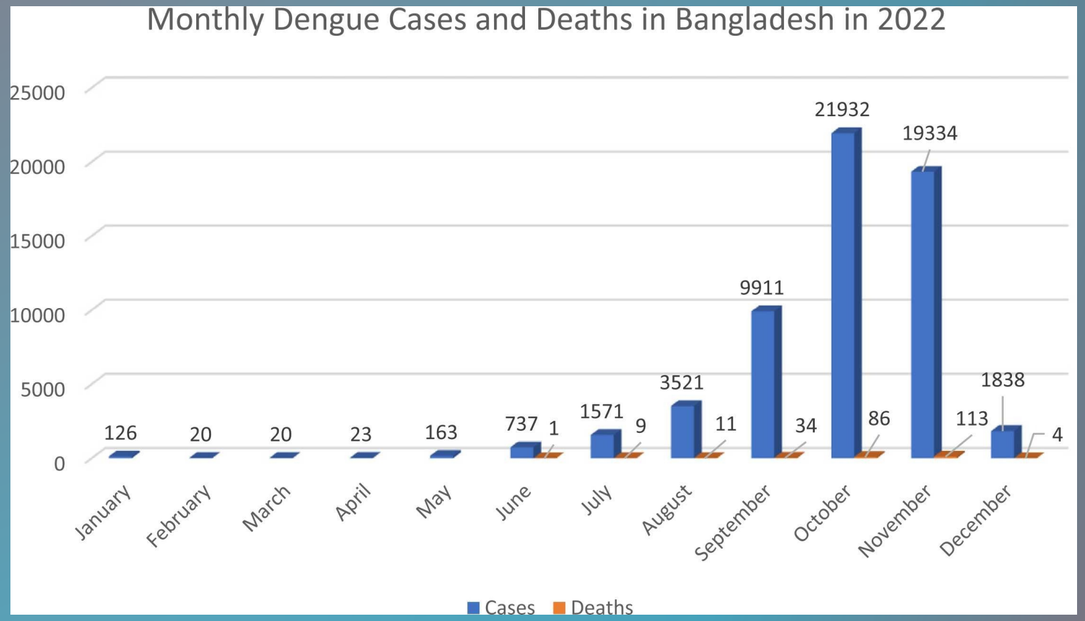
Health

1. Vector borne diseases:

- Vector borne diseases like dengue, chikungunyea may increases in rainy season.
- To avoid these illness, it is advised to destroy possible *ades* mosquito (dengue/ chikungunyea carrying) breeding grounds like old tires, discarded coconut shell or clay pots etc.
- Drain away clean stagnant water and to keep clean around the homes or offices
- Change stagnant clean water of flower vessels in every three days at least
- Wear long sleeve shirts and pants or use repellents for self-protection from mosquito bite
- Regular fogging or spraying to destroy mosquito rest/breeding places
- Avoidance of throwing plastic products or garbage here and there

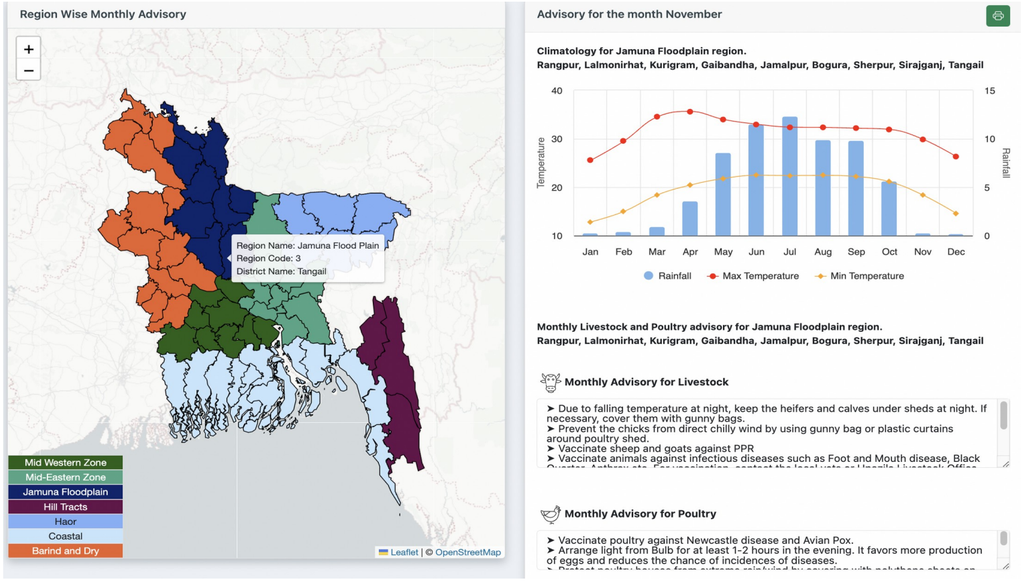


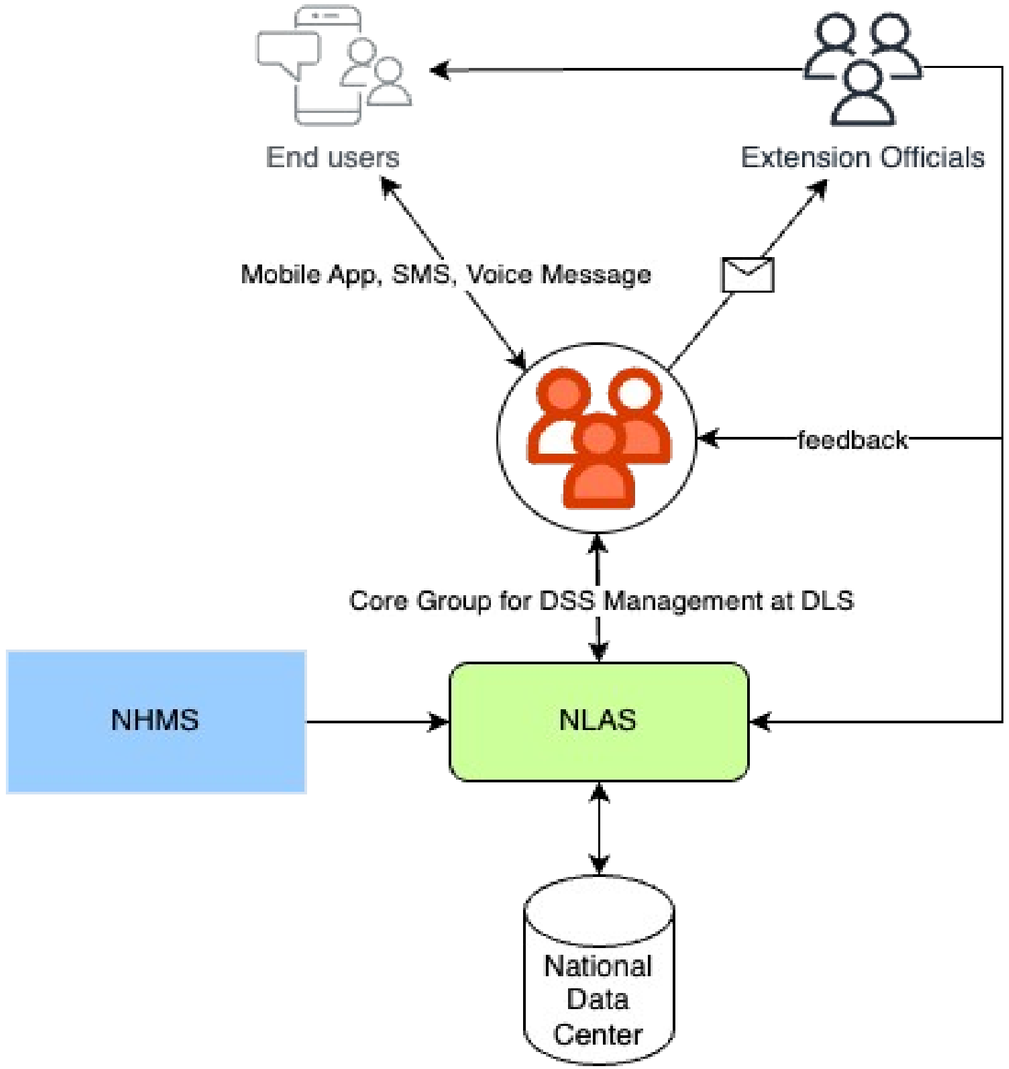
Increasing Dengue Burden and Severe Dengue Risk in Bangladesh ,Kayesh, M.E.H et al.



Dengue in Bangladesh, Bonna, Atia Sharmin et al.

Coproduction of Livestock Advisory DSS - Bangladesh





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Points to Ponder

- Decision Support System not decision making ones. The institutional capacity or arrangements required to operationalize the S2S applications are often very limited.

- CIS is data intensive and most of the DSS/S2S products are focused on National level rather than local level where decisions are implemented

- While some of the DSSs are rich in data, sometimes these data are not processed to produce value added Information, composite impact, sectoral impact are most cases missing

- Need to corproduce S2S bulletins with custom information for sectors. Special sessions need to be arranged for policymakers to convey the key takeaways.

- S2S guidance generation requires forecaster's expert intervention and may frequently require handcrafting

- Although multi-hazard multi-timescale information including projections are required for strategic decision-making, to align with project deliverables do not always contain full scale information.

- Uncertainty with communicating uncertainty in the forecasts

Thank you for your attention!