Ground water management – Rajasthan perspective

Rana Chatterjee
Scientist 'D'
CGWB

Water scenario, Rajasthan

Some Basic facts

- Geographical area: 3,42,239 sq km. (10.4% of country)
- Rainfall: State Average 575 mm (313 mm Western & 675 mm Eastern); (National average – 1170 mm)
- Water Resources : 44.09 bcm (SW – 33.94 bcm ; GW – 11.15) (4% of country)
- Domestic Water requirements : GW - 91% ; SW - 9%
- Surface Water Sources - IGNP, Chambal, Mahi, Bisalpur Reservoirs recently from Narmada Canal and other Minor Reservoirs
- Irrigation Water demand : GW - 77% ; SW -23%
- Most of the Industrial Water requirements are being catered from Groundwater.

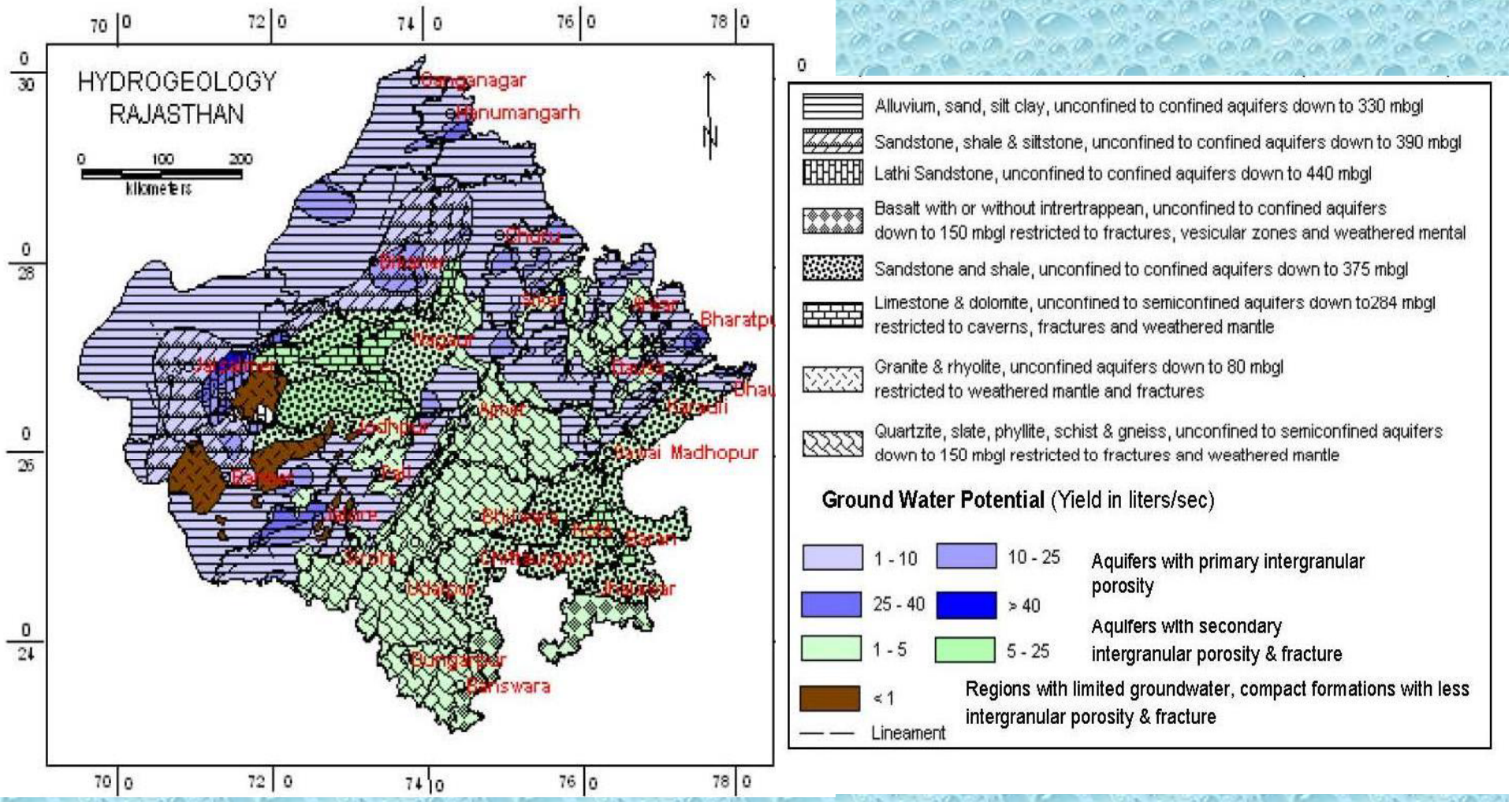
HYDROGEOLOGICAL SET-UP

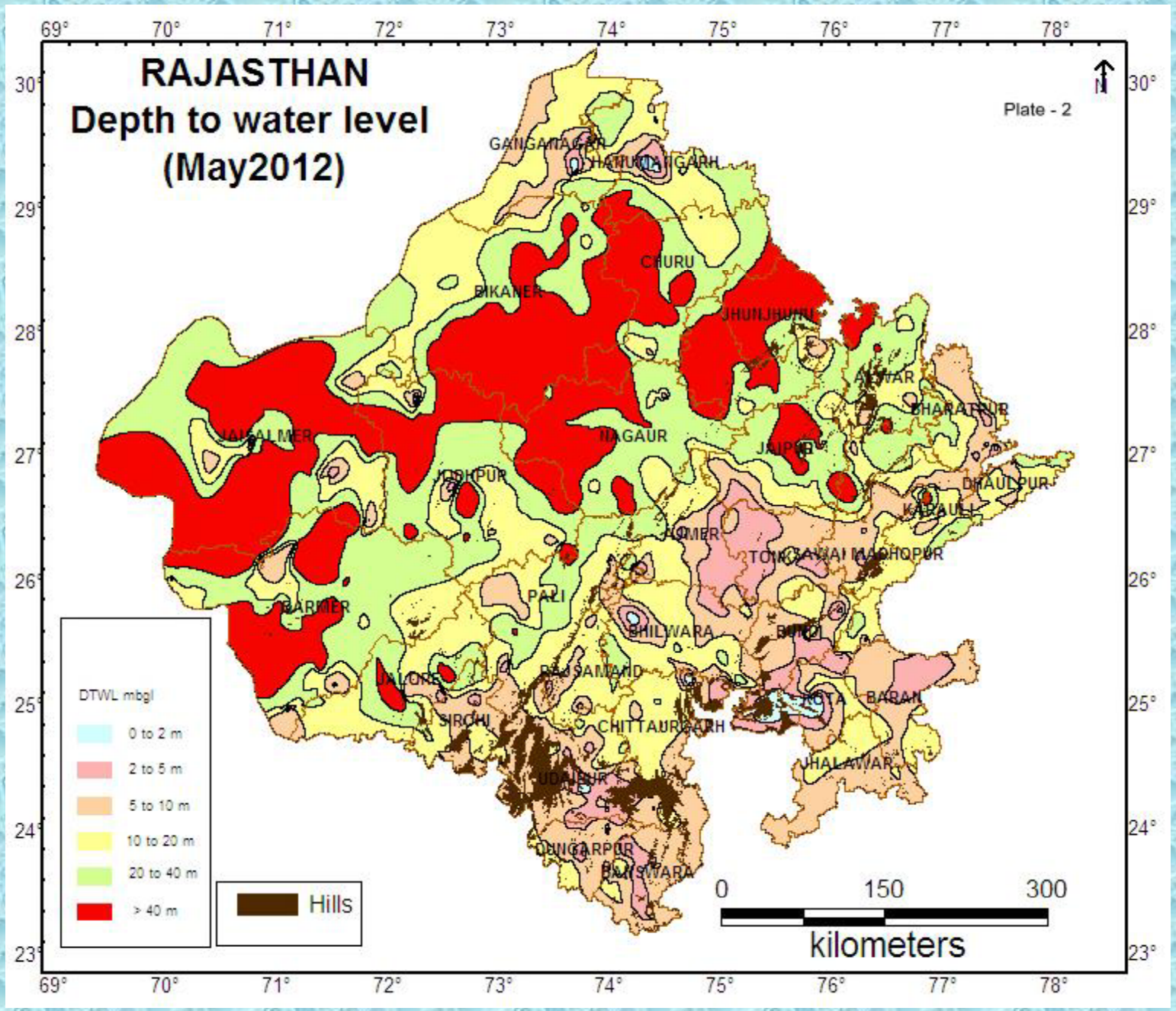
- Diversified, complex geological framework
- *55% area*

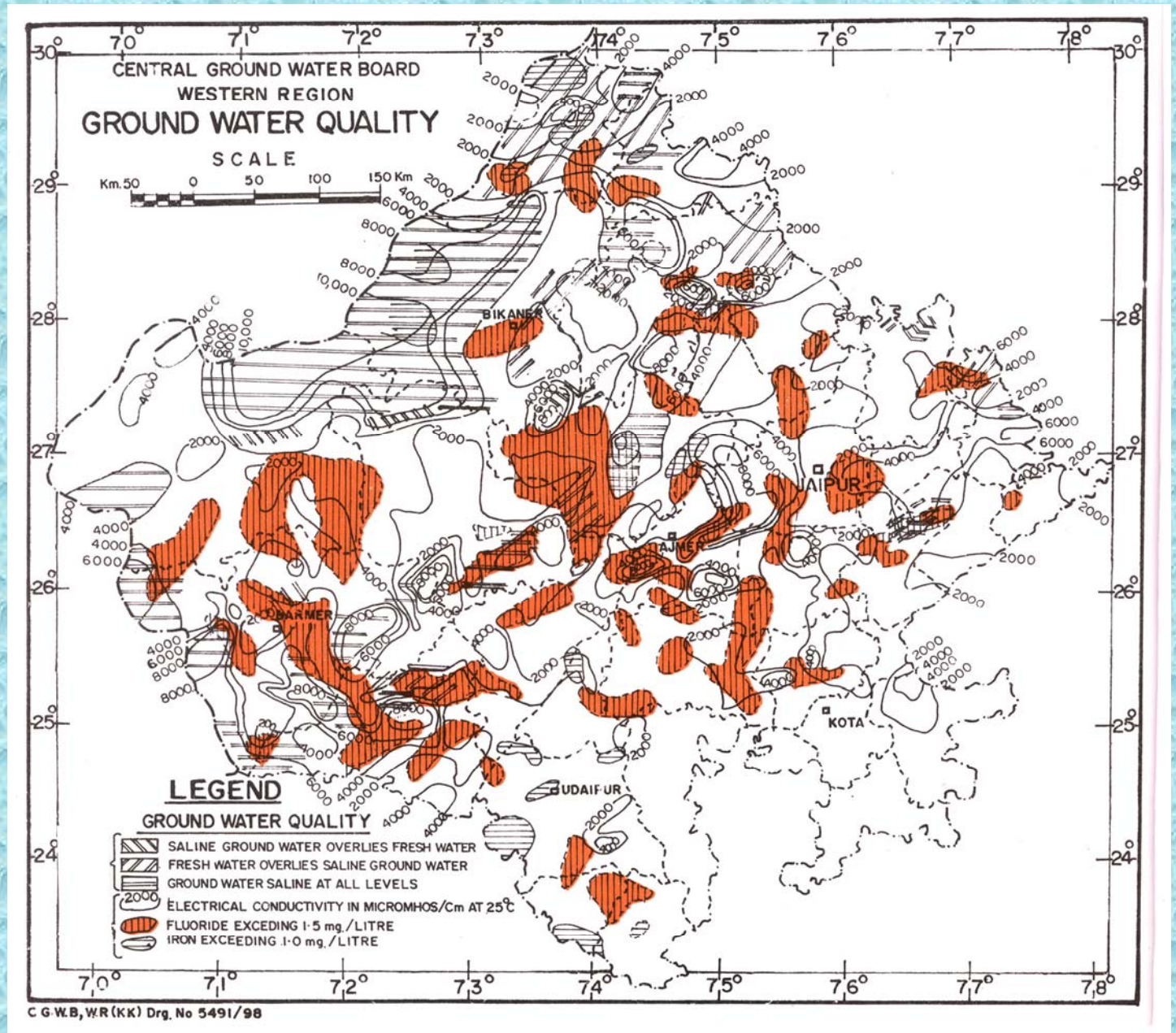
  unconsolidated /semi consolidated formations, good to moderately potential aquifer, but quality of GW is highly variable laterally/ vertically especially in western Rajasthan & parts of Bharatpur
- *45% area*

  consolidated sedimentary - moderate aquifers)/ Igneous metamorphic rocks - poor aquifers

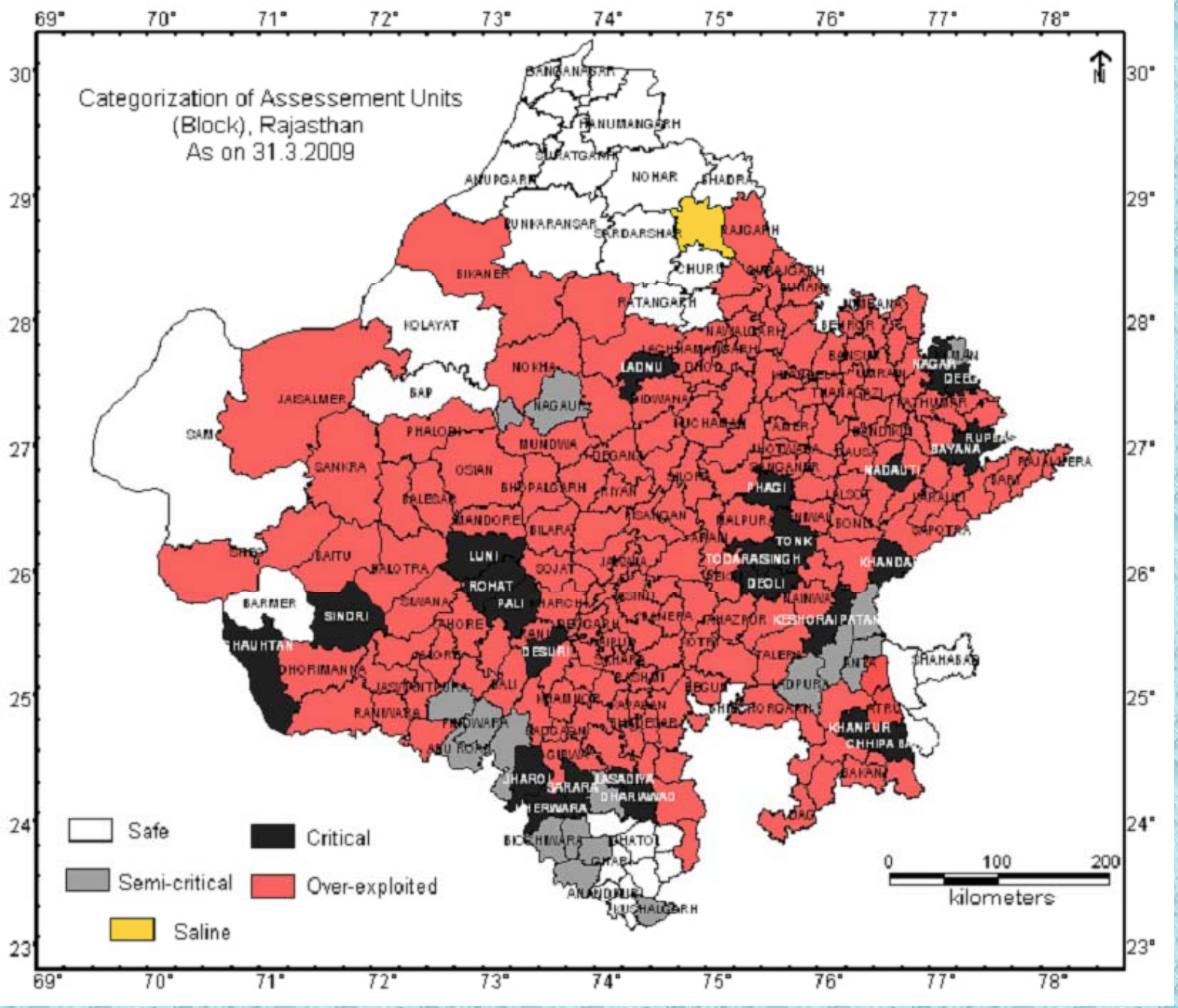
HYDROGEOLOGICAL SETUP




RAJASTHAN
Depth to water level
(May2012)
Plate - 2
N
69°
70°
71°
72°
73°
74°
75°
76°
77°
78°
30°
29°
28°
27°
26°
25°
24°
23°
GANGANAGAR
HANUMANGARH
CHURU
BIKANER
JHUNJHUNU
ALWAR
BHARATPUR
JAISALMER
NAGAUR
JAIPUR
DHAULPUR
KARAULI
JODHPUR
AJMER
TONK
SAWAI MADHOPUR
BARMER
PALI
BHILWARA
BUNDI
JALORE
RAJSAMAND
KOTA
BARAN
SIROHI
CHITTAURGARH
JHALAWAR
UDAIPUR
DUNGARPUR
BANSWARA
DTWL mbgl
0 to 2 m
2 to 5 m
5 to 10 m
10 to 20 m
20 to 40 m
> 40 m
Hills
0
150
300
kilometers



C.G.W.B, W.R (KK) Drg. No 5491/98



SOD: 134%

Total :239

OE: 166

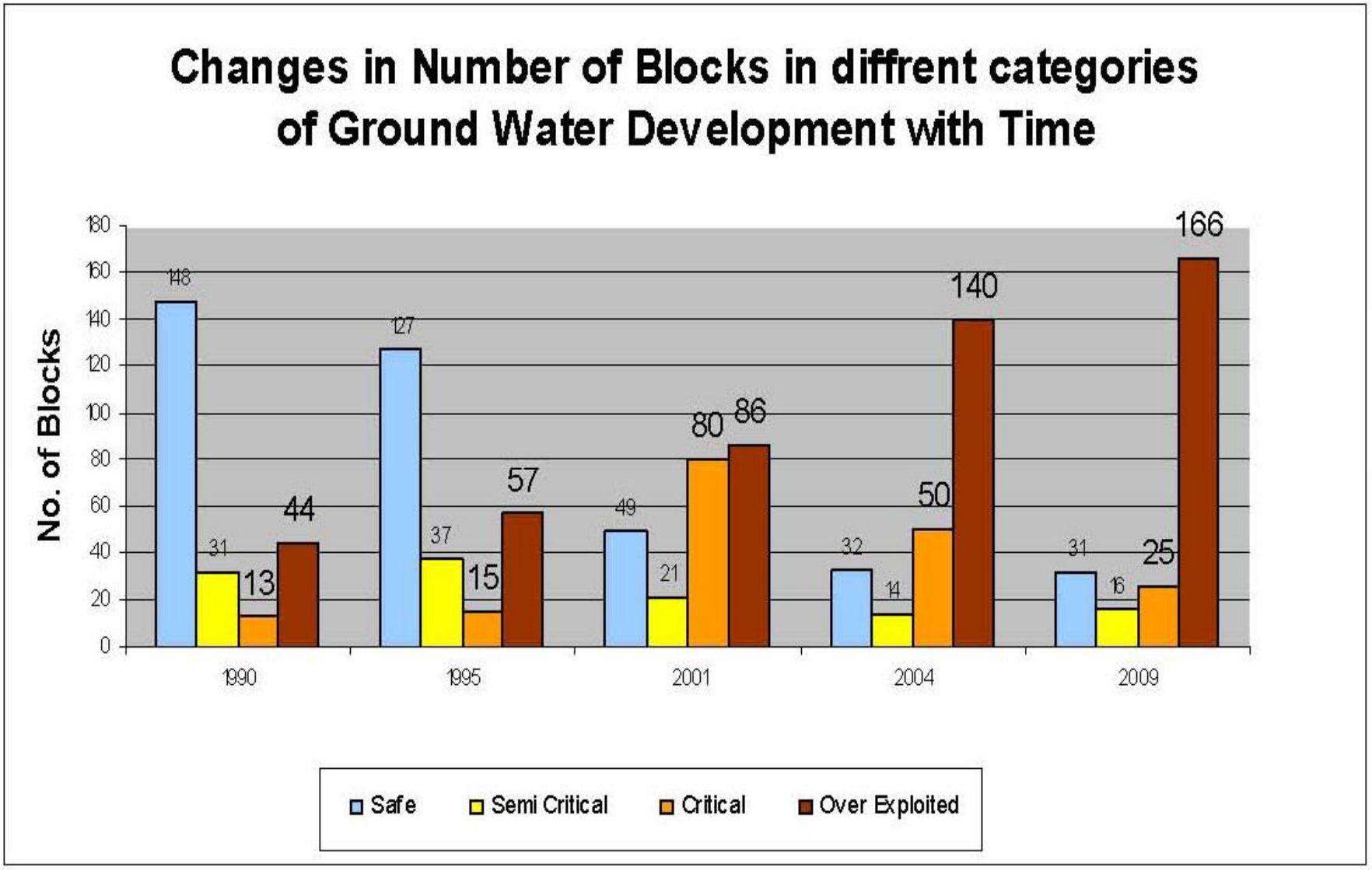
Critical: 25

SC: 16

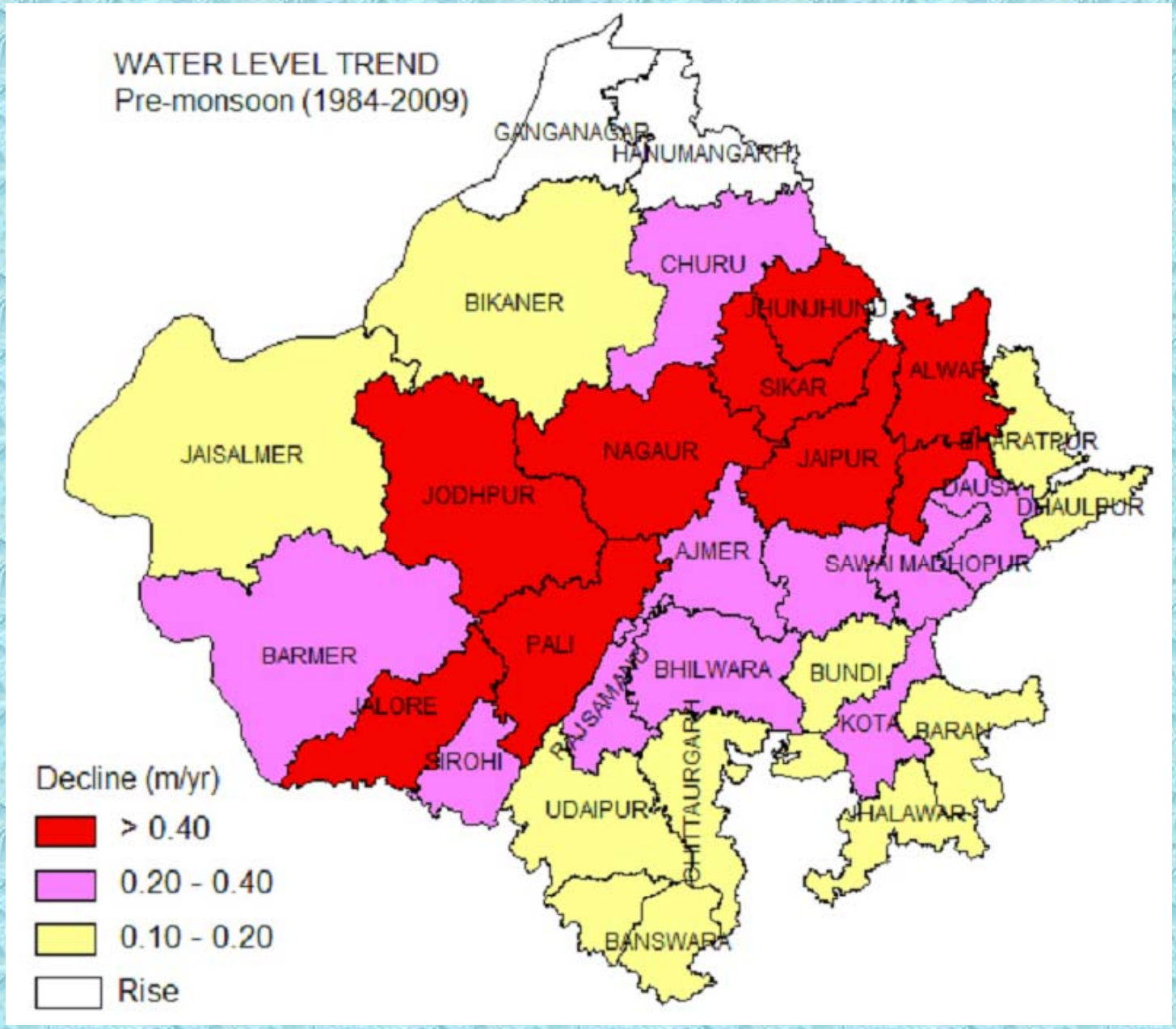
Safe: 31

Saline:1

Overdraft-Progressive increase in OE Blocks



Impact of Over-exploitation–Decline in Water Levels



Way out – General Management Options

- Accessible Information System
- Awareness
- Augmentation
- Conservation
- Conjunctive / Integrated use
- Recycling and reuse
- Reclamation
- Regulation

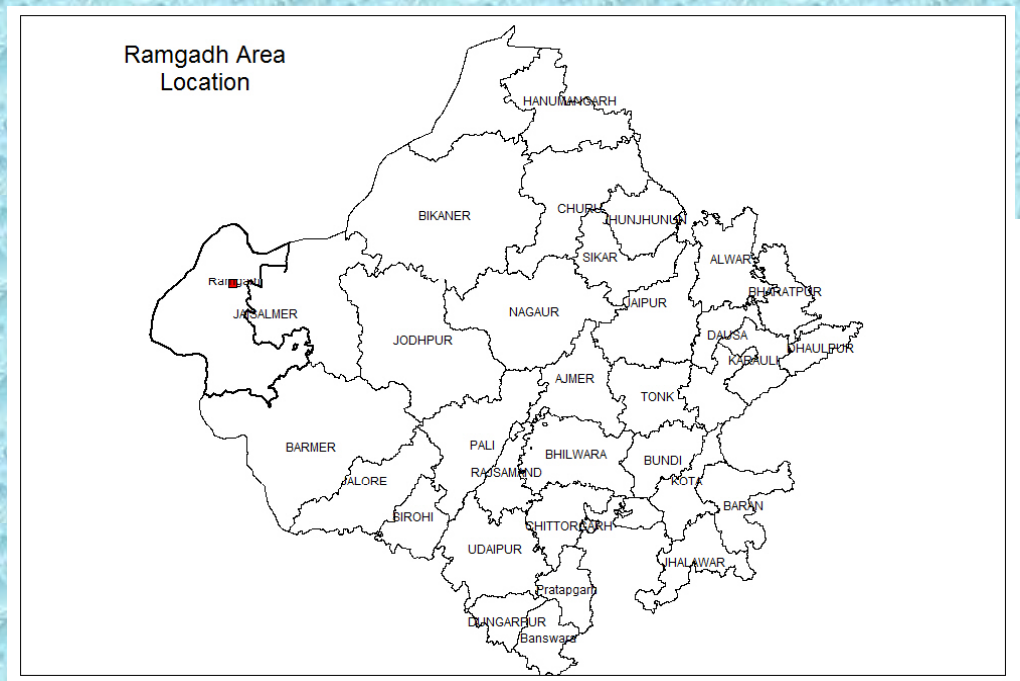
NAQUIM
Aquifer Information and Management

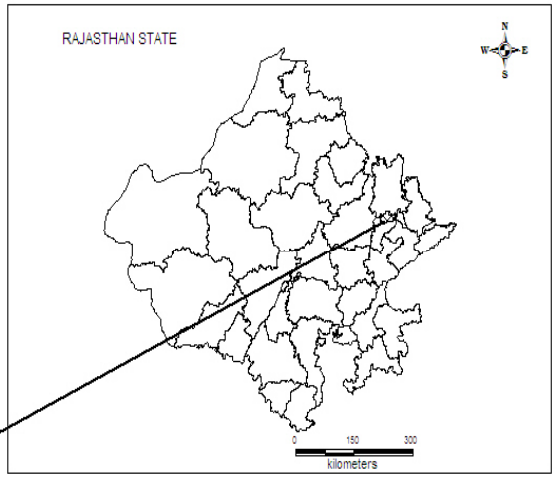
- ***Old management saying*:**

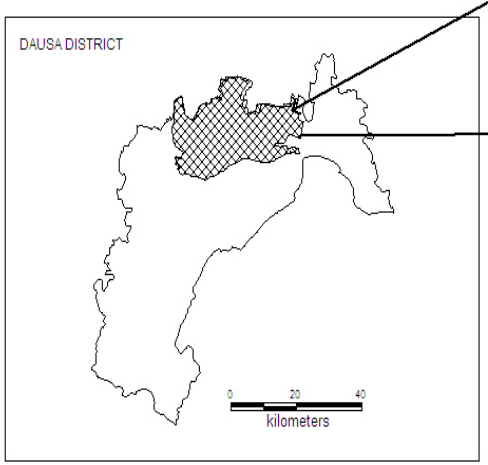
  "You cannot manage what you cannot measure and monitor"

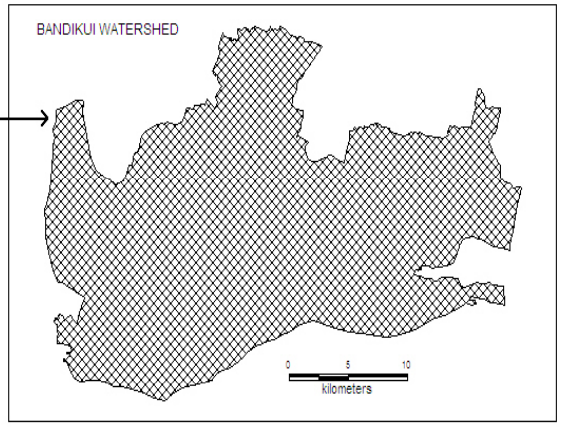
- Aquifers are the repositories for ground water storage – their dimensions, characteristics, quality, storage etc. need to be ascertained to manage them
- Flagship programme of MOWR – *Major steps*
  - To prepare **Aquifer Maps** indicating 3 dimensional disposition of aquifers along with their characterization.
  - To formulate **Aquifer Management Plans**
  - To facilitate sustainable management of groundwater resources at regional and local level through **Participatory Ground Water Management**
- **SGWD –** carried out Aquifer Mapping at a larger scale

Aquifer mapping project area





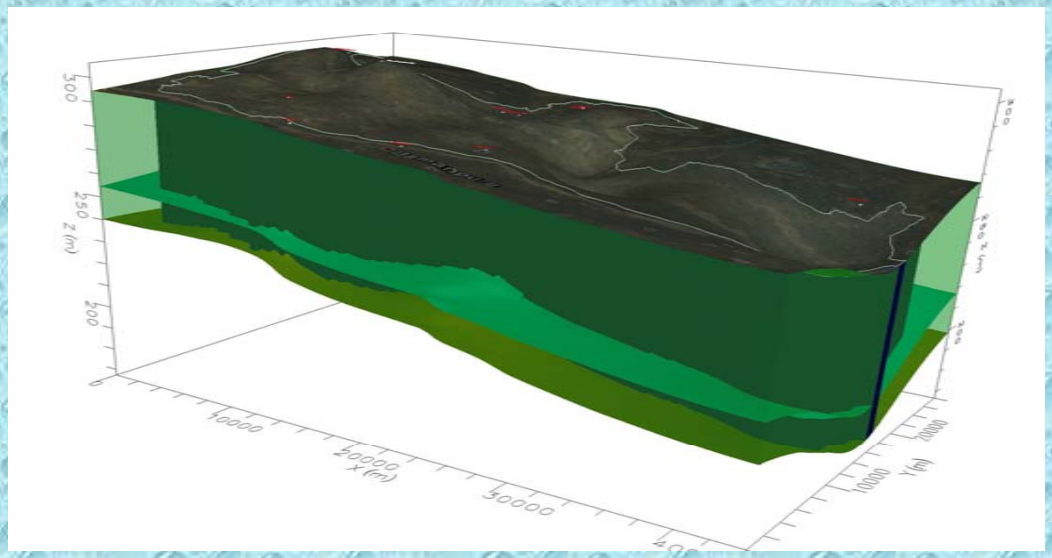




CONCEPTUAL MODEL
Baswa-Bandikui watershed

Model Domain

3D model conceptualisation



Conjunctive use of Surface & Ground water

- Canal command – side effect - rising ground water level, water logging, soil salinity
- Urban areas – side effect – rising ground water level, damages to the buildings
- Solution – Conjunctive/ Integrated use of surface and ground water

Conjunctive use of Surface and Ground Water

- Indira Gandhi Nahar Pariyojna – Study area – 5000 sq. km. Water logged 500 sq.km., Salinity – 3 Eastern blocks – Anupgrah Shakha and Suratgarh branch
- Cause –
  - existence of hardpan
  - seepage's from the main canal, unlined water courses and return seepage of irrigation water
  - seepage from 18 Ghaggar depressions/reservoir meant to store flood water of Ghaggar River. Ground water remained relatively untapped
- Water Availability – Canal water – 4140 mcm

  Ground water – 992 mcm (2% utilization)
- Proposed strategy – Increasing ground water utilization by 18% of canal water release

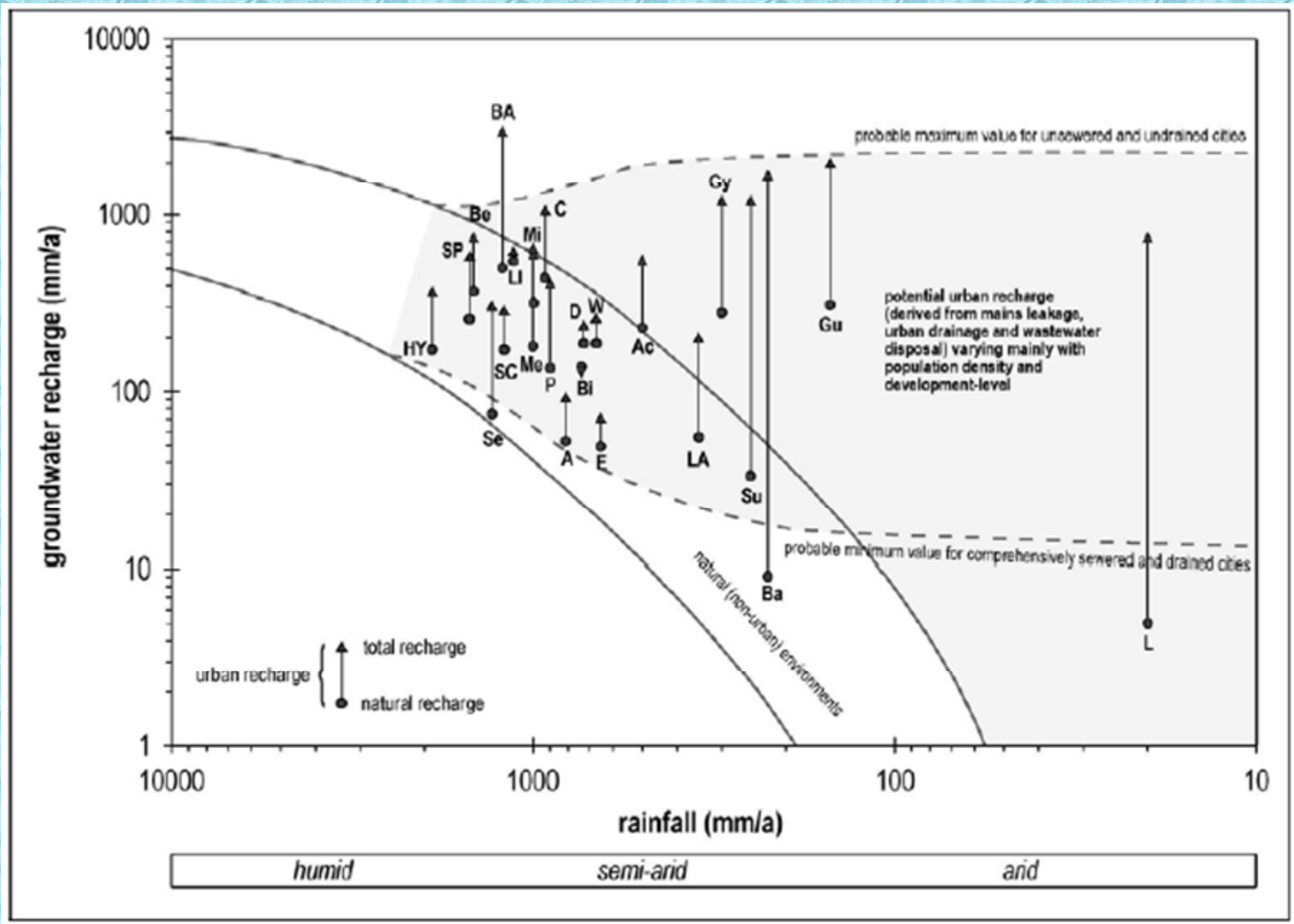
Water Laws in the State

- Mandatory RWH for all properties in plots covering more than 300 sq m in urban areas.
- **Court order:** Ban on drilling of TW in the state
- CGWA – Notified 36 areas, *installation of new ground water abstraction structures is not permitted without prior specific approval of the Authority/ Authorized officer*
- Construction of recharge shaft in Anicuts
- Converting abandoned TWs and DWs in recharge structures
- Limitation for Height of anicuts 1-2 m

Urban Ground Water Scenario
Issues & Challenges

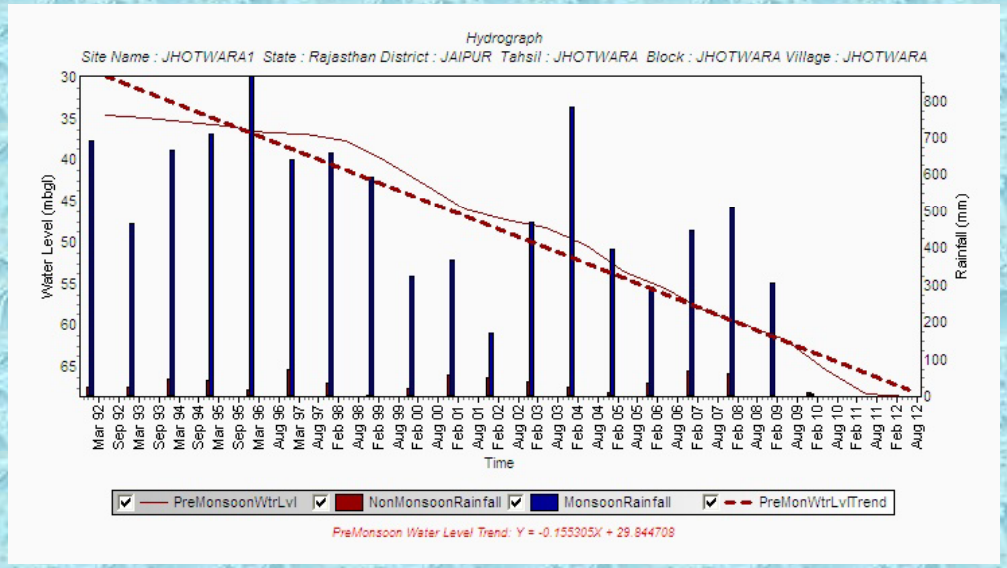
- Accelerated urbanization, limited resource
- Depletion of resource, pollution
- Development & Environment – compartmental approach
- Civic consious – lack of it
- Technological intervention
- Financial sources

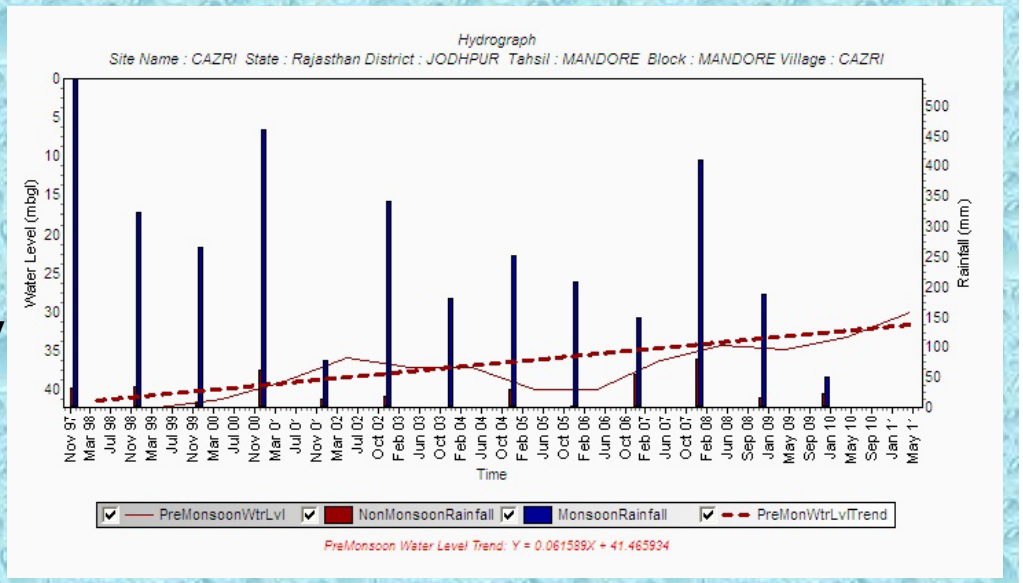
Ground water recharge in Cities



A Tale of Two Cities : *Jaipur vis-à-vis Jodhpur*

- Jaipur
  - Declining water level
  - Growing population & urban settlements
  - Depandance on ground water for domestic & industrial needs
  - Over exploitation of ground water
  - Fluoride and Nitrate pollution
- Jodhpur
  - Rising water level
  - Non-utilization of local gw structures
  - Increase in Kaylana water supply by three times
  - Leakage through old city sewerage system
  - Local hydrogeological setup





Salient Features Jaipur city

Population of City as per 2001	23.74 lacs
Present Population	31.12 lacs
Population connected with water supply	27.98 lacs
Water demand	4197 lac lit
Water Supply – Bisalpur system, tubewells	3400 lac lit

Hydrogeological setup
Jaipur Urban Area

- Avg. rainfall: 640 mm
- Aquifer: Quaternary alluvium
- GW level: 11 to >65 m (central part – shallower ~ 20m)
- GW flow: North to South direction
- Decline in water level: 1 to 3 m/yr.
- Ground water Resources:
  - Annual Replenishable GW Resources : 176 mcm (~87 mm, 14%)
  - Net GW Availability : 159 mcm
  - Ground Water Draft : 445 mcm
  - Stage of GW Development : 208%
  - Category : OE
- GW Quality –
  - General potable except part of wall city
  - Fluoride problem in parts of Sanganer area – geogenic supplemented with dyeing & printing industries
  - Nitrate problem in walled city and adjoining areas – sewerage leakage

Present Scenario

- As per design 418 mld - Bisalpur Project & 100 mld - tube wells, where as the present situation is almost reverse - immense pressure on ground water.
- Increased rate of tube well failure due to drop in water table.
- Reduced yield of new tube wells being constructed in recent years.
- Areas such as Jhotwara, Murlipura, Jagatpura, Malviya Nagar, part of Mansarovar, Bapu Nagar, C Scheme, Jawahar Nagar etc are almost dry.

Management options

- Integrated use of Surface & Ground water
- Rain water harvesting structures should be made mandatory for all houses, existing as wells as new. Presently, it is mandatory for houses with more than 300 sqm.
- Roof top artificial recharge structure should be constructed in all govt. buildings and private properties.
- There are three big industrial areas in town, VKIA, Jhotwara and Sitapura, there are big plots with huge open areas. The industrialist should be persuaded to construct rain water harvesting structures and artificial recharge structures for recharging the aquifer.
- Mandatory RWH for Industries, commercial establishments in specific time frame-with incentive
- Creation of Authorized Technical Pool of experts for design, verification and proper maintenance of AR structures
- Recycling of water-STP in new buildings mandatory
- Ban on using fresh water for green areas, construction activity and non-drinking usage like car washing etc. – treated water
- Industrial water requirement through treated water
- Opening Toll free no for complaints on illegal drilling, violation of Water laws

Acknowledgment

- CGWB, Western Region, Jaipur
- Sh. M. Mehta, former Commissioner, CGWB
- Er. D. Sharma, PHED, Rajasthan
- Jenna Stearns, Staya