INDIA METEOROLOGICAL DEPARTMENT

ASIAN WATER CYCLE SYMPOSIUM

9 SEPT 2007

DR.SURINDER KAUR
DIRECTOR

Proposal

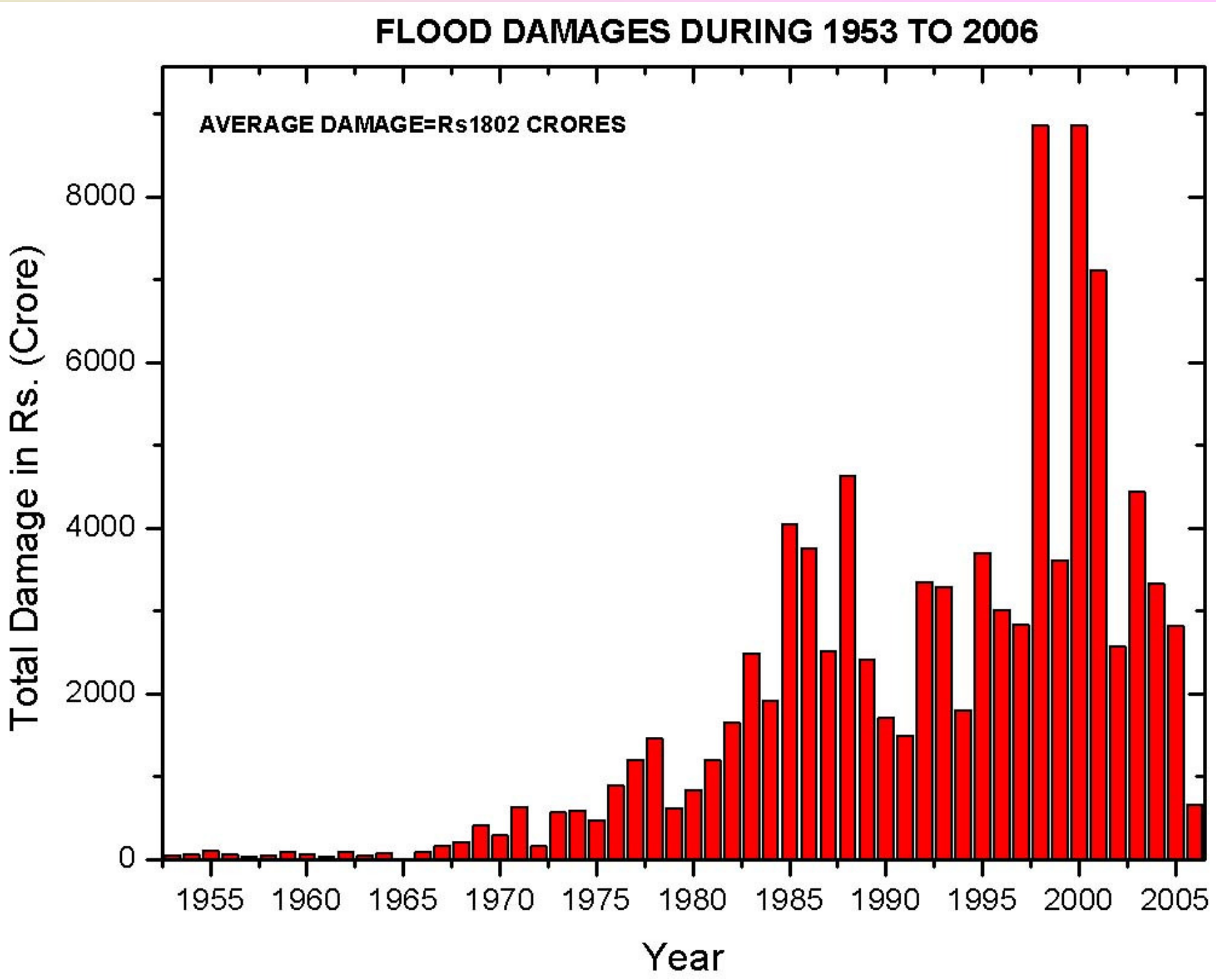
- **IMD is proposing to work on improvement in methodology of**

”Quantitative Precipitation Forecast”(QPF) for Flood Forecasting,

With following background on Flood Forecasting system in India

FLOODS in INDIA

- **Maximum floods Occur in S-W MONSOON season.**
- **Flood is an ANNUAL FEATURE of major rivers.**
- **It is estimated that about 400000 SQ. KM of area is FLOOD PRONE .Out of this about 25% is now FLOOD PROTECTED.**
- **On an average75000 SQ. KMS of area & 33 million population faces FLOOD WRATH every year.**

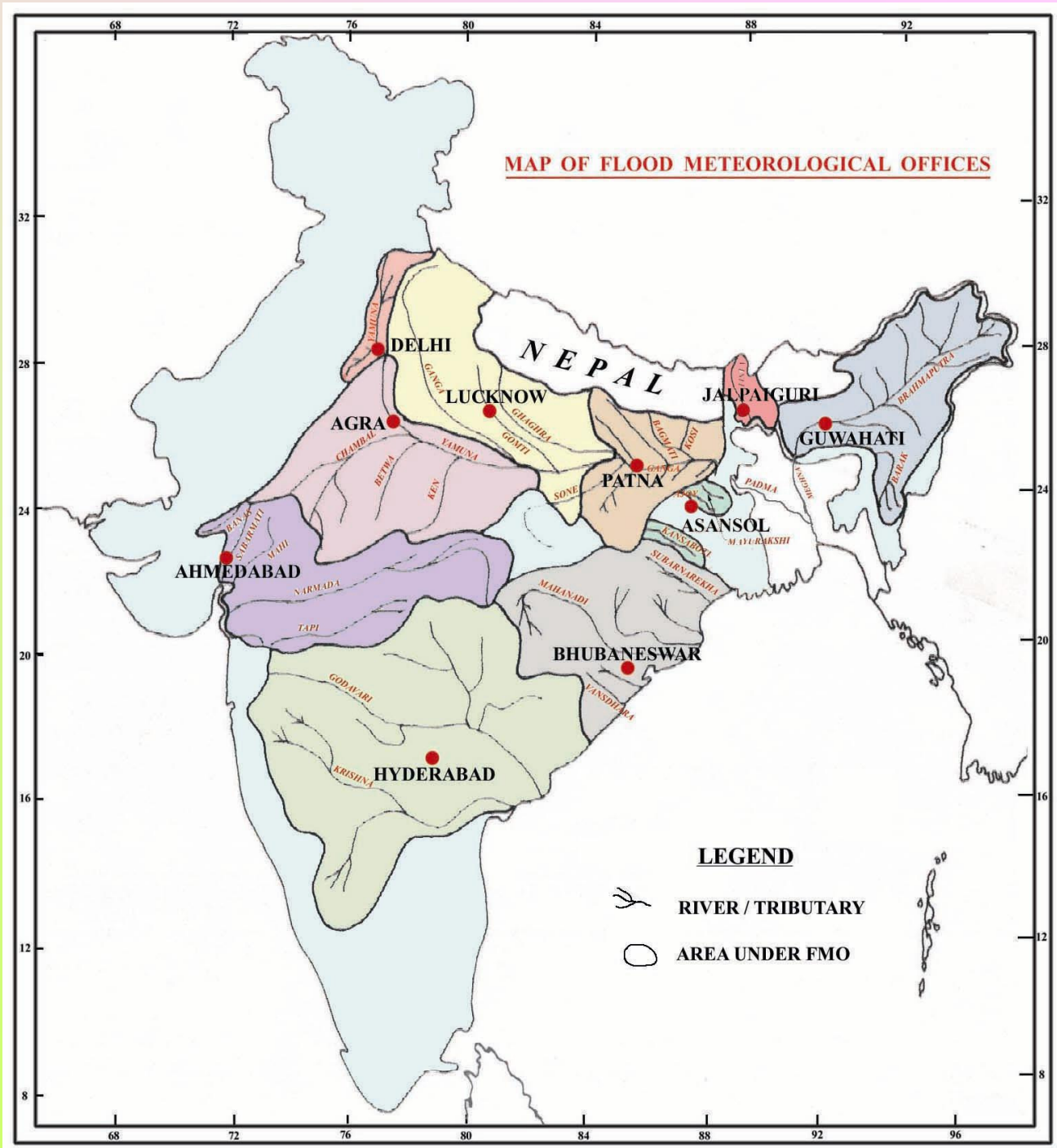

FLOOD DAMAGES DURING 1953 TO 2006
AVERAGE DAMAGE=Rs1802 CRORES
Total Damage in Rs. (Crore)
0
2000
4000
6000
8000
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year

FLOOD FORECATING IN INDIA

In India Flood Forecasting is done by

- India meteorological Department
- Central Water Commission.

IMD is providing Quantitative Precipitation Forecast (QPF) through 10 Flood Meteorological offices to Central Water Commission.


MAP OF FLOOD METEOROLOGICAL OFFICES
NEPAL
DELHI
LUCKNOW
AGRA
PATNA
JALPAIGURI
GUWAHATI
ASANSOL
AHMEDABAD
BHUBANESWAR
HYDERABAD
YAMUNA
GANGA
GHAGHRA
GOMTI
CHAMBAL
BETWA
KEN
SONE
BAGMATI
KOSI
PADMA
BRAHMAPUTRA
BARAK
MAYURAKSHI
KANSABOTI
SUBARNAREKHA
MAHANADI
BANAS
SABARMATI
MAHI
NARMADA
TAPI
GODAVARI
KRISHNA
VANSDHARA
LEGEND
RIVER / TRIBUTARY
AREA UNDER FMO

CENTRAL WATER COMMISSION IS FRAMING FLOOD WARNINGS USING QPF AND FLOOD FORCASTING MODELS

MIKE -11, TANK, NWSH, HBV, NAM,

SSARR etc

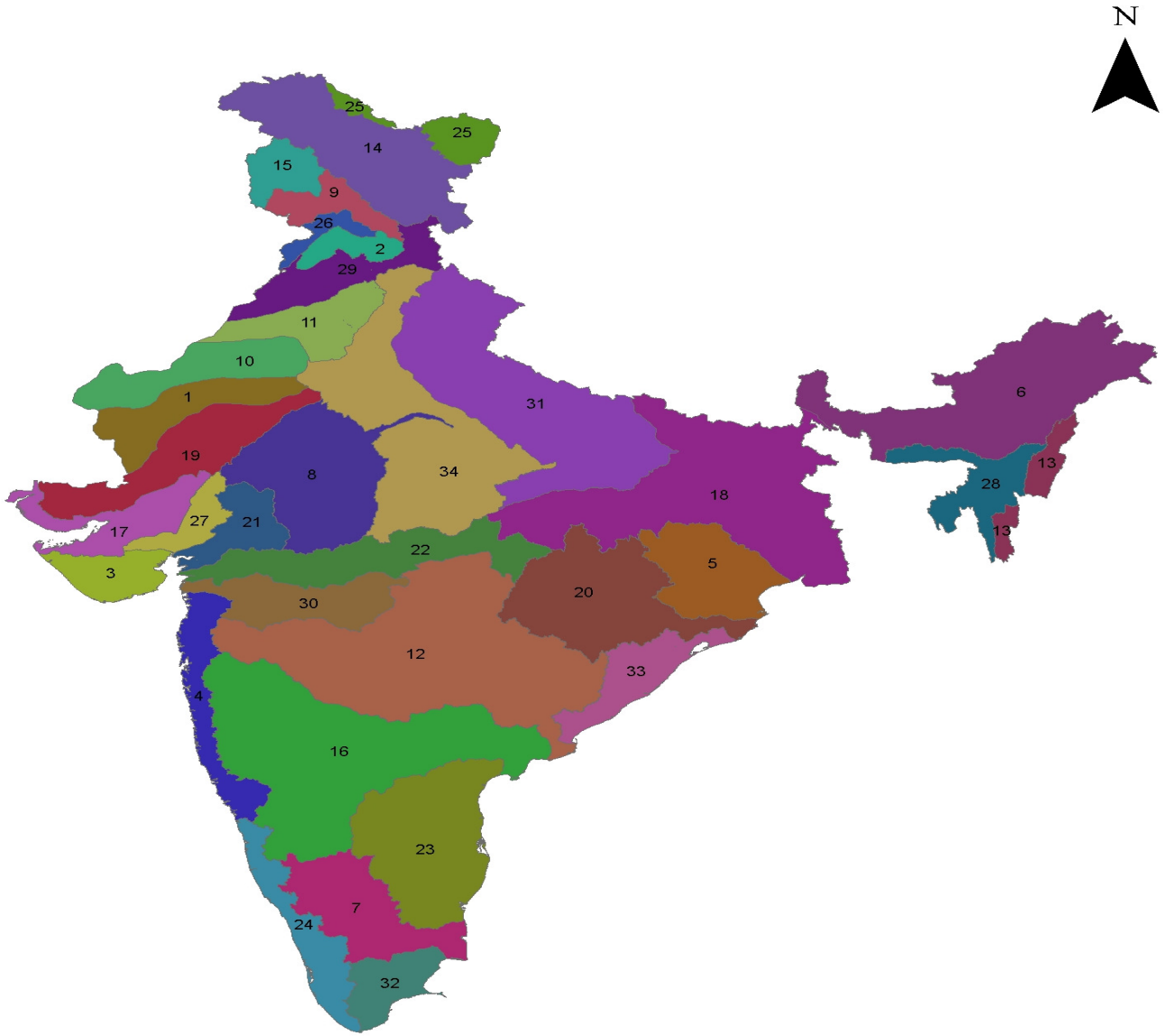
AND ISSUES SAME TO STATE GOVERNMENTS.

The flood warning is provided for 175 flood prone Sites.

DEMONSTRATION PROJECT
MAHANADI BASIN

Watershed Atlas of India

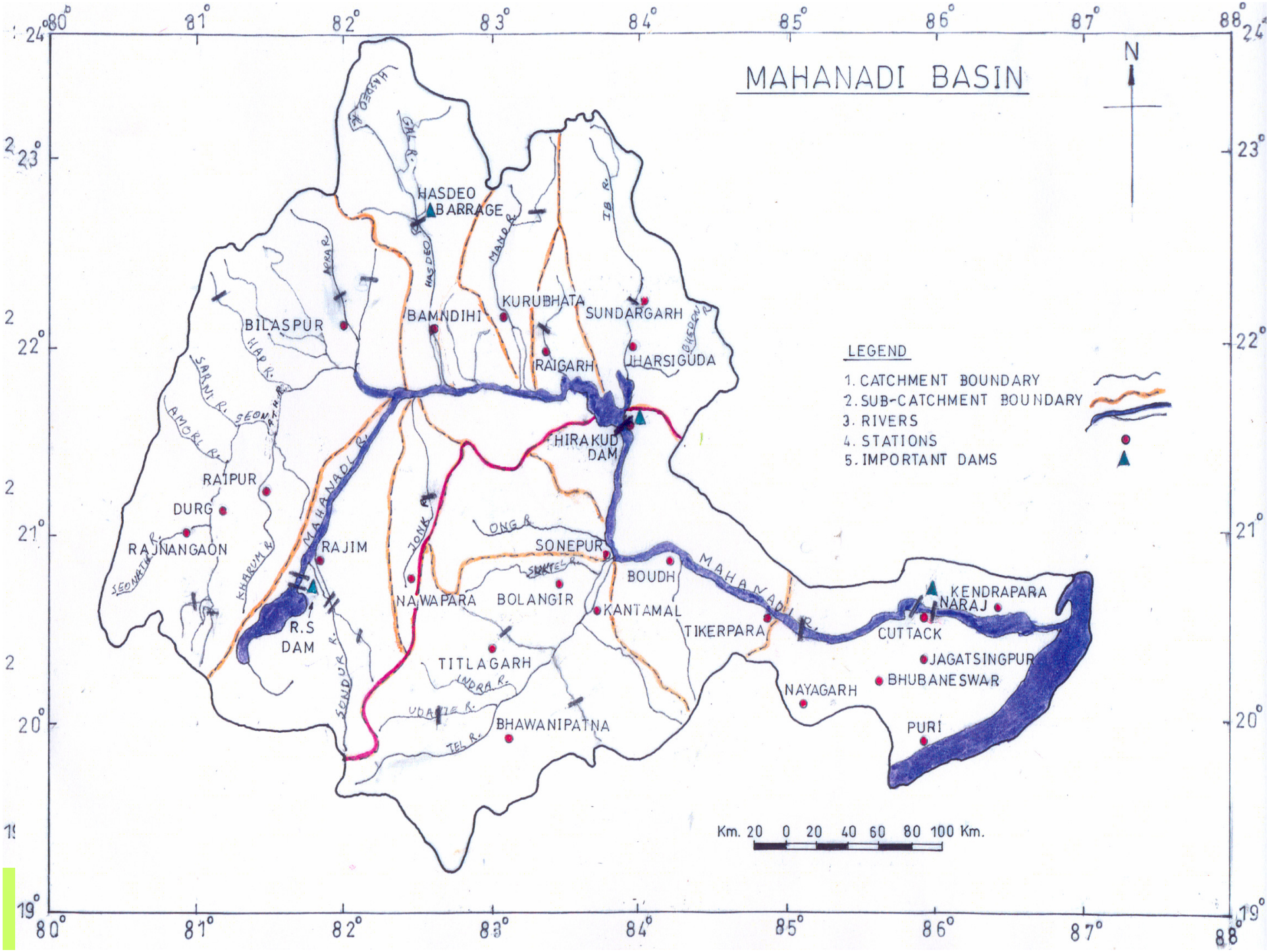
BASIN MAP



Central Ground Water Board

OBJECTIVE

ESTIMATION OF QUANTITATIVE PRECIPITATION FORECAST(QPF) SUBCATCHMENTWISE IN MAHANADI BASIN USING DYNAMICAL MODEL BY ADOPTING DOWNSCALING TECHNIQUE FROM GLOBAL TO BASIN LEVEL


MAHANADI BASIN
N
LEGEND
1. CATCHMENT BOUNDARY
2. SUB-CATCHMENT BOUNDARY
3. RIVERS
4. STATIONS
5. IMPORTANT DAMS
HASDEO BARRAGE
BILASPUR
BAMNDIHI
KURUBHATA
SUNDARGARH
RAIGARH
JHARSIGUDA
HIRAKUD DAM
RAIPUR
DURG
RAJNANGAON
RAJIM
R.S DAM
SONEPUR
BOUDH
NAWAPARA
BOLANGIR
KANTAMAL
TIKERPARA
TITLAGARH
BHAWANIPATNA
KENDRAPARA
NARAJ
CUTTACK
JAGATSINGPUR
BHUBANESWAR
NAYAGARH
PURI
MAHANADI R.
ONG R.
TEL R.
Km. 20 0 20 40 60 80 100 Km.
80° 81° 82° 83° 84° 85° 86° 87° 88°
24° 23° 22° 21° 20° 19°

DEMONSTRATION PROJECT- MAHANADI BASIN

TYPE – INTER- STATE RIVER SYSTEM
(MAINLY ORISSA & CHATISGARH)
CATCHMENT AREA – 1,41,600KM^2
UPPER MAHANADI – 83,400KM^2
LOWER MAHANADI – 58,200 KM^2
TOTAL LENGTH – 851 KM
CHATISGARH – 357 KM
ORISSA – 494 KM

MAJOR PROJECTS

- HASDEO BARRAGE
- HIRAKUD DAM
- NARAJ BARRAGE
- RAVI SHANKAR DAM

FLOOD PROBLEM IN MAHANADI

- FROM FLOOD MANAGEMENT POINT OF VIEW THE BASIN CAN BE DIVIDED IN TWO REACHES VIZ UPPER MAHANADI AND LOWER MAHANADI

- UPPER MAHANADI BASIN TERRAIN IS MOUNTAINOUS WITH STEEP TO MODERATE SLOPES

- DOES NOT HAVE SIGNIFICANT FLOOD PROBLEM

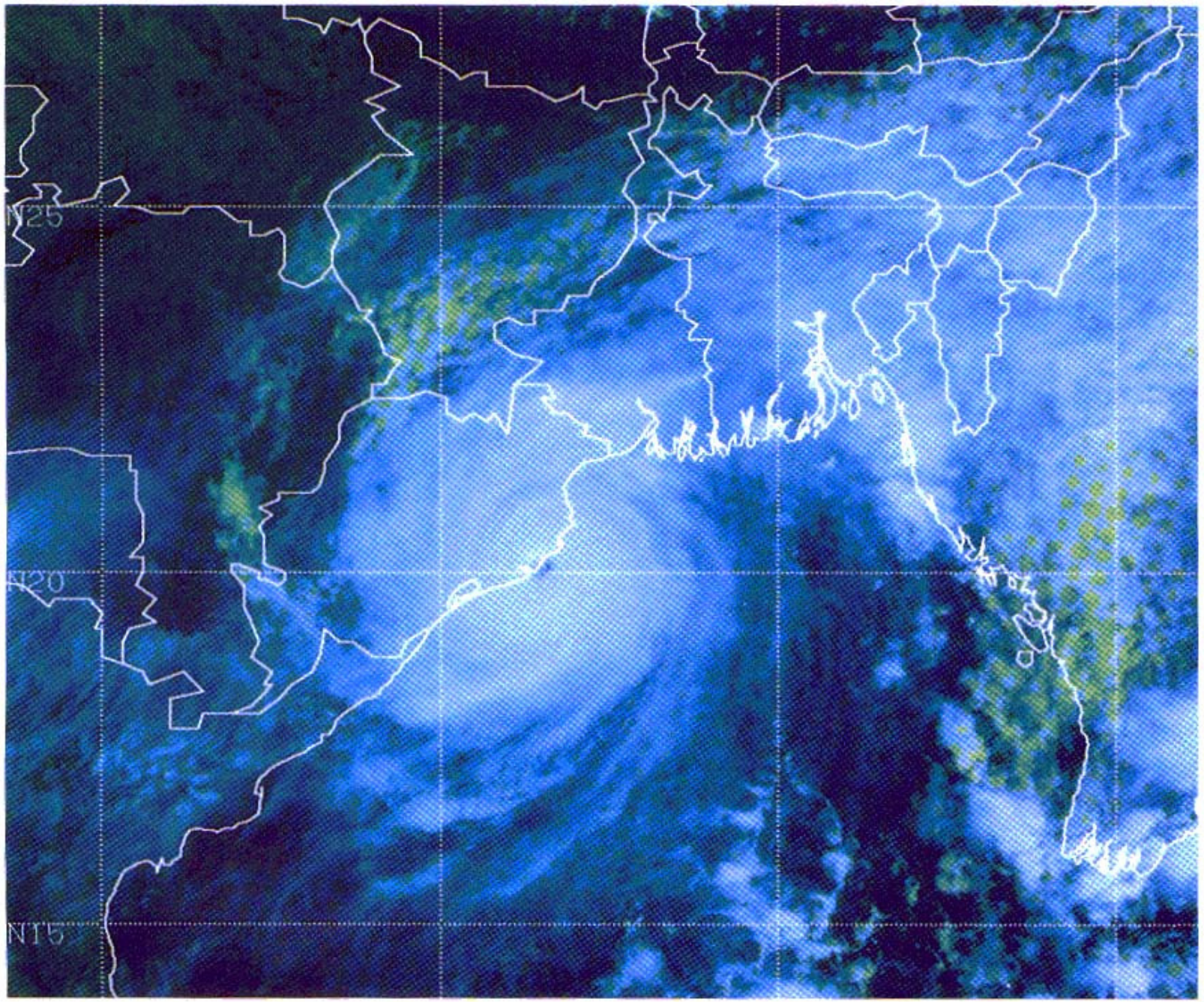
- FLOOD EMBANKMENT HAVE BEEN EFFECTIVE INTERVENTATION IN FLOOD MANAGEMENT IN UPPER MAHANADI

NECESSITY OF FLOOD FORECASTING SYSTEM

- HELPS IN OPERATING RESERVOIR FOR SAFETY OF DAM AND DELTA
- INFLOW FORECASTING TO HIRAKUD RESERVOIR
- FLOOD MANAGEMENT OF DOWNSTREAM REGION
- OPTIMAL UTILISATION OF WATER RESOURCES

SUPER CYCLONE

DURING THE LAST WEEK OF OCTOBER 1999 A CYCLONIC STORM FORMED OVER THE BAY OF BENGAL AND INTENSIFIED INTO A SUPER CYCLONE (SURFACE WIND EXCEEDING 140 KNOTS, CENTRAL PRESSURE DROPED OF 98 hPa) BEFORE CROSSING THE COAST NEAR PARADIP PORT ON 29-10-1999. THE ENTIRE AREA DEVASTED BY THE CYCLONIC STORM AND TORRENTIAL RAIN, MAXIMUM DAMAGE TO THE LIVES AND PROPERTIES WAS CAUSED BY THE STORM SURGE (MORE THAN 6 TO 8 M) AND FLOODING. SEA WATER ENTERED UP TO 35 KM FROM COAST. THE HIGHEST FLOOD WATER WAS MORE THAN 5 M ABOVE MSL AND MOST OF THE MAIN AREA SUBMURGED UNDER A WATER DEPTH OF 3-4 M. NEARLY 10,000 PEOPLE AND MORE THAN 4 LAKH LIVE-STOCK PERISHED.



Super Cyclonic Storm of 29 October 1999

NETWORK IN MAHANADI BASIN

NO OF STATIONS

CLIMATOLOGICAL OBSERVATORIES - 15

RAINGUAGE (REAL TIME) –25

GUAGE SITES(CWC) – 34

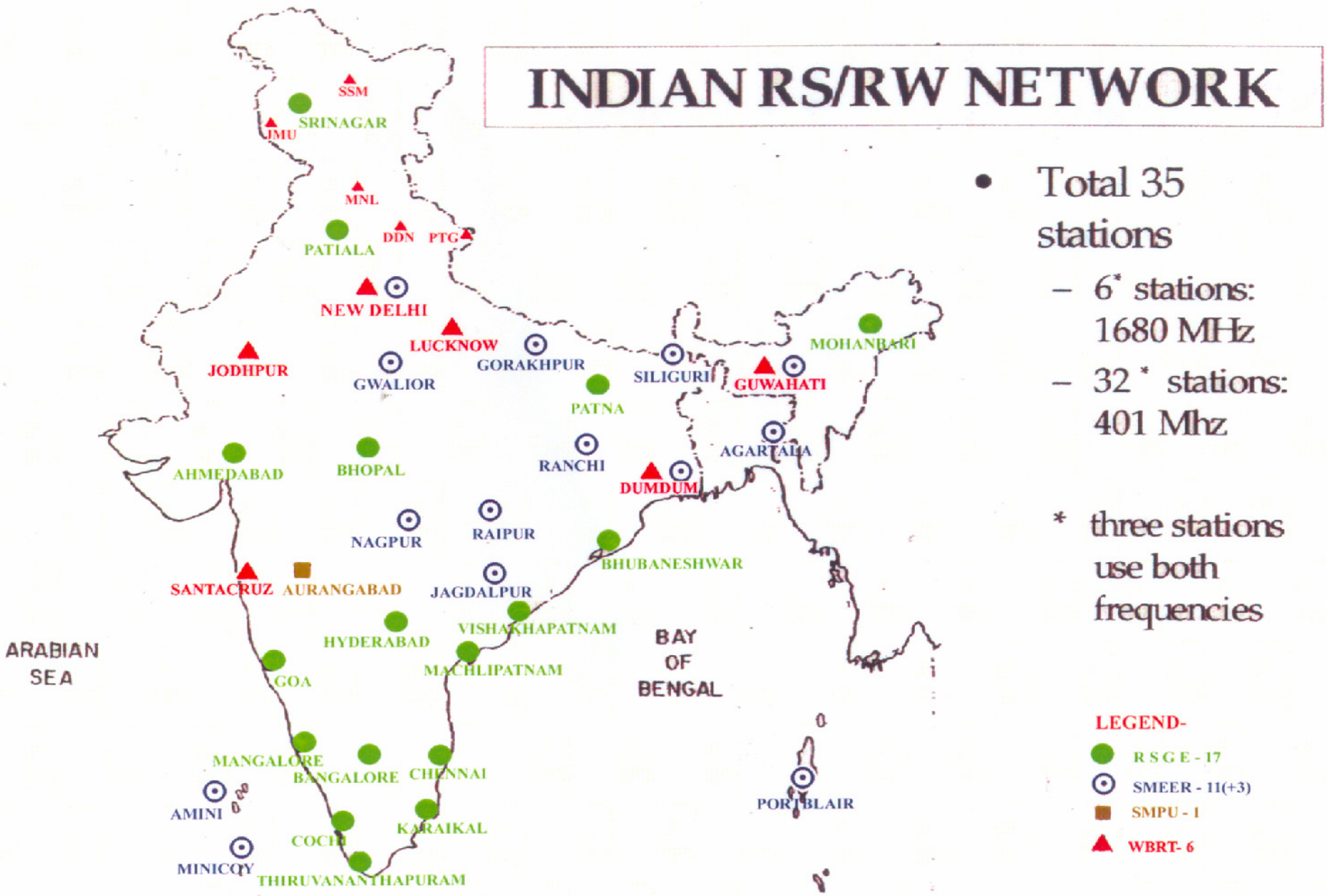
AUTOMATIC WEATHER STATIONS(AWS) _ 6

AVERAGE ANNUAL RAINFALL – 140 CM

MORE THAN 75% IS RECEIVED DURING MONSOON SEASON

IMD is exchanging surface met data of 83 stations and Upper Air Observations of 35 stations through GTS.

RS/RW OBSERVATORIES – 35 Nos.



INSAT IMAGES AVAILABLE on IMD'S WEB SITE

Satellite images Animation

FULL DISC/ SECTOR /NORTH WEST SECTOR

Visible Channel , Infra red channel,

Color Composite. Water vapor Channel

INSAT Products

- Cloud Motion Vectors (CMV)
- Low Level, Medium Level, High level
- Outgoing Long wave Radiation (OLR)
- Quantitative Precipitation estimation
- Sea Surface Temperature

TRAINING DESIRED

TRAINING TO LEARN DOWNSCALING TECHNIQE ALONGWITH SOFTWARE AND ITS APPLICATION TO FORECAST POINT/ BASINWISE QPF

DELIVERABLES

- **LOCATION SPECIFIC PRECIPITATION FORECAST FOR 24 HRS/48 HRS WITH UPDATION EVERY 6 HRS**

- **ESTIMATION OF SUBCATCHMENT WISE PRECIPITATION FORECAST FOR 24HRS/ 48 HRS WITH UPDATION EVERY 6 HRS**

SURVEY OF RESOURCES

INDIA METEOROLOGICAL DEPARTMENT

Name of organisation		**India Meteorological Department**
Contact Person	**Name:**	**Director General of Meteorology**
	Address:	**India Meteorological Department, Mausam Bhawan, Lodhi Road,New Delhi** **Pin-110003, India.**
	Email:	
	Telephone	**011-24611842**

Spatial Data	No.	Type of data	Data Coverage (ex., global, Asia, or lat-long range)	Data Dissemination policy (open, restricted, etc)	Data dissemination mode (web, ftp, CD, etc.,)	Reference (http://)
Remote sensing images						
	1.	Satellite	Full disc/Asia	Open	Web	www.Imd.gov.in
	2.	OLR,QPE,SST	do	do	do	do
	3.	CMV,Low level,High Level	do	do	do	do
Grid (raster) Data						
	1.	Daily R/F	Indian region	Open	CD Rom	National Data centre, Shivaji nagar IMD Pune
Point Data						
No. of station-150	1.	Temprature	Indian region	Open	Web	www.imd.gov.in
	2.	RH	do	do	do	do
	3.	Precipitation, Wind				

Temporal Data							
Type of data	No.	Type of Data	Data Coverage (ex., global, Asia, or lat-long range)	Data Period	Data Dissemination policy (open, restricted, etc)	Data dissemination mode (web, ftp, CD, etc.,)	Reference (http://)
Rainfall							
	1.	ORG	Indian region	1875 onwards	Restricted, can be supplied depending on purpose	CD	www.Imd.gov.in
	2.	SRRG	do	do	do	do	
River Discharges							
	1.	River discharge data	Indian region		do	do	Hhtt//cwc.gov.
	2.	River Level data	do		do	do	
Extremes							
	1.	Annual Extreme R/F	Indian region	1901	Restricted	CD	www.Imd.gov.in
	2.	Extreme R/F	do	do	do		do

Details on Training Services training on specific topics

Topic	No.	Title of training	Duration	Operation mode (Regular, occasional)	Funding (full/partial support, self)	Brief Description (Optional)	Reference (http://)
Flood Related							
	1	Special on Hydrometeorological(Including floods)	Two weeks	Occasional	Full		
Water Quality Related							
	1						
	2						

Drought Related							
	1						
Other							
	1	**Met. (Basic,Inter medsiate, Advance) training**	**4 Months , 4 Months, 6 Months**	**Regular**	**Full**	**Syllabus approved by WMO**	**CTI, Pune http://education.vsnl.com/rmtc**
	2	**Telecom. training**	**4 Months**	**do**	**Do**		**do**
	3	**Instrumentation training**	**6 Months**	**do**	**Do**		**do**

Details on Tools, mathematical models, manuals, methodologies

Topic	No.	Flood Related	Details on Training Services training on specific topics Water Quality Related	Drought Related	Other
	1	QPF	Rain water quality is monitored through a network of 10 BAPMON stations under global atmospheric watch programme of WMO	Methodology, Manuals	
	2	Tropical weather outlook			
	3	Analysis charts and forecast charts			
Delivery		WEB based	Application software	Manuals/Reports	Other
	1	Flood	Mike-11 etc	Flood zone mapping	
	2	Draught	Meteorological draught criteria	Manuals	

Type of training		**Training WS**	**Manual/Tutorial**	**Other**	
	1	**Basic Met. Training**	**Tutorials**	**Telecommunication Training**	
	2	**Intermediate Met. Training**	**do**	**Short term Hydrometeorological Training**	
	3	**Advance Met. Training**	**do**	**Instrumentation Training**	
Brief Description (Optional)					
	1	**Foreign delegates are also imparted different fields under WMO& UNDP**			
Reference (http:)		**Hhtt://education.vsnl.com/rmtc**			

Meteorological Data Collection Network of India Meteorological Department

- **SURFACE OBSERVATORIES NETWORK**
- **Surface Observatories 559**
- **Aviation Current Weather Observatories 71**
- **High Wind Speed Recording Stations 4**
- **INSAT-based Data Collection Platforms 100**
- **Hydro meteorological Observatories**
- **Non-Departmental Raingauge Stations:-**
- **Reporting 3540**
- **Non-Reporting 5039**

- **Non-Departmental Glaciological Observatories (Nonreporting):-**

• Snow gauges	21
• Ordinary Rain gauges	10
• Seasonal Snow Poles	6
Agro meteorological Observatories	219
• Evaporation Stations	222
• Soil Moisture Recording Stations	49
• Dew-fall Recording Stations	80
• Evapo transpiration Stations	39
• Ozone Stations	6
• Radiation Stations	45

Meteorological Information Available on IMD' S Web Site (www.imd.gov.in)

- All India Daily Weather Report
- Current Weather Observations
- Main features of Today's Weather
- All India Weekly weather Report
- Weather Charts
- Cyclone page
- Climate Normal

HYDROLOGICAL DATA
Central Water Commission

- Gauge only 246
- Gauge, discharge 282
- Gauge, discharge and silt 41
- Gauge, discharge and water quality and silt 261
- Gauge, discharge and water quality 115

Out of these 945 sites, data of 286 sites is available to general public/ research institutes.

web site www.cwc.nic.in

THANK YOU