GROUND WATER GOVERNANACE – Changing Perspective

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Central Ground Water Board

India Geospatial Forum
10-12th Feb, 2015, Hyderabad

Ground water Management Issues and Challenges

- Over-exploitation of Ground Water
- Skewed Development and Under-utilization in Eastern States
- Precise assessment of Ground water withdrawal
- Availability and Sustainability of GW in hard rock areas
- Spring management in hilly terrain / Urban GW management
- Water logging and salinity problems in canal command areas
- Climate change and its impact on ground water.
- Ground Water Quality & Its Management
- GW Governance _ Legislative Framework dealing with Ground water

Critical Issues _ Ground water Governance

- Even though the National Water Policy (NWP) 2012 do not have statutory status, and thus cannot be legally enforced, they are the outcome of intensive political discussions and so state governments could find them useful in developing their own water policies.
- The Water (Prevention and Control of Pollution) Act of 1974 and the Environmental (Protection) Act of 1986 deal with most pollution issues in India, but there are thirteen other related policy and legal ordinances.
- Groundwater management falls under the jurisdiction of the states and to this effect the central government has circulated since 1970 a model groundwater bill.
- Regretfully, only a few states (15) have formally adopted it.

Critical Issues _ Ground water Governance

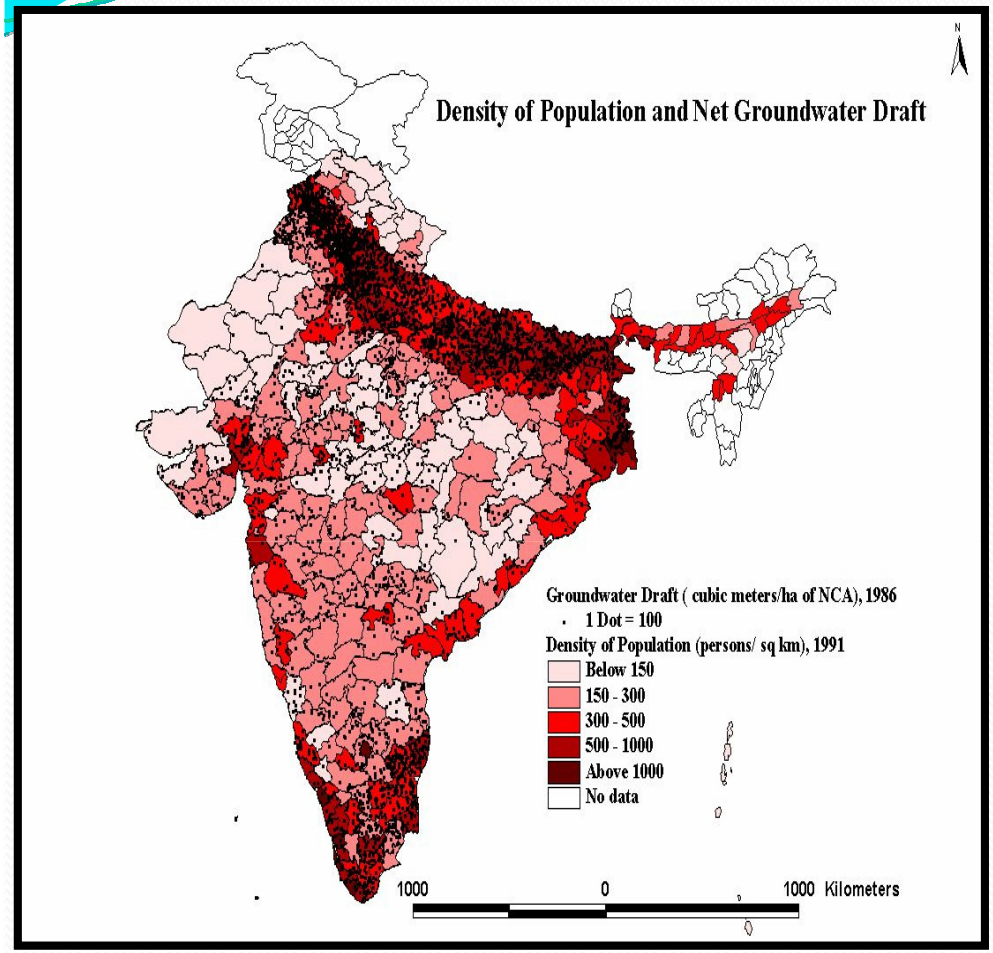
- Nevertheless, the two main legal drawbacks (the resource being assumed to follow the right to land and the absence of groundwater legislation at the central level) have been sorted out by:
  - The Supreme Court and High Court rulings have affirmed the government's right and obligation to protect groundwater under the right to life guaranteed by the Constitution
  - The legislative framework is reasonably robust for effective groundwater management, so the priority lies in enforcement of existing measures, supported by innovative approaches such as an expansion of community based-management.

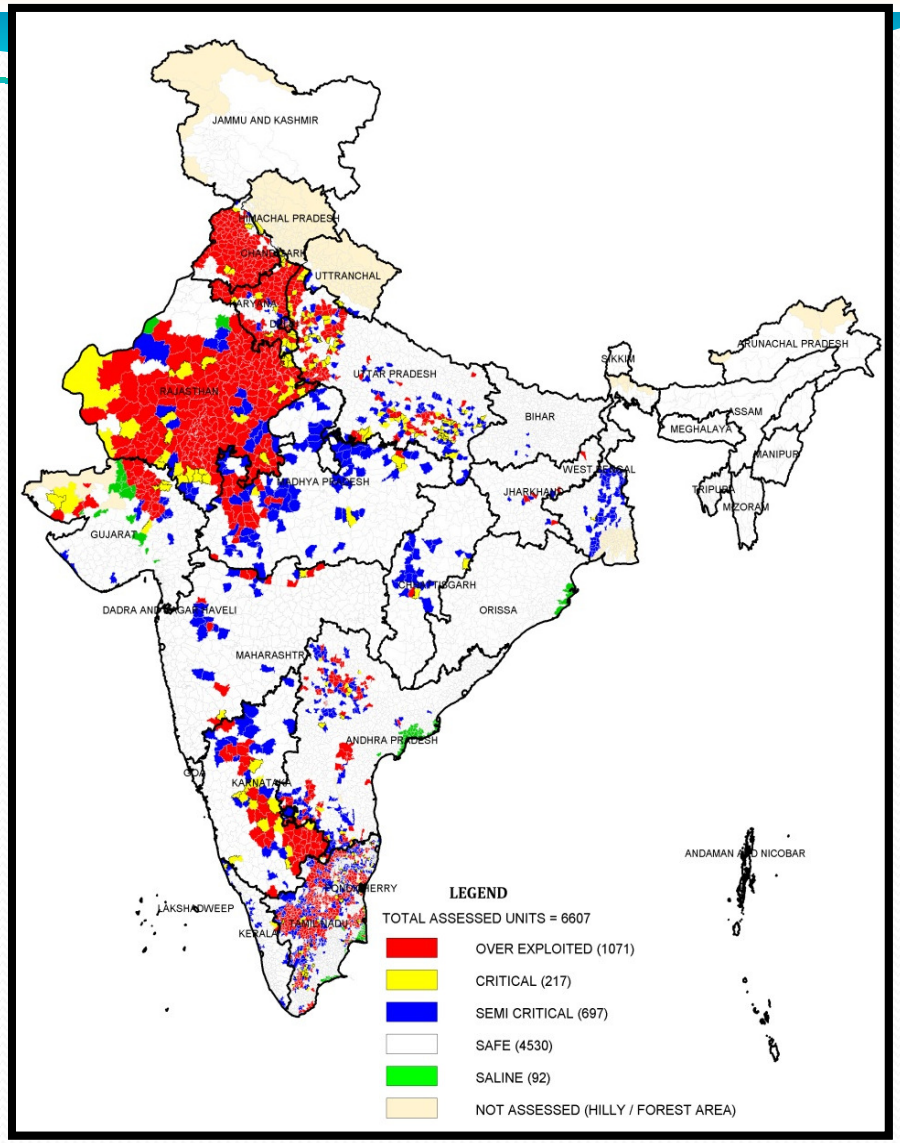
Learning Objectives_ Changed Perspective

- To discover the relationship between stress on the groundwater system and the investment in management;
- To appreciate the linkages between groundwater and surface water and how they may be managed together;
- To understand the role of groundwater in planning water management at the national and basin levels;
- To appreciate the importance of good groundwater management for ecosystem protection.

round water scenario in country

- There has been a pivotal shift from groundwater development to groundwater management.
- Groundwater is the most preferred source of water for various user sectors in India.
- The spatial distribution of availability of groundwater resources is uneven.
- The increasing dependence on ground water as a reliable source of water has resulted in indiscriminate extraction.
- Sustainability of ground water sources is jeopardized
- Complex water laws – Ownership


Density of Population and Net Groundwater Draft
N
Groundwater Draft (cubic meters/ha of NCA), 1986
1 Dot = 100
Density of Population (persons/ sq km), 1991
Below 150
150 - 300
300 - 500
500 - 1000
Above 1000
No data
1000
0
1000 Kilometers


JAMMU AND KASHMIR
HIMACHAL PRADESH
CHANDIGARH
UTTRANCHAL
HARYANA
DELHI
RAJASTHAN
UTTAR PRADESH
BIHAR
SIKKIM
ARUNACHAL PRADESH
ASSAM
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
WEST BENGAL
JHARKHAND
MADHYA PRADESH
GUJARAT
CHHATTISGARH
ORISSA
DADRA AND NAGAR HAVELI
MAHARASHTRA
ANDHRA PRADESH
GOA
KARNATAKA
PONDICHERRY
LAKSHADWEEP
KERALA
TAMIL NADU
ANDAMAN AND NICOBAR
LEGEND
TOTAL ASSESSED UNITS = 6607
OVER EXPLOITED (1071)
CRITICAL (217)
SEMI CRITICAL (697)
SAFE (4530)
SALINE (92)
NOT ASSESSED (HILLY / FOREST AREA)

Ground water Utilization

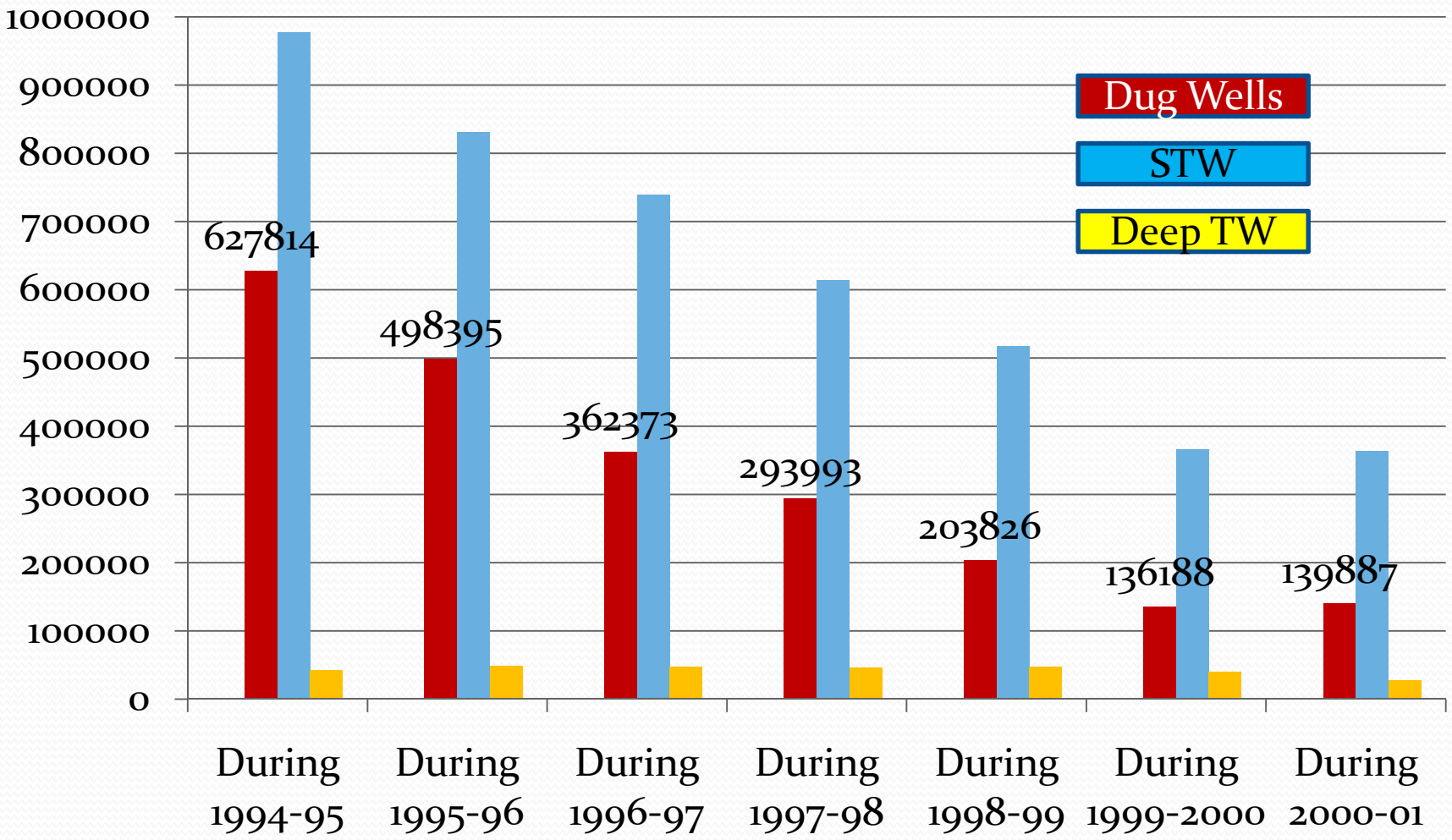
- 3rd MI Census held in 2001-02
- 4th MI census held with Reference Year 2006-07
  - 21 million MI structures
  - Out of which 19.75 million is Ground water
    - Dug wells – 9.2 Million (80% owned by Private people)
    - Shallow Tube wells – 9.12 Million ((95% owned by Private)
    - Deep Tube Wells – 1.44 (84% owned by Private)
  - Remaining is Surface water flow / Lift schemes
  - UP has highest number of n
  - - MI schemes followed by AP and Maharashtra.

Growth of GW Abstraction Structures with Time				Source: MI Census
Years	Dug Wells	Shallow Tube Wells	Deep Tube Wells	Total
Up to 1993-94	7354905	3944724	227070	
During 1994-95	627814	977358	42701	
During 1995-96	498395	831255	49365	
During 1996-97	362373	739898	47968	
During 1997-98	293993	613874	46864	
During 1998-99	203826	517942	47587	
During 1999-2000	136188	366780	40456	
During 2000-01	139887	363861	28183	
Sub Total	9617381	8355692	530194	18503267
Increment During 2001-05	-417381	764308	909806	
Total as on 2006-07	9200000	9120000	1440000	19760000

Total MI structure As on 2000-01 : 19.7 Million ,
As on 2006-07 : 21.0 Million

MI structures also includes Surface water Flow and Lift Schemes other that GW structures whose Culturable Command area up to 2000 ha

Increment in GW Abstraction Structures

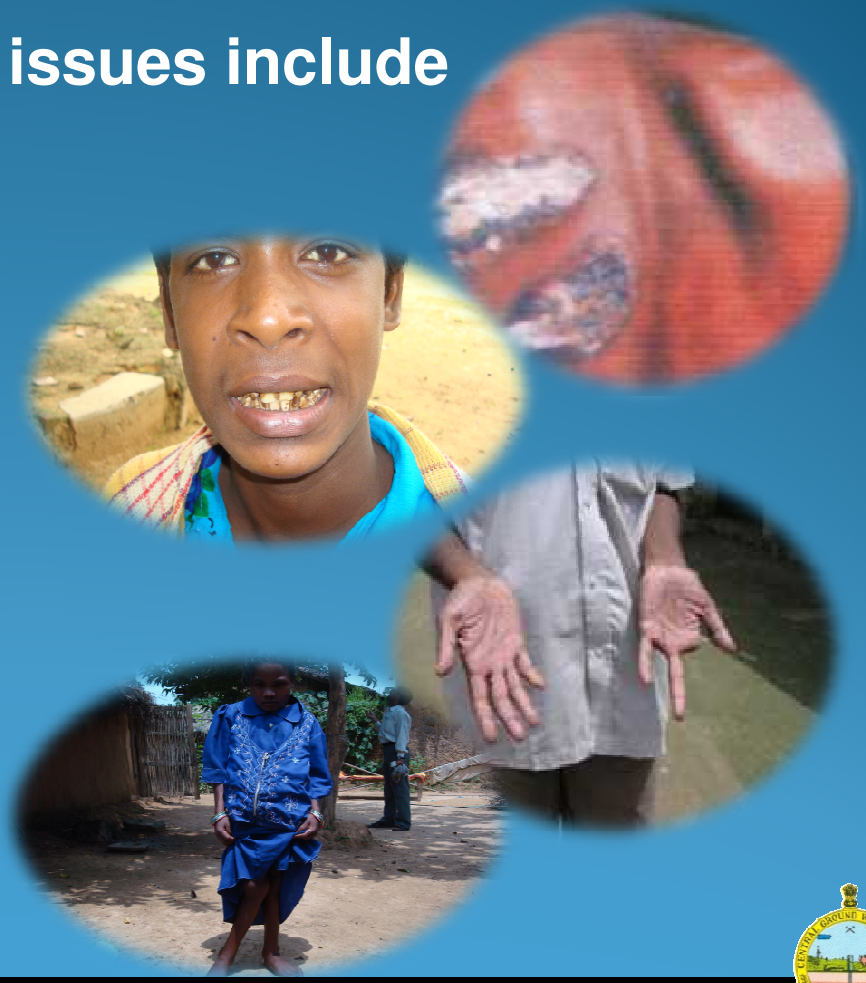


Implications of Overexploited / Critical Blocks

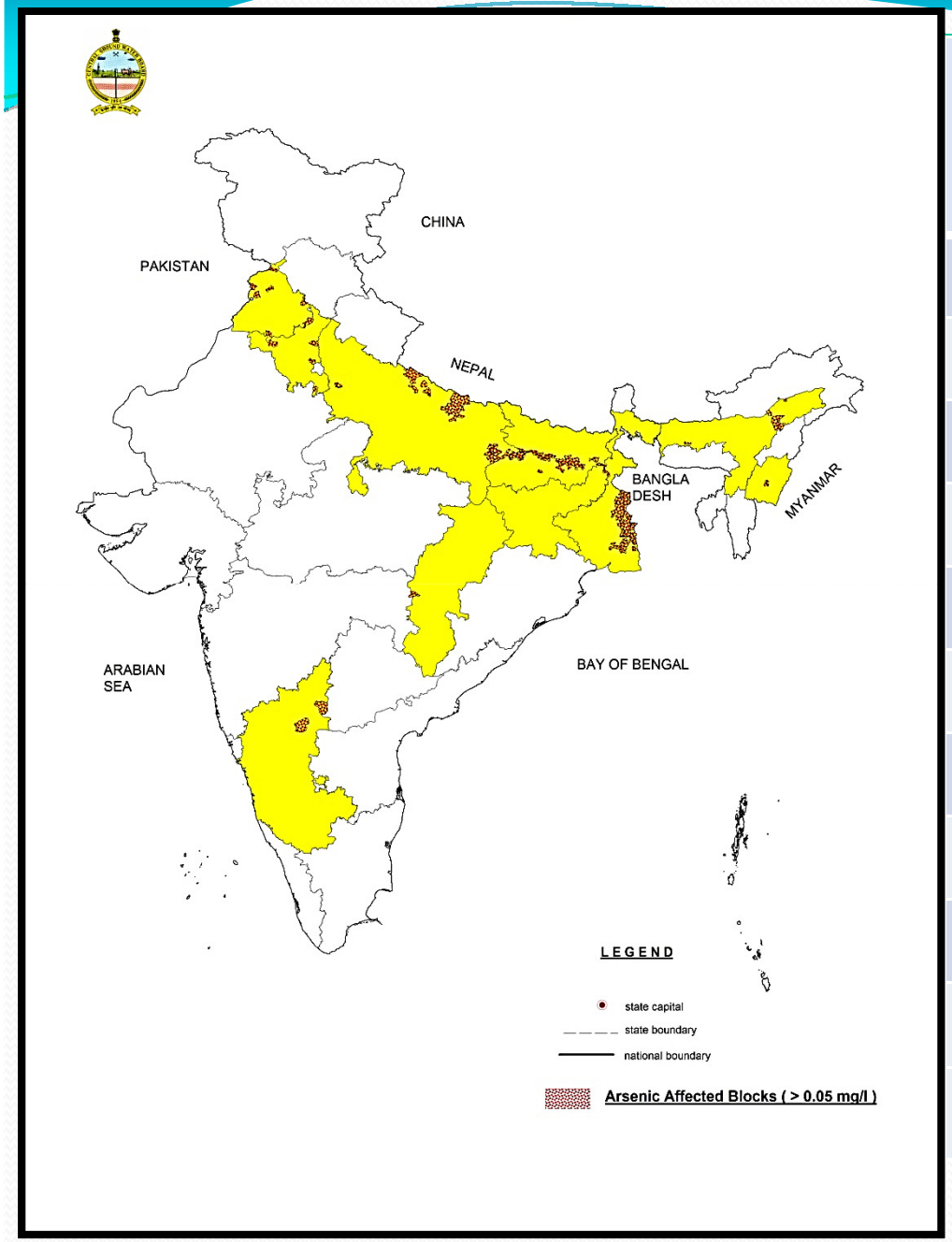
i. Significant decline in ground water levels.
ii. Drying up of shallow wells.
iii. Deterioration in ground water quality.
iv. Increasing energy consumption for lifting water
v. Need to regulate extraction, development and management of ground water.

Major Water Quality Issues In India

- Ground water in major parts of the country is potable.
- Major Ground Water Quality issues include
  - Arsenic
  - Fluoride
  - Iron
  - Nitrate
  - Salinity
  - etc



Areas affected by Arsenic



Sr. No.	States	Affected Districts/Total
1	Assam	18/27
2	Bihar	15/28
3	Jharkhand	1/24
4	Chhattisgarh	1/27
5	Haryana	13/21
6	Karnataka	2/30
7	Manipur	2/9
8	Punjab	6/22
9	Uttar Pradesh	20/75
10	West Bengal	8/19
	Total	86/282

Water and climate change

Possible Impacts of Climate Change on Ground water

- Rainfall Variability vis-a-vis natural Ground Water Recharge
- Ground Water Quality Changes
- Sea Water Ingress in Coastal Aquifers
- Changed ground water regime and new dynamic balance between surface and ground water
- Changed Steam Aquifer relationships

Need for GW management...contd

- Increasing thrust on GW resources and the present scenario of availability vis-a vis demand calls for a re-orientation of our approach for GW management
- Skewed development and need for Holistic approach for GW management
- Management of GW in the country to be taken up with a proper planning keeping in mind various social obligations and its requirement for various purposes.
- Need to synergize the fragmented efforts of various agencies/stakeholders working the GW domain

Mitigation and Adaptive Measures

Under Climate Change Scenario

- Rainwater harvesting and Artificial Recharge
- Coastal Aquifer Management
- Water Quality Mitigation Measures
- Conjunctive Management
- Ground Water Use Efficiency
- Adopting the Concept of Virtual Water
- R & D Need

Management of Ground Water Resources

- **Supply Side Measures**
  - **Scientific Development of Ground Water Resources**
    - Ground Water Development in Alluvial Plains:
    - Ground Water Development in Coastal Areas:
    - Ground Water Development in Hard Rock Area
    - Ground Water Development in Water-logged Areas
    - Development of Flood Plain Aquifers
  - **Rainwater Harvesting and Artificial Recharge**
- **Demand Side Measures**
  - **GW Regulation**
- **Participatory Management Measures**

GW Management Strategies

- **Characterization of regional and local aquifer systems**
  - Regional Aquifer System Mapping.
  - Ground water development potential of deep aquifers in Indo-Gangetic-Brahmaputra alluvial plains.
  - Geophysical investigations for characterization of deep aquifers.
  - Strengthening of ground water monitoring networks
  - GW modeling in OE/Critical Areas

GW Management Strategies

- **Supply side GW management**
  - Ground water development in eastern and northeastern states.
  - Ground water management in coastal areas.
  - Conjunctive use of surface and ground water resources in canal command areas.
  - Rainwater harvesting and artificial recharge to ground water.
  - Urban water recycling and re-use.
  - Management of water quality.

GW Management Strategies

- **Demand side GW management**
  - Regulation of Ground water Development
  - Research & Development Initiatives
  - Capacity Building
  - Institutional Strengthening

MAJOR ACTIVITIES OF CGWB

- Hydrogeological Surveys
- Ground Water Exploration
- Ground Water Regime Monitoring
- Ground Water Quality
- Ground Water Resource Assessment
- Geophysical Investigation
- Artificial Recharge and Rainwater Harvesting
- Central Ground Water Authority
- Data Dissemination
- Training and Capacity Building
- Mass Awareness

Ground water Governance Initiatives

Initiatives for Better Governance of GW Resources

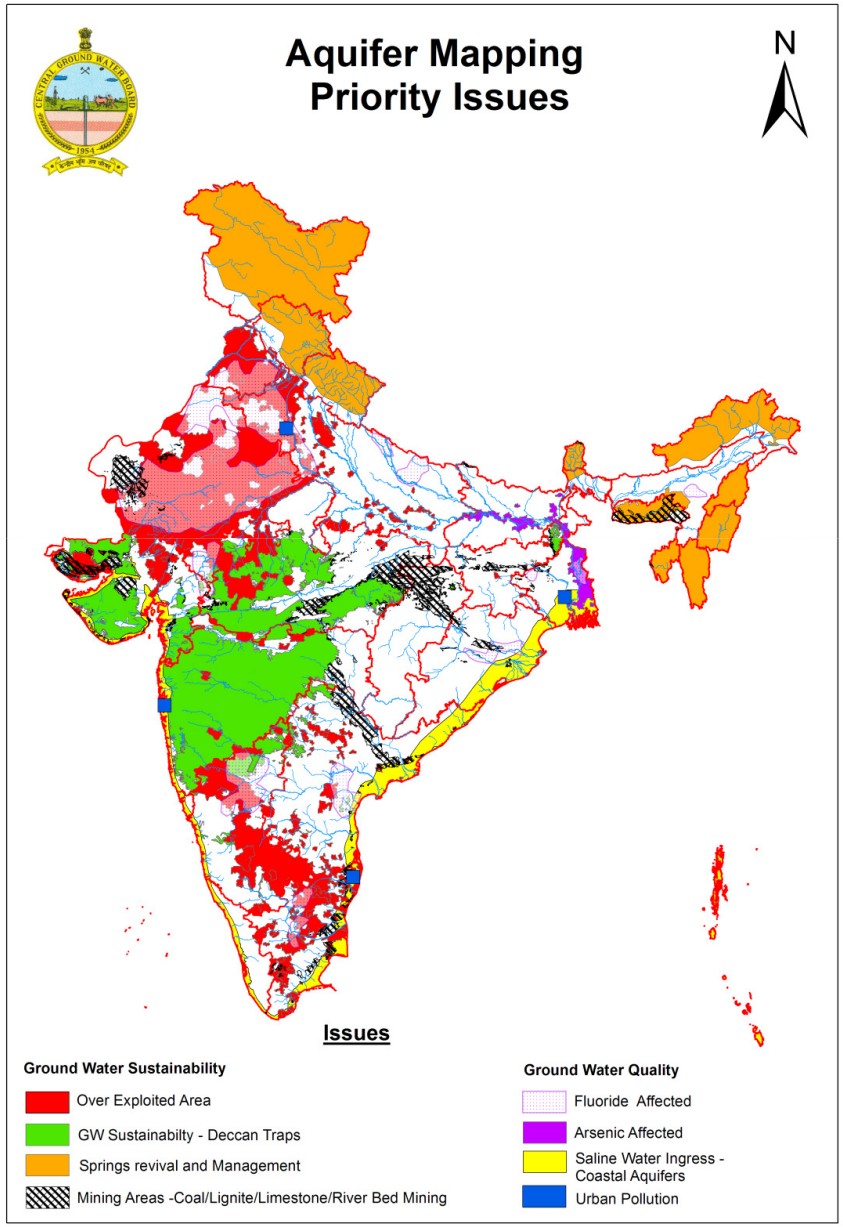
- Central Ground Water Authority constituted in 1997
- State Ground Water Authority functional in 13 States
- Model Bill for regulation of Ground water circulated last in 2005- 14 States/UTs enacted legislation based on Model Bill
- Roof top rain water harvesting made mandatory by 31 States/UTs through inclusion in Building bye laws /Rules/Regulations for urban areas.
- Development of Standardized Designs for Artificial Recharge and Rain Water Harvesting

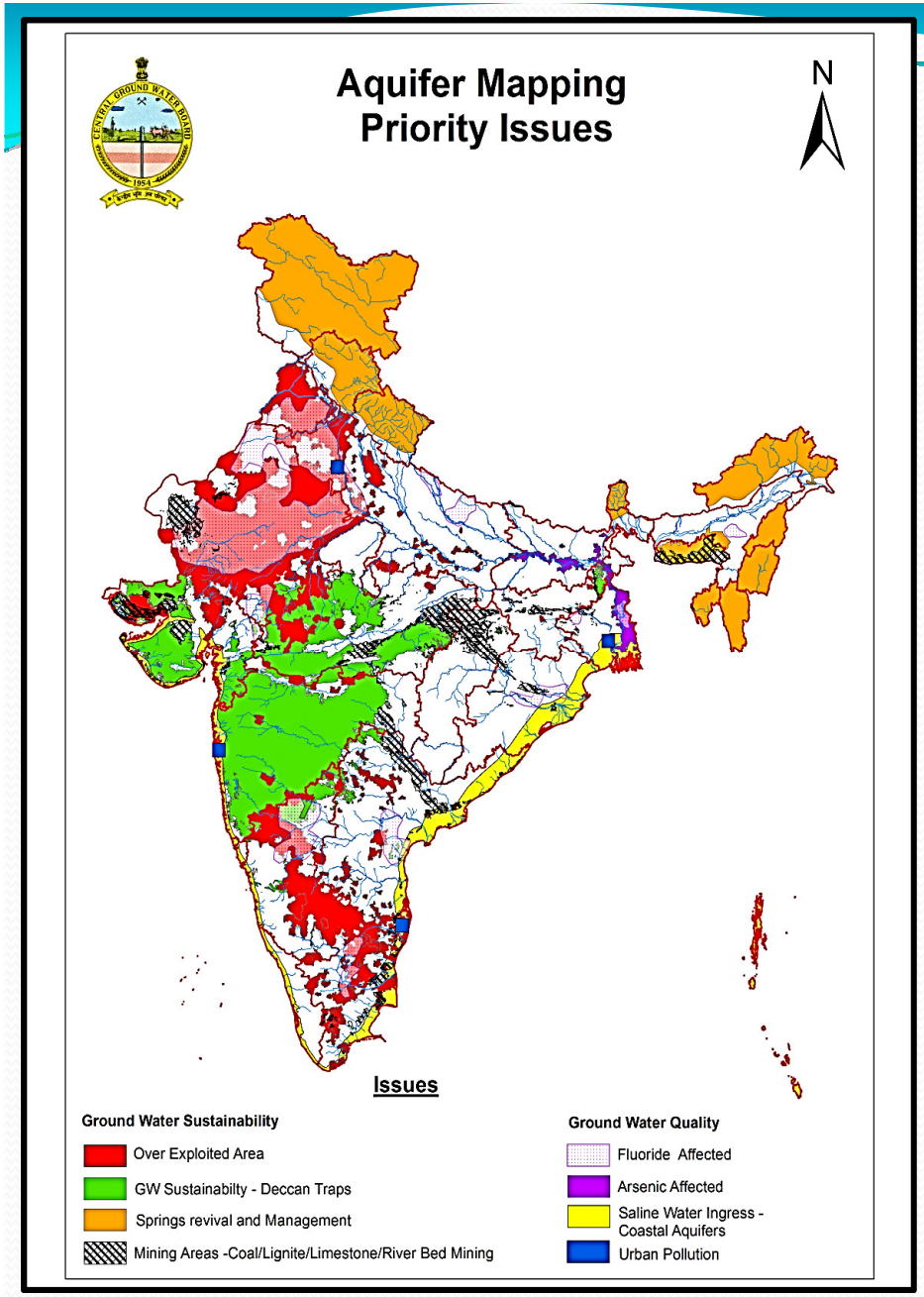
Regulation of Ground Water by Central Ground Water Authority (CGWA)

- CGWA has notified **162 areas in 10 States /UTs** for regulation and control of ground water.
- 'No Objection Certificate(NOC)' for ground water extraction is not accorded for any purpose other than drinking and domestic in Notified Areas.
- District Authorities have been appointed as authorized officers for discharging regulatory functions.
- In Non-Notified areas NOC is subject to implementation of recharge measures.
- NOC process have been made online and fully Transparent

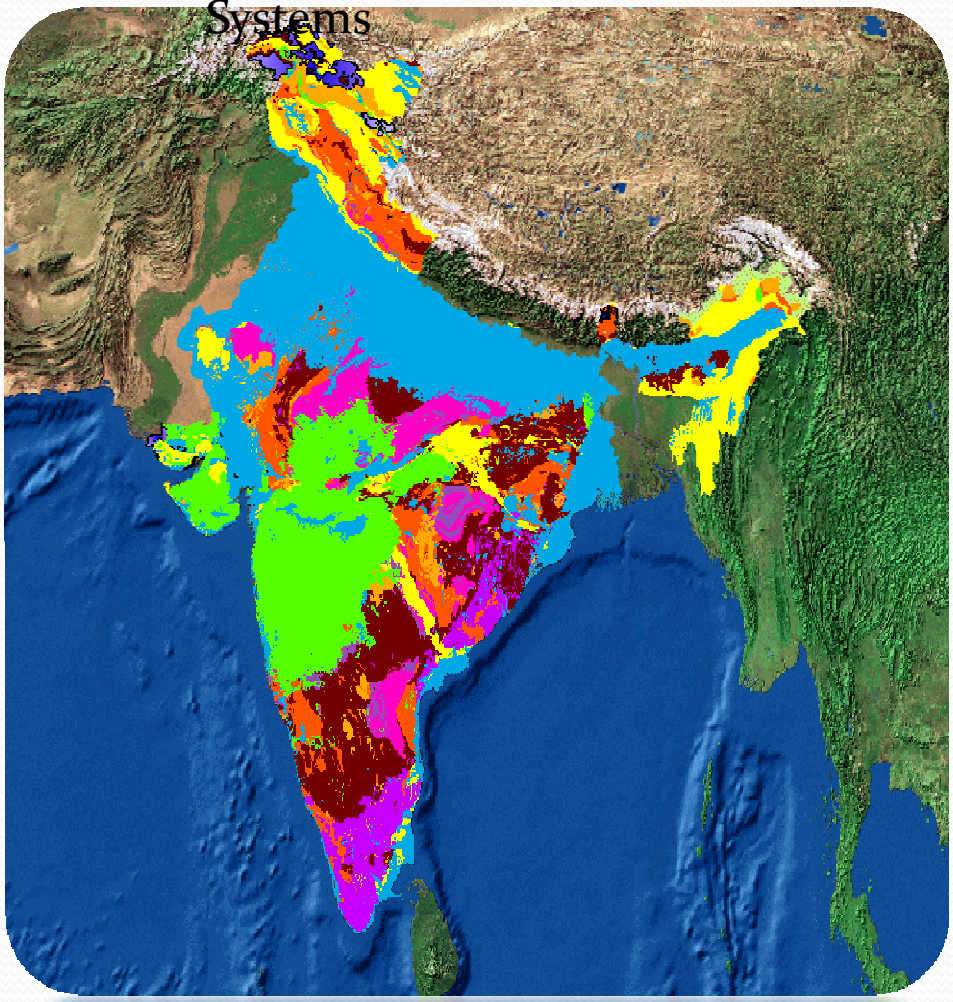
Aquifer Mapping

- Total area of the country - 32 Lakh Sq.Km
  - Coverable Area- 23.25 lakh Sq. Km
  - Priority Area for mapping in XII plan – 8.89 lakh Sq. Km
- Aquifer mapping in 3D on 1:50,000 scale undertaken.
- Facilitate participatory ground water management
- Create a data base

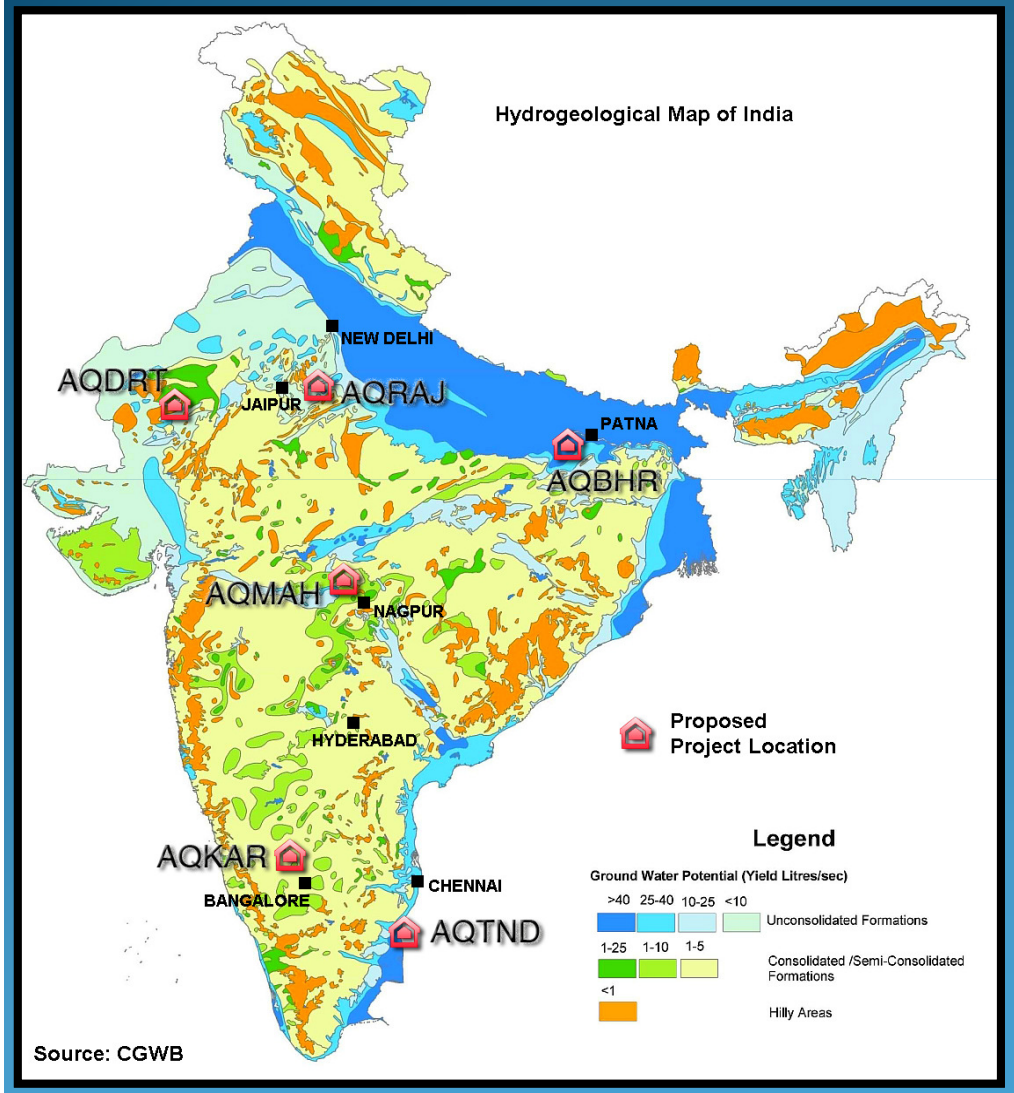




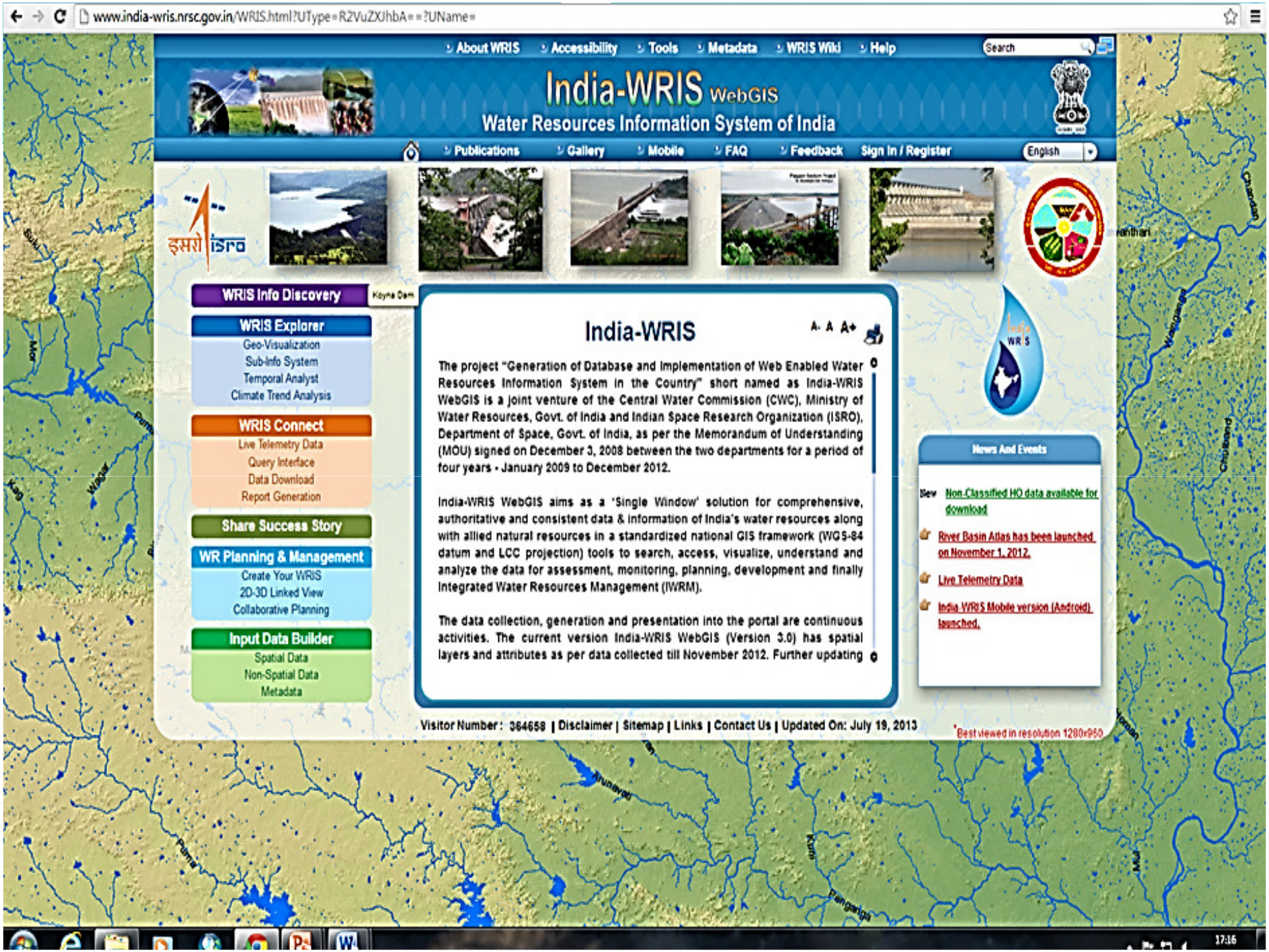
Principal Aquifer Systems



Pilot Project Areas



Pilot Project Areas	Km^2
Baswa-Bandikui Watershed, Dausa District, Rajasthan - I – AQRAJ	633
Maner-Khagaul Area, Patna Dist, Bihar (Watershed GNDK013) - II – AQBHR	~500
Watershed WGKKC-2, Nagpur district, Maharashtra - III – AQMAH	360
Parts of Tumkur District, Karnataka - IV – AQKAR	376
Lower Vellar, Cuddalore district, Tamil Nadu - V – AQTND	234
Part of Thar Desert, Jaisalmar District, Rajasthan. - VI – AQDRT	505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Temporal Analyst
Climate Trend Analysis
WRIS Connect
Live Telemetry Data
Query Interface
Data Download
Report Generation
Share Success Story
WR Planning & Management
Create Your WRIS
2D-3D Linked View
Collaborative Planning
Input Data Builder
Spatial Data
Non-Spatial Data
Metadata
India-WRIS
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The project "Generation of Database and Implementation of Web Enabled Water Resources Information System in the Country" short named as India-WRIS WebGIS is a joint venture of the Central Water Commission (CWC), Ministry of Water Resources, Govt. of India and Indian Space Research Organization (ISRO), Department of Space, Govt. of India, as per the Memorandum of Understanding (MOU) signed on December 3, 2008 between the two departments for a period of four years - January 2009 to December 2012.
India-WRIS WebGIS aims as a 'Single Window' solution for comprehensive, authoritative and consistent data & information of India's water resources along with allied natural resources in a standardized national GIS framework (WGS-84 datum and LCC projection) tools to search, access, visualize, understand and analyze the data for assessment, monitoring, planning, development and finally Integrated Water Resources Management (IWRM).
The data collection, generation and presentation into the portal are continuous activities. The current version India-WRIS WebGIS (Version 3.0) has spatial layers and attributes as per data collected till November 2012. Further updating
News And Events
New Non-Classified HQ data available for download
River Basin Atlas has been launched on November 1, 2012.
Live Telemetry Data
India-WRIS Mobile version (Android) launched.
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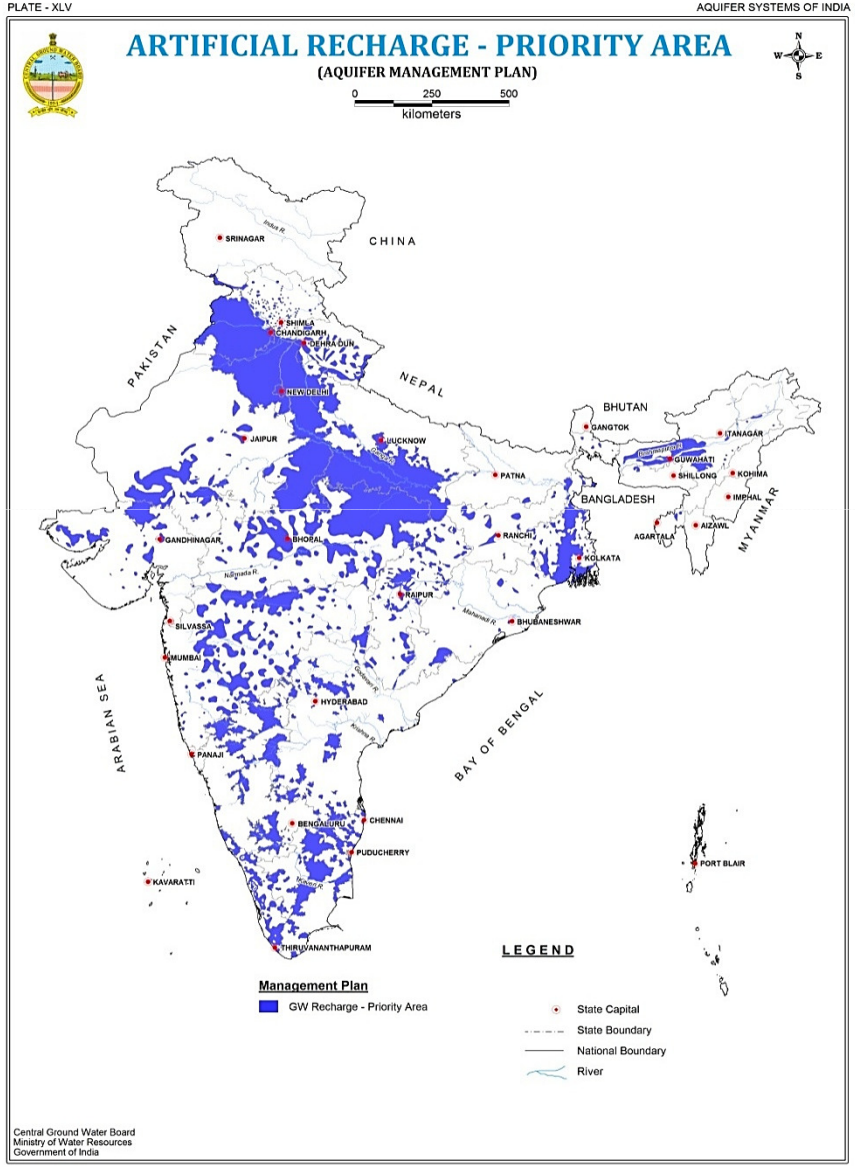
Artificial Recharge Structures

Check dam

Check dam

Recharge pond

Master Plan of Artificial Recharge to Ground Water (2013)



Area suitable for Artificial Recharge	9,41,541 Sq Km.
Volume of Water Available for recharge	85,565 Million Cubic Meter (MCM)
No. of Structures	1.11 crore
Estimated Cost	INR 79,178 Crore

Participatory Ground water Management (PGWM)

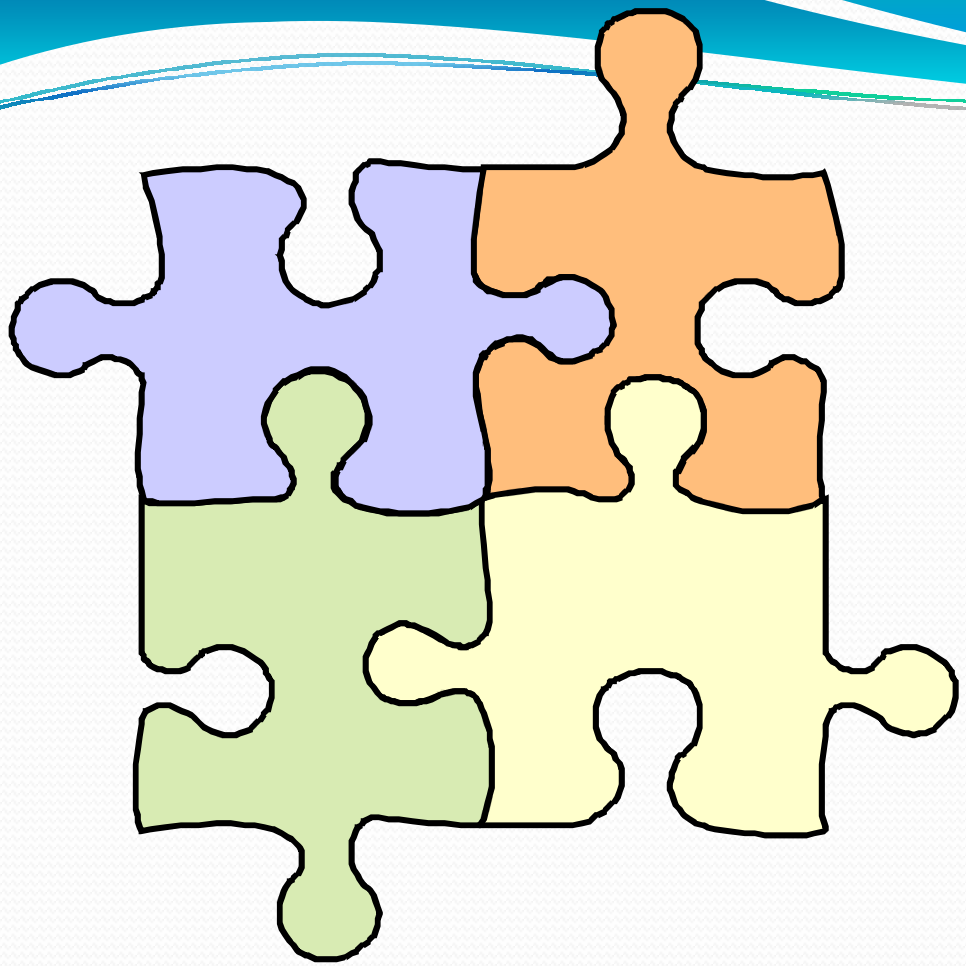
- PGWM is aimed in ground water management at grass root level to enable the community and stake holders to monitor and manage the ground water themselves.
- Implementation through collaborative approach amongst CGO's, research institutes, PRIs, NGO's and the local community.
- Programme will be executed at the village level by grass root ground water workers after providing necessary trainings, to address issues of Management of Groundwater & Monitoring leading to sustainability of Groundwater.
- Grass Root Workers to collect primary Hydrogeological data, periodic monitoring of wells, sensitizing villagers regarding ground water trends, extensive usage, ground water quality so that stake holders can plan water use as per water budget.
- The program will catalyse and scale up the PGWM process to facilitate the field level outreach.

WAY FORWARD

- **Establishing mechanism for data sharing within the framework of data access policies**
- **Refinement of Methodology for Assessment of Ground water Resources.**
- **Development of ground water basin models for conjunctive use of surface and ground water.**
- **Development of Decision Support System (DSS) for planning and management of ground water resources.**
- **Recycling and reuse of water.**

WAY FORWARD

- **Environment and radioisotope applications in groundwater dating, contaminant transport and groundwater recharge studies.**
- **Application of RS/GIS in Ground Water.**
- **Mapping of High Altitude Aquifers**
- **Participatory Research -.**
- **Coastal Aquifer Management:** There is a need to construct "Sanctuary wells"
- **Trans-boundary management of aquifers**



Let us Join hands
for this
Endeavour

THANKS