

International Workshop on ‘Earth Observations in the Service of Water Management’

(26-28 September 2006 in Bangkok)

Members:

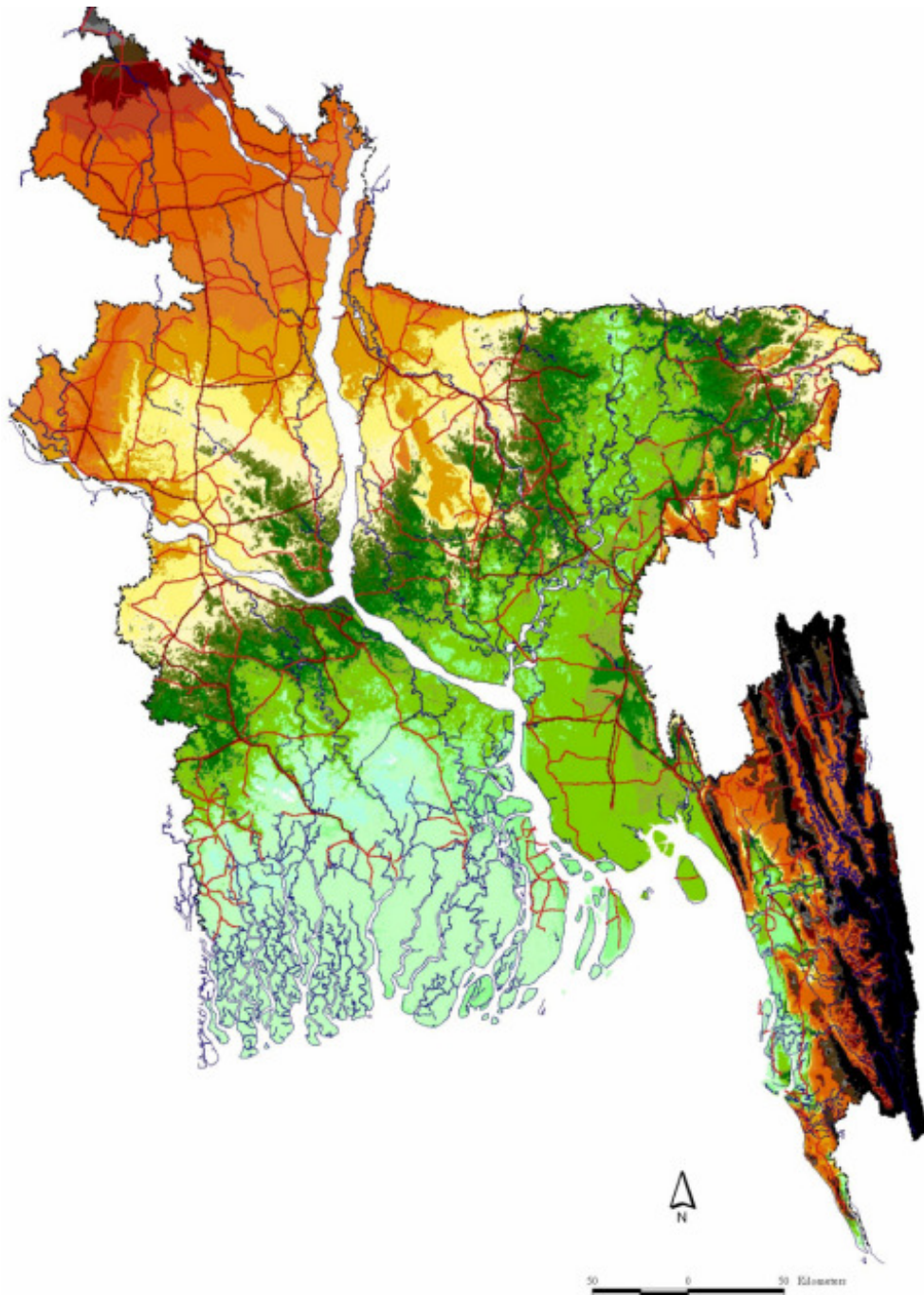
- 1. Brig. Gen. Shah Md. Sultan Uddin Iqbal, Joint Secretary, Ministry of Defence, Government of the People’s Republic of Bangladesh.**
- 2. Md. Akram Hossain, Director, Bangladesh Meteorological Department, Government of the Peoples Republic of Bangladesh.**
- 3. Dr. Md. Mafizur Rahman, Associate Professor, Department of Civil Engineering, Bangladesh University of Engineering and Technology (BUET), Bangladesh.**

Natural Disasters in Bangladesh

- **Cyclone & associated Storm Surge**
- **Nor'westers/Tornadoes**
- **Drought**
- **Floods**
- **River Erosion**
- **Heat Waves**
- **Cold Waves**
- **Earthquakes and Tsunami**
- **Land slide**

Topography of Bangladesh

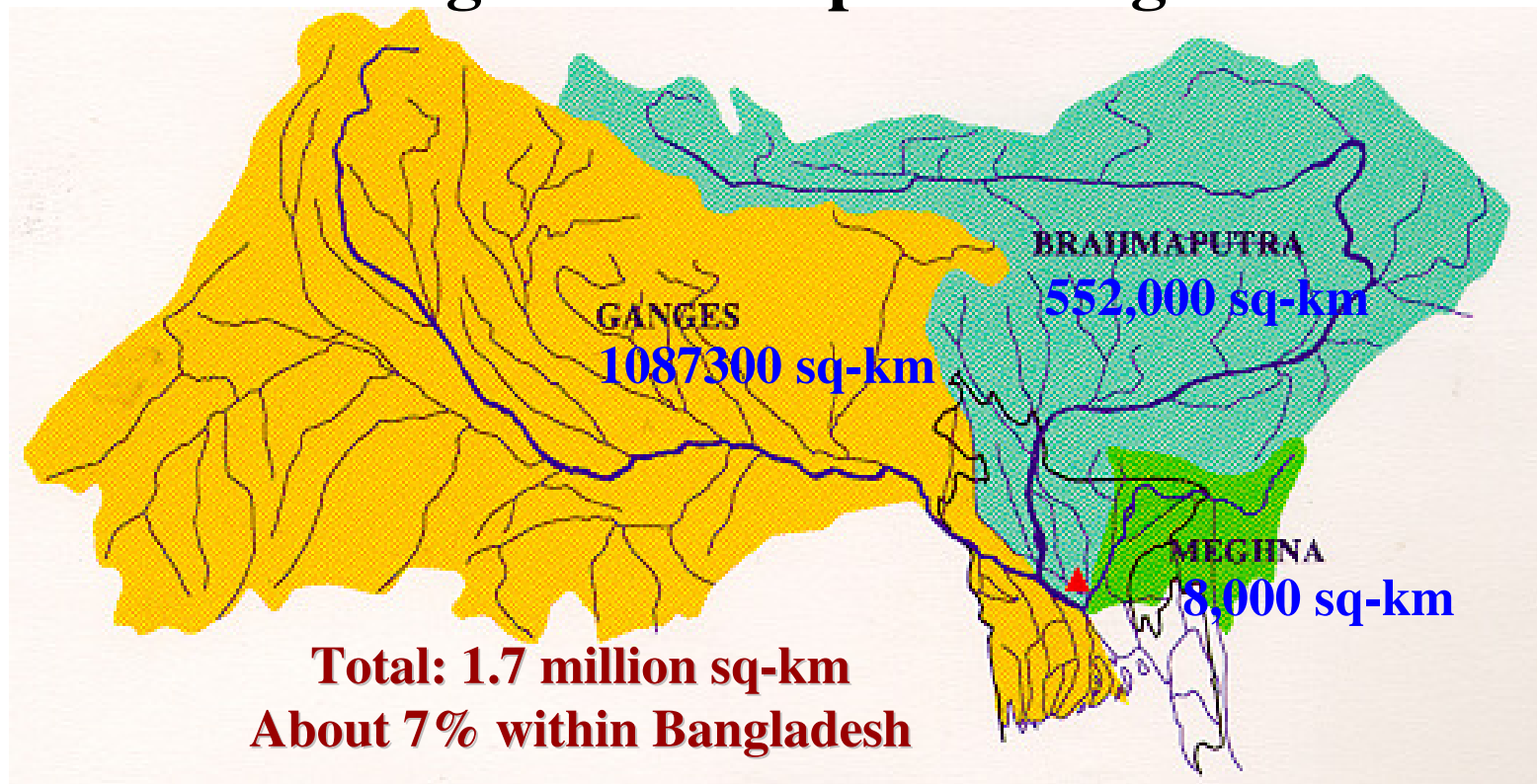
- Land elevation of 50% of the country is within 5 m of MSL
- About 68% of the country is vulnerable to flood
- 20-25% of the area is inundated during normal flood



Position of Bangladesh in the world and Asia map



The Ganges-Brahmaputra-Meghna Basins



➤ Flow

- ❑ The Ganges-Padma: 1,000 ~ 120,000 cumec
- ❑ The Brahmaputra: 2,400 ~ 102,000 cumec
- ❑ The Meghna: 500 ~ 30,000 cumec

If stored over Bangladesh Plain would have about 9.0 m of standing water depth

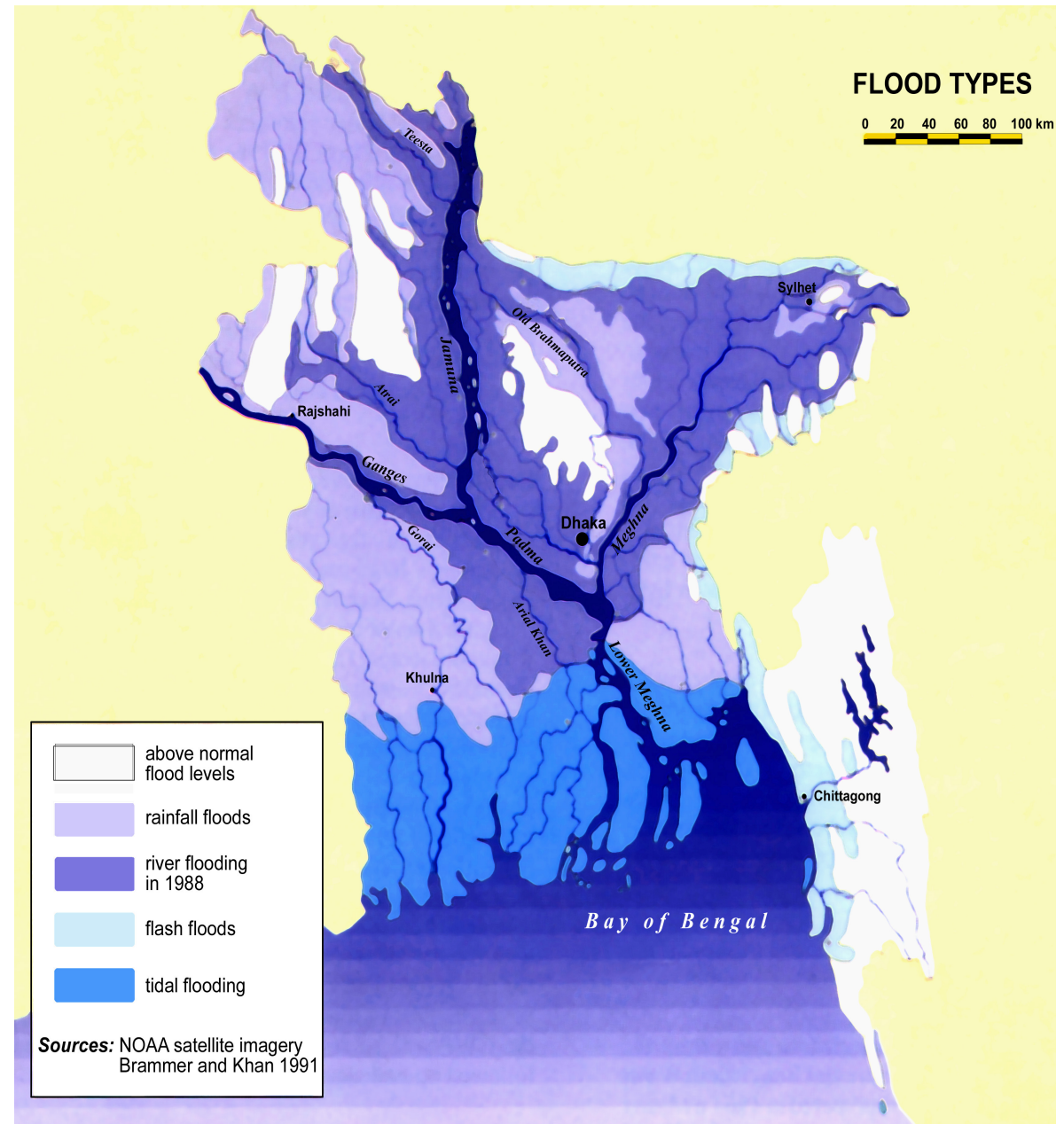
➤ Annual Sediment Transport

- ❑ The Ganges-Padma: 886 Mtons
- ❑ The Brahmaputra: 600 Mtons
- ❑ The Meghna: 1 Mtons

If stored over Bangladesh flood plain would have about 1.6 cm thick sedimentation

Types of flood

- 1 River Flood
- 2 Flash Flood
- 3 Rain-fed Flood
- 4 Tidal Flood due to Storm Surges



Flood types in Bangladesh

Observational Facilities of BMD

- ◆ **35 First Class Surface Observatories**
- ◆ **10 Pilot Balloon Observatories**
- ◆ **3 Rawinsonde Observatories (One is in functional and instrument of another one is going to be replaced)**
- ◆ **12 Agromet Observatories**
- ◆ **4 Radar Stations at Dhaka, Rangpur, Cox's Bazar and Khepupara**
- ◆ **Satellite Ground Receiving Station of GMS, NOAA and INSAT**
- ◆ **World Area Forecasts Charts (WAFS) from the World Area Forecasting Center, Bracknell London.**
- ◆ **Receiving System of Satellite Distribution (SADIS)**
- ◆ **Two high-gust anemometers in operation over the country.**

Present Status of Bangladesh Meteorological Department

Data Collection Status

Bangladesh Meteorological Department (BMD) is the only authorized Government Organization to-

- * Record,**
- * Collect and**
- * Preserve**

The meteorological and seismological data of Bangladesh

BMD prepares various astronomical data of Bangladesh on the basis of

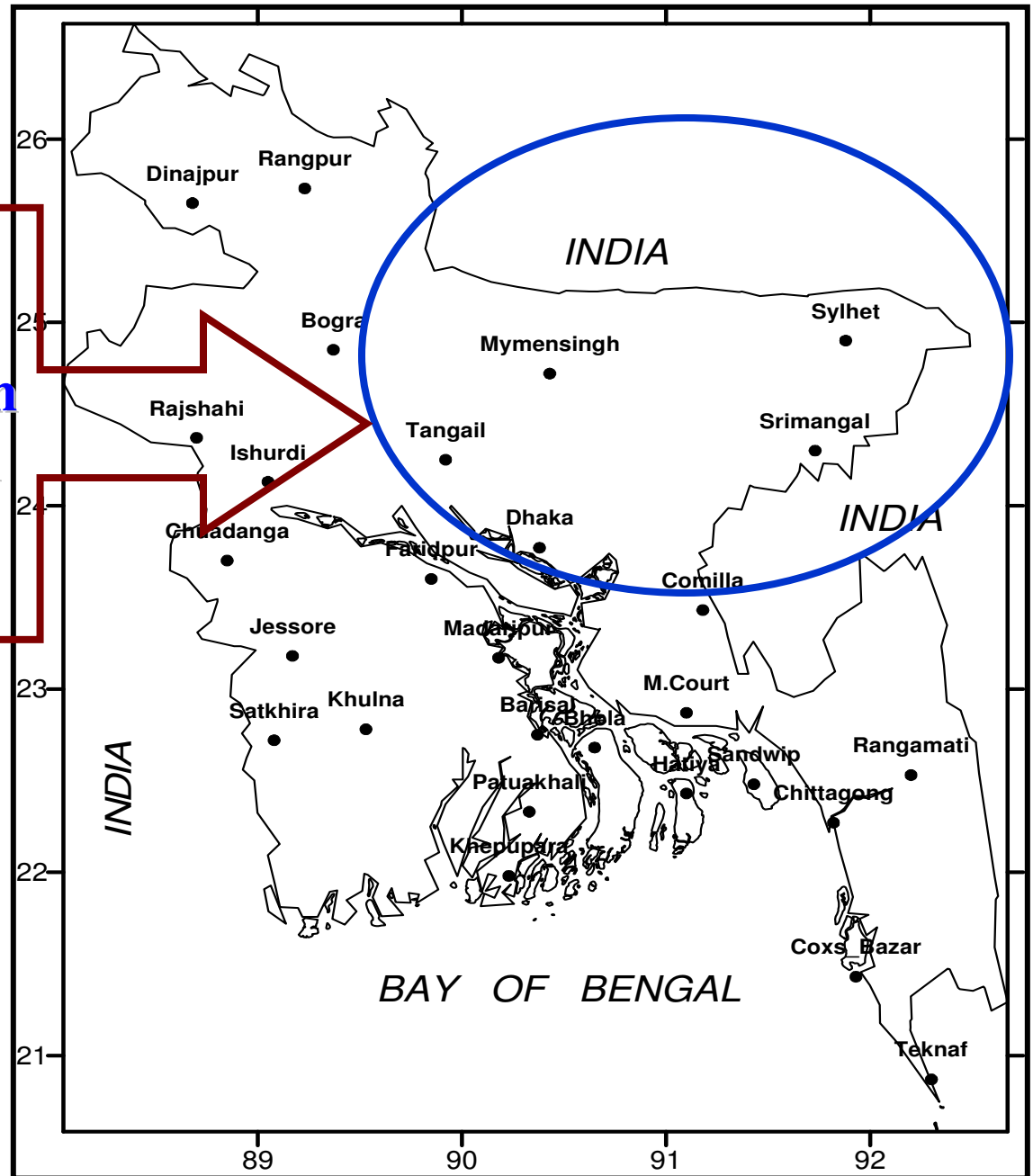
- * Indian Ephemeris**
- * British-American Astronomical data.**

BMD is Recording and Collecting the following data:

- * 3-hourly synoptic data**
- * 6-hourly Pilot Balloon data**
- * 12-hourly Agromet data**
- * Daily Rawinsonde data and**
- * Digitized Seismological data at the time of occurrence of the Earthquakes.**

Location of 35 Meteorological Observatories

Meteorological Stations
are sparse but 10 data
loggers for precipitation
measurement have been
installed in Sylhet
by Prof. Hyashi



Surface Observations

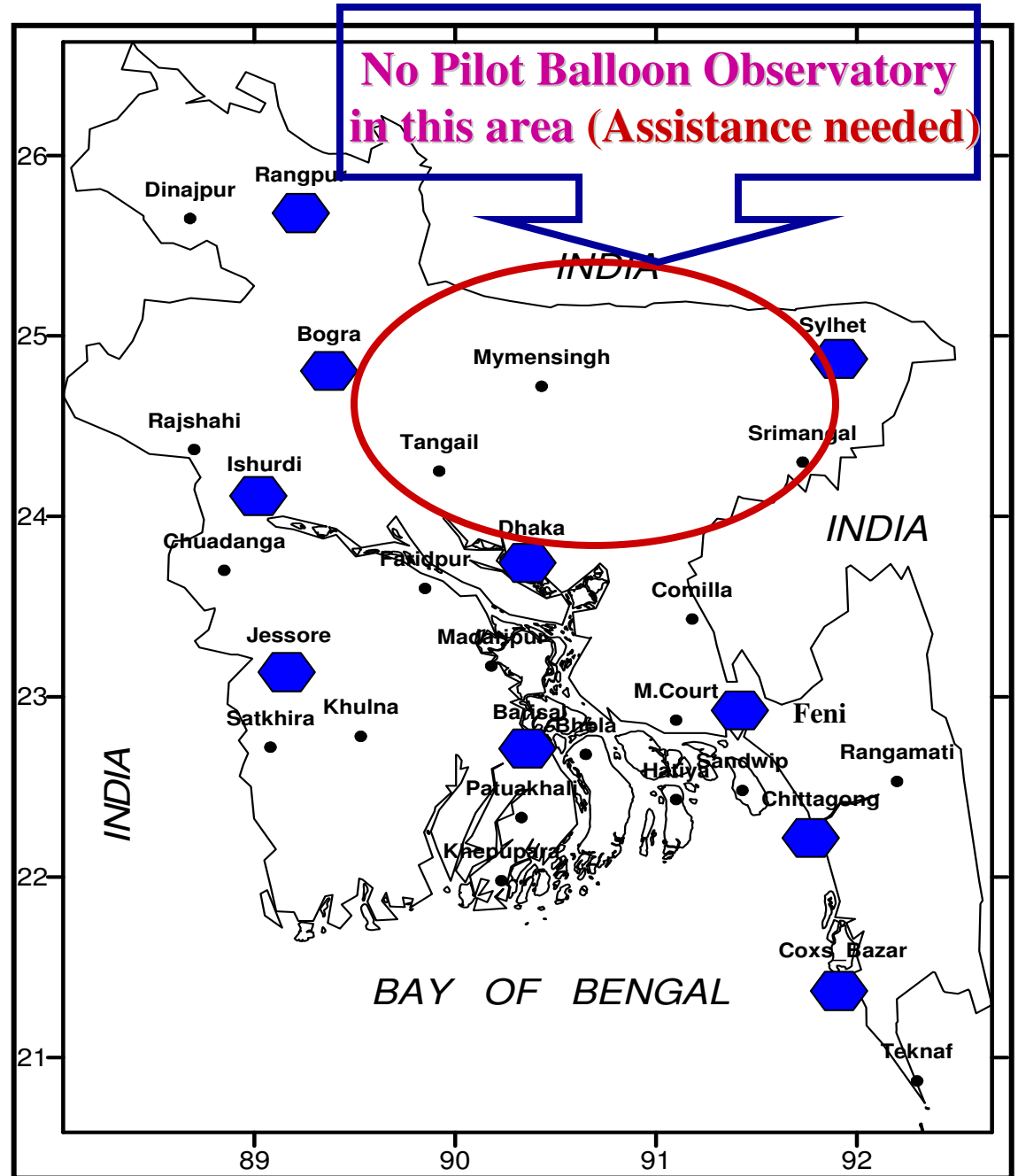
Observations of the following parameters are made by BMD from its surface observatories:

- 1. Rainfall**
- 2. Relative Humidity**
- 3. Temperature**
- 4. Wind Speed & Direction**
- 5. Sun-shine Hours**
- 6. Pressure**
- 7. Cloud Type, Amount & Height of the Base**
- 8. Horizontal Visibility**
- 9. Past & Present weather situation**

OBSERVATORIES OF BMD

● LOCATION OF FIRST CLASS OBSY.

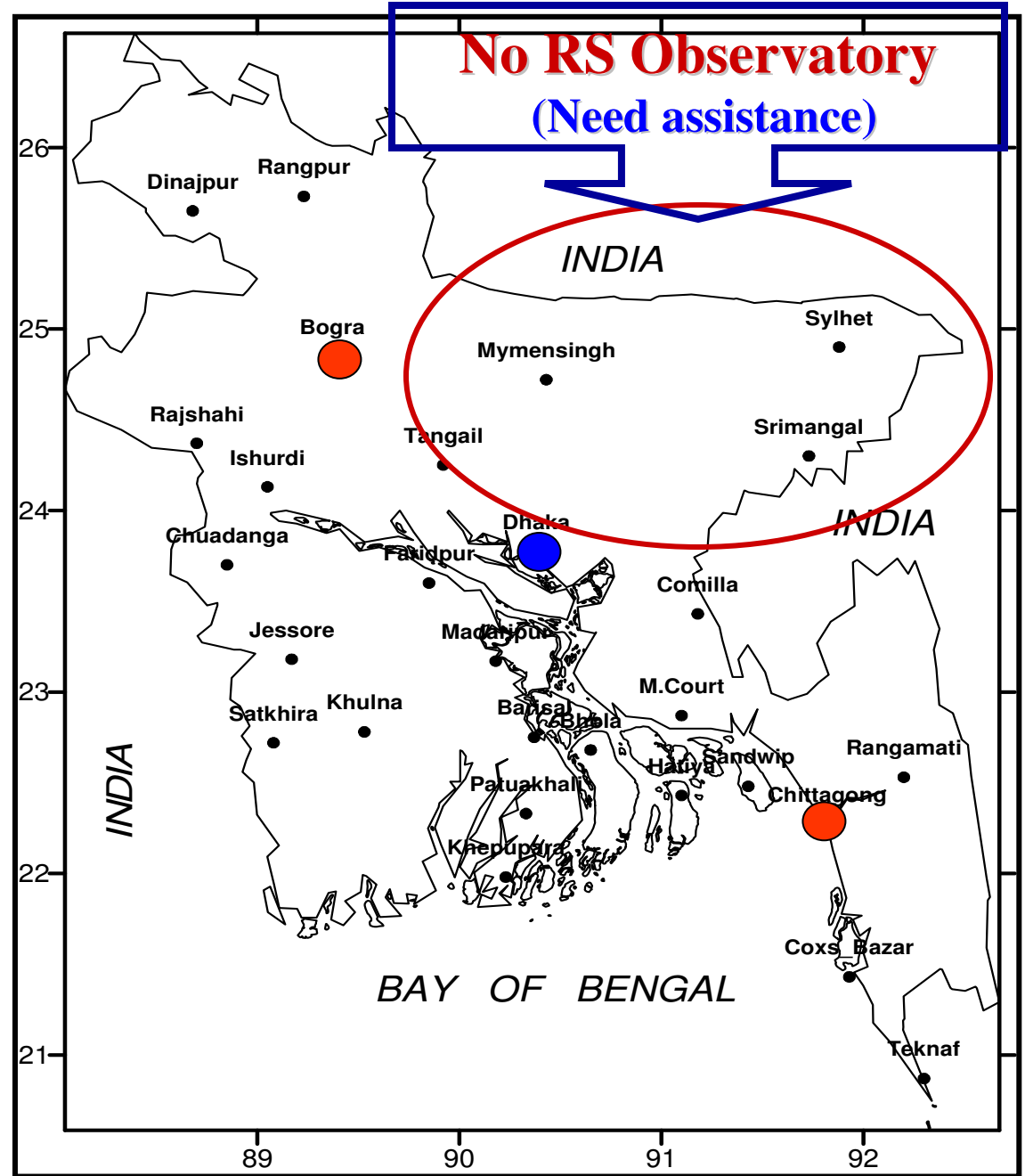
⬡ LOCATION OF FIRST CLASS OBSY + PBO



**LOCATION OF
RAWINSONDE
OBSERVATORIES OF
BMD**

LEGEND

- OPERATIONAL STATION**
- NON-OPERATIONAL STATIONS**



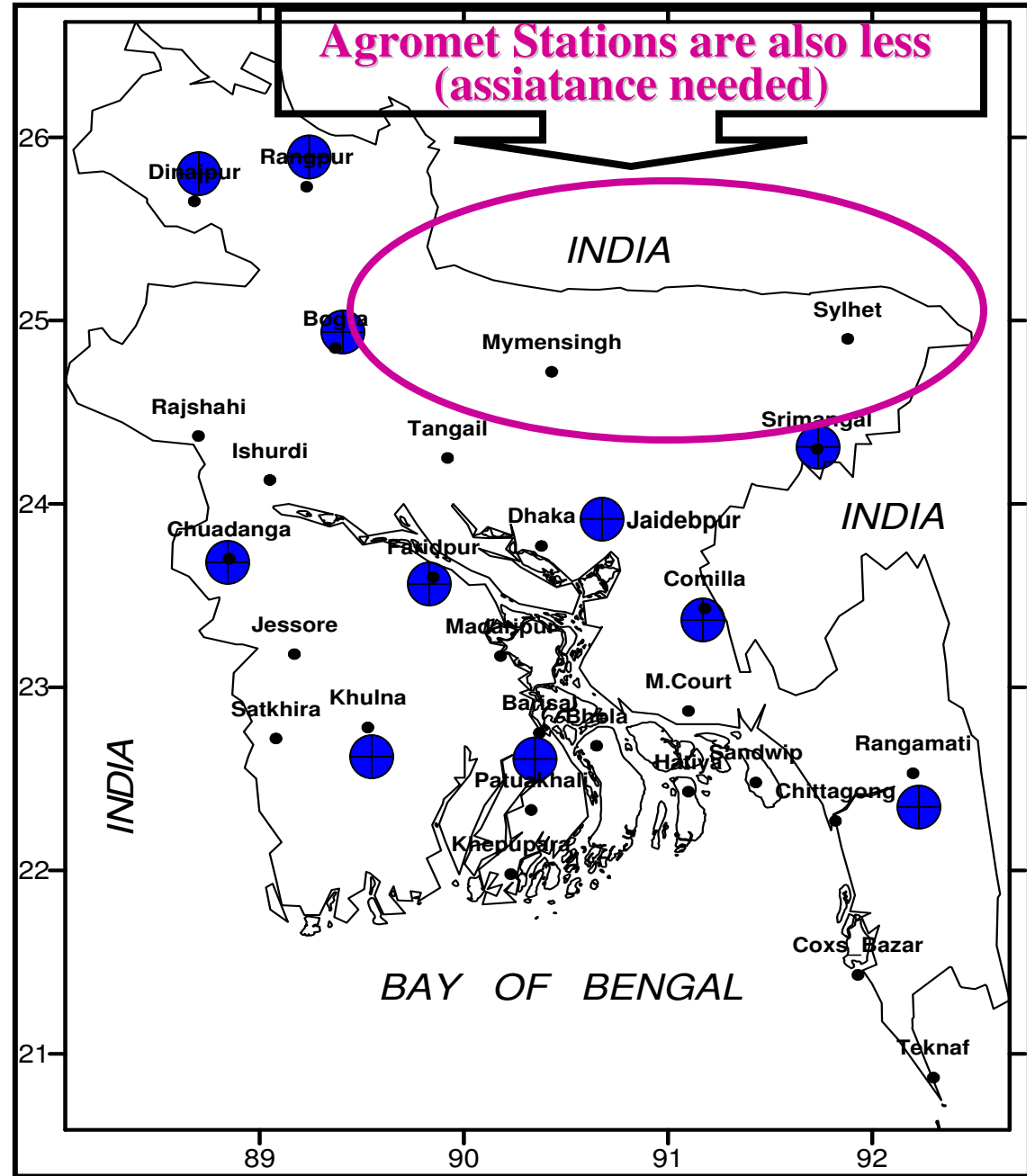
Upper Air Observations

Upper air observations of the following parameters are made from the Pilot Balloon Observatories (PBO) and Rawin Sonde (RS) observatory:

1. Upper Wind speed and Direction at different Standard Heights
2. Geo-potential height
3. Atmospheric Temperature at different Standard heights
4. Dew point Temperature at different Standard heights
5. Wind Speed and Direction at Standard Pressure Levels.

**LOCATION OF
AGROMETEOROLOGICAL
OBSERVATORIES OF BMD**

 **11 OPERATIONAL
AGROMETEOROLOGICAL
STATION**



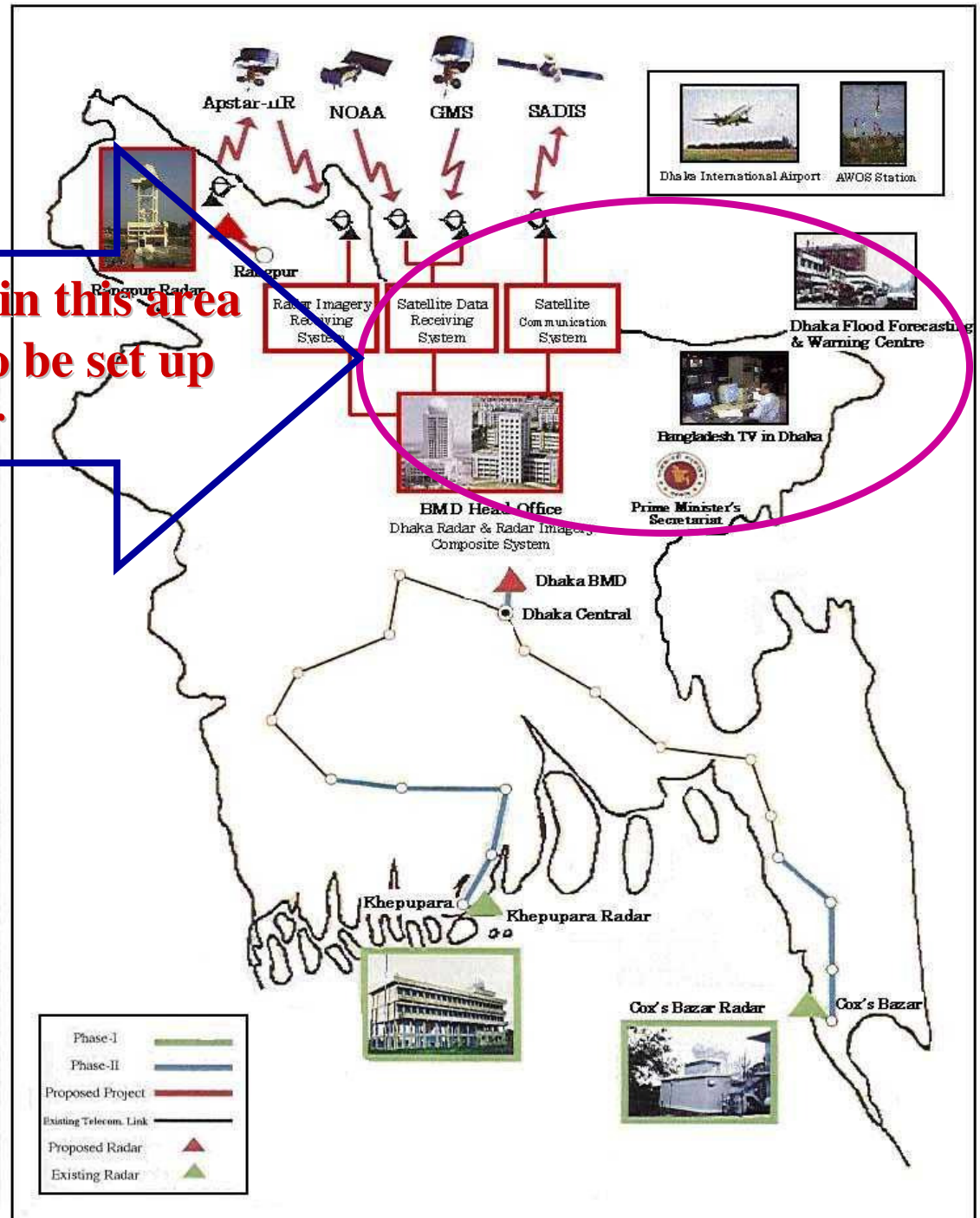
Agro-meteorological Observations

The following parameters are measured by the Agro-meteorological Observatories:

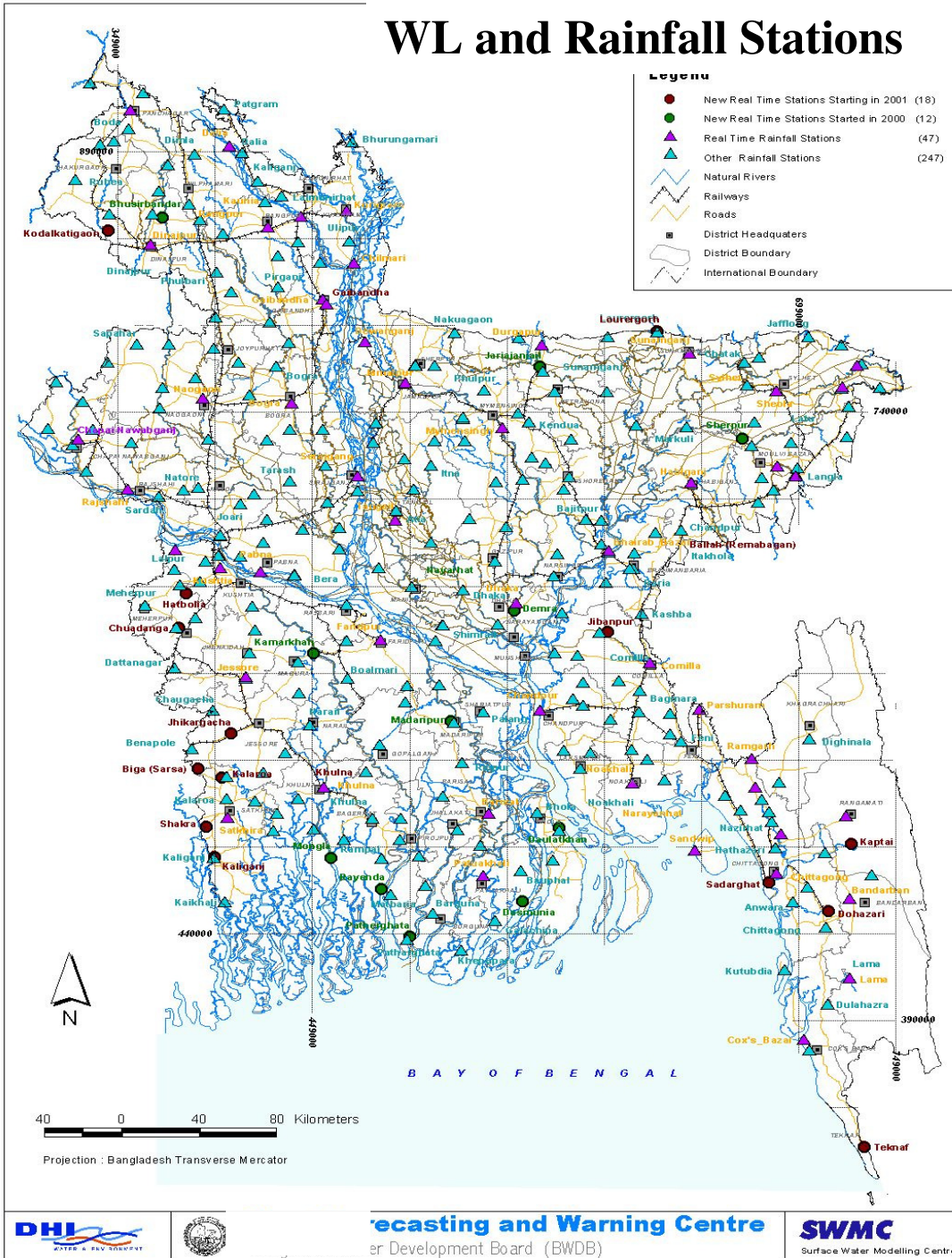
- 1. Soil Moisture**
- 2. Soil Temperature (at 5, 10, 20, 30, 50 cm depths)**
- 3. Evaporation**
- 4. Solar Radiation-**
 - a) Pyranograph**
 - b) Eppley Pyranograph**
- 7. Evapotranspiration**
- 8. Bright Sun-shine hours**

**No RADAR Station located in this area
but one RADAR is going to be set up
at Moulavi Bazar**

**LOCATION
OF RADAR
STATION,
MICROWAVE
& VSAT LINK**



WL and Rainfall Stations



- **FFWC Flood monitoring Stations: 85**
- **Real Time Flood Forecasting Stations: 46**
- **Real Time Data Collection:**
 - ✓ **WL : 85**
 - ✓ **Rainfall : 51**

Tools used in Forecasting of weather

- ❖ Analyzed charts of surface and upper air observations**
- ❖ Model products of ECMWF and NCMRWF**
- ❖ Satellite image of Meteosat, INSAT, Feng Yan etc.**
- ❖ RADAR Images**

Data Management Process in BMD

- **BMD is maintaining a database.**
- **BMD has 58 years' digitized meteorological data and 88 years' computerized Seismological data in Hard Disc, Diskettes, Magnetic Tapes and in Printed forms.**
- **For quality control, existing international standards and guidelines of WMO are strictly followed by the BMD.**
- **Data recorded by all the departments are regularly scrutinized for proper quality control.**

BMD is collecting and issuing the following data and forecast:

- **Half hourly and hourly aviation data**
- **Half hourly and hourly warnings/forecasts for aviation**
- **4-hourly and 12-hourly weather forecasts/warnings for River and Sea navigation**
- **10-days agro-meteorological forecasts**
- **One month's long range weather forecasts**

Users of BMD database

BMD's processed and preserved meteorological, seismological and astronomical data are regularly supplied as per the requests of-

- **various national and internationally funded research projects**
- **educational institutions**
- **agricultural agencies**
- **irrigational organizations**
- **construction companies**
- **industries, insurance agencies**
- **shipping companies**
- **national and international airlines and**
- **Non-governmental organizations.**

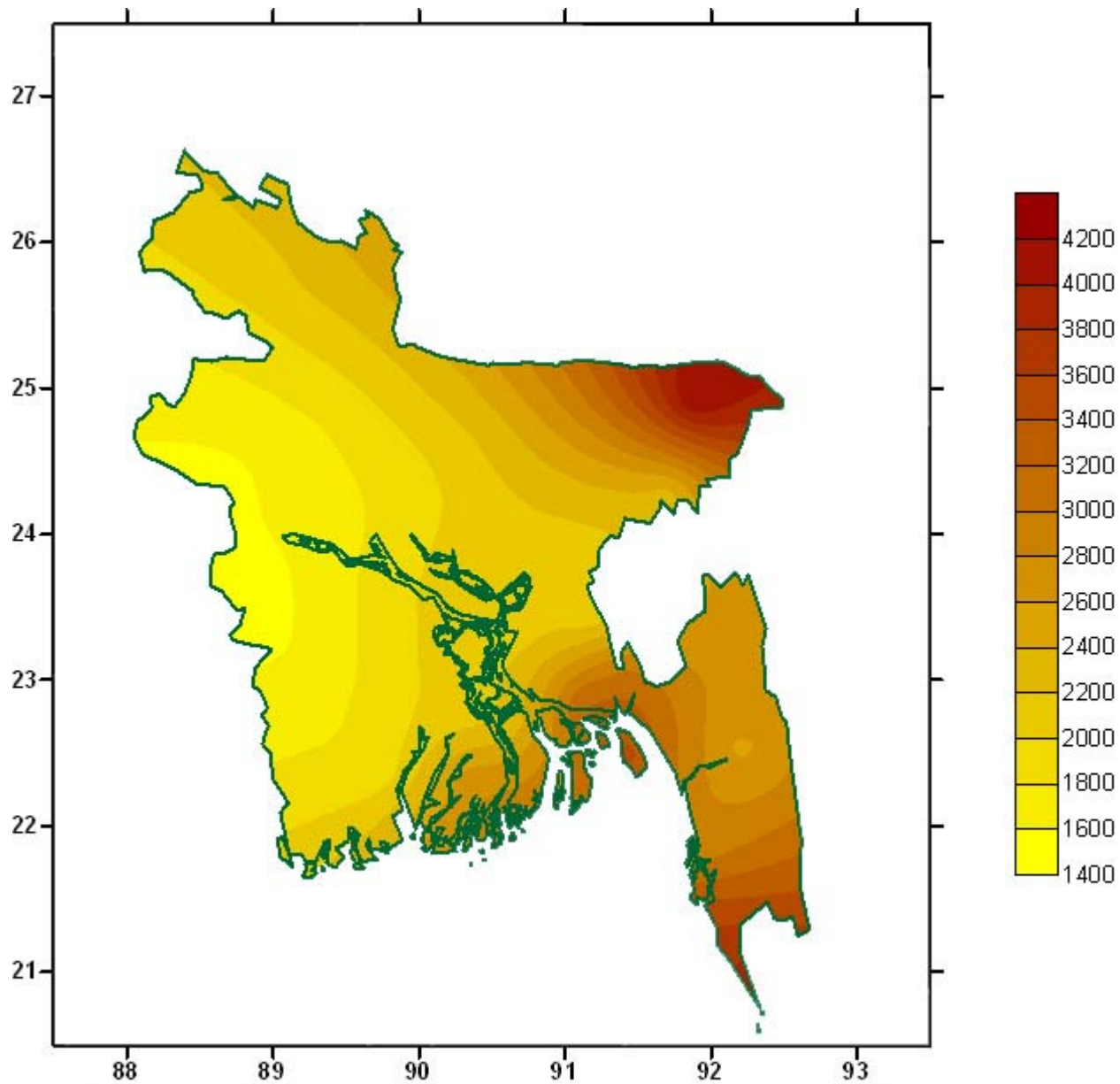
These data are supplied in exchange of government approved fee of BDT. 2000/= per parameter for all the stations of all the available years.

Problems of Observations in the North and Northeastern part of Bangladesh

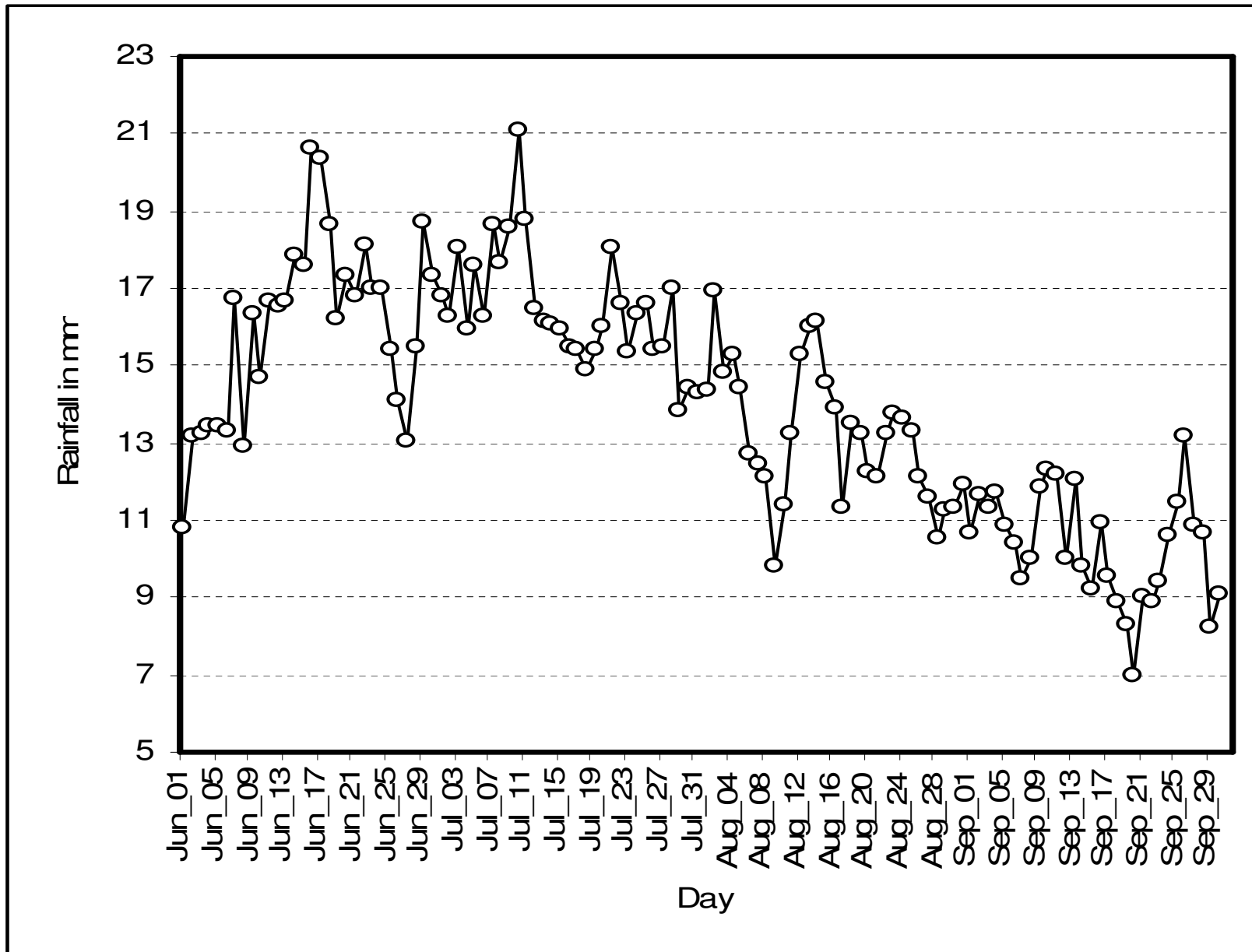
- 1. Observation facilities are scanty.**
- 2. Rawinsonde Observatories are not sufficient.**
- 3. Data Reception from the upper catchment area of Bangladesh are meager.**
- 4. Observational data and information are not available on real time basis most of the time.**
- 5. It is difficult to issue forecast of heavy rainfall and flash floods of Bangladesh with sufficient lead time because of the lacking of facilities.**
- 6. No Doppler RADAR in BMD as yet.**

- 7. Existing BMD's radar systems can not provide the required precipitation data since the catchments area of the river Meghna, Ganges (partially) and Brahmaputra (partially) are unfortunately located out of range of the existing meteorological radar network.**
- 8. Satellites have the coverage and options for frequent observation of catchments area of Meghna, Ganges and Brahmaputra.**
- 9. Satellites data can be used partially in real time basis for monitoring rainfall/Heavy rainfall and flash floods.**

**Southeastern,
Eastern and
Northeastern
area are the
Heavy
Rainfall zone
of Bangladesh**

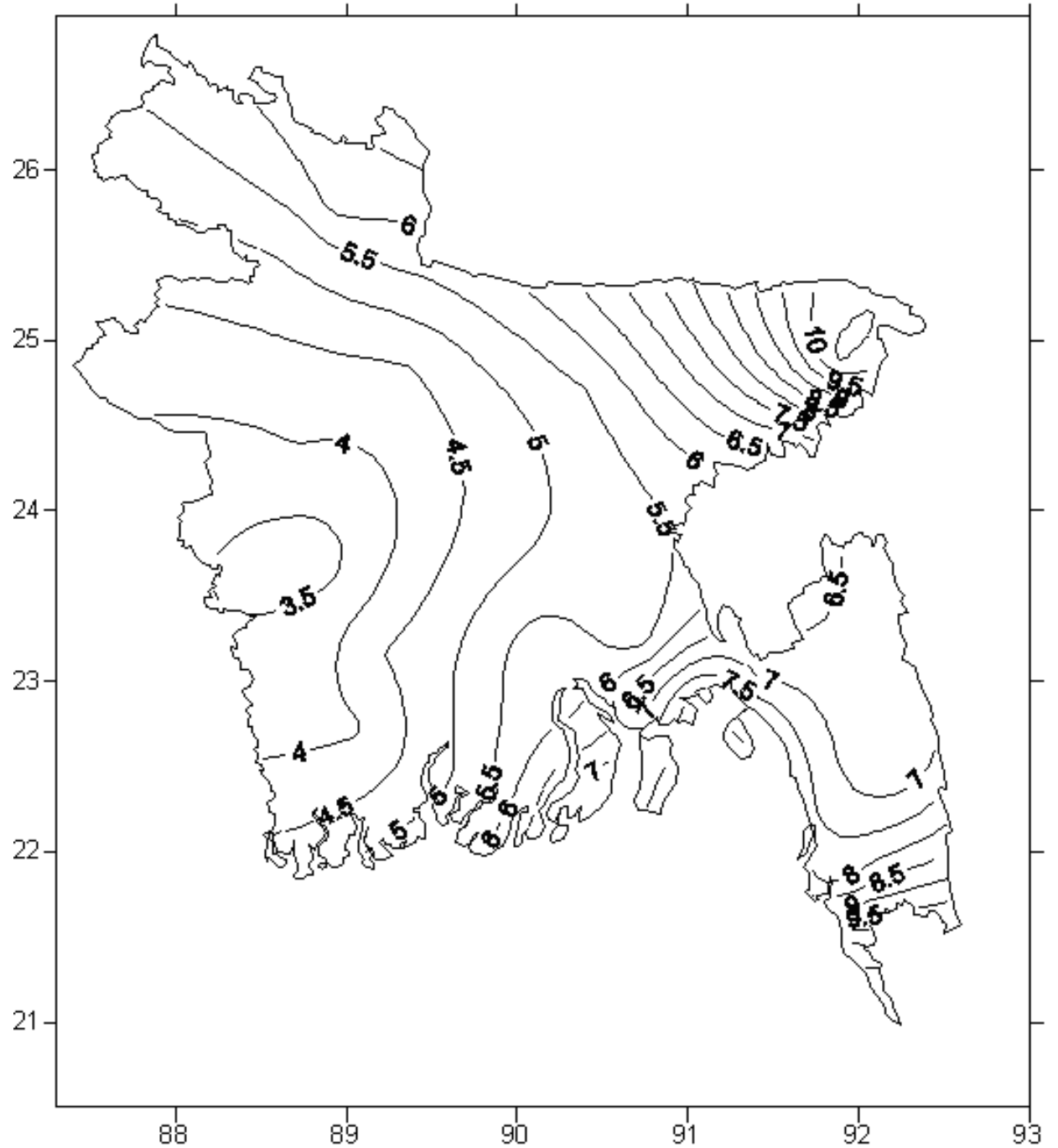


YEARLY RAINFALL (in mm) DISTRIBUTION OVER BANGLADESH

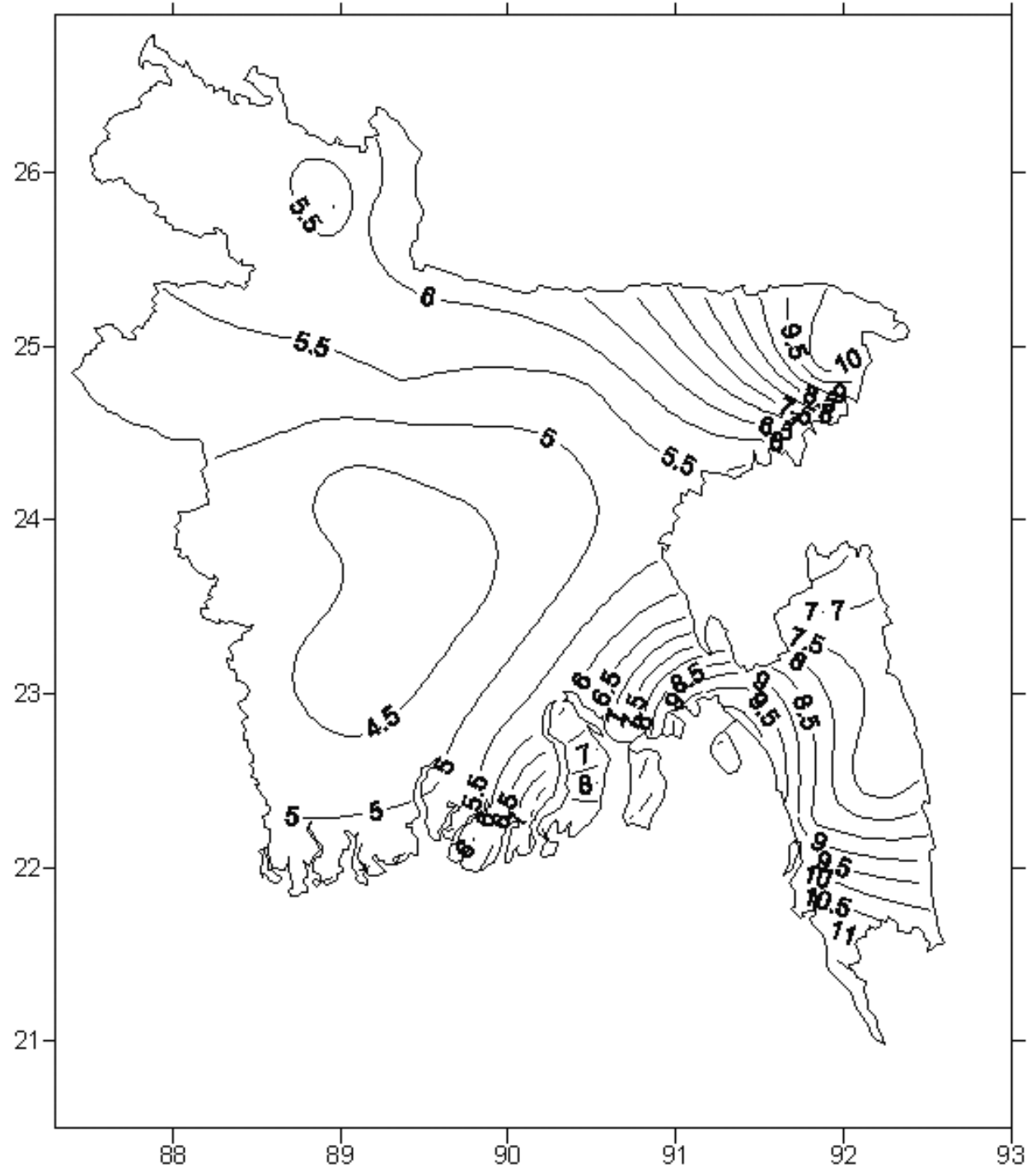


Daily average rainfall pattern of Bangladesh during monsoon season

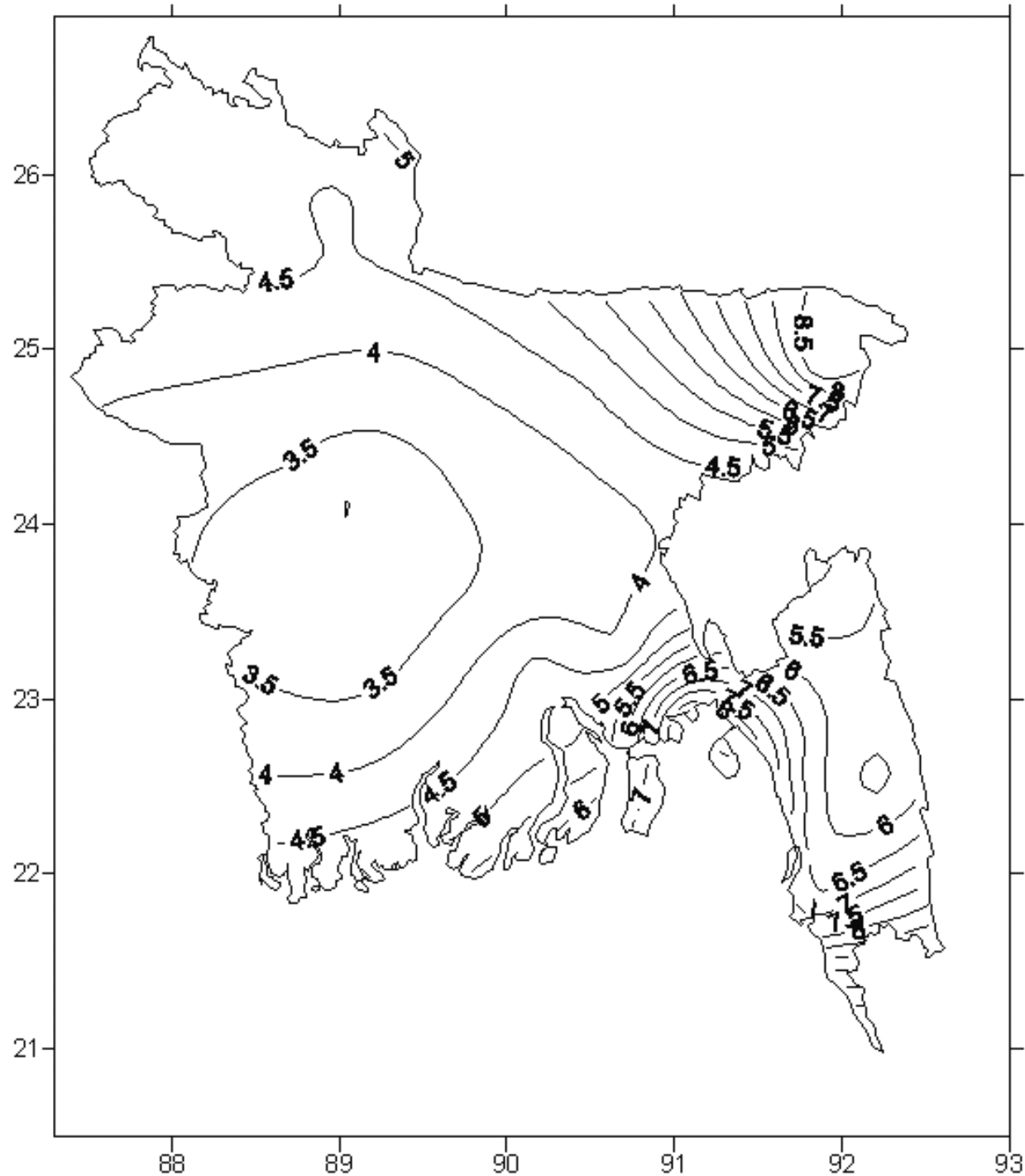
**Spatial
distribution of
frequency of
heavy rainfall in
Bangladesh in
June**



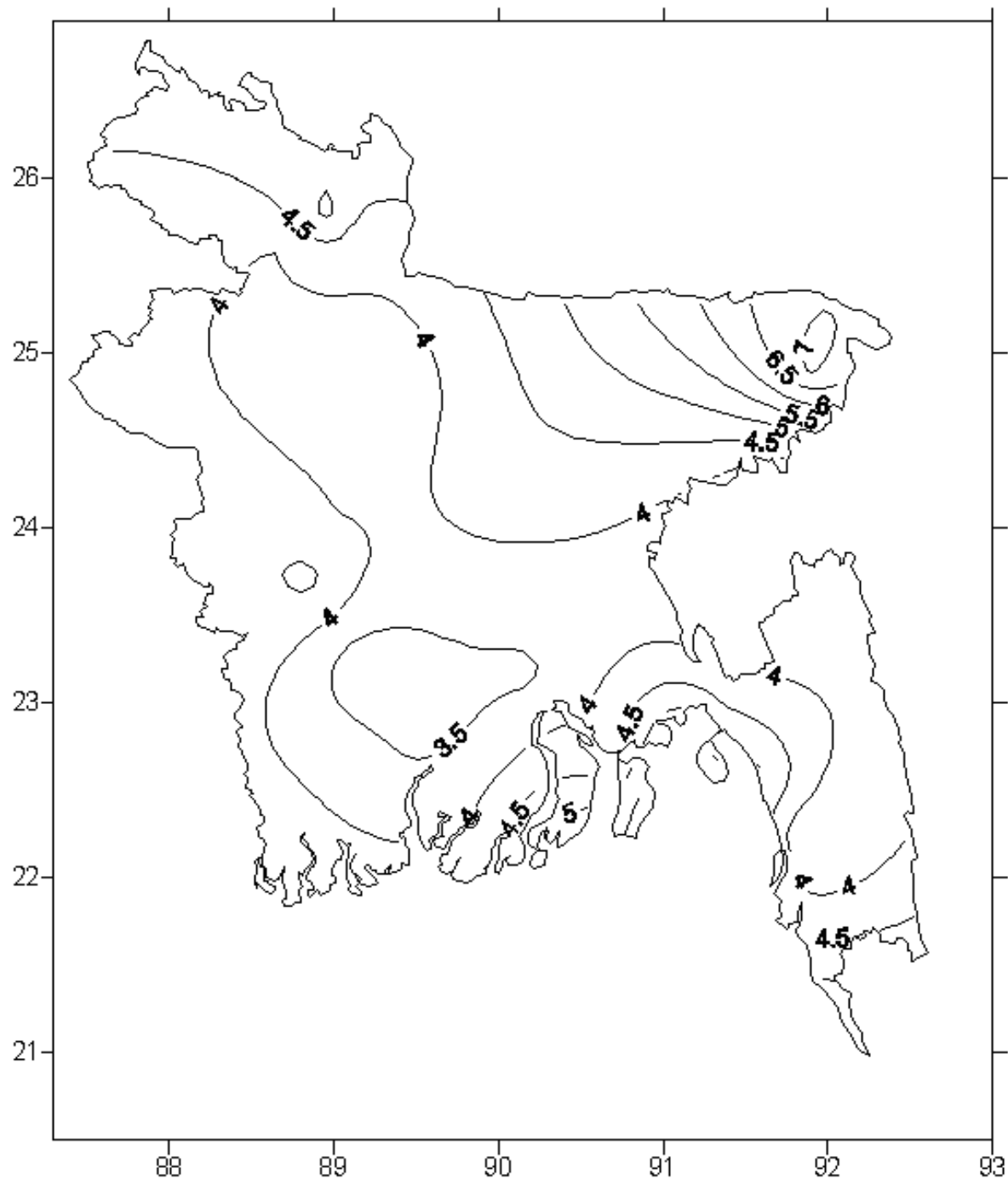
**Spatial
distribution
of frequency
of heavy
rainfall in
Bangladesh
in July**



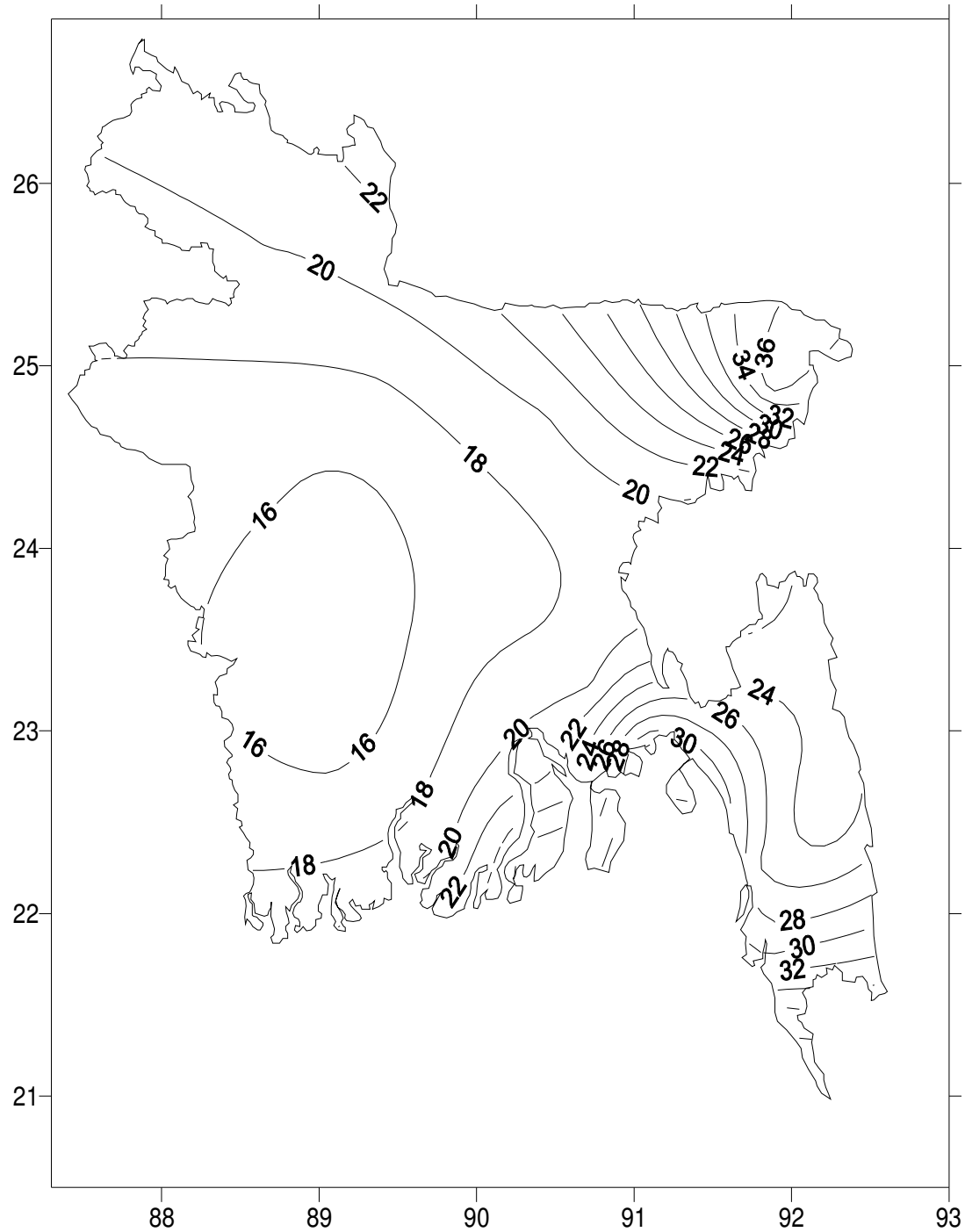
**Spatial
distribution of
frequency of
heavy rainfall
in Bangladesh
in August**



**Spatial
distribution of
frequency of
heavy rainfall in
Bangladesh in
September**



**Spatial
distribution
of frequency
of heavy
rainfall in
monsoon
season in
Bangladesh**



Objective/Strategy of the Water Cycle Initiative

- To identify and support the research initiatives of National Meteorological and Hydrological Services (NMHSs) in Asian Countries, generally including collaboration with groups in universities or research institutes, which are likely to lead to economic benefits, particularly in agriculture and water resources management.

Decision in the last Meeting:

Decision was taken in the last November, 2005 (MAHASHRI) meeting that the Japanese side was supposed to perform the following activities:

- (a) Carry out a Survey of the Meghna Basin Area.**
- (b) Give additional rain gauges.**
- (c) Up gradation of Dhaka Radar to Doppler made (if possible).**
- (d) For continuous radar observation provide Magnetron for Dhaka Radar.**
- (e) Up gradation of GMS antenna (Dhaka) to MTSAT antenna.**

Follow up action

- **In the meantime, a team of Japan under the leadership of Professor Hayashi of Kyoto University surveyed the Sylhet region i.e. the northeastern part of Bangladesh and installed 10 automatic rain measuring instruments as a follow up action.**
- **For continuous observations during monsoon season, they handed over 3 Magnetrons for Dhaka Radar.**
- **BMD's Doppler Radar Project at Moulavi Bazar is in progress.**

Data Policy to be formulated

- **Facilitating communication and cooperation among the Meteorological and Hydrological Services of the Asian Countries.**
- **Collecting, analyzing and disseminating information on the past and current Meteorological, Hydrological and other water related data.**
- **Promoting the availability of information on the socio-economic aspects of water relates issues.**
- **To promote the development of data assimilation methods for application to numerical weather and climate predictions and for the estimation of derived climatological quantities.**
- **To use the data (both real and derived) in models for flood forecasting.**

Data Policy to be formulated (continued)

- **To promote the timely exchange of information, data and new knowledge on atmospheric and water modeling through publications, workshops and meetings.**
- **Improving collection, management, exchange, access to and use of observational data and other relevant information on current and historical Meteorological and water related events, and their impacts and promoting improvement of observations including the monitoring of Meteorological and Hydrological variability.**
- **To build up awareness.**

Recommendations

- **Bangladesh needs rainfall and water level data in the upper catchments of the major rivers Meghna-Brahmaputra-Ganges to give efficient and timely forecasts of flood.**
- **Networking of the stations outside the country with BMD.**
- **To keep reasonable flow of the rivers.**
- **Capacity building of personnel of BMD and other related organizations.**
- **Free access to rainfall and water related data for all member countries.**

- **To involve BMD and SMRC in research activities related to Meteorology and water management to promote monsoon studies regionally and globally.**
- **To study tropical drought and rain-producing systems.**
- **To study interaction between tropical and mid-latitude weather systems.**
- **To enhance capacity building.**
- **Management of Water Resources.**

- **BMD should be well equipped with modern instruments and existing instruments need upgradation.**
- **Automatic observation system connected with automatic data logger should be installed in every station. This will provide continuous monitoring data, which, in turn, will facilitate in better forecasting and prediction.**

- **More initiatives for linkage between Government Organizations and Research institutions are essential.**
- **Upgradation/installation of Simulation facilities for future forecasting of Nor'westers, Flood, Cyclone, Tsunami, Heavy rainfall etc.**
- **It is suggested to broadcast the weather forecasting frequently on radio in the coastal areas.**

THANK YOU