Towards Water Security
- Managing the Ground Water Crisis

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“Is Source Sustainability through GW Recharge required in every scheme ? ”

Aquifers Subjected to Heavy Exploitation

Understanding of Aquifer ???

Ground water availability continuously reducing
-Rainfall declining
-Indiscriminate extraction

Responsible users/sources
-Irrigation tubewells
-Drinking water tubewells
-Industries
-Commercial units
-Infrastructural activity
-Bulk uses
-Fish development
-Horticulture
-Mining

GW Pollution emerged as a bigger threat
-Challenge of Potable water supply
- Risk through Food Chain

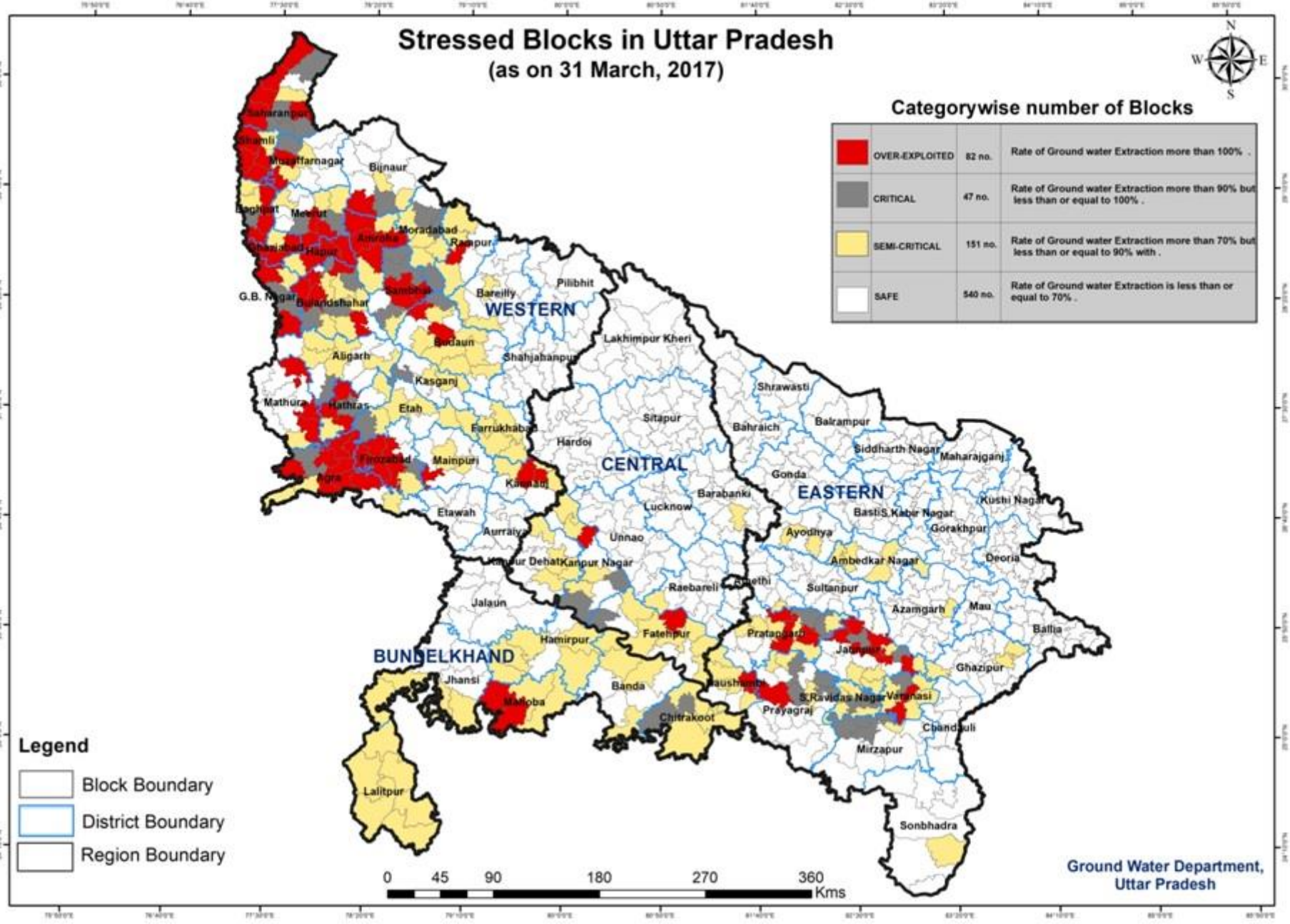
Extraction becoming uncontrolled - Biggest concern

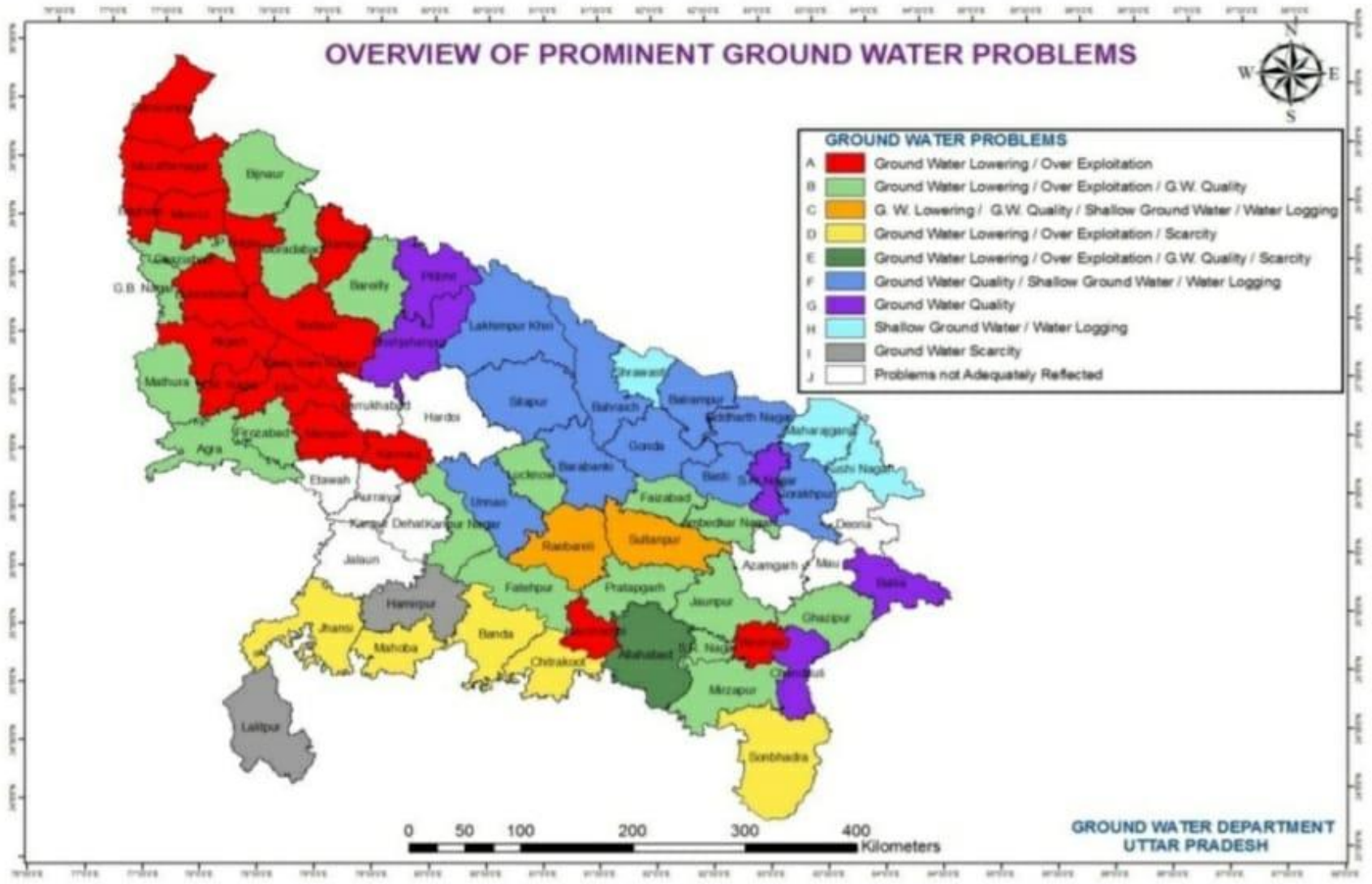
- Recent study published in the Geophysical Research Letters concludes that unabated large scale GW extraction resulted into –

- An important anthropogenic contribution is sea level rise due to ground water depletion resulting from irrigation.
- Earth's rotational pole has drifted towards east at a speed of 4.36 cm/year during 1993-2010 due to ground water depletion.
- Earth being tilted nearly 80cm eastwards.
- Humans have pumped out 2150 gigatons of ground water.
- ***Extraction in Western North America and North-Western India is the majorly responsible for this situation.***

Extraction becoming uncontrolled - Biggest concern

- The above situation can be well understood with the reported G.W. extraction data of the County –
- India the biggest exploiter; 25% , 239 bcm (as reported).
- Ground situation of extraction is much more alarming.
- Uttar Pradesh tops in GW exploition.
- More than 50% (121 bcm) of extraction is contributed by most of North Western States - U.P., Punjab, Haryana, Delhi, Himachal Pradesh, Rajasthan and M.P..
- In U.P., situation is extremely grave. Actual extraction is around 80 bcm, or even more, much higher than the reported figure of 46 bcm.
- Ground water quality is another area of grave concern for ensuring sustainability of ground water.


Stressed Blocks in Uttar Pradesh
(as on 31 March, 2017)
Categorywise number of Blocks
OVER-EXPLOITED 82 no. Rate of Ground water Extraction more than 100% .
CRITICAL 47 no. Rate of Ground water Extraction more than 90% but less than or equal to 100% .
SEMI-CRITICAL 151 no. Rate of Ground water Extraction more than 70% but less than or equal to 90% with .
SAFE 540 no. Rate of Ground water Extraction is less than or equal to 70% .
N
S
E
W
WESTERN
CENTRAL
EASTERN
BUNDELKHAND
Saharanpur
Shamli
Muzaffarnagar
Bijnaur
Meerut
Moradabad
Amroha
Rampur
Hapur
Ghaziabad
G.B. Nagar
Bulandshahar
Bareilly
Pilibhit
Budaun
Aligarh
Shahjahanpur
Kasganj
Mathura
Hathras
Etah
Farrukhabad
Lakhimpur Kheri
Sitapur
Hardoi
Shrawasti
Bahraich
Balrampur
Siddharth Nagar
Maharajganj
Gonda
Barabanki
Lucknow
Kushi Nagar
Basti
S.Kabir Nagar
Gorakhpur
Ayodhya
Deoria
Ambedkar Nagar
Firozabad
Mainpuri
Agra
Kannauj
Etawah
Auraiya
Unnao
Kanpur Dehat
Kanpur Nagar
Raebareli
Sultanpur
Azamgarh
Mau
Ballia
Jalaun
Hamirpur
Fatehpur
Pratapgarh
Jaunpur
Ghazipur
Jhansi
Mahoba
Banda
Kaushambi
S.Ravidas Nagar
Varanasi
Prayagraj
Chitrakoot
Chandauli
Mirzapur
Lalitpur
Sonbhadra
Legend
Block Boundary
District Boundary
Region Boundary
0 45 90 180 270 360
Kms
Ground Water Department,
Uttar Pradesh

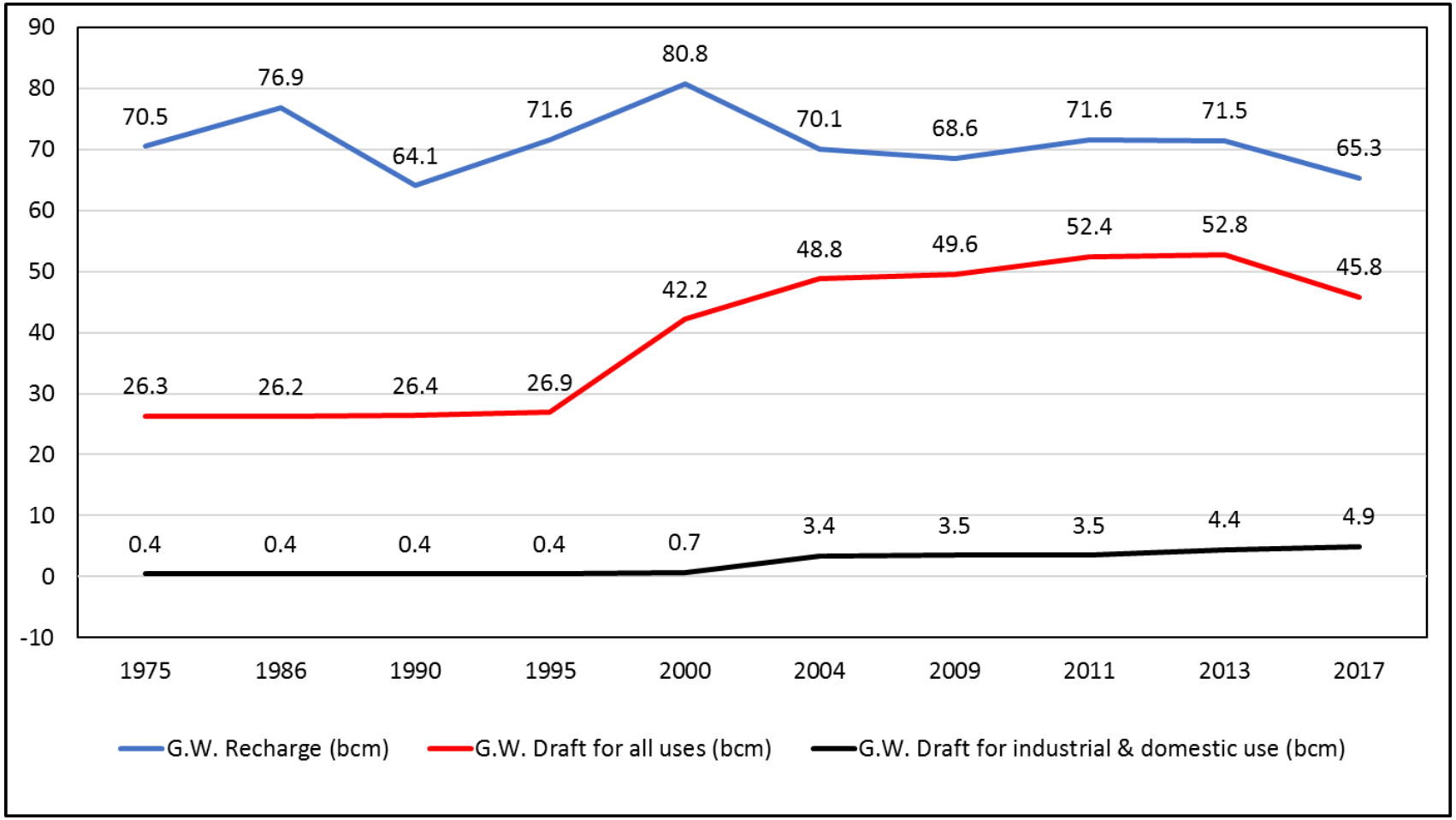


(Source: Sinha, R.S. - 2008)

Major Supplies - Ground Water Dependent

- Ground Water governs the economic growth of the state
- Contribution to GDP – > 9 %
- **Share of Ground Water**
- Irrigation supplies/Irrigated Agriculture - 70%
- Drinking Water Domestic Supplies
  - Urban: 75-80%
  - Rural : 90-95%
- Industrial Water Demand - 95 %
- Infrastructural, Commercial and Bulk Uses - >95%

Groundwater Exploitation in U.P.



Ground Water Scenario

- MI tubewells - 36.69 lakh (2013-14) increased to 44.04 lakh as on 31.03.2019. About 16.5 lakh borings without pumpset.
- 13800 drinking water tubewells and more than 30 lakh India Mark II handpumps.
- About 35000 STW.
- 80% urban drinking water supplies & 90 % rural supplies dependent on ground water, through 15000 tubewells.
- Under Jal Jeevan Mission, about 30000 new tubewells to be constructed.
- Unaccounted tubewells, borings in different user sectors – No proof count.
- Ground Water Mining started in different urban & rural areas from static resource.
- Ground Water Availability reduced from 44 bcm in 1975 to 20 bcm in 2017.
- Aquifer storages and yield drastically reduced.

Background

• “Falling groundwater level threatens city” - this news item published in Indian Express on 18 March, 1996.

•Subsequent PIL by MC Mehta in Hon’ble Supreme Court.

•Judgement of Hon’ble Supreme Court dt. 10-12-1996.

•Hon'ble Supreme court’s observations.

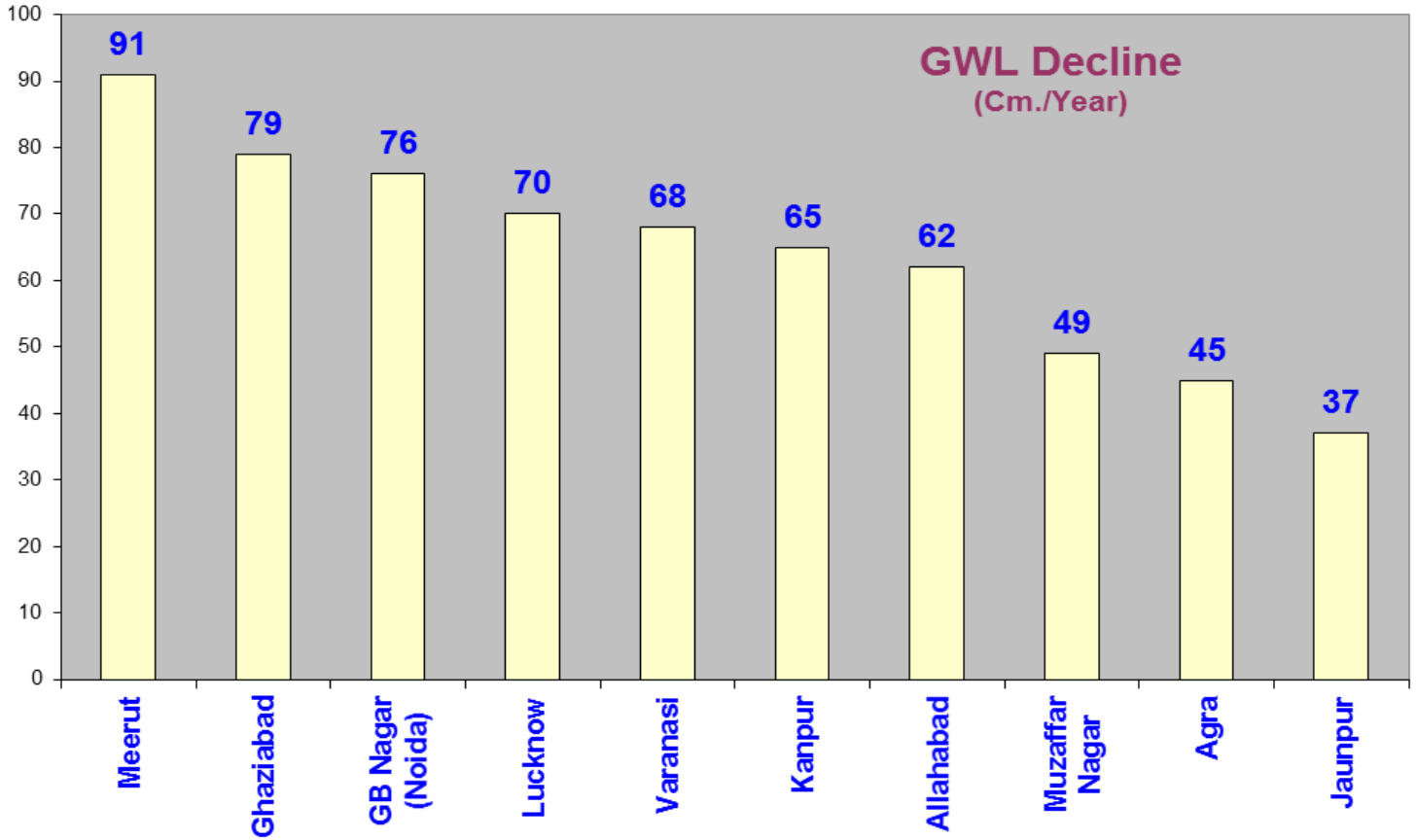
- Statuary authority to develop a constant mechanism for G.W. planning and management.

- Overturned MoWR stand that the GW is a state Subject.

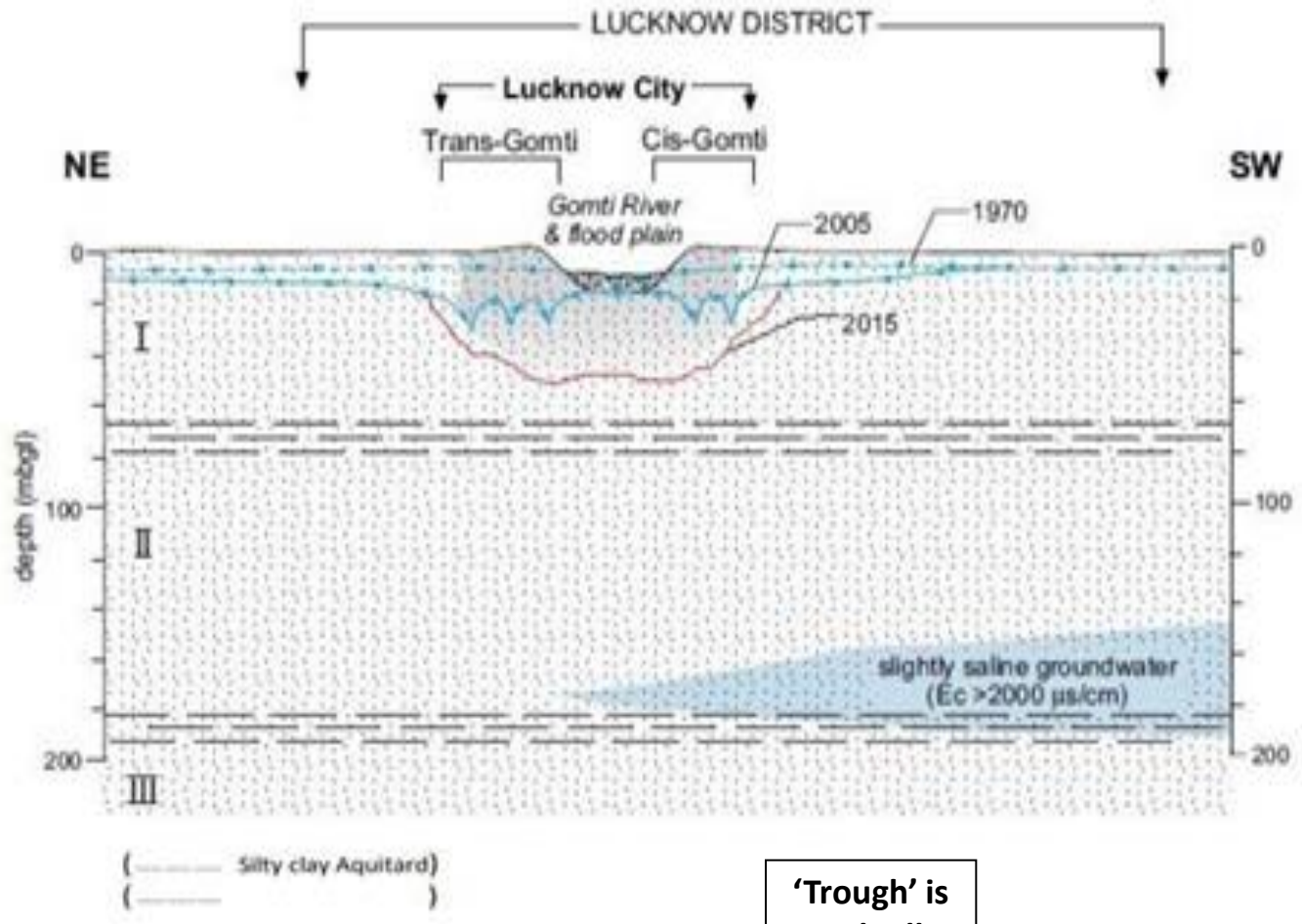
- The India Easement Act-1882.

•`CGWA constituted in 1997 with the a clear mandate **to control indiscriminate extraction of groundwater resources in the country** (under EP Act 1986 - Mother Act).

Average Yearly Decline in Major Cities



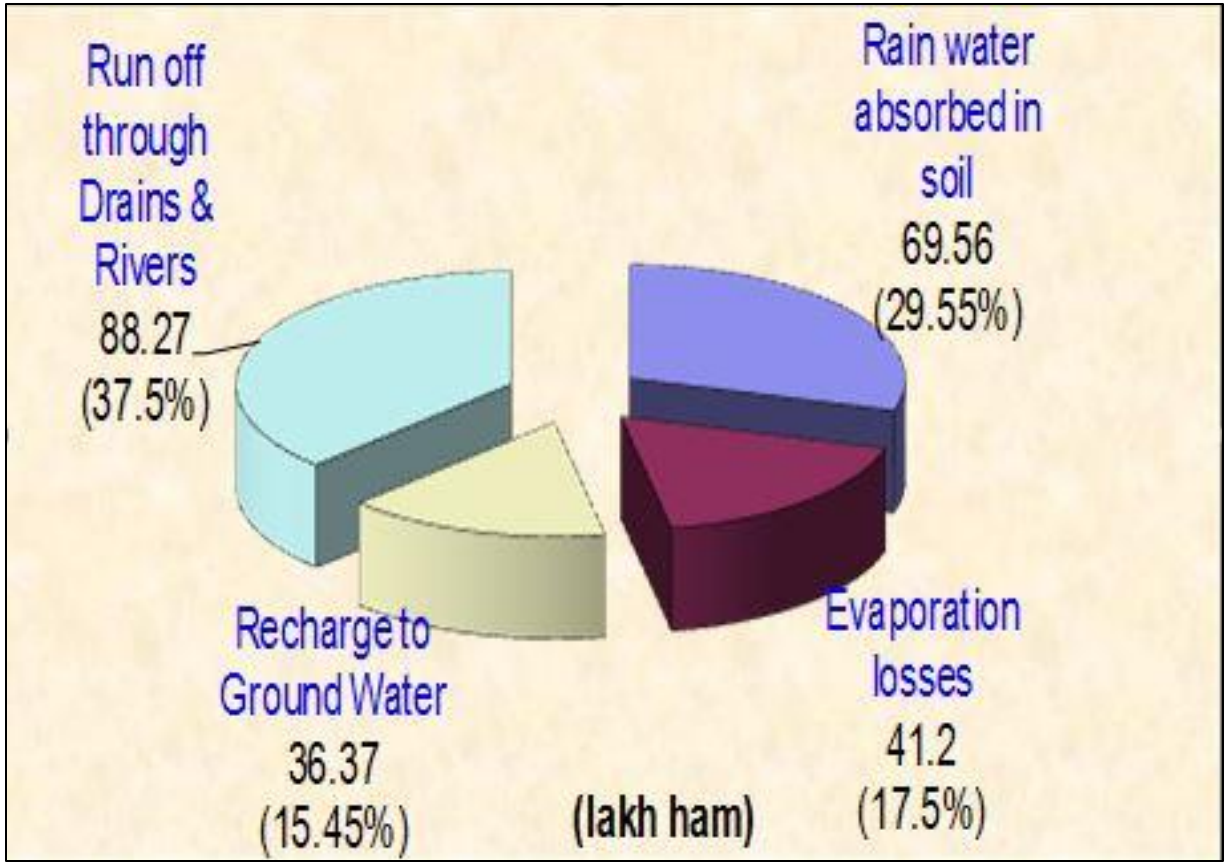
Ground Water Trough in Lucknow City



'Trough' is gradually increasing

Normal Annual Rainfall in U.P.- 947mm

Rain Water Availability- 235.40 lakh ham/per year



Decadal Changes in Average Annual Rainfall in Uttar Pradesh

Decade	1971-1980	1981-1990	1991-2000	2001-2010	2011-2019
Average Annual rainfall (mm)	1280.1 (135%)	923.8 (97.5%)	872.9 (92.10%)	737.4 (77.8%)	732.47 (77.31%)
Normal Annual Rainfall in U.P.: 947.4 mm (Figure in percentage with respect to normal rainfall)					

Issues

- Understanding and knowledge of ground water is lacking.
- Science of extraction and restoration completely ignored.
- No integration in ground water quality assessment. No protocol for sample collection & analysis and use of quality data.
- **Crisis of ground water management.**
- **E-flows of ground water fed river heavily reduced.**
- **Issues of virtual water / consumptive use not yet recognised in ground water resource assessment.**
- **No Integration between surface water and ground water supplies.**
- **Inadequate and non-targeted Ground water regulatory measures.**

What is needed to make Groundwater more Visible - A management perspective

- For overall reform of groundwater sector, we need to have Sustainable actions & solutions for onward implementation.
- Groundwater is not a resource that could be exploited and utilised indiscriminately.
- A robust, dedicated mechanism should be in place.
- Clarity on data with a transparent information system should be the first step.
- Online Real time daily data system to be placed in public domain through a Groundwater Data Watch, so that public/community can be sensitised.

Action Point

Restoration of Depleted Aquifers through Composite package (to ensure Source sustainability)

- For meaningful actions, RRR approach need to be adopted through implementation of composite aquifer restoration package
  - Reduce demand & consumption
  - Reduce and regulate extraction
    - Fixing allowable abstraction limit and water metering
    - Reduce withdrawal rate
    - Recycle
    - Reuse
    - Use of water efficient methods
  - Recharging

What is needed to make Groundwater more Visible - A management perspective

- Groundwater resource estimation and data should be more simplified for common understanding and enhancing knowledge.
- User wise groundwater extraction data should be shared regularly with stakeholders.
- Aquifer maps on 1:10000 scale be prepared to enhance visibility of groundwater.
- Identification of surplus and deficient zones for suitable management actions.

Key Indicators to Achieve Source Sustainability
(Holistic and Integrated Approach needed)

First Step should be to find out groundwater stress areas under Jal Jivan Mission Scheme

- Assessment of Monsoon run-off and non-committed runoff

(- Key to GW Recharge)

- Assessment of Demand and supply for different uses.
- Village wise/ watershed wise Assessment of --

- Aquifer potential (yield and storage)
- GW Availability (Dynamic and Static)
- Ground Water Exatraction for different uses (all users)
- Depth of wells (for different users)

Key Indicators to Achieve Source Sustainability
(Holistic and Integrated Approach needed)

- Pattern of Ground Water levels pre and post monsoon

(Guildeline to be followed : Decline/rising /No change)

- Rainfall pattern during last 10-15 years (source water)
- Area hyodrogeology/lithology and soil type.
- Pattern of Water Uses in agriculture, drinking, industrial, commercial & other user sectors in the vicinity/watershed.
- Surface water availability and pattern of uses.

Key Indicators to Achieve Source Sustainability

(Holistic and Integrated Approach needed)

- Surface water bodies and their usages.
- Groundwater Quality for all parameters for drinking water and irrigation uses.
- Risk of contamination through Food chain.
- Finding prospects of feasible and site specific recharge structures.
- Ensuring no contamination risk in GW recharge process, especially direct recharging through ingection/recharge well technique.

Key Indicators to Achieve Source Sustainability

(Holistic and Integrated Approach needed)

- Filter can check only physical impurities. No devise to check disolved Chemical contamination.
- Assessing application of Water efficient practices in all user sectors and its acceptability.
- Ensuring maintenance and monitoring of various activities to be undertaken.
- Survillience mechanism for technical assessment of various works/activities taken up by different stakeholders.
- Mechanism for Impact assessment should be a mandatory provision.
- SoP of CGWB needs to be reviewed and expanded for different Aquifers/Hydrogeological set up.
- SoP may include an overall holistic approach for achieving ultimate Resotoration of depleted Aquifers.

Catchment Protection

- Mapping of catchment areas
- Identifying areas under encrochment
- Restoration of catchment areas

Thank You