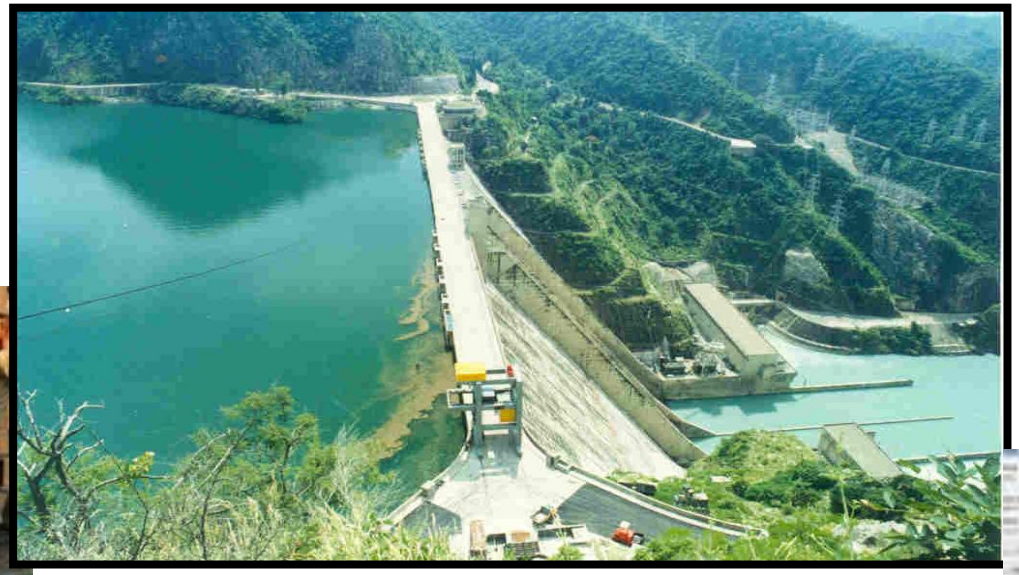
HYDROLOGY PROJECT
CRUCIAL FOR INDIA

Hydrology Project Phase – III

Approach towards Integrated Water Resources Management



Presented by:

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Ministry of Water Resources, River Development & Ganga Rejuvenation

RELIABLE, TIMELY, QUALITY, CONSISTENT, PUBLIC DATA

Project Background

- **Hydrology Project-I (HP-I) was taken up to develop Hydrological Information System (HIS) for collecting hydrological, meteorological, water quality data.**

- **HP-I was implemented during the period 1995 to 2003 for Rs. 605.28 crore (IDA credit) and Grant in aid of Euro 14.46 Million from Government of Netherlands**

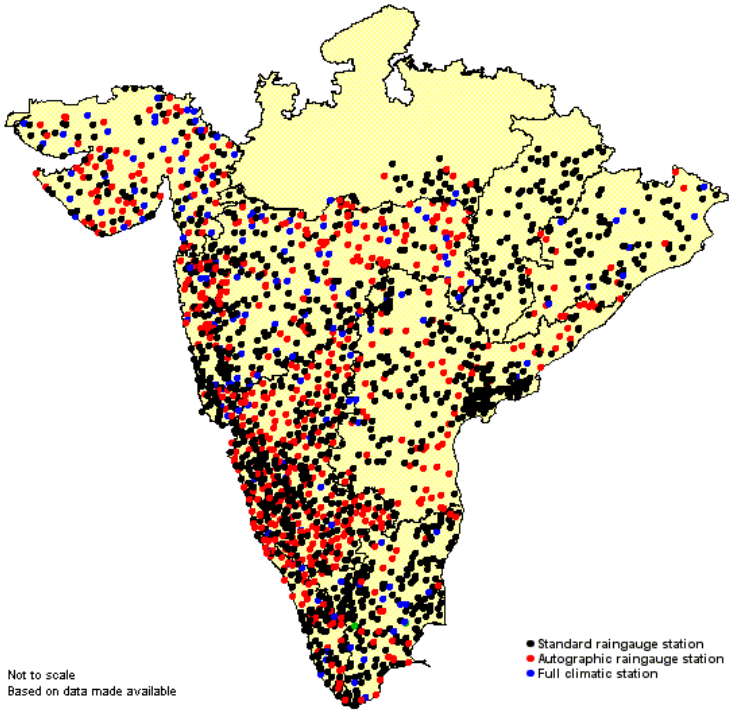
- **9 States**
- **6 Central Agencies (CWC, CGWB, CWPRS, IMD, MoWR, NIH)**

Achievement under HP-I

❖ Facilities created

- River Gauge Stations : 916
- Observation Wells : 7,912
- Hydro-meteorological Stations : 436
- Data Centers : 390
- Data Storage Centers : 28

Hydro-meteorological stations developed under HP-1



❖ Software developed

For Surface Water

- SWDES (Surface Water Data Entry Software)
- HYMOS (Hydrological Modelling System)
- WISDOM (Water Information System for Data On-line Management)

For Ground Water

- GWDES (Ground Water Data Entry Software)
- GEMS (Groundwater Estimation and Management System)
- WISDOM

❖Outcomes

- Development of HIS
- Uniformity of HIS
- Use of HIS

Salient features of HP-II

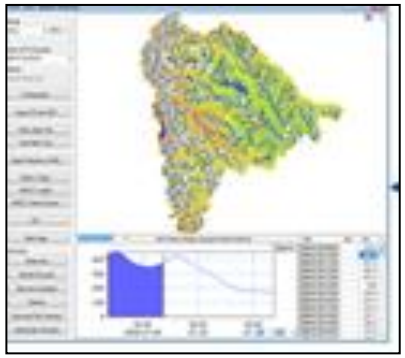
Objective:

To extend and promote the use of Hydrological Information system (HIS) developed under HP-I by all potential users concerned with the Water Resources Planning and Management, both in public and private, thereby contributing to improve productivity and cost effectiveness of water related investments.

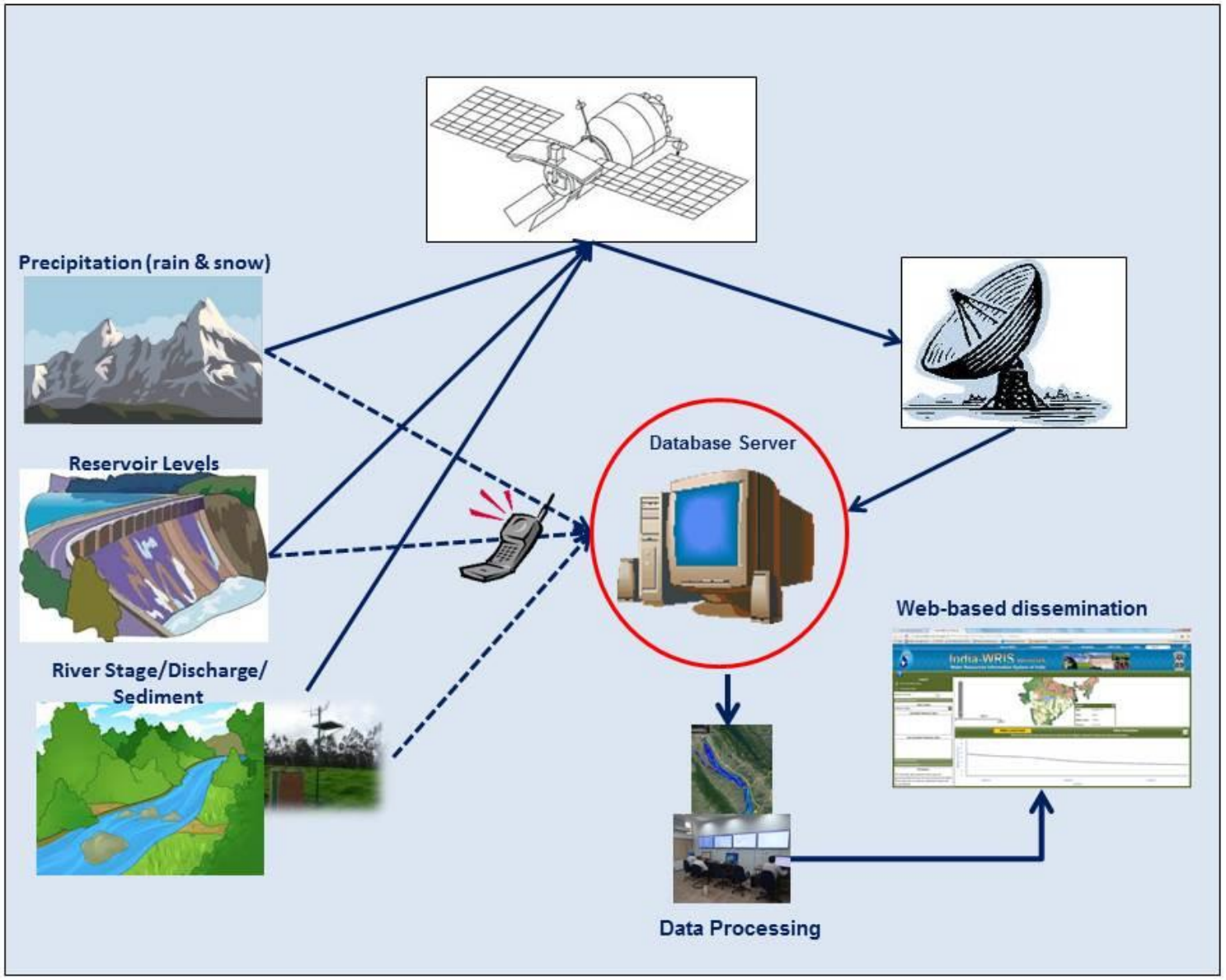
- **Duration** - April 5, 2006 - May 31, 2014
- **Estimated cost** - Rs. 631.83 crores
- **World Bank (IBRD Loan)** - US$104.98 million
- **Coverage** - 13 states and 8 central agencies

Highlights of Journey From HP-I to HP-II

- **From Manual Data Collection ------ Real Time Data Acquisition System**
- **From Desktop Data Management ------ Web-based Data Management**
- **Collating Data into Analyzed Information for Decision Making (DSS Planning, HDA, PDS)**
- **Up gradation to real time flood forecasting and reservoir operation systems (RTDSS & RTSF & ROS)**



Hydrological Information System- HIS



Achievements under HP-II

1. Upgradation/ strengthening of Hydrological Information System (HIS)

A. Construction of Data Centres

S. No.	Description	Total Number
1	State Data Centre	4
2	Divisional data centre	4
3	Sub Divisional data centre	12
4	Training centre	5
5	Site offices / site stores etc.	64

Himachal Pradesh

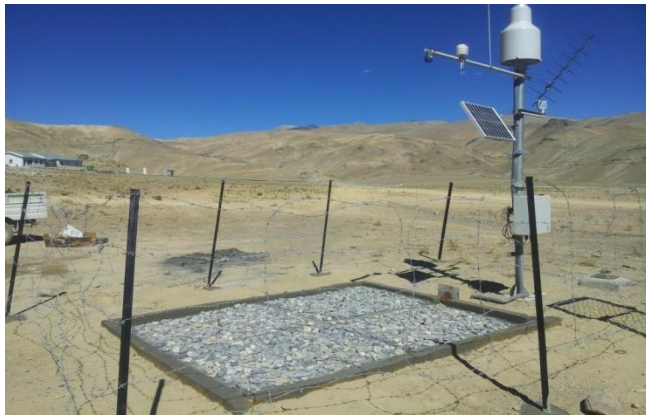
Puducherry

Goa

Achievements under HP-II

B. Strengthening of meteorological stations

Sl No.	Description	Total Number
1	Manual FCS, Raingauges and SRRG	679
2	Digital Raingauges and AWS without telemetry	56
3	Automatic Weather Station (AWS) with telemetry	132
4	Digital Rain Gauges (DRG) with telemetry	318

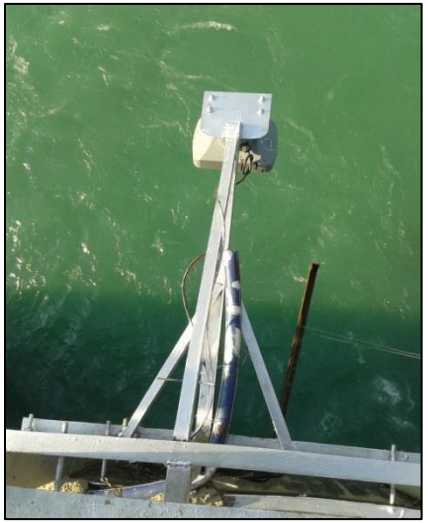


Achievements under HP-II

C. Strengthening of hydrological stations

	Hydrological Stations	
1	Establishment / upgradation of river/ reservoir water level measurement stations	*245*
2	Gauge and discharge sites	*195*
3	Gauge plates / staff gauge	224
4	Automatic water level recorder - shaft encoder type/Bubbler/RADAR	114
5	Current Meter	387
6	ADCP	36

Water Level Recorder



D. Strengthening of Groundwater Monitoring

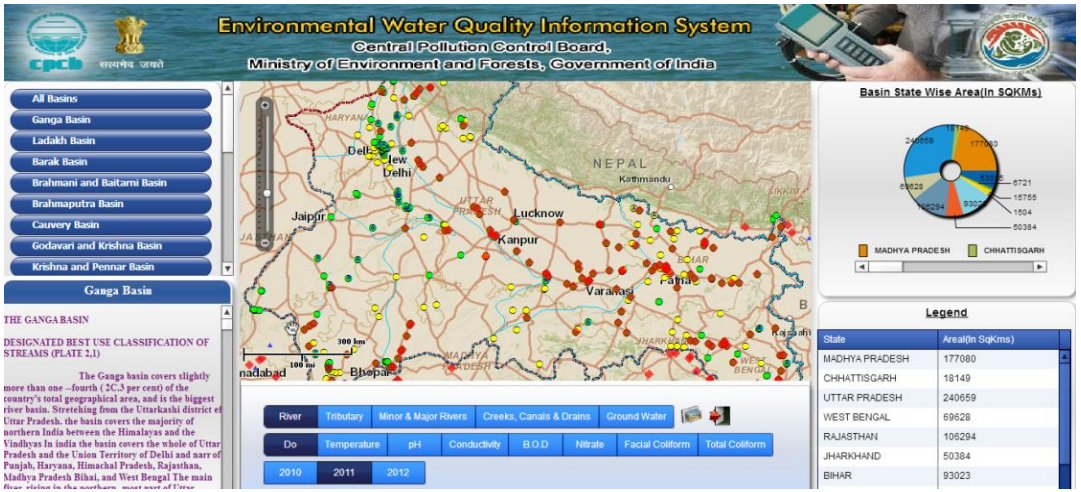
	Ground Water	
1	DWLR without telemetry	136
2	DWLR with telemetry	265
3	Construction of Piezometers without DWLR	2540
4	Construction of Piezometers with DWLR	196

Digital GW Recorder

Achievements under HP-II

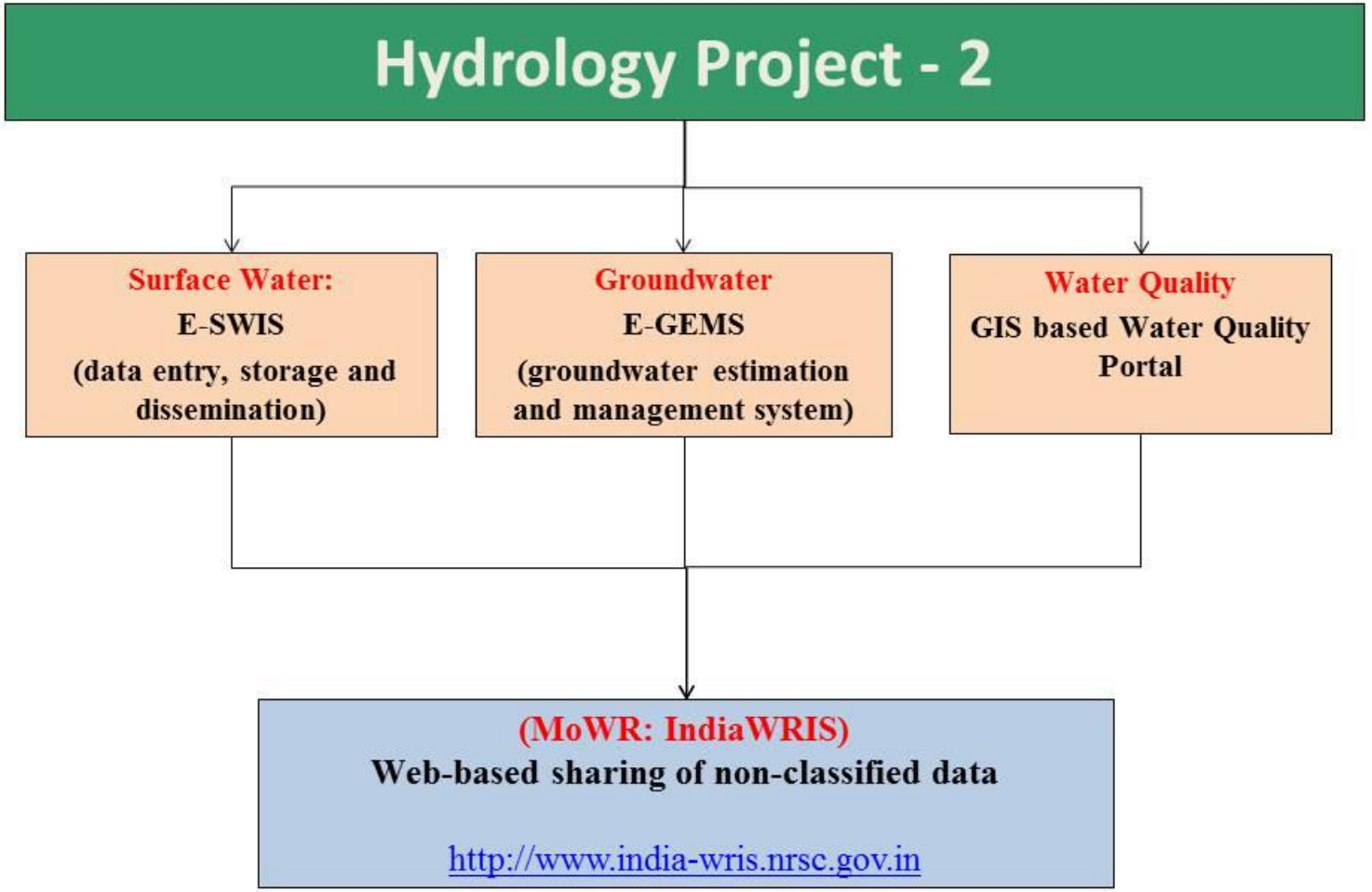
E. Strengthening of Water Quality stations

Sl. N	Water Quality monitoring stations	
1	Real time Water quality Stations in Ganga and Yamuna by CPCB (10 Parameters)	10
2	Real time Water quality Stations by CWC (6 parameters)	3
	Construction & establishment of Laboratories	
3	Level 2+	3
4	Level 2	3
5	Level 1	12



Achievements under HP-II

F. Development of Web-based Data Management System



Achievements under HP-II

2. River Basin Planning and Management Tools

A. Hydrological Design Aids (HDA)

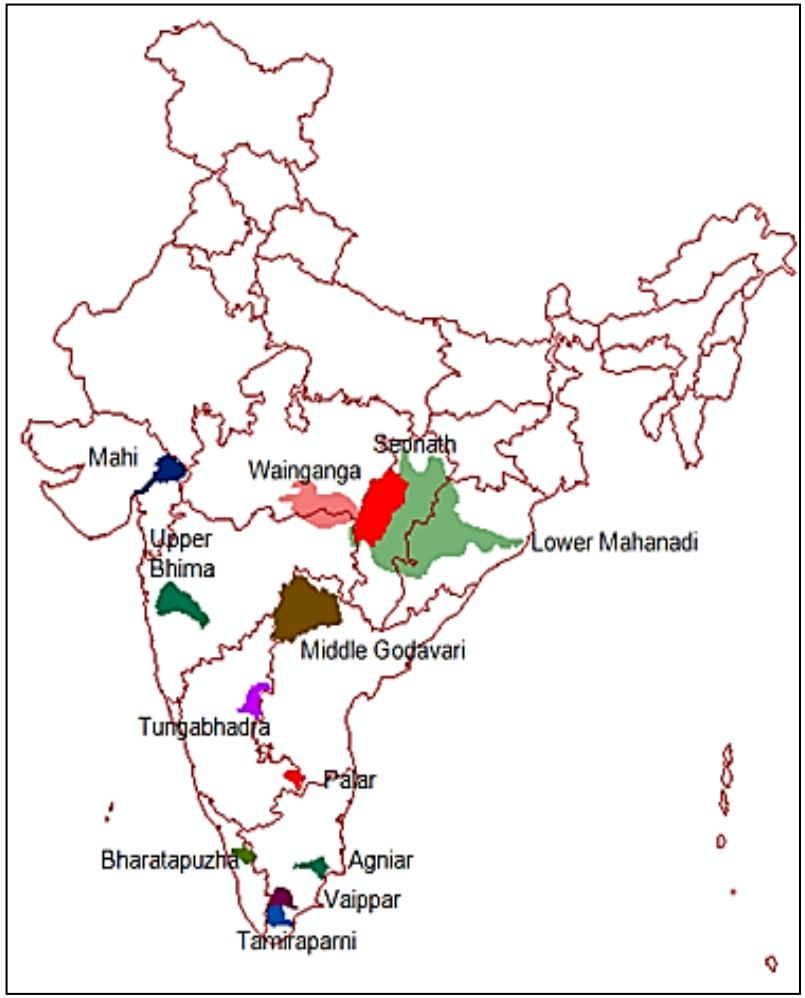
- The tool facilitates and expedites the hydrological design of infrastructure

- The tools also provide (for the first time in the country) the basis for uniform approaches among states and between states and central agencies.

- Modules developed so far:
  i. Assessment of water resources potential availability/ yield assessment.
  ii. Estimates of Design Flood
  iii. Sedimentation rate estimation

Achievements under HP-II

B. Decision Support System (DSS) for Water Resources Planning and Management

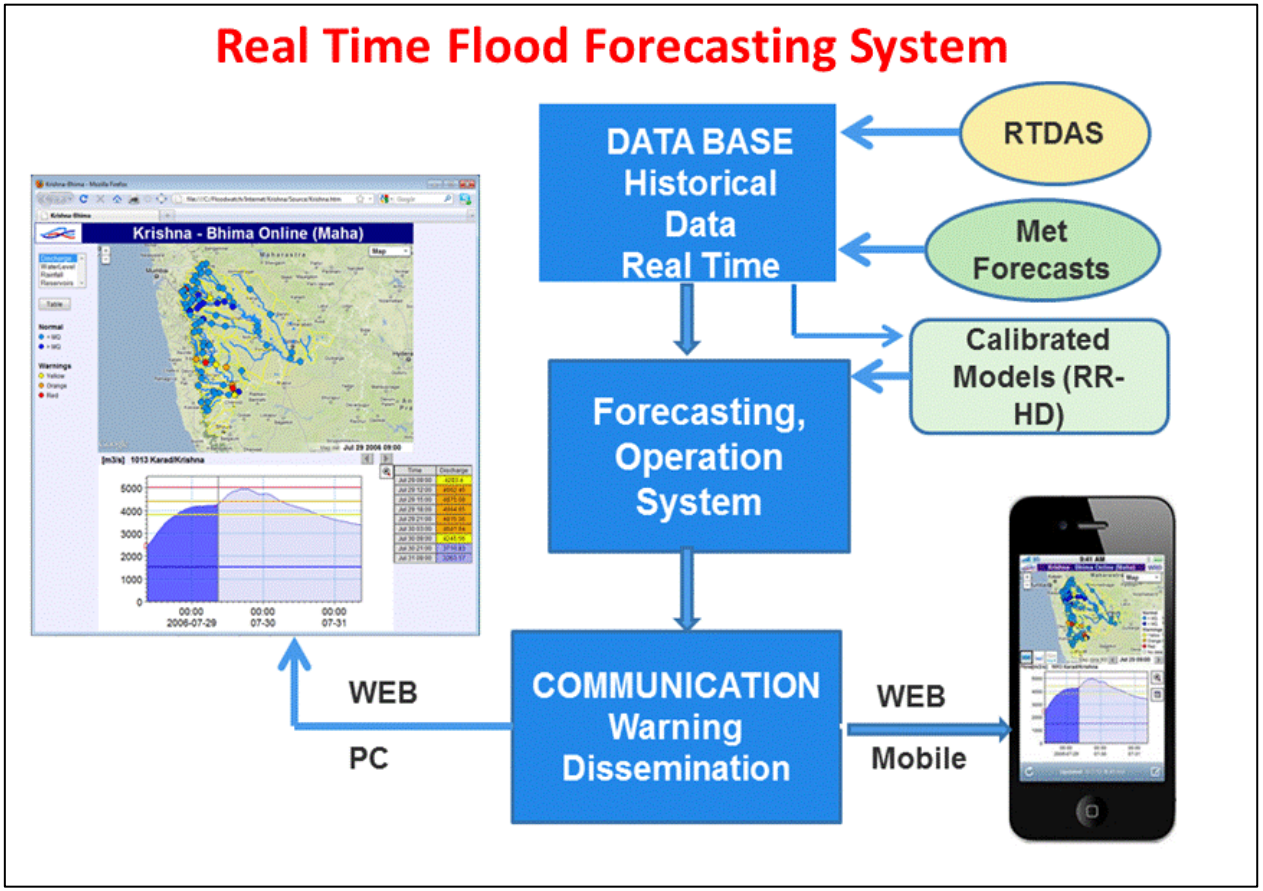


- DSS framework set-up in 13 river basins across 9 states

- Modules includes:
  i. Surface water planning for investments and inter-sectoral water allocation
  ii. Integrated operation of reservoirs for flood and irrigation management.
  iii. Conjunctive water use planning for surface and groundwater use
  iv. Drought monitoring and management
  v. Water quality management

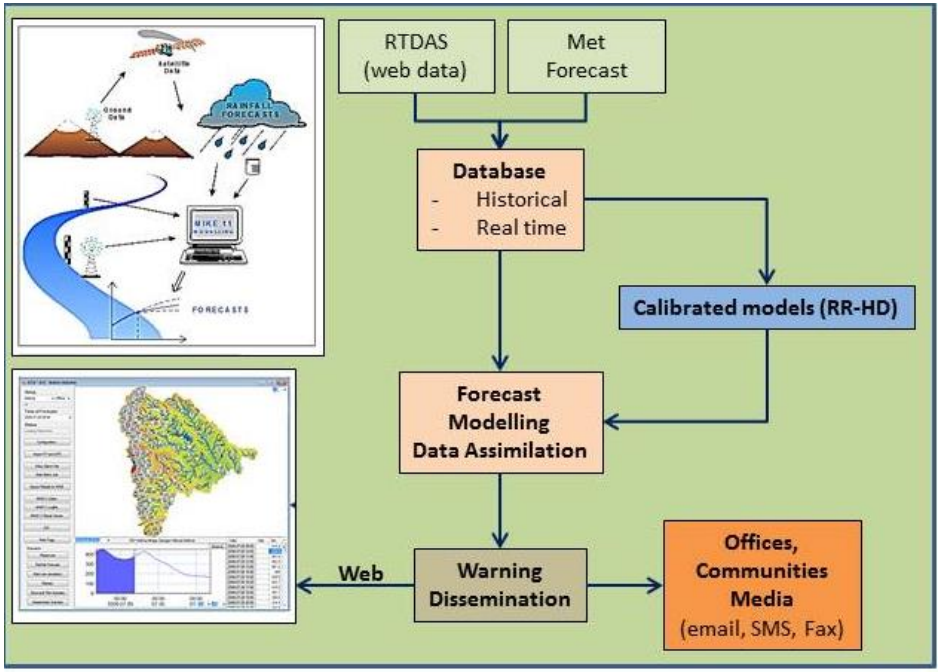
Achievements under HP-II

C. Stream Flow Forecasting and Reservoir Operation Systems for Flood Management



Achievements under HP-II

(i) Real Time Decision Support System (RTDSS) - BBMB



- **RTDSS system in place**

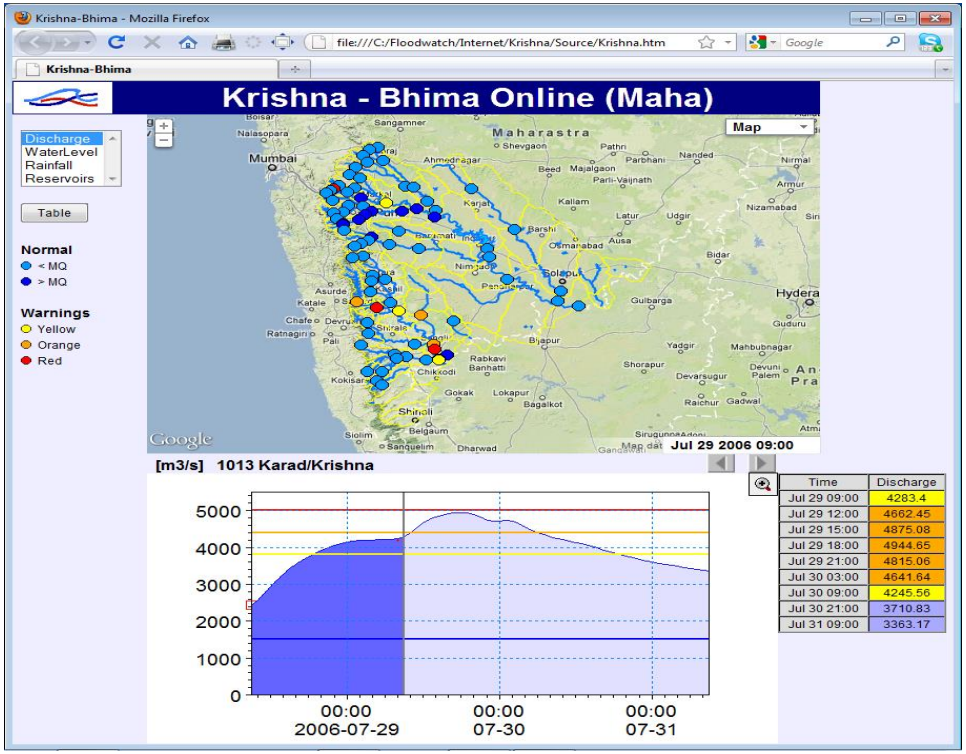
- **The system make use of satellite based 3-days climate forecast and integrates with real time hydrological information system and reservoirs models**

Achievements under HP-II

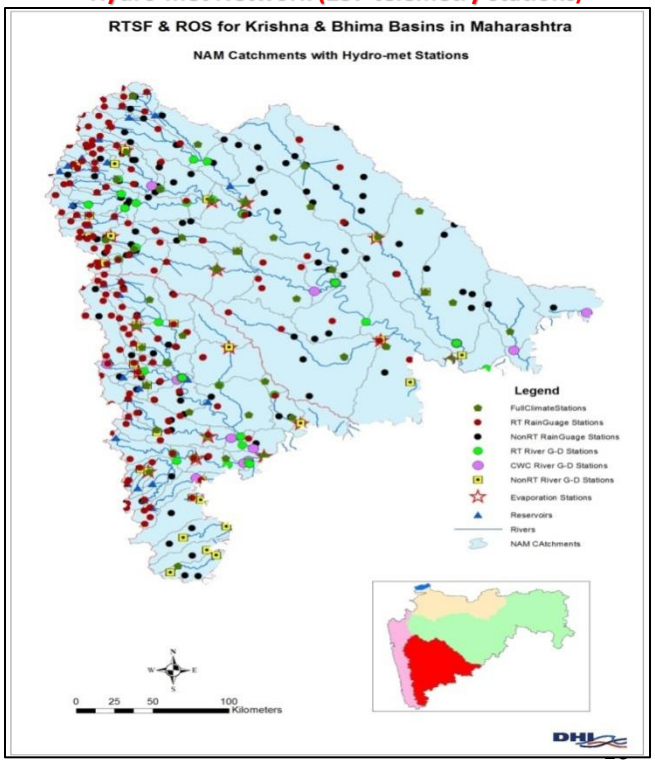
(ii) Real Time Flood Streamflow Forecasting and Reservoir Operation System (RTSF & ROS) – Krishna & Bhima Basins

- **The system is designed to reduce future flood damages and dry season water supply through improved reservoir management based on daily/hourly flood forecasting.**

- **The RTDAS is operational with 237 real-time reporting monitoring stations.**



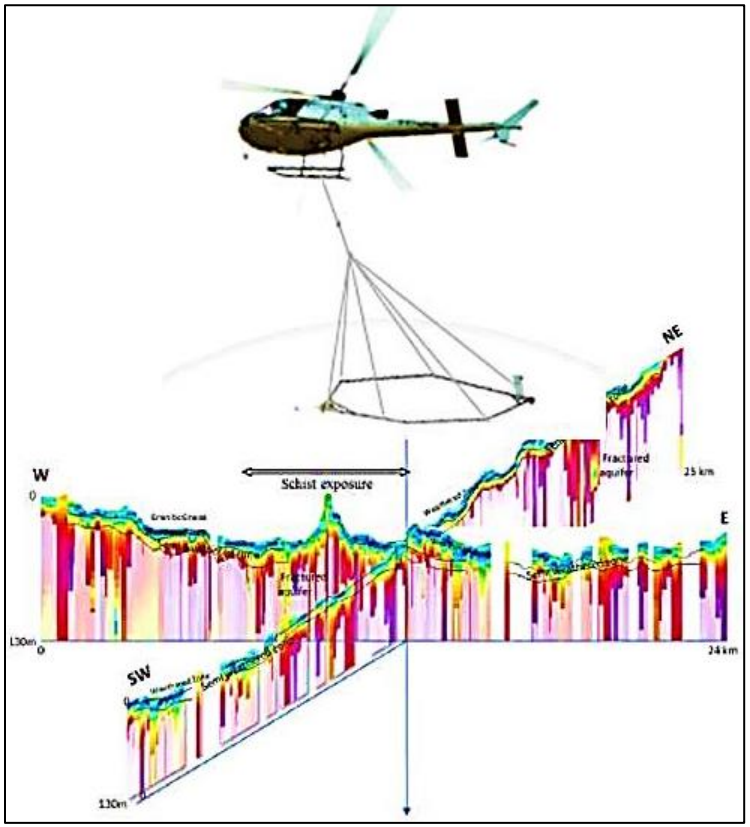
Hydro-met Network (237 telemetry stations)



Achievements under HP-II

3. Groundwater Management (Aquifer Mapping)

- 6 pilot projects of aquifer mapping was carried out to develop the framework for large scale mapping.
- The projects piloted use of advance techniques including heliborne techniques for faster and accurate mapping of aquifers.



Details	Area (sq km)
Baswa-Bandikui Watershed, Dausa District, Rajasthan – I – AQRAJ	598
Maner-Khagaul Area, Patna Dist, Bihar II – AQBHR	521
Watershed Nagpur district, Maharashtra - III – AQMAH	360
Parts of Tumkur District, Karnataka - IV – AQKAR	376
Lower Vellar, Cuddalore district, Tamil Nadu - V – AQTND	344
Part of Thar Desert, Jaisalmar District, Rajasthan. - VI – AQDRT	675

Achievements under HP-II

4. Purpose Driven Studies (PDS)

- **39 specific studies have been undertaken across the Hydrology Project implementing agencies (supported by external consultancies or universities where needed)**

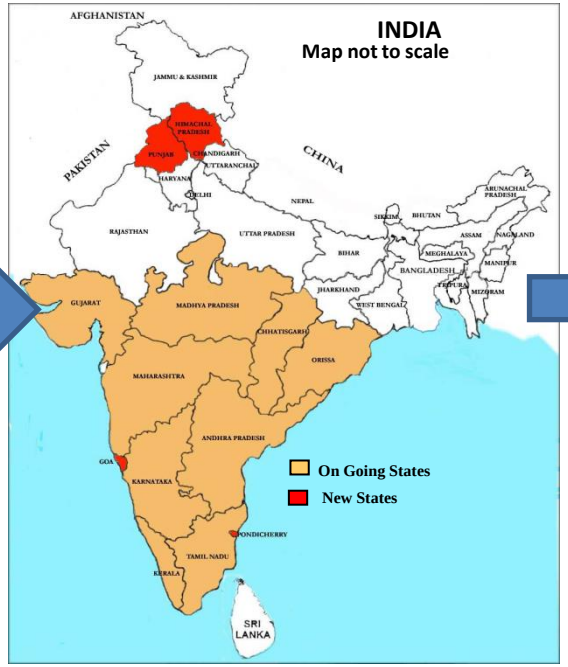
- **The studies includes:**
  - **groundwater management,**
  - **water quality issues,**
  - **reservoir sedimentation problems, and**
  - **improved water management practices to address crop water needs.**

Hydrology Project Phase – III
Approach towards Integrated Water Resources Management

HP-I

- 9 States
- 6 Central Agencies

HP-II



- 13 States
- 8 Central Agencies

HP-III

Across All Indian States and UTs

Objectives of HP-III

- **Align water resources development goals in line with the National Water Mission and National Water Policy 2012.**

- **Bring the entire nation on equal footing as far as HIS, water resources applications and their use are concerned.**

- **Move towards Integrated Water Resources Management.**

Components under HP-III

Component 1: ***Upgrading and extension of Ground based Water Resources Monitoring System (WRMS)***

Component 2: ***Development of spatiotemporal, Information and Knowledge Services and Products***

Component 3: ***Tools for planning, design, operation and Montoring system***

Component 4: ***Institutional Strengthening and Capacity Building***

Expectations from the Workshop (Sep 16-17, 2014)

- **Awareness raising**
  - **National (from different States)**
  - **International organisations**
    - **To showcase what India has to offer in terms of technology**
    - **Acquaintance with latest technology**
- **Exploring opportunities**
  - **Cross learning**
  - **explore various options and to assess which technology is best suited – State specific?**

Issues	Analytical Implications	Specific Tools (examples)
Storage and Hydropower Investments	• Understand system hydrology • Understand hydrological, economic, environmental, and social impacts of alternatives	• ArcSWAT/HECRAS • Riverware • Ribasim • HEC-RESIM • Mike Basin • Dam Break Analysis
Watershed management	• Land degradation • Sediment contribution of various tributaries • Structural and vegetative investment design	• Atlases • EN Watershed Toolkit • Specialized models (e.g. Geospatial Model for Soil Erosion)
Irrigation Investments	• Areas with irrigation potential • Crop water/irrigation requirements • Comparing investments • Irrigation modernization	• Mapping/databases of existing and potential irrigation in the EN • CropWAT • Guidelines for water efficiency • Multi-criteria analysis • EN Irrigation Toolkit
Flood Management	• Improved weather and hydrological forecasting • Improved inundation modeling and visualization • Modern communication	• Improved use of ETA, TRMM, CMORPH, FEWS, HEC-RAS, HEC-HMS, HEC-GEORAS, inundation modeling • Integration of spatial information in ArcGIS • Extended hydrologic forecasting • Risk Maps (Gambella) using Globally Applicable Flood Inundation Tool (USGS GFT) • Daily and Weekly bulletins; Seasonal Forecast • Web Portal with real-time maps
Overall Basin Management	• Understanding natural system hydrology (e.g. rainfall-runoff, groundwater interactions) • Understanding water investments for regulation, demands, etc. • Environmental sustainability/Climate Change	• ArcSWAT, HEC-HMS • NileDSS and Mike Basin • Ribasim, Riverware, HEC suite • Inundation mapping • ENMOS • Economic Analysis • Multi-criteria Analysis • Climate Change analysis • Multi-Sectoral Investment Opportunity Analysis

Thank You