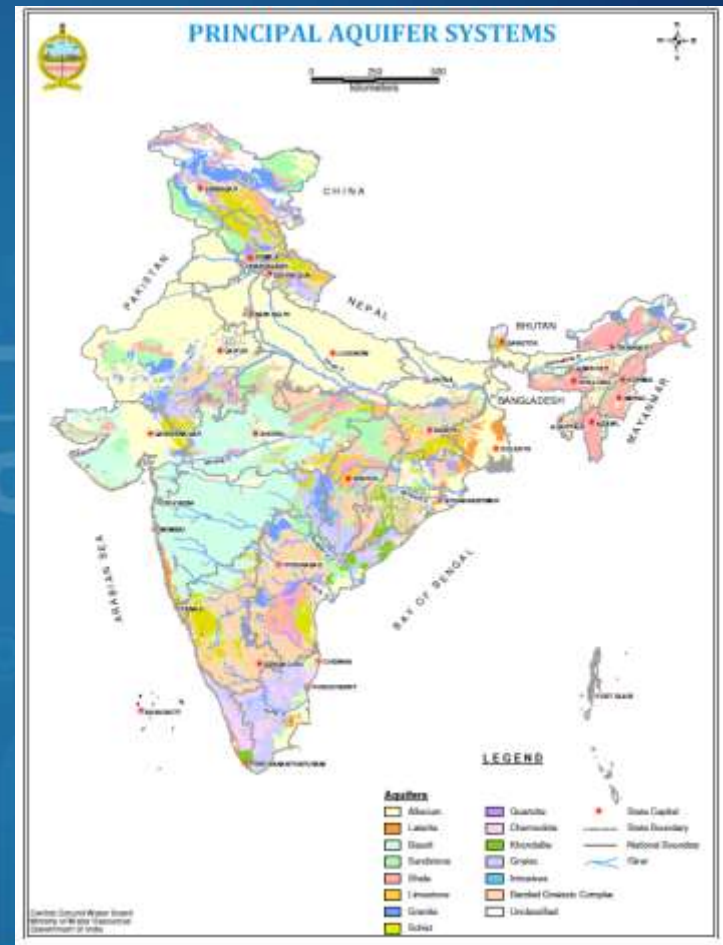


Aquifer Mapping and Management : An Approach in Indian Perspective

Dr. R. C. Jain

Formerly Chairman,
Central Ground Water Board and
Central Ground Water Authority



Ground water -the backbone of India's agriculture and drinking water security - under tremendous stress


India - The largest consumer of groundwater in the world - estimated usage 245 bcm per year

GW meets nearly 60 per cent of the demand for irrigation and about 80 per cent of the domestic water demand.

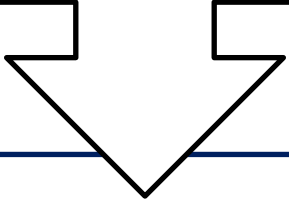
Out of 6607 Blocks in the country 2077 Blocks of the country are either in Overexploited (1071), Critical (217) Semi-Critical (697) Stage or are Salinity affected (92) as per the assessment made in the year 2011.

Sustainability of this resource is vital to ensure food and drinking water security

However, there is no dedicated programme on groundwater management in the country today.



Most groundwater-related interventions are currently part of other programmes like : Integrated Watershed Management Programme (IWMP), River basin management and other programmes on water resources and rural development, including the Mahatma Gandhi Rural Employment Guarantee Scheme (MGNREGS).



Hence, Groundwater resources are simply perceived as a part of watersheds, landscapes, river basins, villages, blocks, districts, states etc, but aquifers are seldom considered.

Specific programs such as drinking water and sanitation still seem to be bound to sources rather than resources.

This approach is restrictive and concludes at understanding groundwater prospects with a special reference to locating drinking water sources

Even today a good “strike” of groundwater is considered a sound measure of success, without any reference to the strength and potential of the aquifers behind

“sources of water supply”.

Hence, It is imperative to design an aquifer mapping programme with a clear-cut groundwater management purpose

Rationale for Aquifer Management

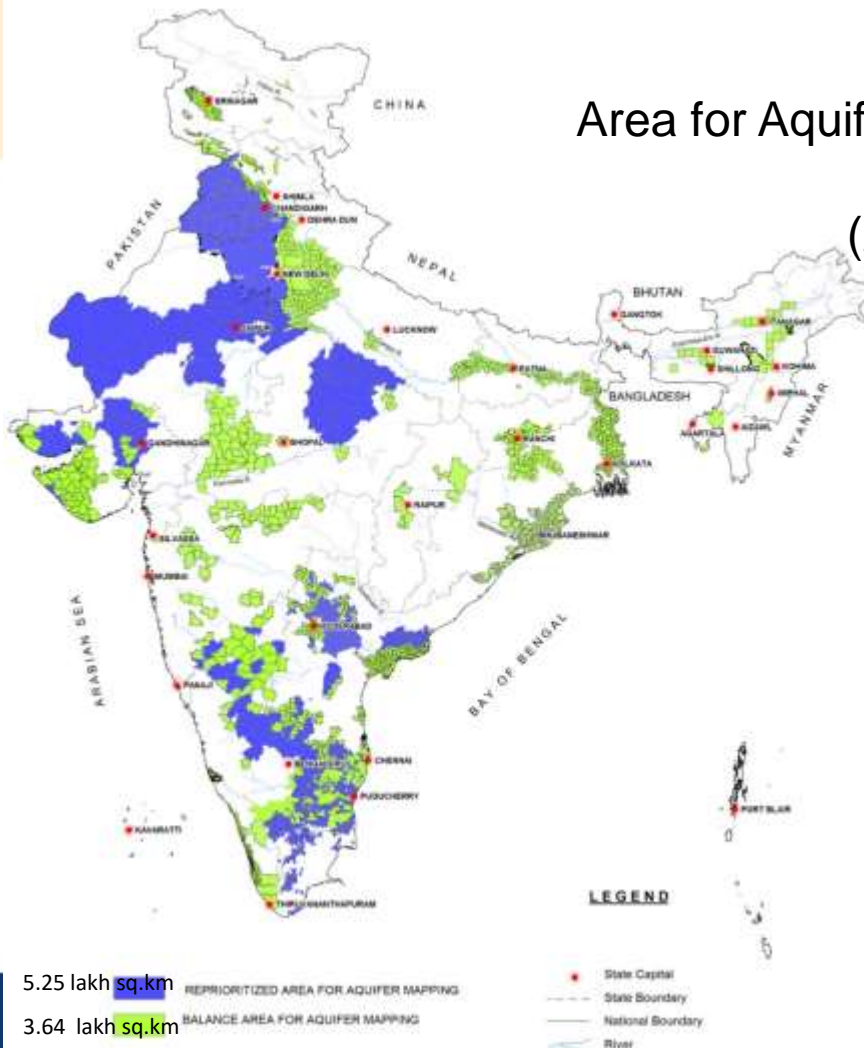
- **Aquifers are the repositories for ground water storage – their dimensions, characteristics, quality, storage etc. need to be ascertained to manage them**
- **Ground water has a complex nature of occurrence, recharge, discharge etc.**
- **Shift from “ground water development” to ground water management” .**
- **What is needed is a standard methodology for aquifer mapping and management which ingrains the principles and practices of participatory management .**

Aquifer Mapping & Management Programme

- National Aquifer Mapping and Management Programme (NAQUIM) commenced from year 2012.
- Four major components
 - Mapping of aquifers, resource, quality, recharge potential
 - Ground Water Modeling and Management Plan
 - Dissemination of Data/information / plan
 - Participatory management of the resource
- Out of 23 lakh sq.km mappable area, around 8.89 lakh sq.km area is envisaged to be covered in first phase (2012-17- XII FYP) and remaining during second phase .

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Area for Aquifer Mapping during XII Plan (2012-17)

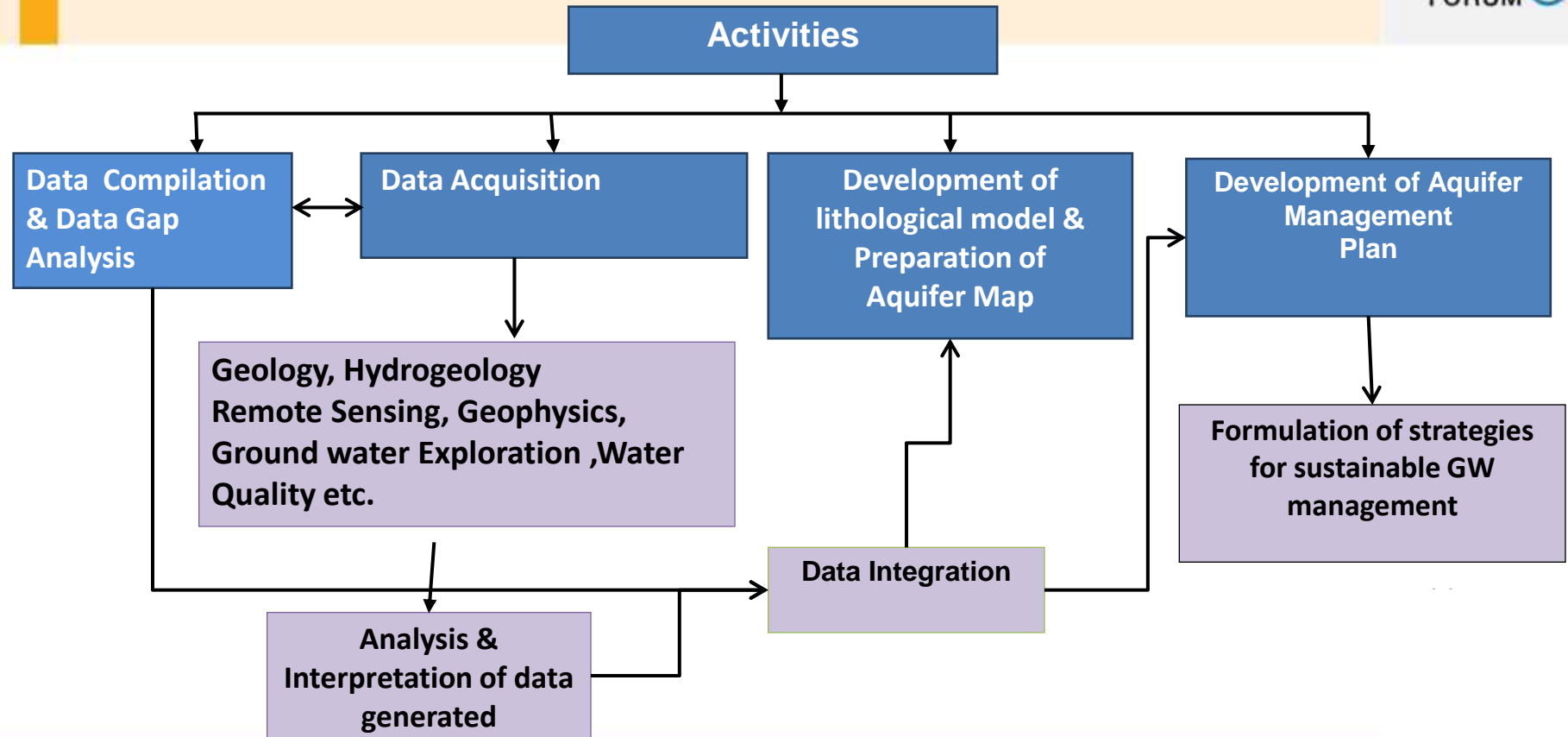


Total OE/Critical
Blocks- 1288
Being covered (1127)
• Priority areas in 8
states- 915
• Other areas- 212

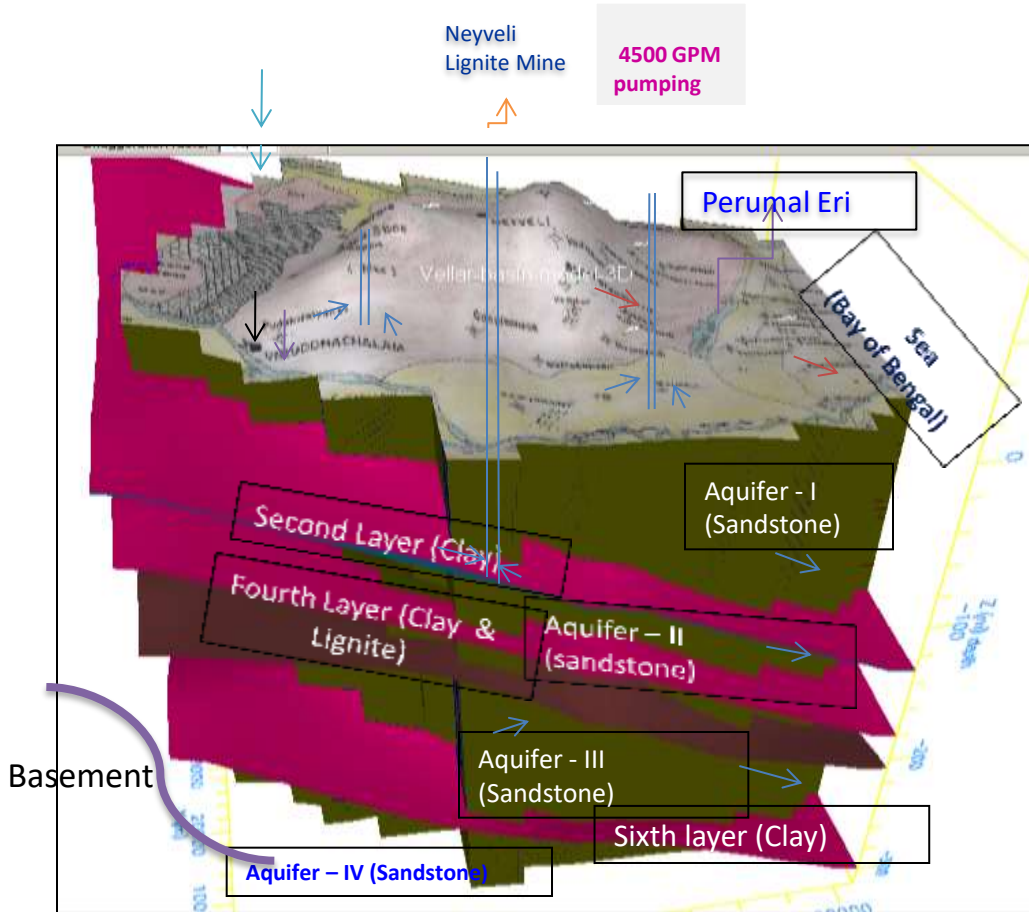
Approach for Aquifer Mapping Program

- Identification of areas and their prioritization in consultation with State governments.
- Status of data availability and compilation.
- Identification of data gaps.
- Generation of data for filling up the gaps.
 - Geology
 - Hydrogeology
 - Remote Sensing
 - Geophysics
 - Exploration
 - Water Quality etc.
- Processing and compilation of thematic maps on GIS Platform.
- Assessment of Potentiality of Aquifer
- Assessment of ground water resources
- Identification of aquifer issues such as
 - Ground water stressed areas
 - Water quality vulnerable areas
 - **Water logging areas**
 - **Non potential ground water areas**
 - Recharge areas
- Development of ground water management plans for supply and demand side management through aquifer response modelling .
- Development of Aquifer Information and Management System(AIMS)

Process Flow for Aquifer Mapping & Management



Aquifer Management Plan – Lower Vellar Watershed, Cuddalore district, Tamilnadu



1. Sea water intrusion – Threat along the coast .(Aquifer units – I to II)
2. Heavy withdrawal for Lignite mining (45,000 GPM) (Aquifer – III)
3. Pumping for irrigation, Industries & Domestic . (aquifer I & II)
4. Desilting of Perumal Eri.(will induce recharge & would have influence on Aquifer – I)
5. Aquifer – IV (For future drinking use-Chennai)

Recommended Strategies

Sr. No	Management Options	Upper Cuddalore Aquifer (Aquifer unit-I)	Lower Cuddalore aquifer (Aquifer Unit-II)	Upper Neyveli Sandstone (Aquifer Unit-III)	Middle Neyveli Sandstone aquifer (Aquifer Unit-IV)
	Vulnerability	Domestic & Irrigation	Irrigation & Industrial	Mining & Irrigation	Drinking water supply to Chennai
1	Threat of sea water intrusion	Vulnerable (0-5 Km from coast)	Vulnerable (0-5 Km from coast)	Vulnerable(0-5 Km from coast)	Vulnerable(0-5 Km from coast)
2	Decline in GW Level	Vulnerable in central portion	Entire aquifer	NO	NO
3	Management option	Change in crop that requires less water than paddy and sugarcane following a drought year . Periodic Monitoring for water level and quality along the coast.	Change in crop that requires less water than paddy and sugarcane following a drought year .Periodic Monitoring for Piezometric level & quality along the coast.	Periodic Monitoring for piezometric level and quality along the coast and around Neyveli lignite mine	Periodic Monitoring for piezometric level and quality along the coast.

ADVANCED TECHNOLOGY FOR AQUIFER MAPPING

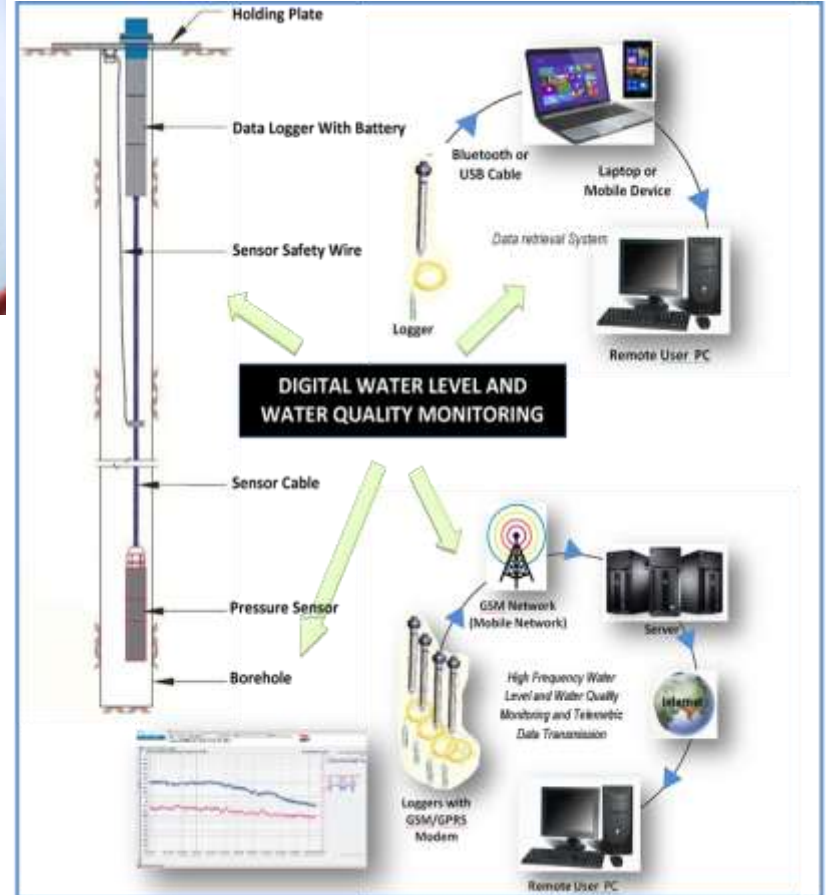
Heliborne Geophysical Surveys



High accuracy survey equipment -DGPS



Automated water level and water quality monitoring



Aquifer mapping & management

Description

- A native description of maps

Sustainable yield management goal

- For the aquifers, stating that the average withdrawals should not exceed long-term recharge, at least as a guiding principal

Artificial recharge programs

- Inputs for implementing **artificial recharge programmes** effectively, indicating plans for implementing artificial recharge for the aquifers concerned.

Groundwater Management strategies

- aquifer mapping will lead to a groundwater management strategy, which includes appropriate **demand-management strategies** in addition to water use and recharge.

Location specific protocols and agreements

- Aquifer mapping will lead to location-specific protocols and agreements within the user community as well help arrive at a robust regulatory framework through legislation.

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Sum up

“Know your Aquifer...Manage your Aquifer...!”

So what is the Essence?

- Demystification of Science of Hydrogeology
- Infusion of a sense of ownership amongst stakeholders
- Effort by Government and community to work in tandem for sustainable management