First Steering Committee Meeting (SCM 1)

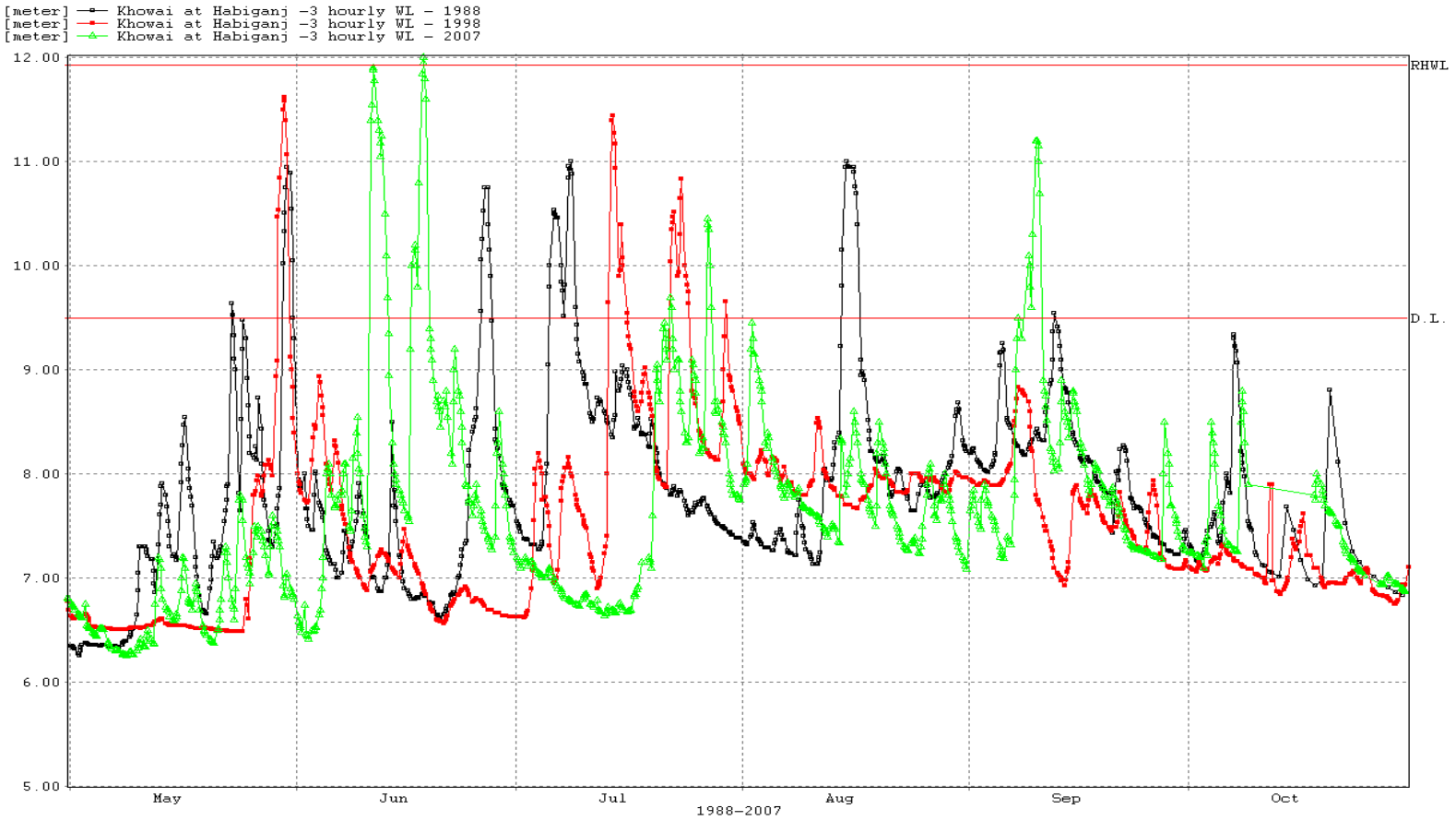
South Asia Flash Flood Guidance (SAsiaFFG) Project

New Delhi, India
26-28 April 2016

Presented by

Meer Abul Hashem
Sub-Divisional Engineer
Flood Forecasting & Warning Center (FFWC)
Bangladesh Water Development Board (BWDB)

Status of Flash Flood Fight in Bangladesh



Preface

- Flash Flood occurs frequently in the Northeast Region (Haor Area) of Bangladesh
- Flash floods in the months of April-May damage the main crop Boro rice nearly or just before the harvest
- Forecast of flash flood for few or several days may be very useful in harvesting the Boro rice early even before complete maturity so that farmers can capture at least part of the crop for their livelihood round the year or take necessary preparedness to save the crop.

Flash Flood Vulnerable Area

- North-East (Netrokona, Sherpur, Sunamganj, Sylhet, Moulvi Bz. & Habiganj) (Haor Area)

  -Flash floods are triggered by high intensity rainfall in neighboring Indian catchments located in Meghalaya & Tripura.

- South-Eastern Hilly Areas
- North-West (Teesta Basin)

  -Rainfall is predominantly within Bangladesh, although there is also substantial cross runoff into Bangladesh causing Flash Flood.

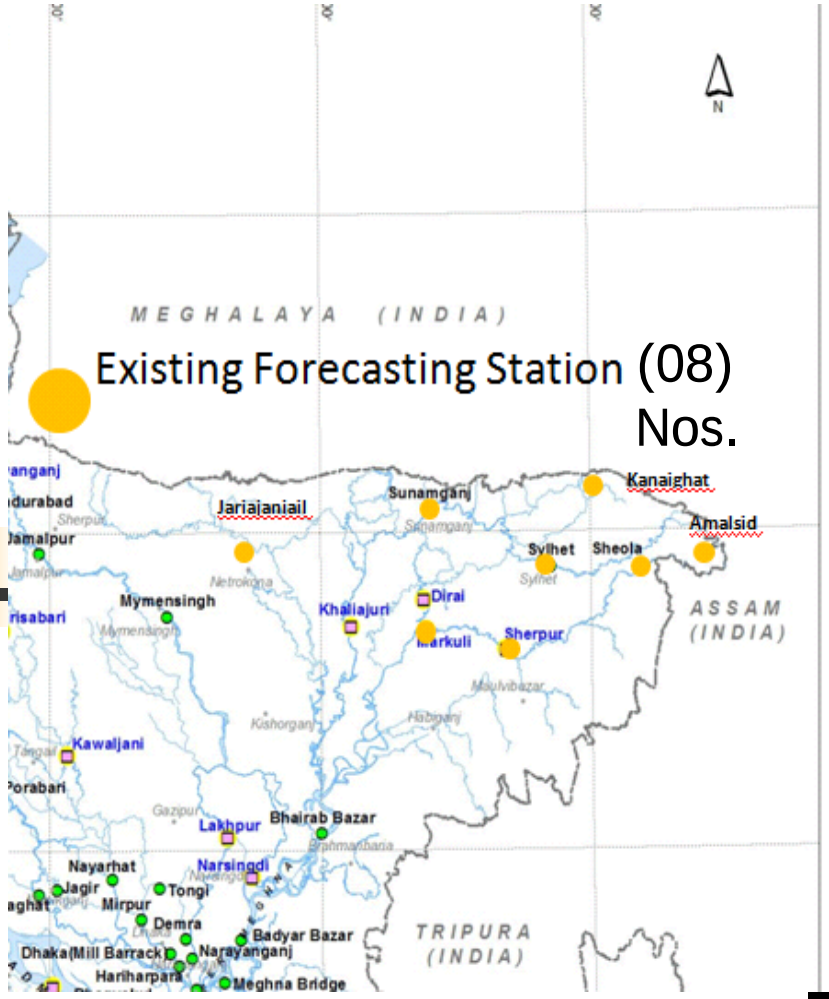
Flash Flood in Bangladesh

- Rainfall of short duration
- Small hilly area
- Rapid water level rise
- NE, SE and NW Region
- April-October (mainly occurs in pre-monsoon)

Present Activities/Status in NE Region

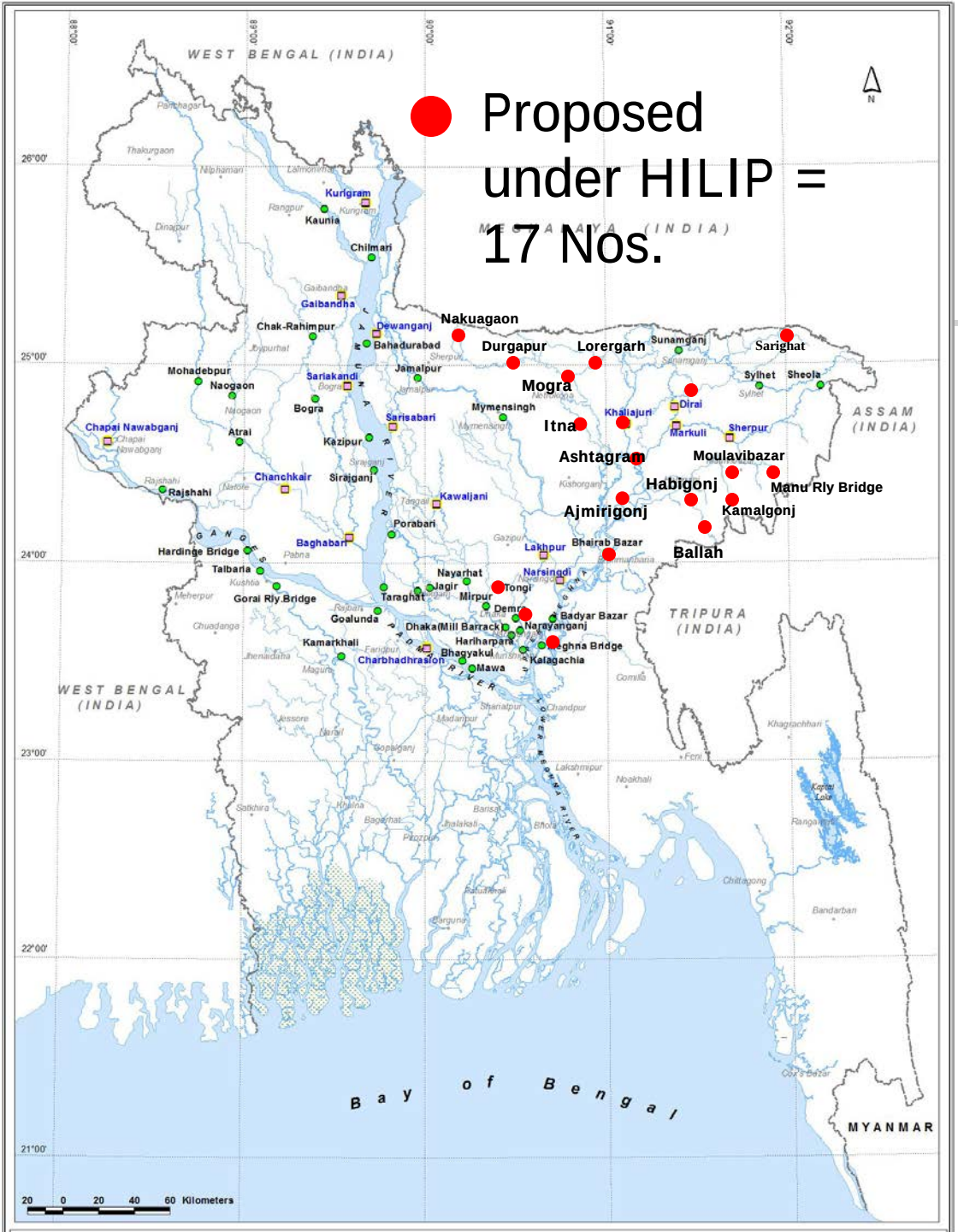
- Based on 24 nos. Meteorological and Hydrological Observation stations in NE Region.
- No Hydrological Model in NE Region

- Qualitative Flash Flood Prediction based on Satellite images (BMD, IMD and NOAA rainfall forecast)
- Long-range weather Forecast from BMD (Monthly forecast)
- Dissemination (by SMS, email etc) Limited to BWDB field offices (North-eastern Region field offices)



River	Station
Kalni	Markuli
Kangsha	Jariajanjail
Surma	Sylhet
	Sunamgonj
	Kanaighat
Kushiyara	Sherpur
	Amalshid
	Sheola

4 rivers 08 stations
Up to 2015



River	Station
Manu	Maulavibazar Railway Bridge
Kowai	Habigonj
Sarighat	Sarigowain
Manu	Moulvibaza
Meghna	Narsingdi
Kalni	Ajmirigonj
	Astagram
Kushyara	Sheola
Kalni	Bhairab Bazar
	Baidder Bazar
	Meghna Bridge

Modernization Hydromet System in NE Region

- Automatic data collection system (real time)

1. *04 Stations have installed under HKH-HYCOS project supported by WMO & ICIMOD (Ballah, Sunamganj, Chatlaghat, Zakiganj)*
2. *04 Stations have installed under WMIP supported World bank (Nakuagaon, Durgapur, Sarighat, Shaola)*

Proposed

All of existing manual Hydrological stations shall be automated in NE region of Bangladesh.

Complexity of the Problem

- Is the mandate of a Meteorologist or a Hydrologist?
- Hydrologist can do a little (for flash flood forecasting) after a raindrop falls on Earth.
- Rainfall intensity and hydrology of catchment are important factors in flash flood dynamics

Cont.

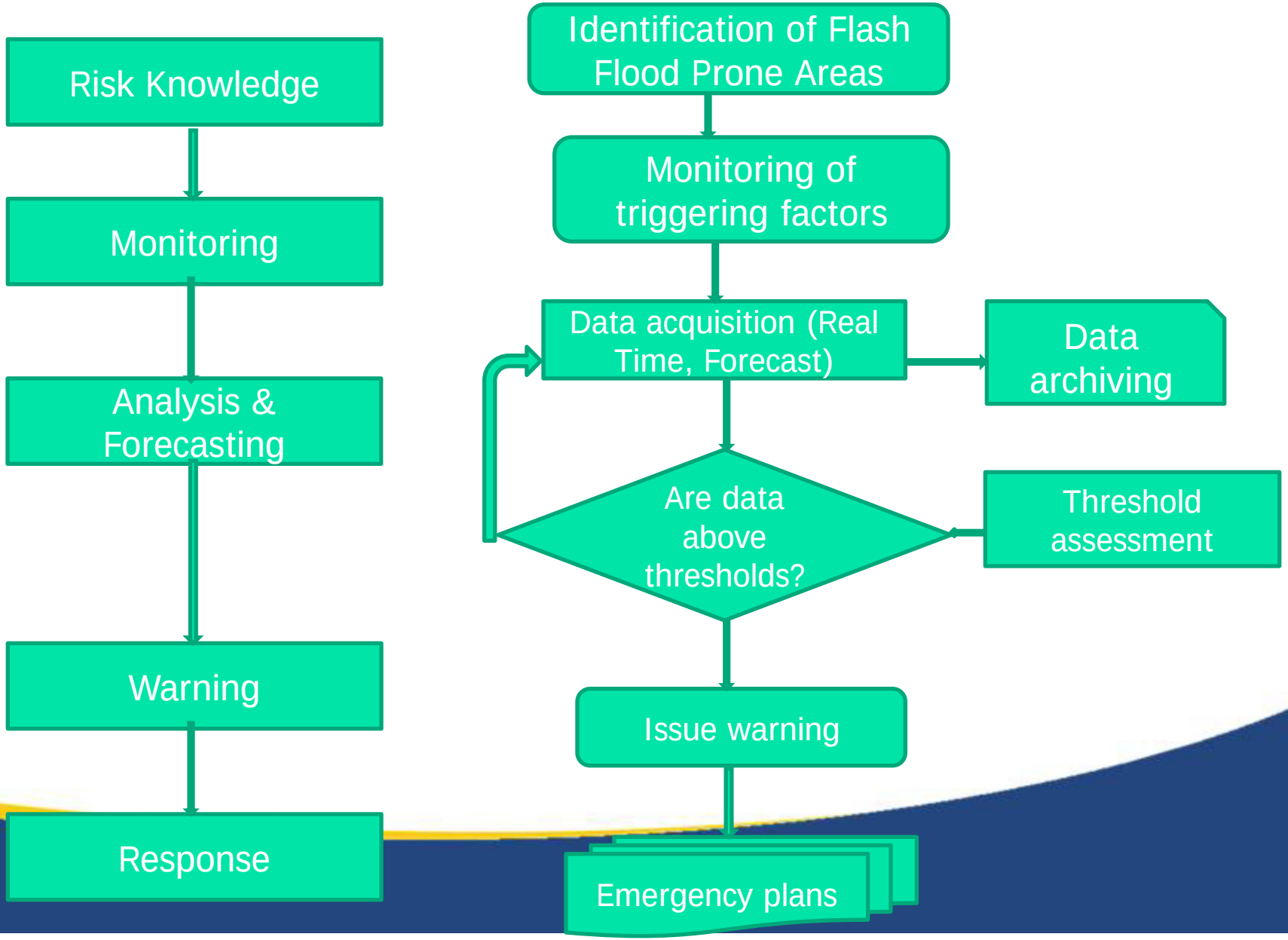
Complexity of the Problem

- 100 mm RF in 6 hrs. may or may not result in a flash flood, owing to such factors as antecedent precipitation, soil moister content, permeability, terrain gradients and so on.
- Quantitative precipitation forecast (QPF) is needed but is rarely available.
- Therefore, Flash flood forecasting involves both a hydrological and a meteorological forecast.

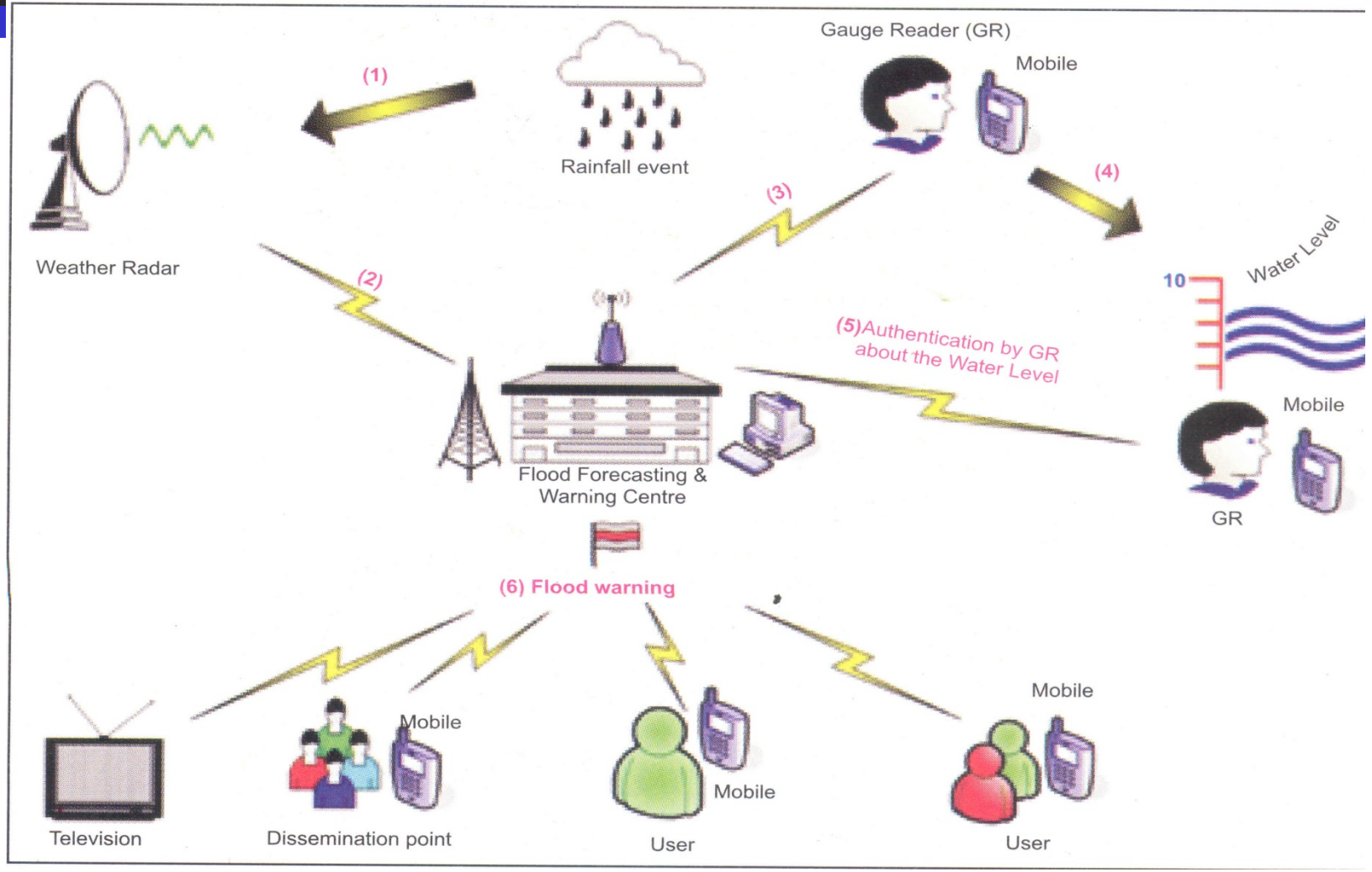
Flash Flood Events

Year	District	Area (sq. km.)	Flash flood date	No. injured	No. killed	No. affected	No. of houses damaged	No. of villages affected
2012	Sylhet	3490.4	27 Jun		2	416,000	29,800	
	Cox's Bazaar	2491.9			38			
	Chittagong	5283.0			23			
	Bandarban	4479.0			36			
2011	Cox's Bazaar	2491.9	22 Jul		10	300,000		200
2010	Cox's Bazaar	2491.9	15 Jun		53	20,000		
2009	Habiganj	2636.6	04 July		6			
2007	Sunamganj	3669.6	11 Jun		850			
	Netrakana	2810.4						
	Habiganj	2636.6						
	Feni	928.3						
2006	Sylhet	3490.4	02 Jun		5			
	Chittagong	5283.0						
2004	Dhaka	31120.0	14 Sep			600,000		100
2003	Sunamganj	3669.6	27 Jun			500,000		
	Sylhet	3490.4						
	Netrakana	2810.4						
	Habiganj	2636.6						
	Maulvi Bazaar	2799.4						
	Cox's Bazaar	2491.9						
	Feni	928.3						
2002	Sylhet	3490.4	03 May	16				
2000	Chittagong	5283.0	24 Jun		11			
1999	Sylhet	3490.4	15 Jul		27			

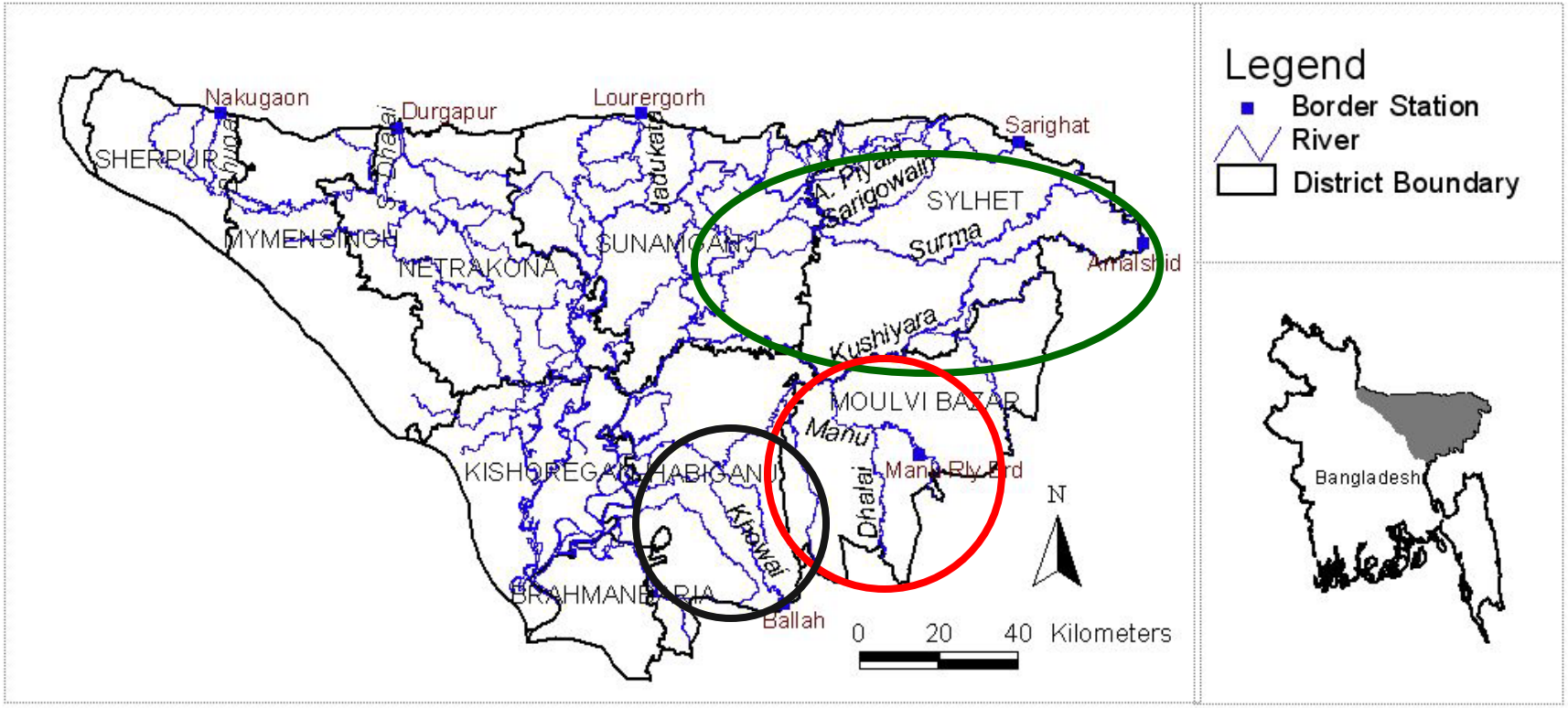
Elements of Flash Flood Warning System



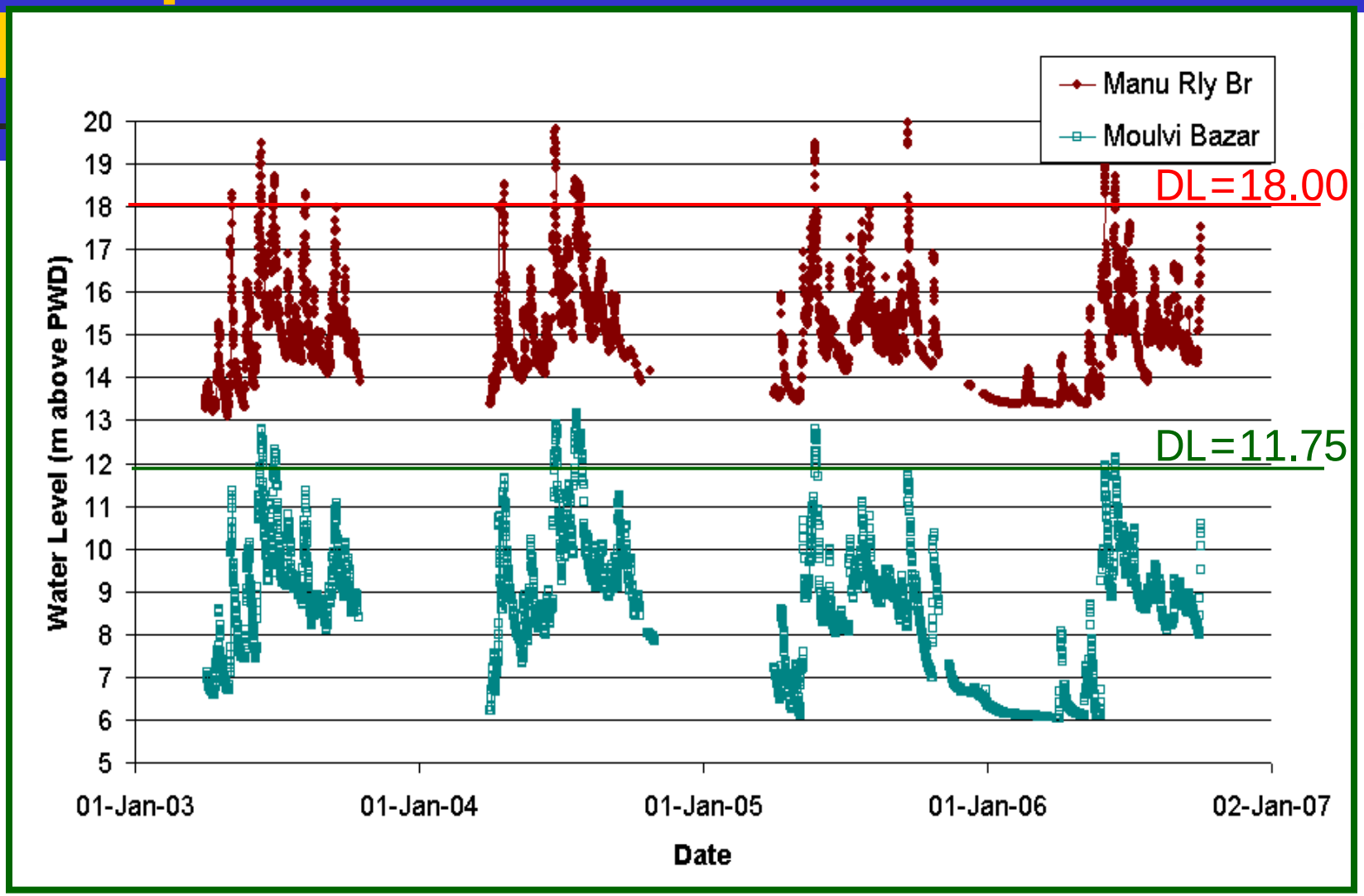
Flash Flood Warning procedure & Dissemination system



North Eastern Region

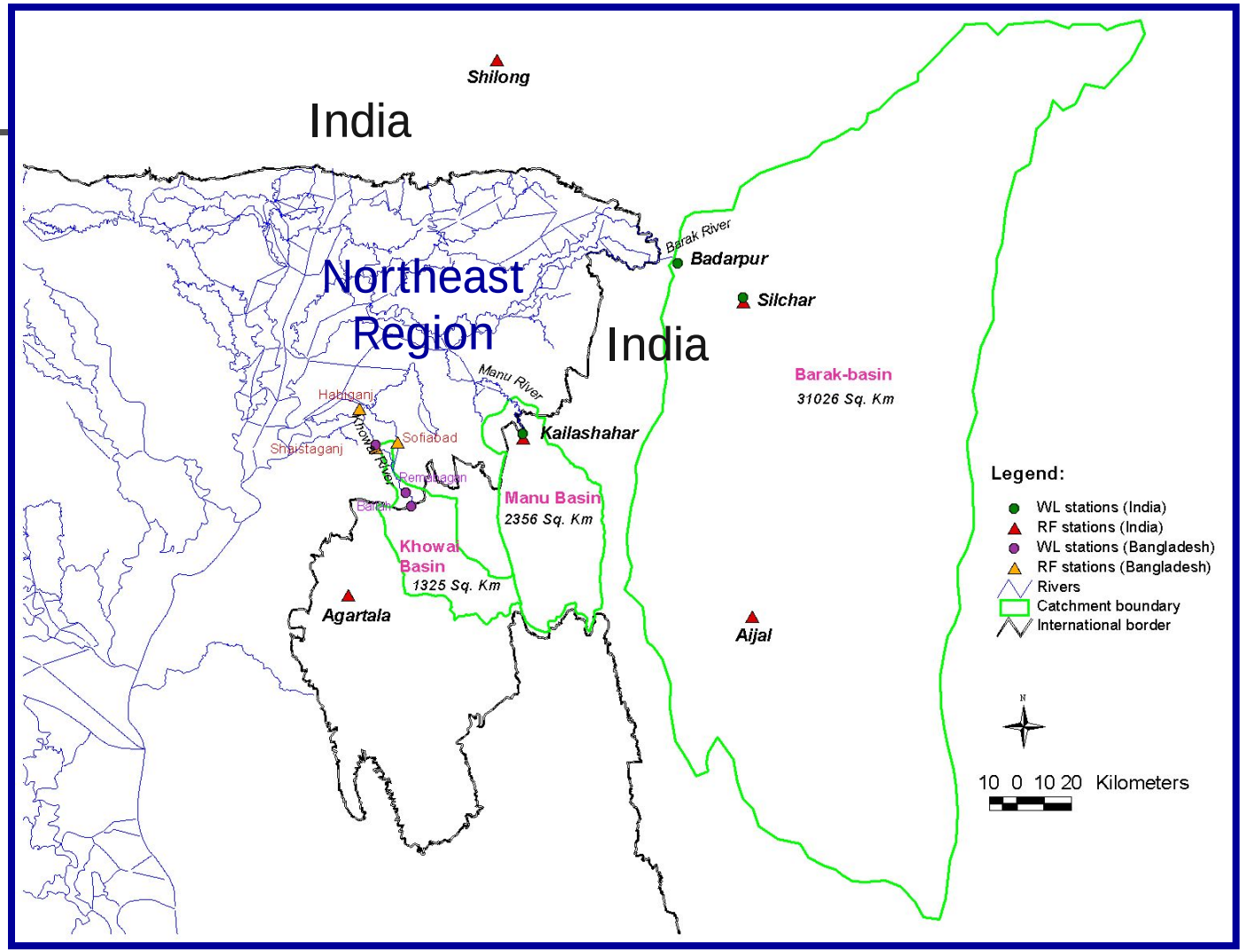


Example as Water Level in Manu River

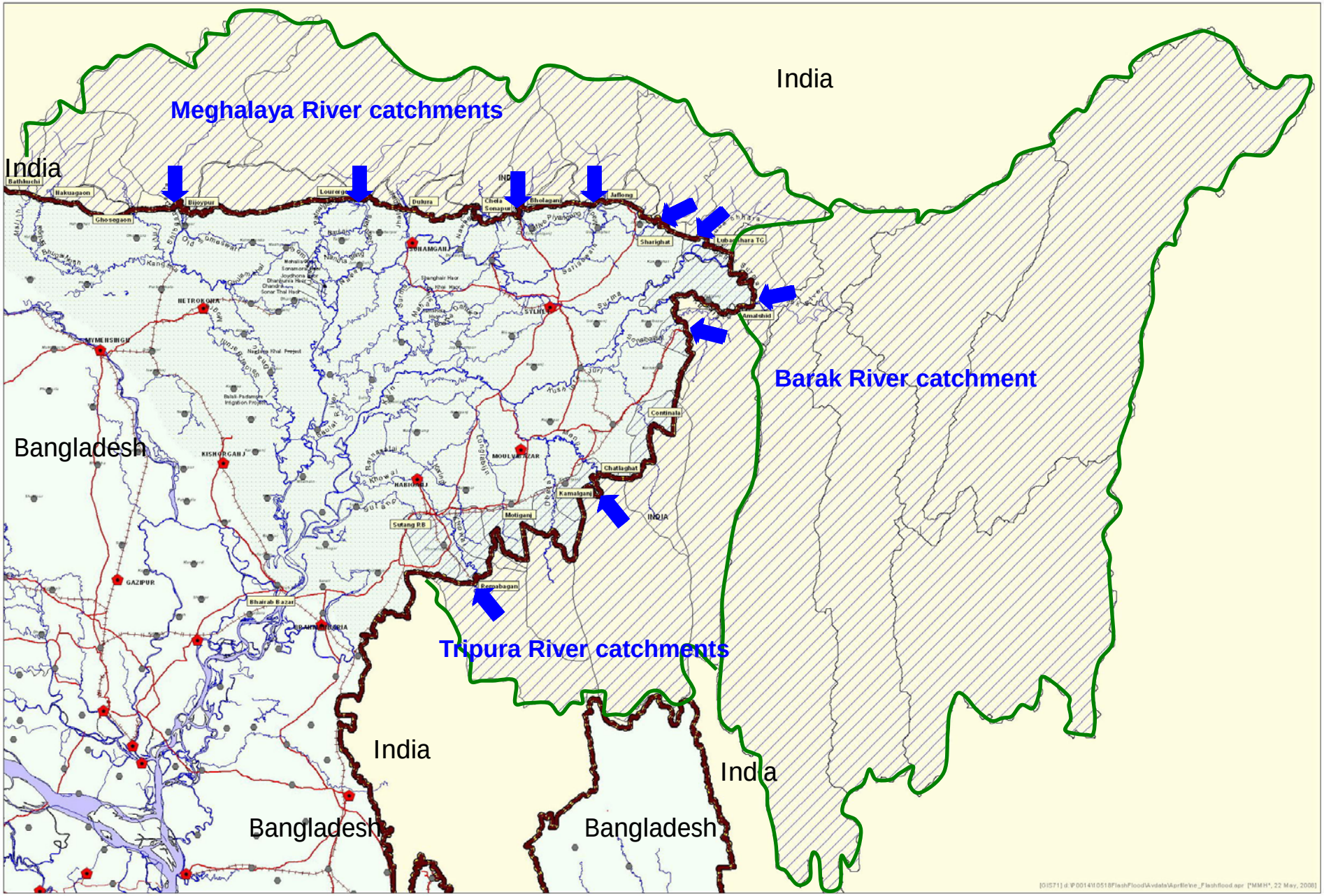


Catchment Area

- Barak
- Manu
- Khowai



Catchments that contribute flash flood

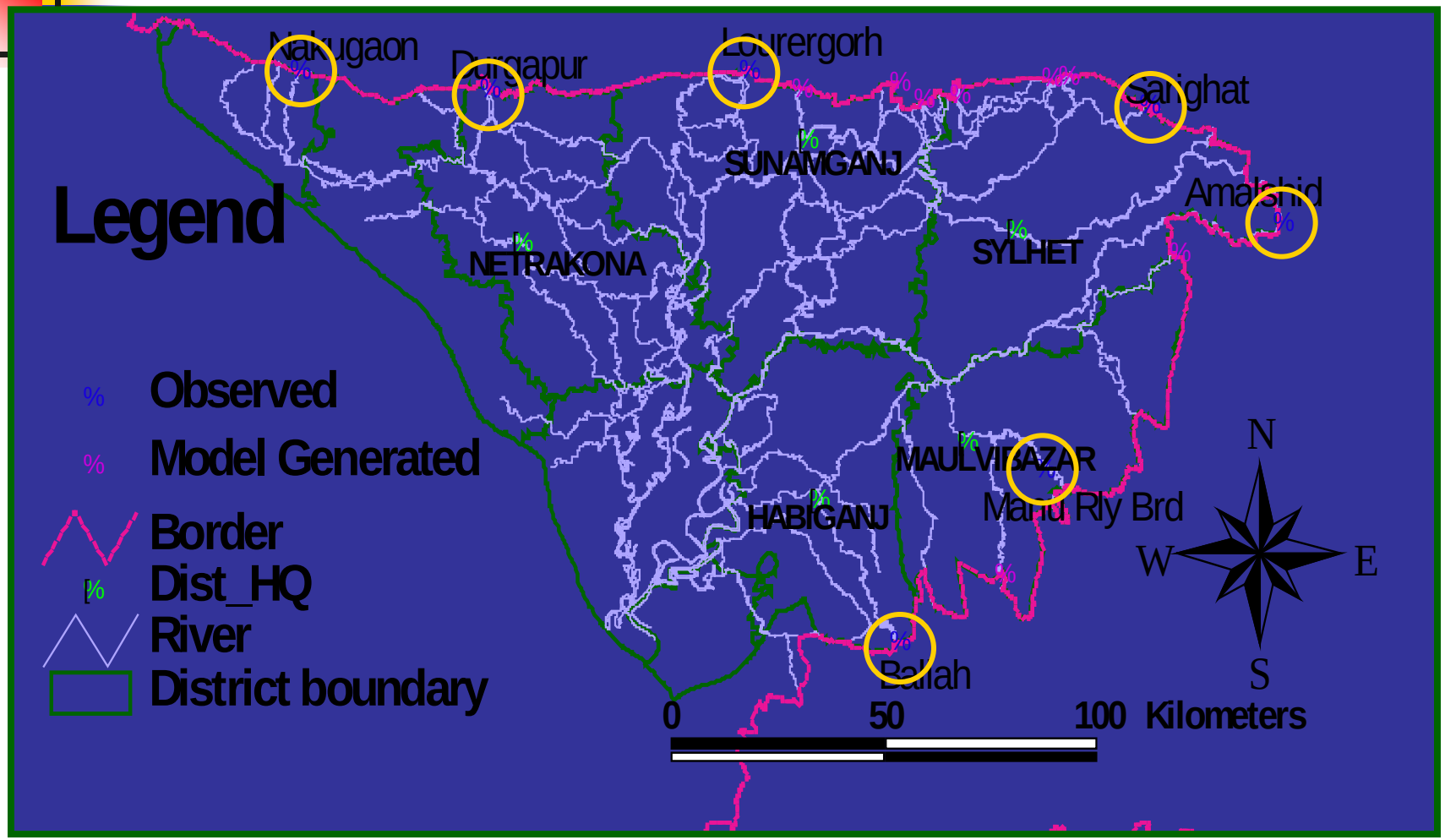


Way Forward

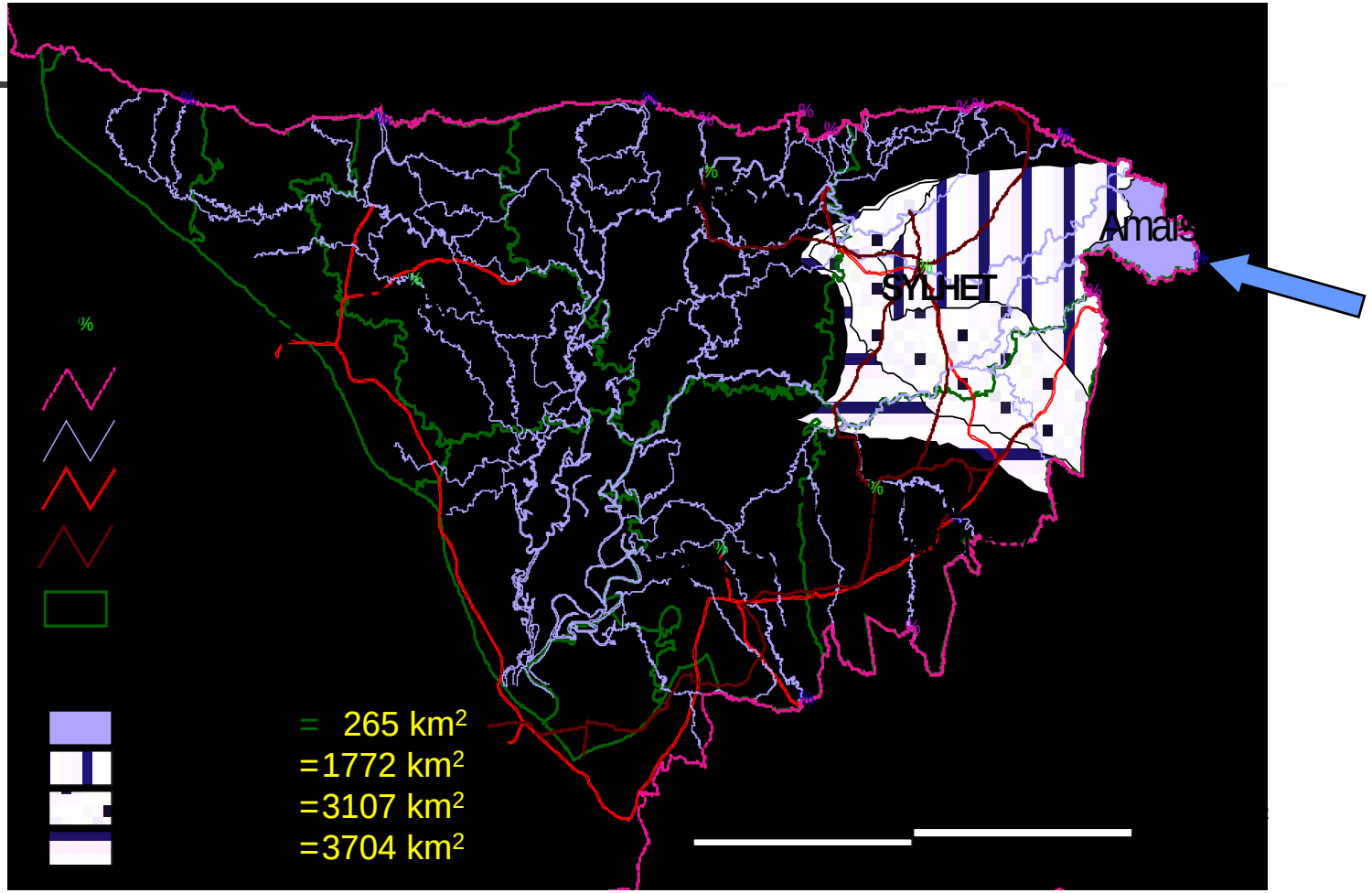
Methods to improve flash flood forecast in NE region:

- Continuous WL and RF measurements at border (It is better of Real Time data)
- Meteorological forecast
- Measurements inside India

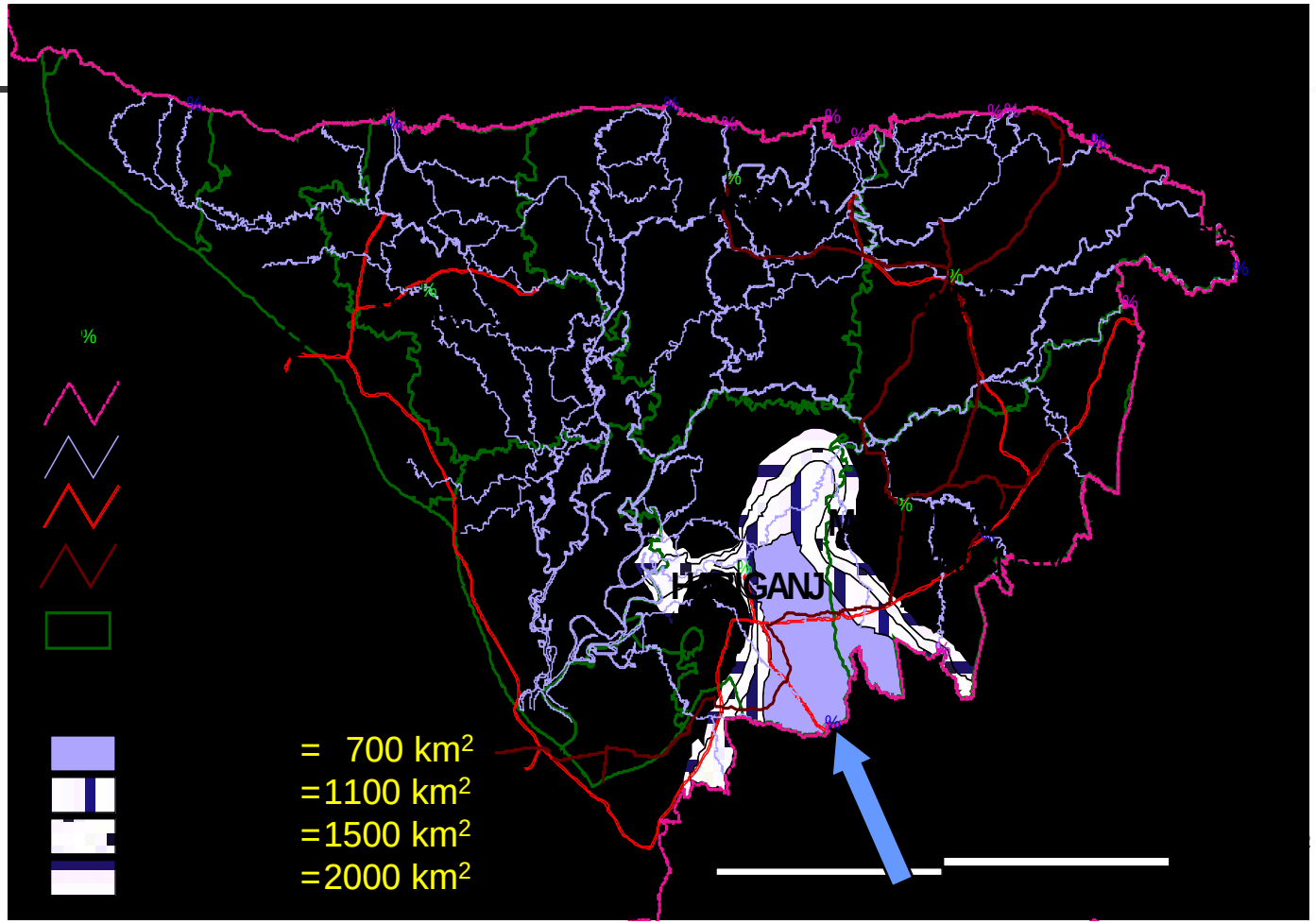
Flood Peak Travel Time



Flood Scenarios with Time for Peak at Amalshid



Flood Scenarios with Time for Peak at Ballah



Flooding impacts of rivers

River Name	Data Type	Peak Value in Year 2007		Area Coverage (km^2)			
		Water Level (m PWD)	Discharge (m^3/s)	6h	12h	18h	24h
Active Chela	Scaled from Lourergorh	-	632	1,318	4,588	6,361	7,364
Barak	Observed at Amalshid	18.0	5,040	265	1,772	3,107	3,704
Dhalai	Scaled from Manu RB	-	350	382	1,626	2,594	3,468
Active Piyain	Scaled from Sarighat	-	763	475	1,999	2,491	3,113
Jhalukhali	Scaled from Lourergorh	-	200	1,219	3,604	6,197	7,494
Nawagang	Scaled from Lourergorh	-	200	544	2,828	4,362	5,154
Sarigowain	Observed at Sarighat	13.4	1,017	202	1,918	2,356	3,012
Shibganjdhal	Observed at Durgapur	15.0	2,555	300	1,534	3,546	5,646
Bhugai	Observed at Nakugaon	24.3	494	103	358	665	1,125
Jadukata	Observed at Lourergorh	11.8	3,986	660	3,039	4,028	5,034
Manu	Observed at Manu RB	19.5	1,057	1,070	2,875	3,960	4,912
Khowai	Observed at Ballah	24.0*	1,100*	727	1,166	1,584	1,997

Travel Time to District Headquarter

River Name	Rank	Travel Time (hr)				
		Sylhet	Sunamganj	Moulvibazar	Habiganj	Netrokona
Active Chela	1	< 6	< 6	-	-	-
Jhalukhali	2	6-12	< 6	-	-	-
Nawagang	2	6-12	< 6	-	-	-
Jadukata	3	12-18	< 6	-	-	-
Manu	4	-	-	< 6	-	-
Barak	5	6-12	-	-	-	-
Dhalai	5	-	-	6-12	-	-
Khowai	5	-	-	-	6-12	-
Active Piyain	6	12-18	-	-	-	-
Sarigowain	6	12-18	-	-	-	-
Shibganjdhal	7	-	-	-	-	-
Bhugai	7	-	-	-	-	-

Training and Capacity Building supported by RIMES

- Training on 20-21 August 2013 at FFWC
- Secondment Training on 12 January – 11 March 2014 at RIMES, Bangkok
- Training on 28-29 April 2014 at FFWC

Training and Capacity Building at Community Level supported by RIMES

i. Community consultation meeting on 18 July 2012 at Jagdal
ii. Training workshop on 26 February 2014 at Sunamganj
iii. Training workshop on 15 June 2014 at Sunamganj
iv. Training workshop on 17 June 2014 at Jaliapalong, Cox's Bazaar

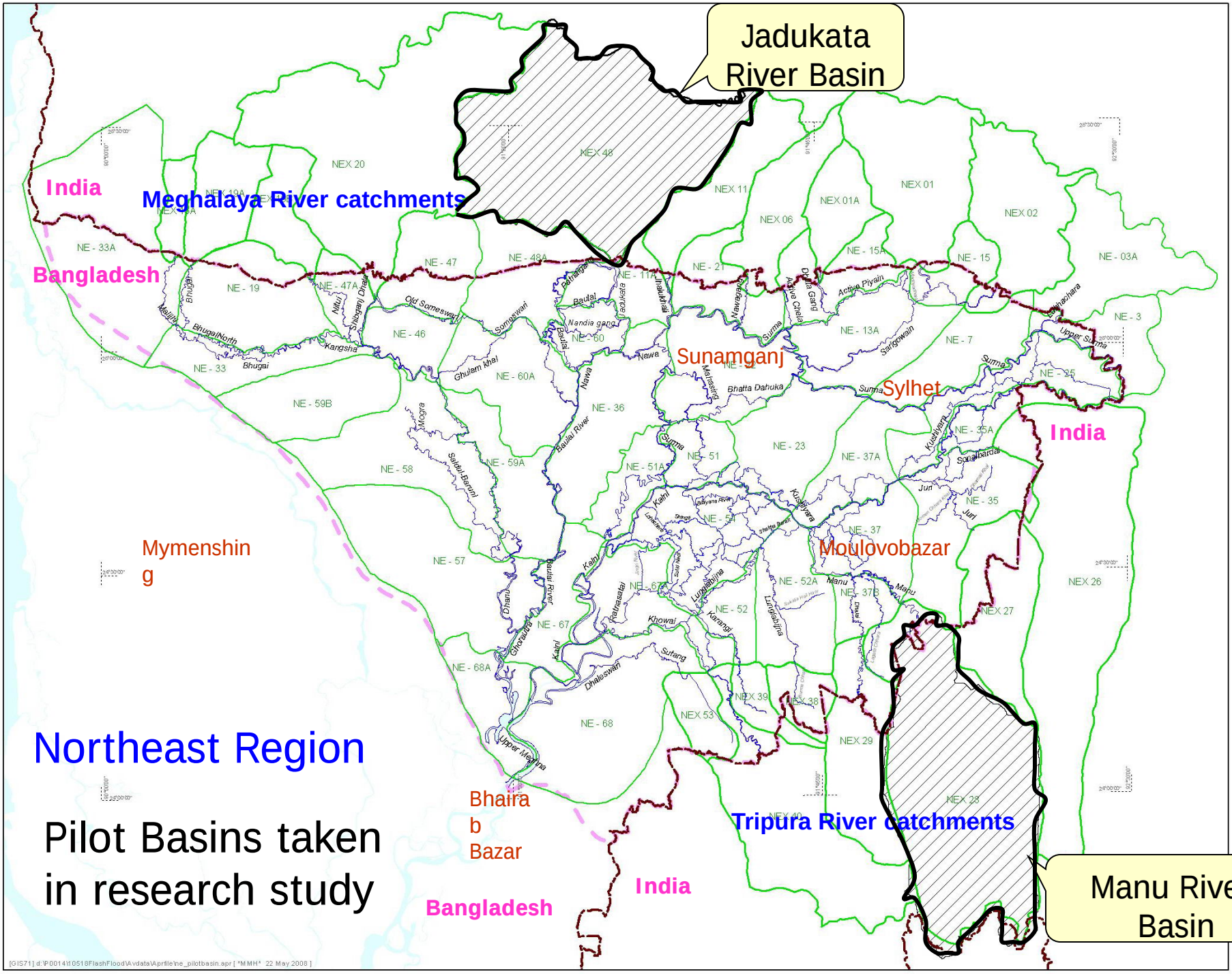
Flash Flood Forecasting in the Northeast Region of Bangladesh Using ECMWF data (2008)

A Pilot Study of the Manu and Jadukata River Basin

Background

- About 60% of the total runoff in the Northeast Region is produced, mostly in the form of flash flood
- The three Indian catchments: the Meghalaya River catchments, the Barak River catchments, and the Tripura River catchments generates the Flash Flood
- Land Topography, meteorological and hydrological information of those catchments are not available
- The previous Flash flood forecast study (FAP10) in the region drew attention on unavailability of:

  - rainfall data of the Indian catchments,
  - temporal resolution of the rainfall data, and
  - the quantitative precipitation forecasts of the catchments


Jadukata River Basin
India
Meghalaya River catchments
Bangladesh
Sunamganj
Sylhet
India
Mymenshing
Moulovobazar
Northeast Region
Pilot Basins taken in research study
Bhairab Bazar
Bangladesh
India
Tripura River catchments
Manu River Basin

Activities

1. Rainfall, Water Level & Discharge measurement at the outlets of two basins
2. Development of New Rating Relation
3. Hydrological Model development of two pilot Basins: Manu river basin and Jadukata river basin based on *ground measured rainfall inside Bangladesh*
4. Evaluation of Satellite measured rainfalls in the basins:

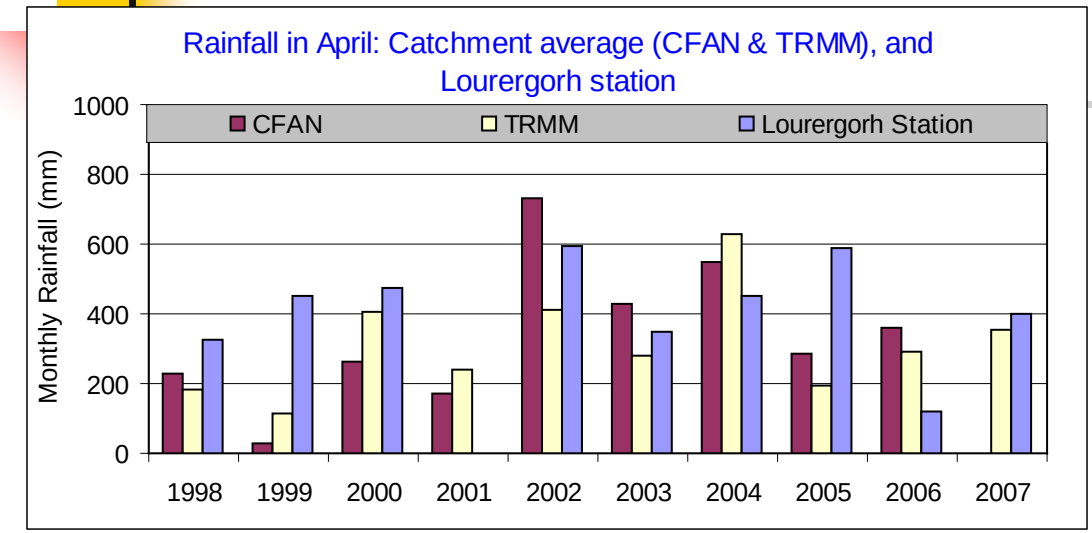
   - *Tropical Rainfall Measurement Mission (TRMM),*

   - Climate Forecast Application in Bangladesh (CFAN),

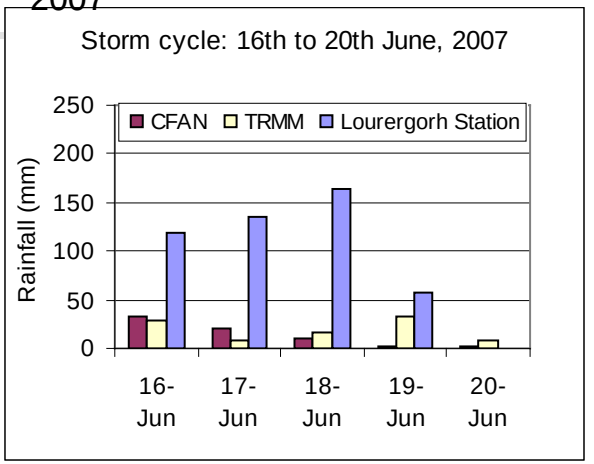
Findings

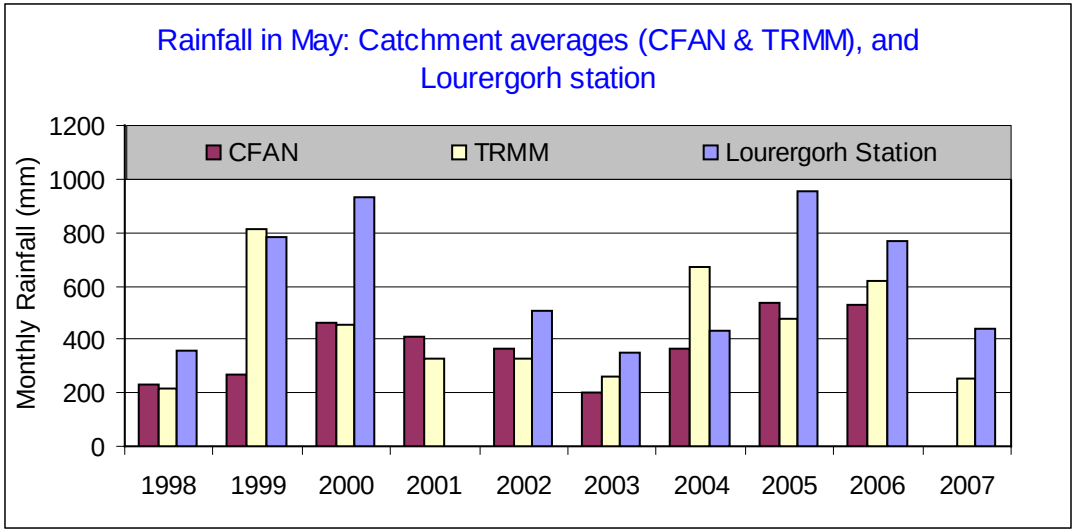
- Rainfall measured within Bangladesh territory is not sufficient for computation of flash flood in NE region
- Rating relations at the outlets of basins within India need to be updated
- Rainfall measured within Indian is essential for computation of flood volume
- Closer Frequency (less than 12 hour) than daily rainfall records estimates flood volume more accurately
- Rainfall forecasted by European Center for Medium Range Weather Forecast (ECMWF) is not suited for forecasting flash flood in the Northeast region

Comparison of Ground measured & Satellite measured rainfalls in Jadukata Basin

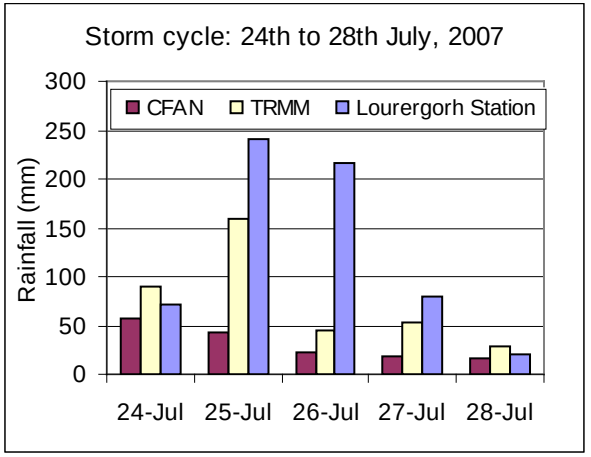


Storm in Jadukata Basin June 2007

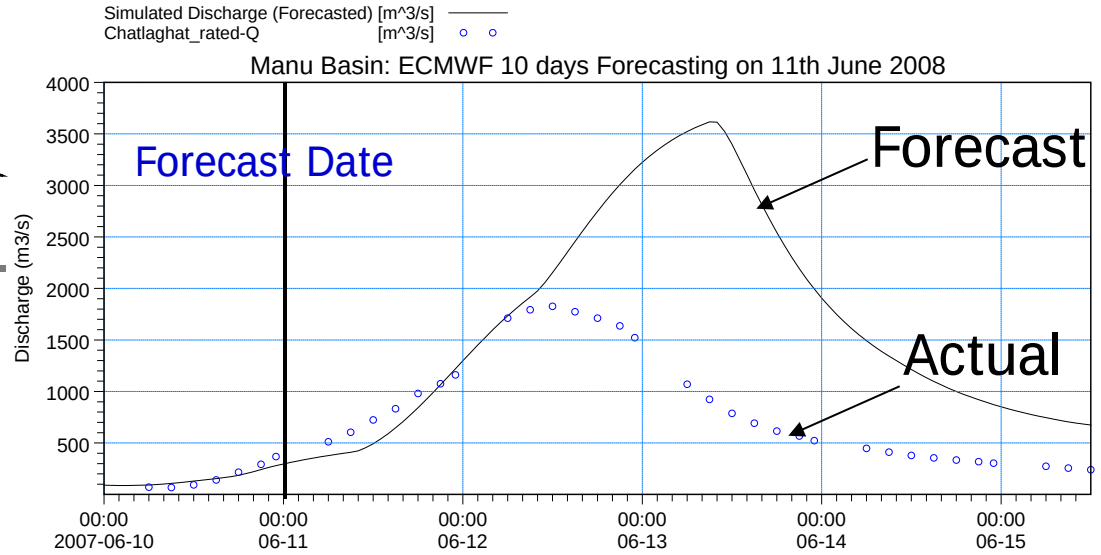




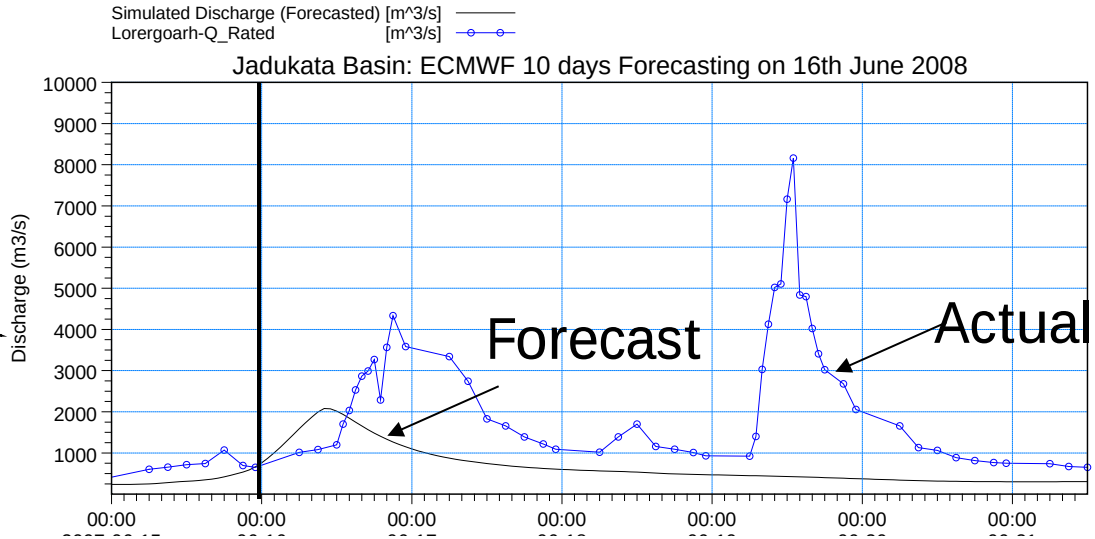
Storm in Jadukata Basin July 2007



Forecast: Manu Basin



Forecast: Jadukata Basin



Conclusions & Recommendations of previous Initiatives

- Flash flood are forced by intensive rainfall in steep, fast responding catchments.
- The physics can be resolved in numerical model “MIKE 11” but following data required:

  -Rainfall measurement with high temporal and spatial resolution,

  -Quantitative precipitation forecast

  -High temporal regulation water level measurements in combination with rating curves, to define cross border flows
- A network of continuous rainfall stations (Real Time) are to be established in North-east region
- Rainfall-runoff models can be developed for upstream

Flash Flood Guidance

The flash flood guidance system functions at one level as a disaster mitigation tool by:

- mitigating loss of life and livelihoods
- it can be used to provide maps of flash flood probabilities, threats and decision-aiding for imminent actions.
- as a guide to where special care should be taken
- in the design and locations of particular facilities as the population expands to live in Flash prone Areas.


THANK YOU