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# Ground water monitoring using GIS based tool for informed decision making (National mapping)



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A wide, dry riverbed in a valley with forested mountains in the background. The sky is clear and blue. The foreground is a vast, flat, sandy area. The mountains are covered in dense green forest. The water is visible in the distance, forming a thin line between the mountains.

WATER ON THE EARTH'S SURFACE ----- ALMOST COMPLETELY VISIBLE

**GROUNDWATER ----- LARGELY OUT OF SIGHT, BUT NOT OUT OF MIND**

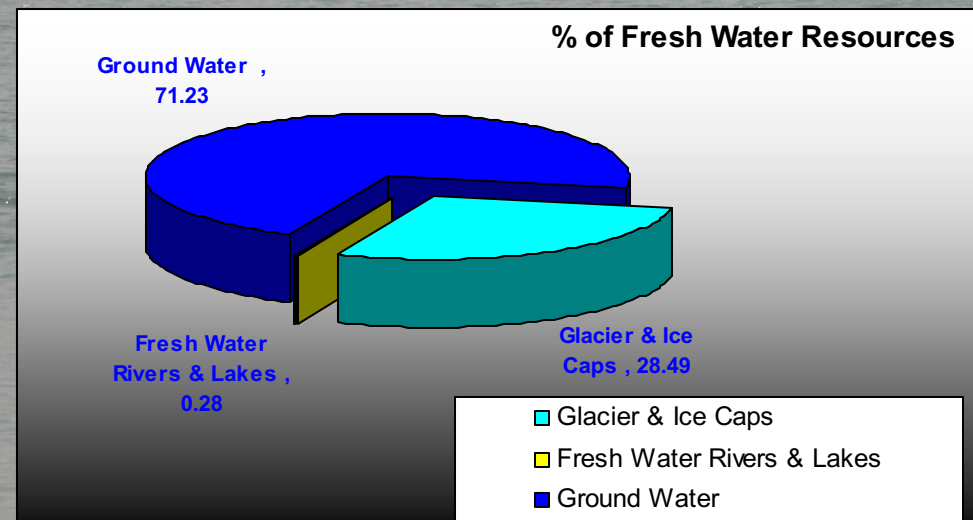
# GLOBAL WATER DISTRIBUTION

- Why ground water monitoring is important (Availability, trend, balance)

	BCM	% of Water Resources	% of Fresh Water
<b>EARTH WATER RESOURCES</b>	1454		
Ocean & Seas	1370	94.22	
Glacier & Ice Caps	24	1.65	28.5
Fresh Water Rivers & Lakes	0.24	0.02	0.3
Ground Water	60	4.13	71.2



- What is the data availability status in the country



4.13% OF ALL WATER IS GROUND WATER

AMONG ALL FRESH WATER SOURCES, 71.2% IS GROUNDWATER ----

DAY BY DAY DEPLETION TREND Mahanadi River (Orissa)

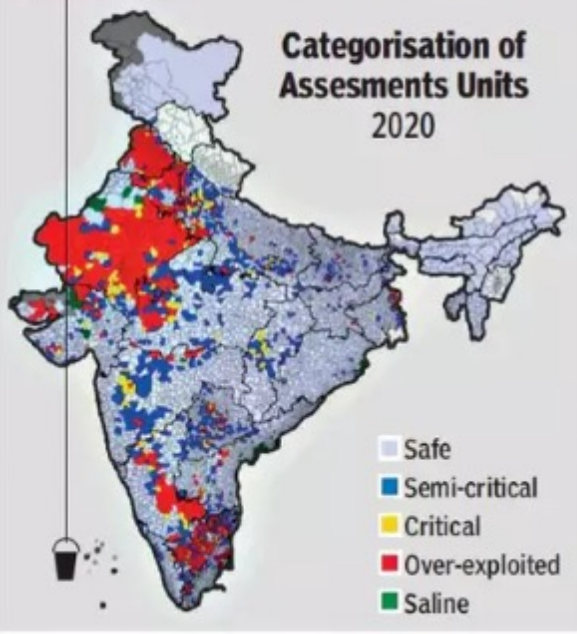
# GROUND WATER SITUATION



Total no. of assessment units  
 2017: **6,881**  
 2020: **6,965**

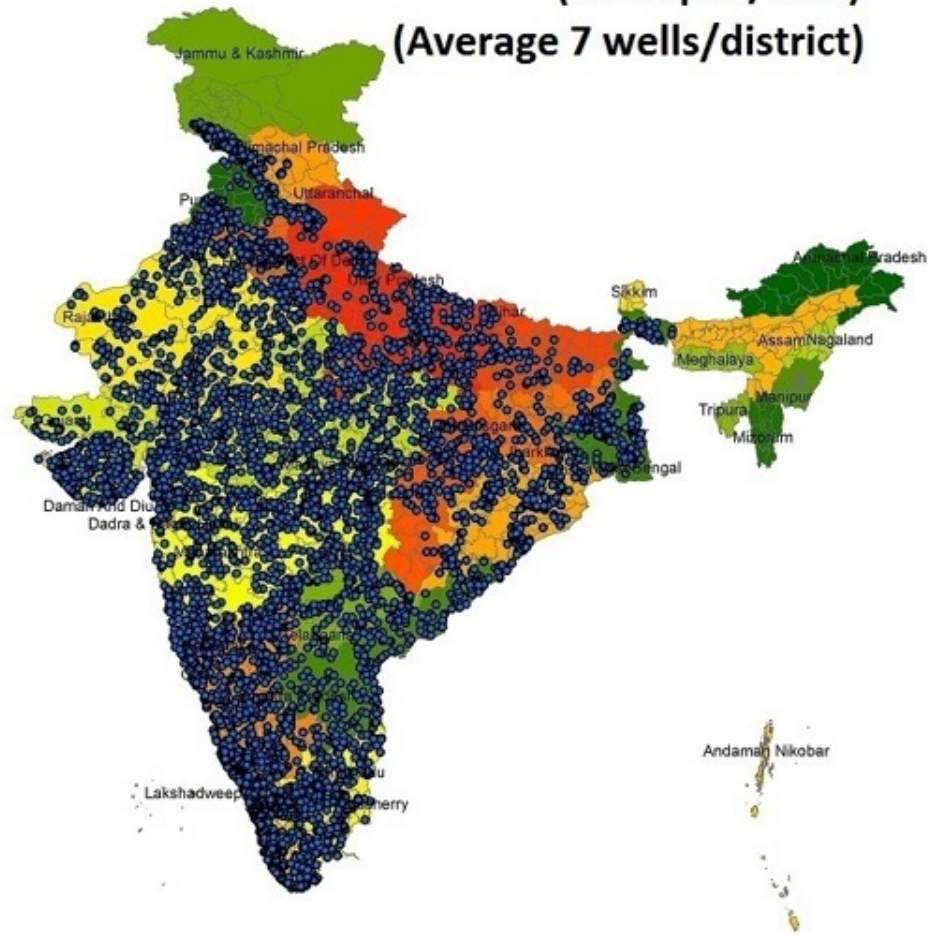
## 2017 vs 2020

	No. of units	% of total
<b>Safe</b>		
2017	4,310	62.6
2020	4,427	63.6
<b>Semi-critical</b>		
2017	972	14.1
2020	1,057	15.2
<b>Critical</b>		
2017	313	4.6
2020	270	3.9
<b>Over-exploited</b>		
2017	1,186	17.2
2020	1,114	16
<b>Saline</b>		
2017	100	1.5
2020	97	1.3



\*units: block/taluk/tehsil/mandal/firka; Source: Central Ground Water Board

Only 4886 wells have long term data 2007-2017  
 (672 sqkm/well)  
 (Average 7 wells/district)



1. Need a platform to host crowd source data to complement CGWB data
2. Different organization are collecting data but not archiving in a common platform

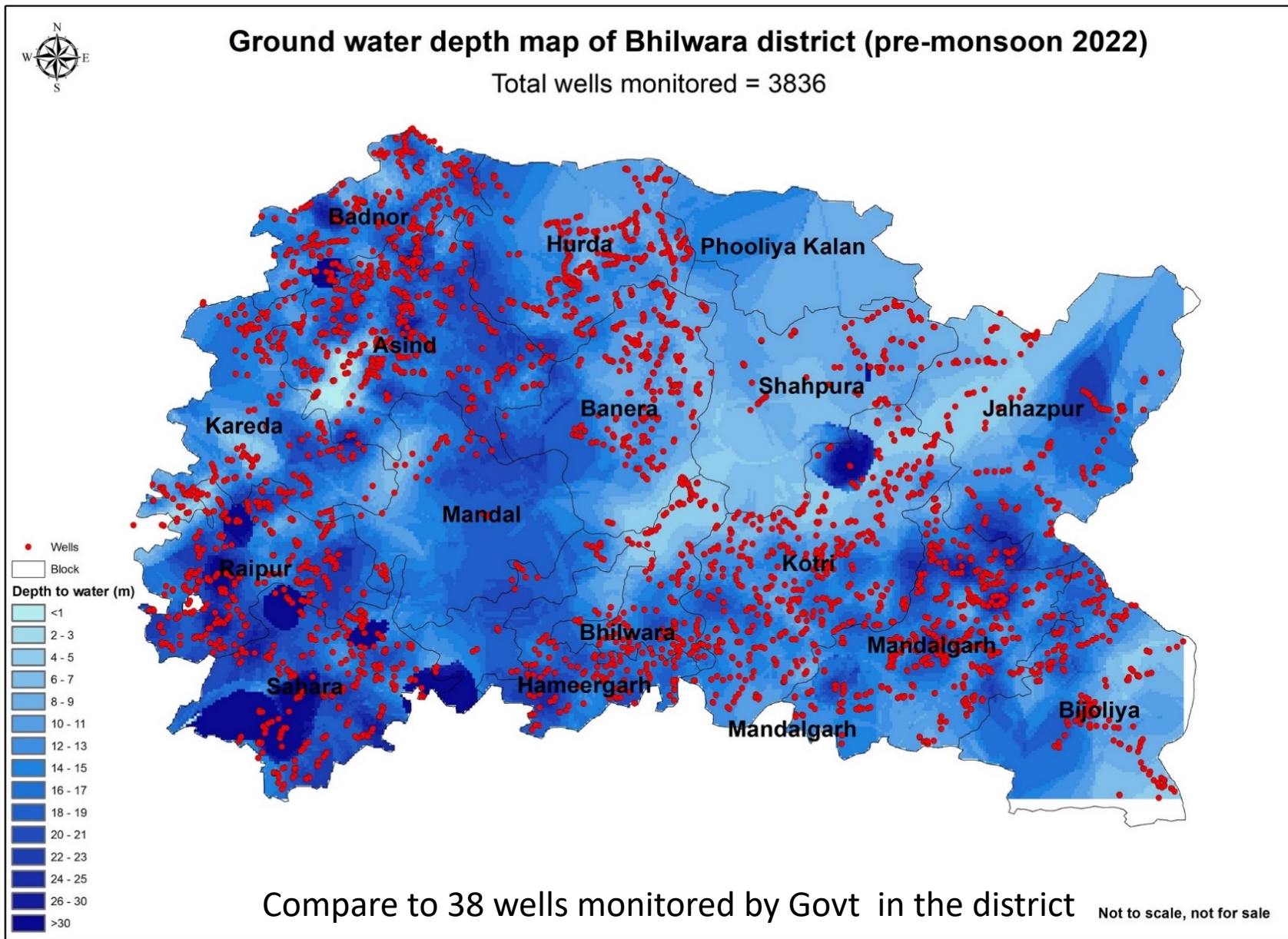
# Ground water monitoring tool (Napo Jal Bachao Kal)– Measure water and save tomorrow)

- Complementing CGWB ground water data for better decision making of soil and water conservation
- Building observability of ground water changes across over exploited area
- Modelling of the data for better visualization and action by partners
- Use the data for improving recharge-discharge potential area in CLART

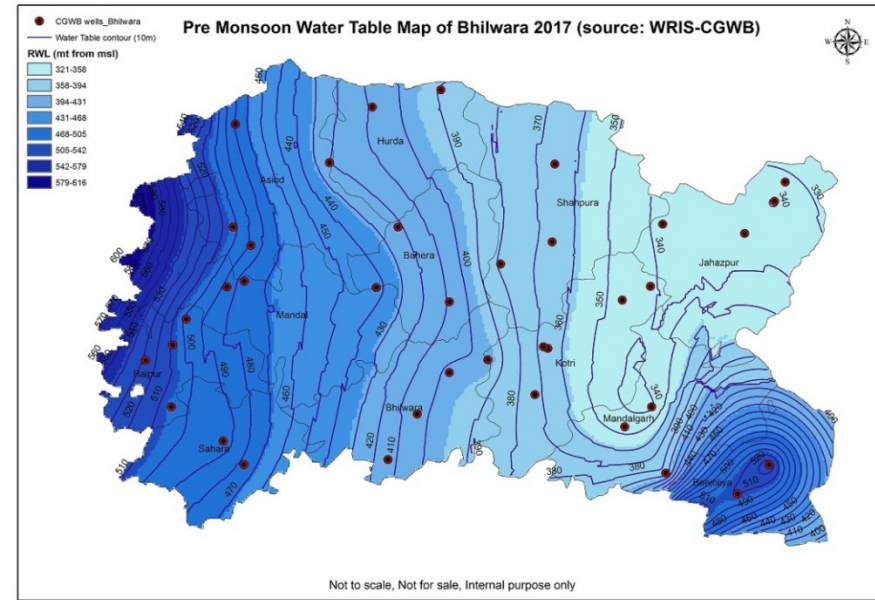
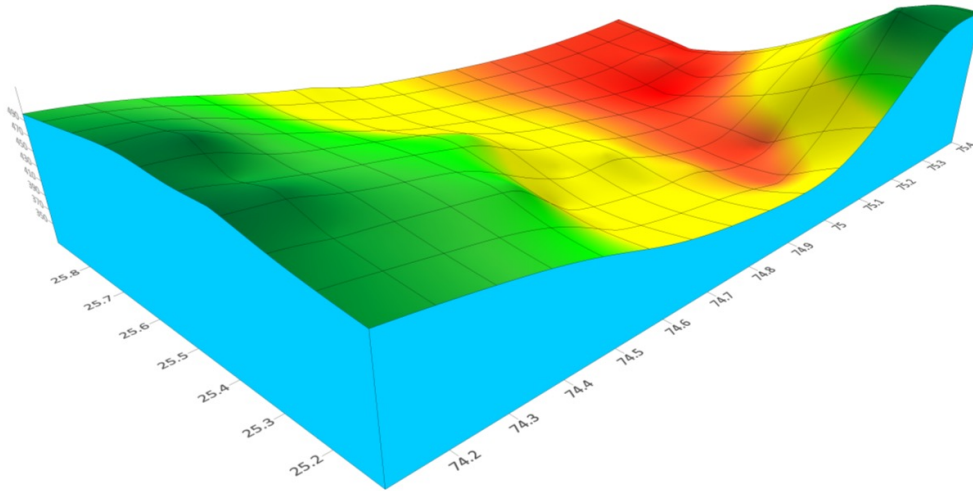
(150+ organizations collectively join hands....)

Seasons	Wells Monitored	States	Districts	Blocks	Villages
Pre-Monsoon 2020	18,041	12	113	390	5353
Post-Monsoon 2020	20,733	16	141	376	5272
Pre-Monsoon 2021	34,698	12	97	485	9803
Post-Monsoon 2021	32,247	12	87	514	9465
Pre-Monsoon 2022	40,385	12	134	678	10613
Post-Monsoon 2022	32,804	12	149	541	8023
Pre-Monsoon 2023	38,295	12	156	655	9859
Post-Monsoon 2023	36,233	12	88	375	7534

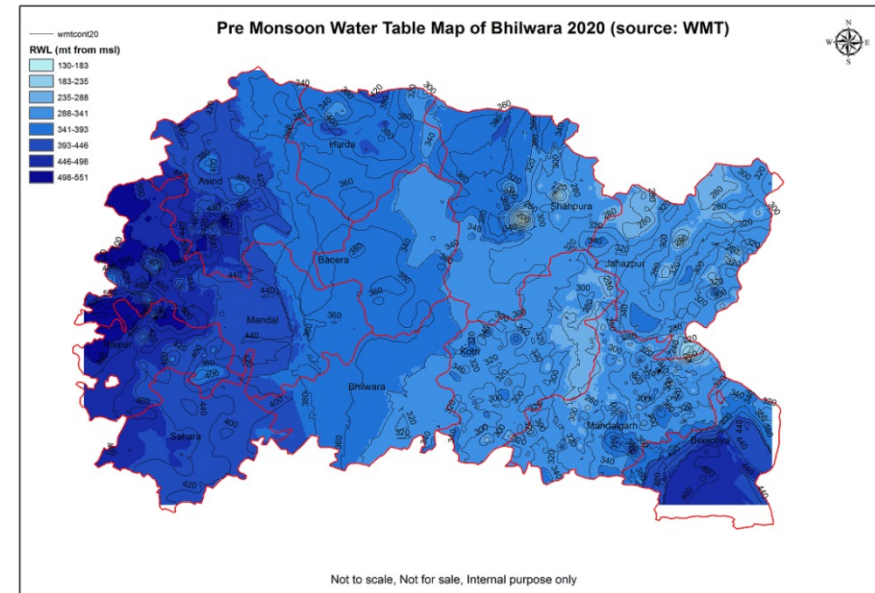
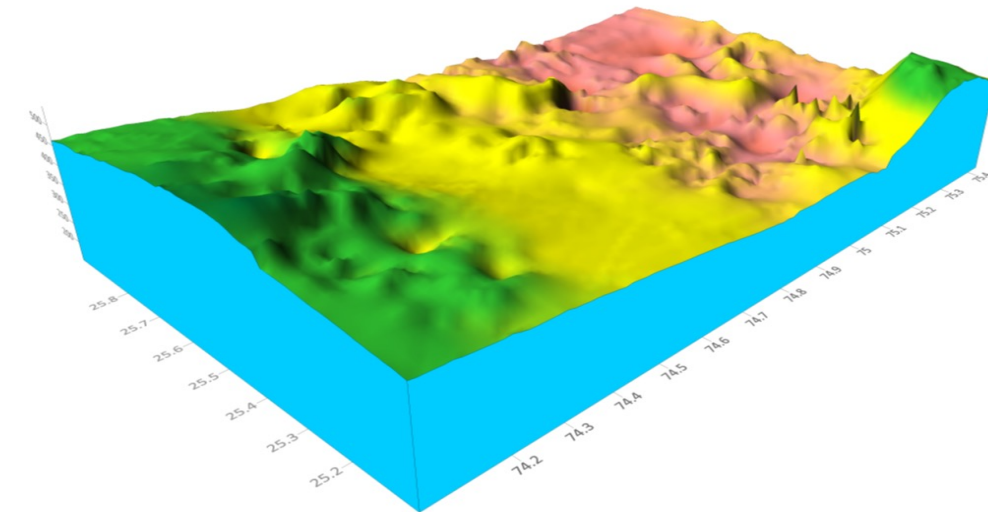
# So, What is the difference?



## CGWB data wise water table of Bhilwara district



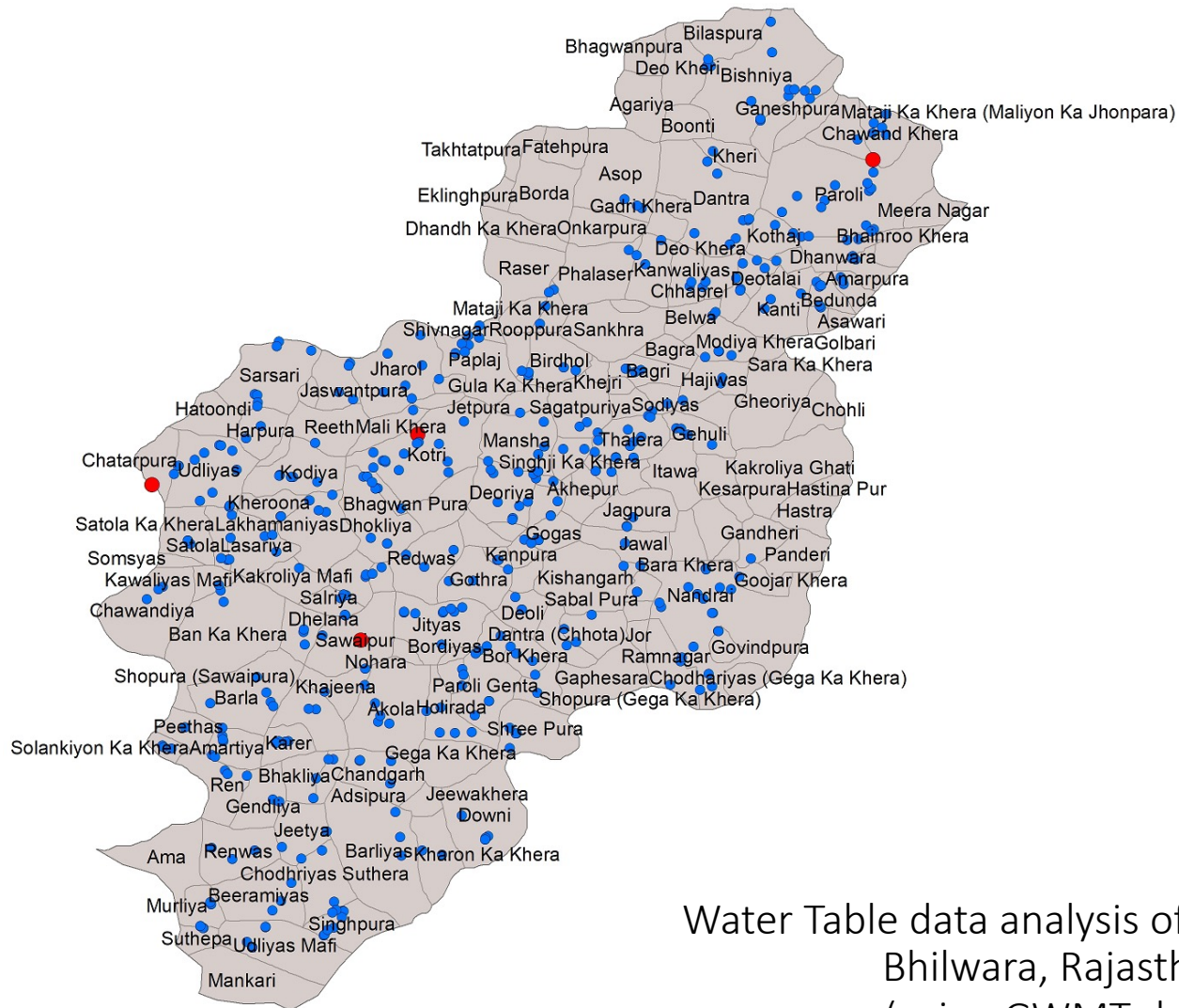
## WMT data wise water table of Bhilwara district



WMT data at a higher resolution showing local variation of ground water regime

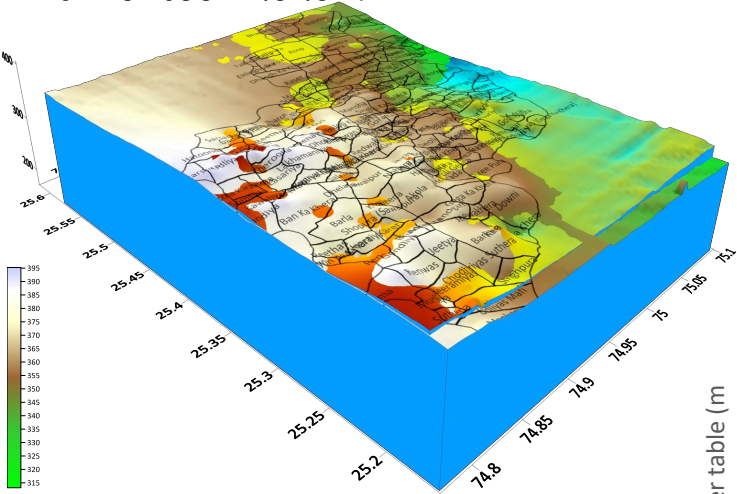


# So, What is the difference?

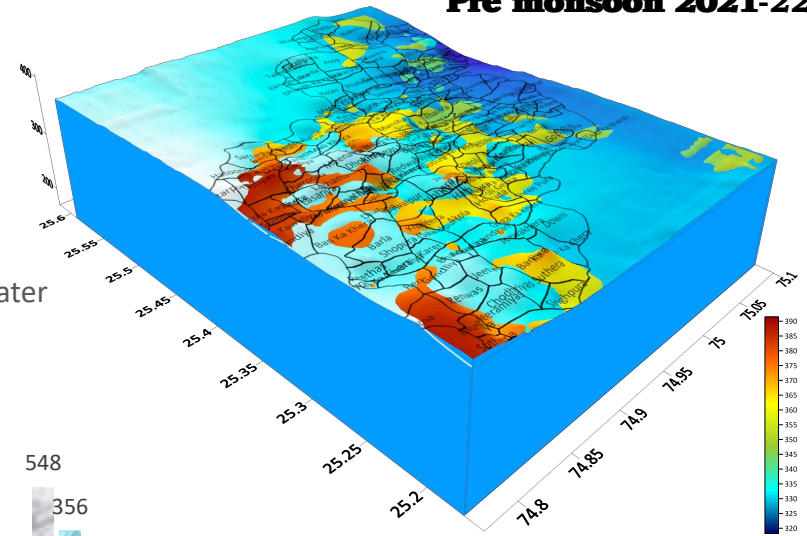


# Year to year comparison (pre monsoon)

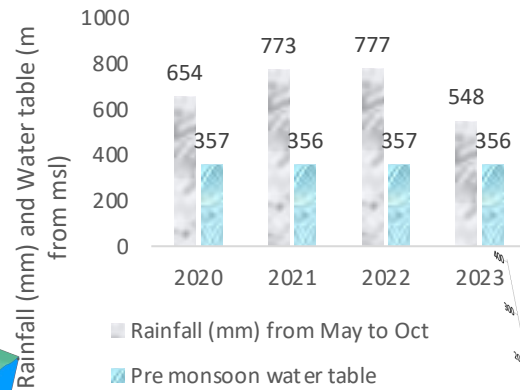
**Pre monsoon 2020-21**



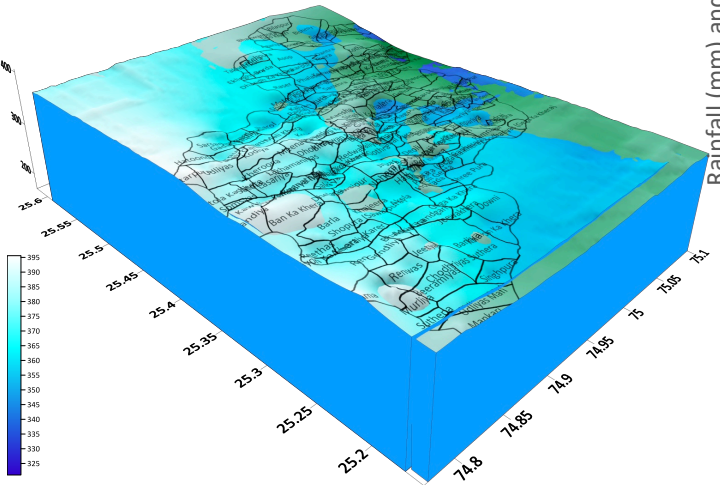
**Pre monsoon 2021-22**



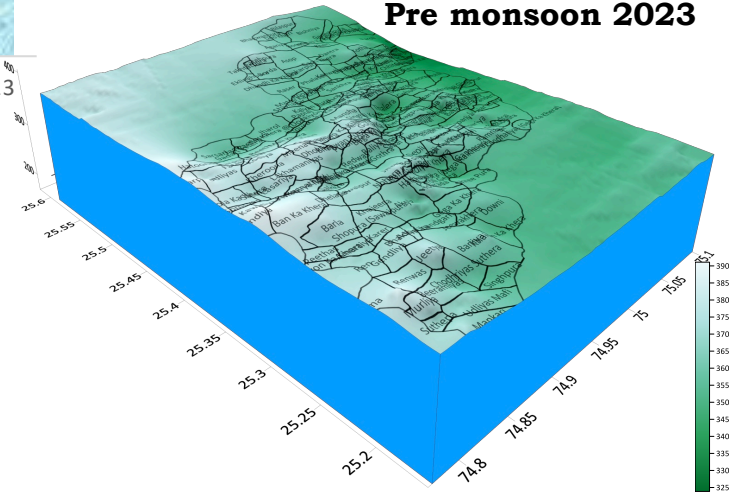
**Rainfall and Premonsoon Water table**



**Pre monsoon 2022-23**

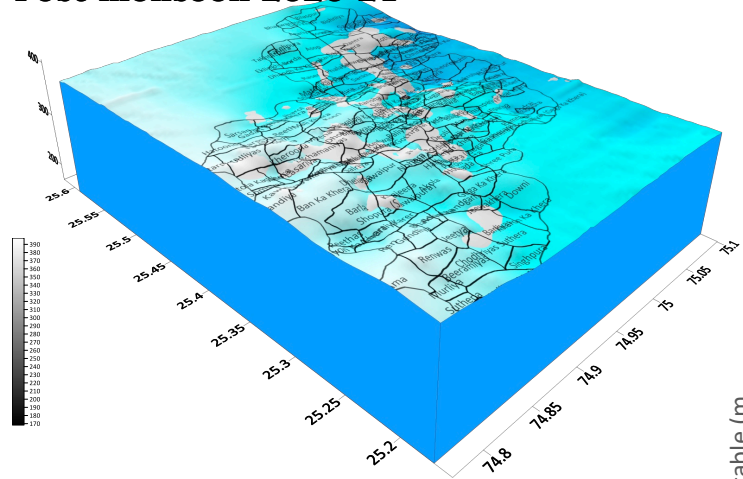


**Pre monsoon 2023**

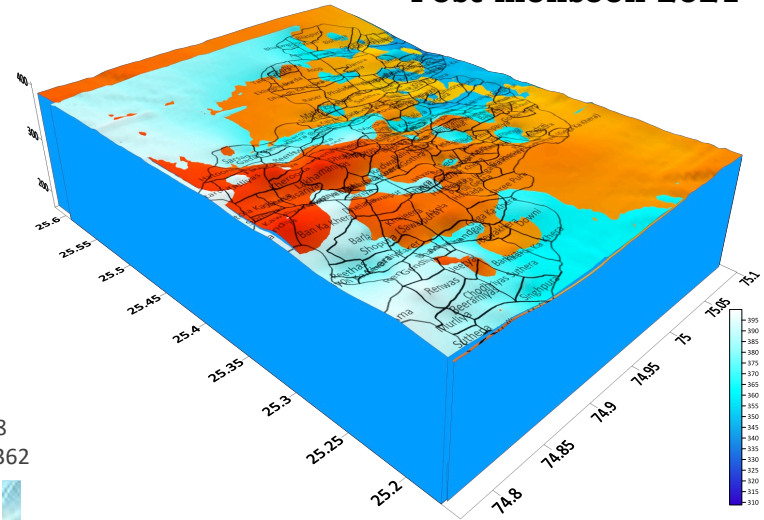


# Year to year comparison (post monsoon)

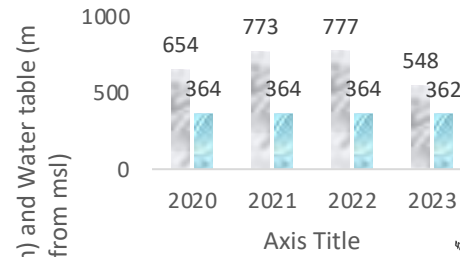
**Post-monsoon 2020-21**



**Post monsoon 2021-22**



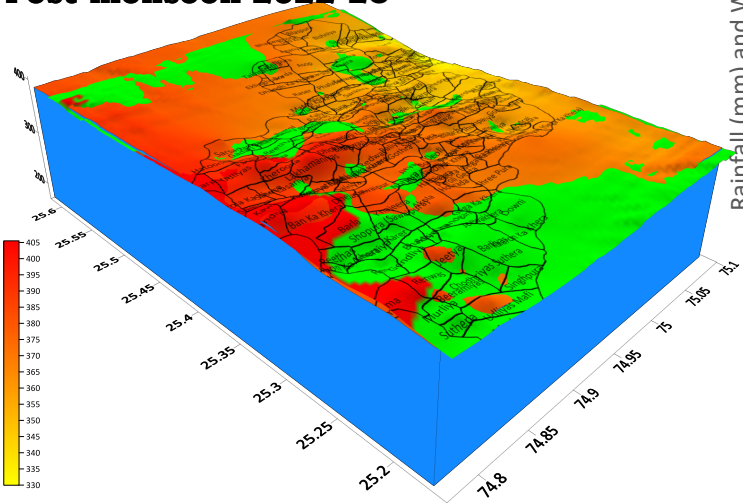
**Rainfall and Post monsoon Water table**



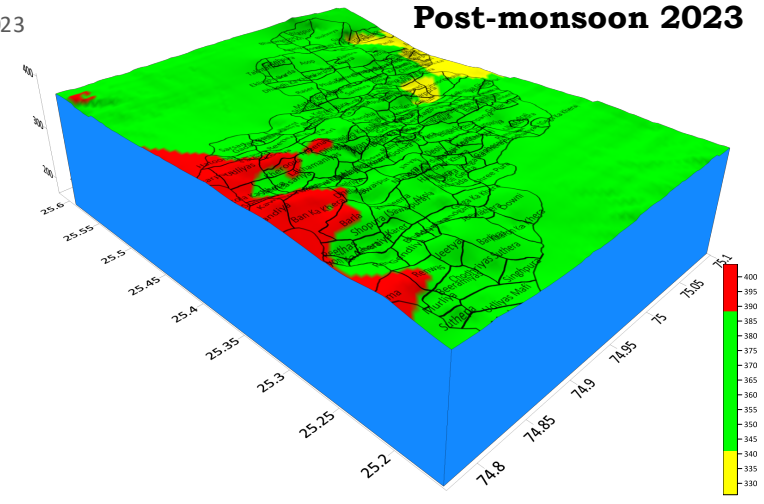
Rainfall (mm) and water table (m from msl)

■ Rainfall (mm) from May to Oct  
 ■ Post monsoon water table

**Post-monsoon 2022-23**



**Post-monsoon 2023**



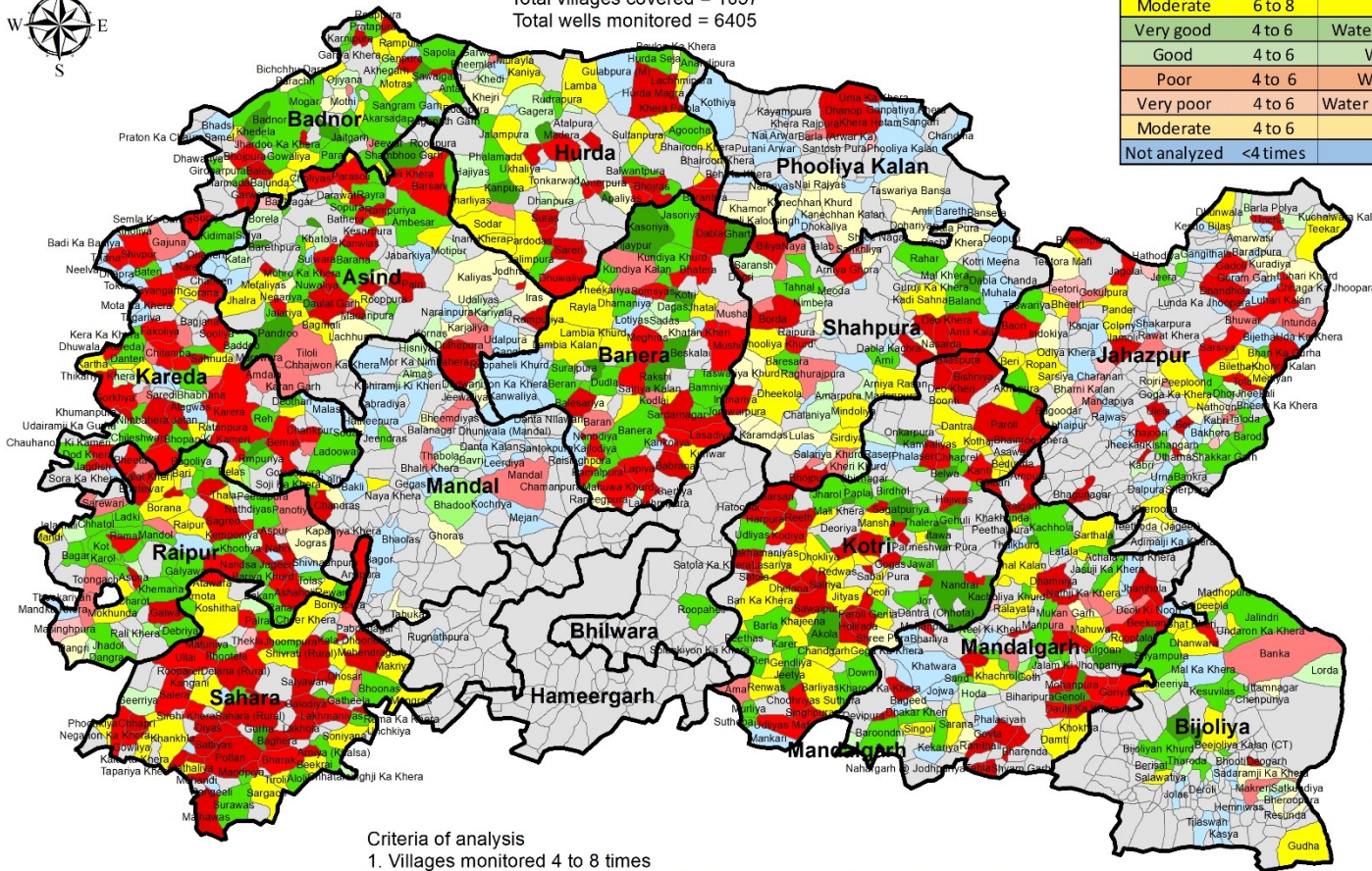
# Village to Village status

## Village level categorization of Ground water situation in Bhilwara district based on WMT data (2020-2023)



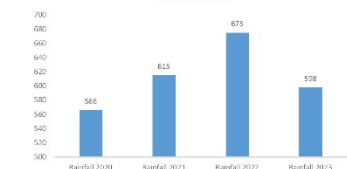
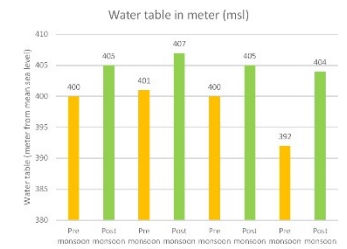
Total villages in the district = 1847 (census 2011)  
 Total villages covered = 1057  
 Total wells monitored = 6405

Category	Monitored (times)	Village Category (based on times of monitoring and water table rise/fall)	No of villages
Very good	6 to 8	Water table raised more than 50% time	42
Good	6 to 8	Water table raised 0-50% time	200
Poor	6 to 8	Water table declined 0-50% time	108
Very poor	6 to 8	Water table declined more than 50% time	137
Moderate	6 to 8	Stable water table	164
Very good	4 to 6	Water table raised more than 50% time	8
Good	4 to 6	Water table raised 0-50% time	80
Poor	4 to 6	Water table declined 0-50% time	64
Very poor	4 to 6	Water table declined more than 50% time	13
Moderate	4 to 6	Stable Water table	74
Not analyzed	<4 times	Not suitable for analysis	167



### Criteria of analysis

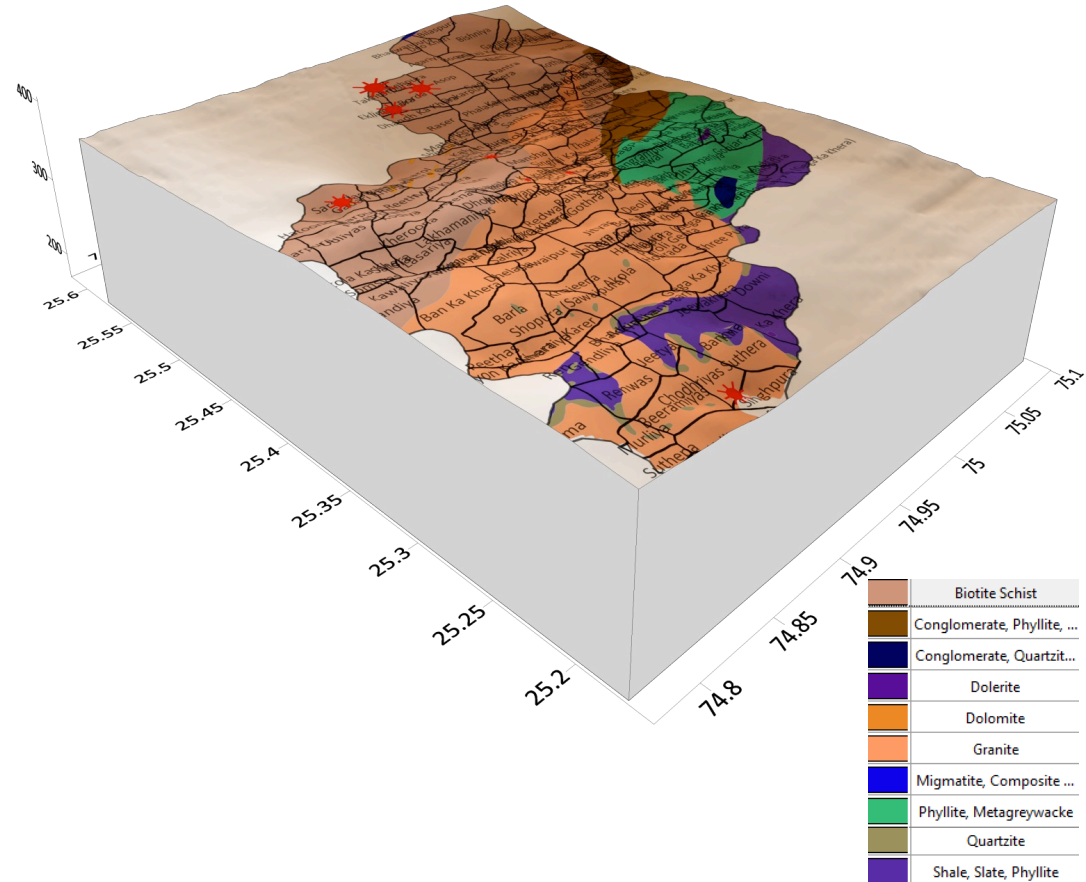
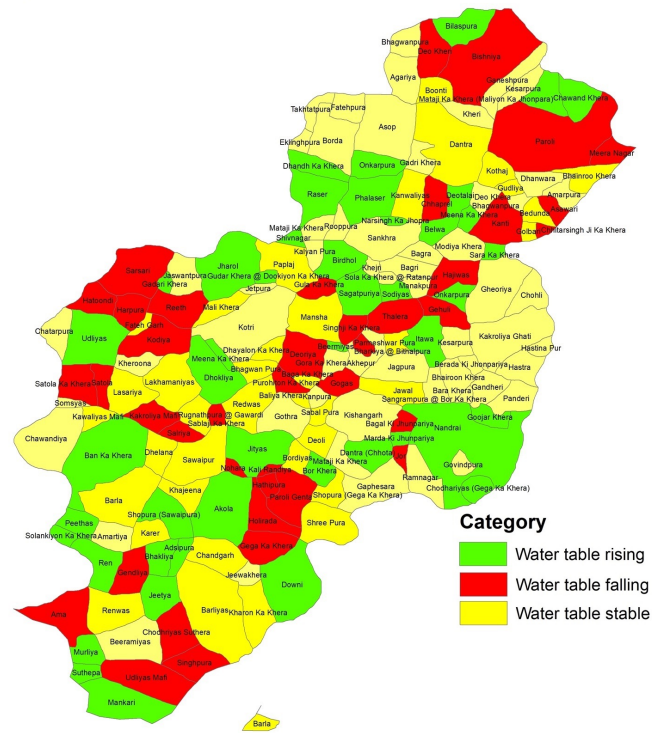
1. Villages monitored 4 to 8 times
2. % of time raised/declined of total monitoring time (pre-pre & post-post and year to year)
3. 6 to 8 times - Category A, 4 to 5 times - Category B
4. If Rise% > Decline% & (a) Rise is >50% time - Very Good  
 (b) Rise is 0-50% time - Good  
 if Decline% > Rise% & (c) Decline is 0-50% time - Poor  
 (d) Decline is >50% time - Very Poor  
 if Rise% = Decline% -- (e) Stable



# Correlate with geology data

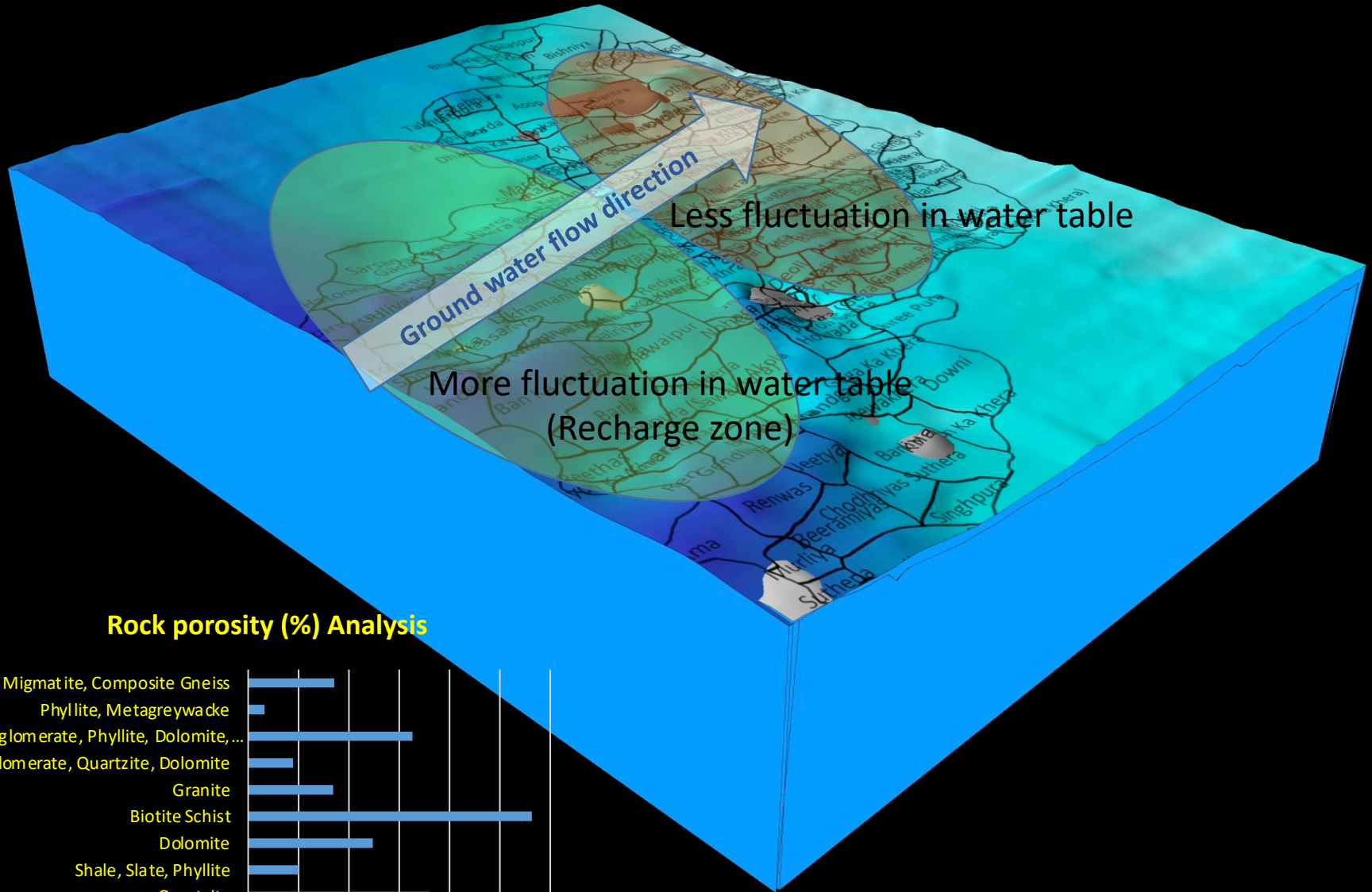
Geology

Village level status of Ground water (2020-23)

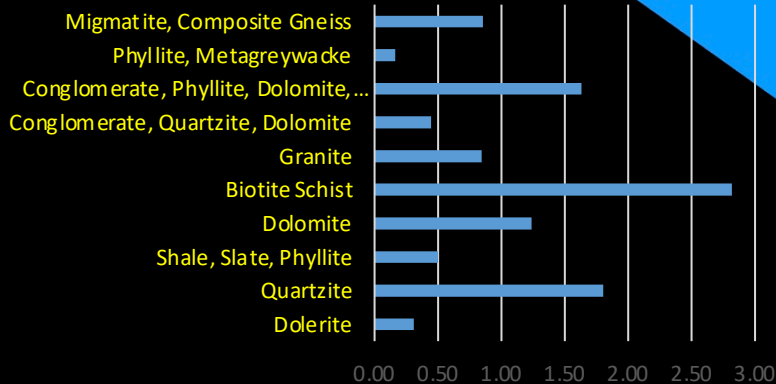


Not to scale, not for sale

# Correlate with geology data

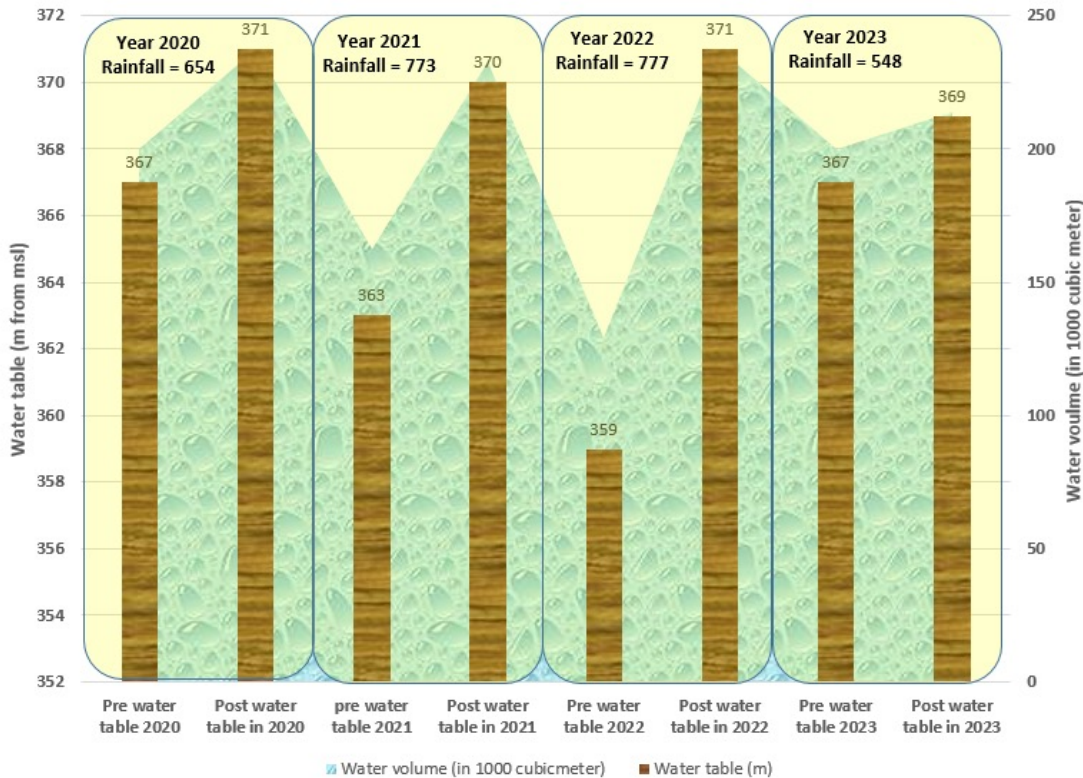


## Rock porosity (%) Analysis

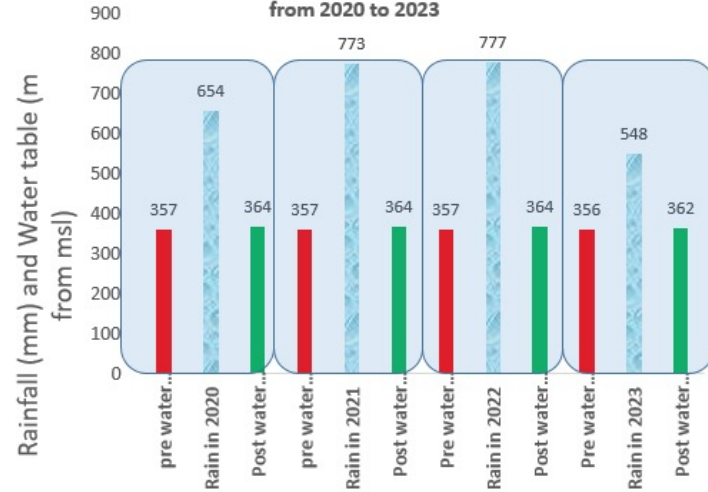


# And within village

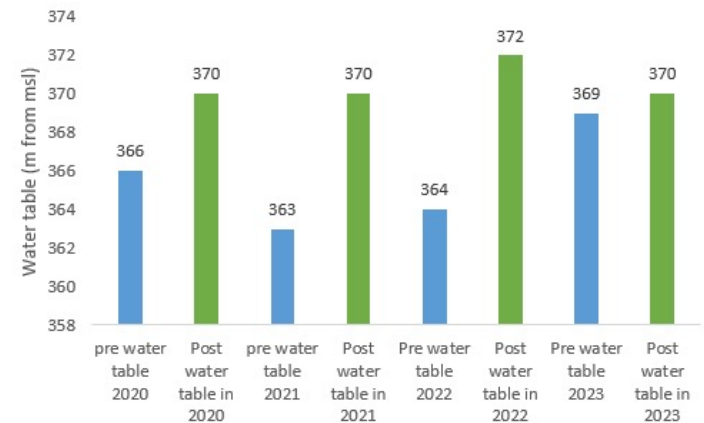
### Ground water scenario around Deoriya WHS



### Rainfall and Water table correlation in Kotri block, Rajasthan from 2020 to 2023



### Ground water scenario in Deoriya village



# Protocols

- 3 wells far apart from each other in the same village.
- We should be able to measure these wells twice a year in the next few years.
- Take the GPS measurement at the ground level and note the depth to water level also from this same point.
- Measure water level in meters.
- If there is a motor connected to the well, please ensure a minimum of 24 hrs gap between the motor being run and the depth being measured.
- If you are equipped and experienced in measuring bore well depths then you are welcome to record depth of bore wells also. Otherwise, you can stick to open wells.
- The data collection period for premonsoon is 15<sup>th</sup> May, 2020 to 30<sup>th</sup> May, 2021 and for post-monsoon is 15<sup>th</sup> Oct to 30<sup>th</sup> Oct. In case the rain is ongoing in your location, please collect data 5 days after the rain stop



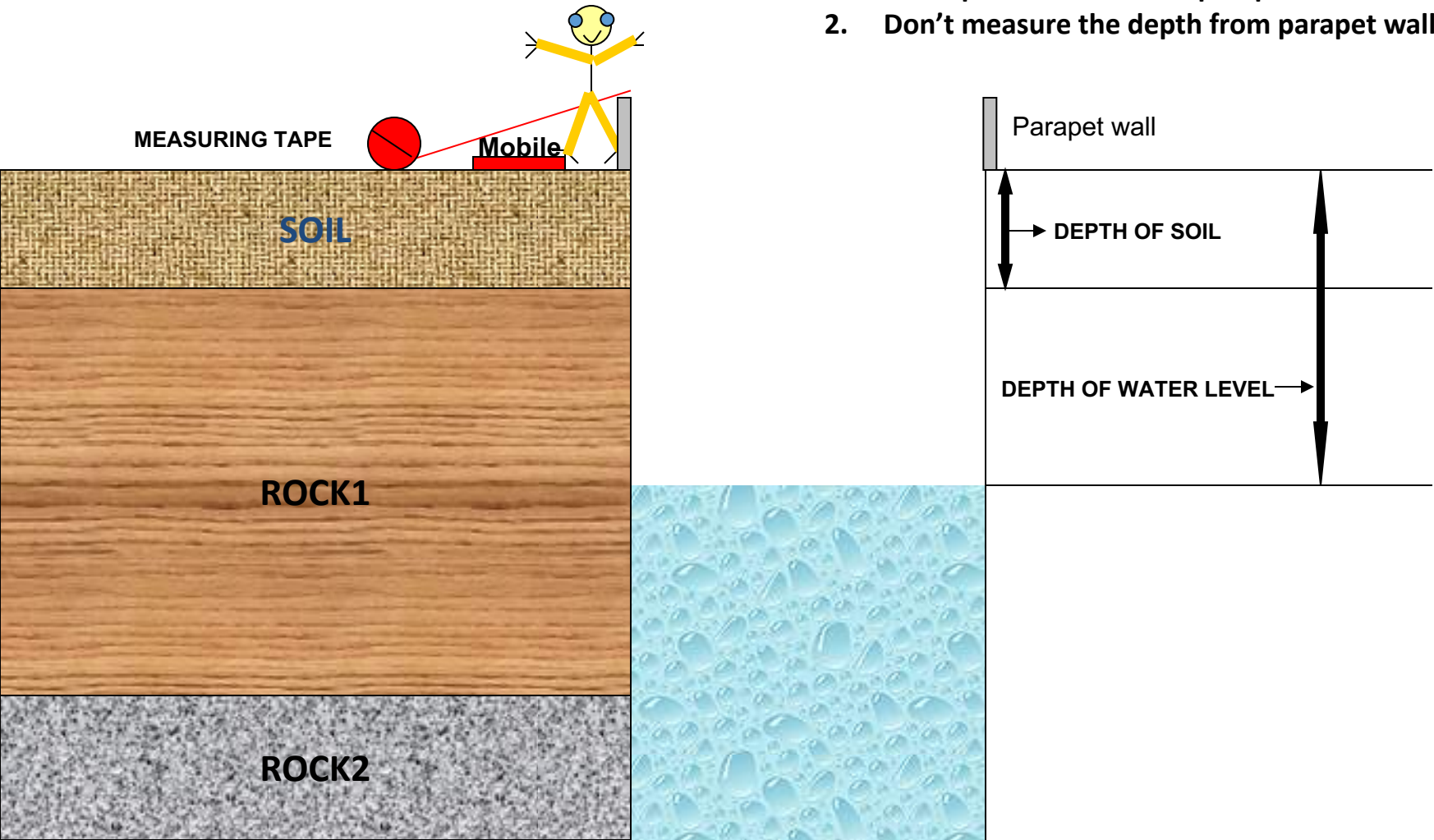
# PROCEDURE OF WELL MEASUREMENT

**Do:**

1. Put the GPS/Mobile on the ground
2. Measure the depth to water from the ground

**Don't:**

1. Don't put the Mobile on parapet wall
2. Don't measure the depth from parapet wall



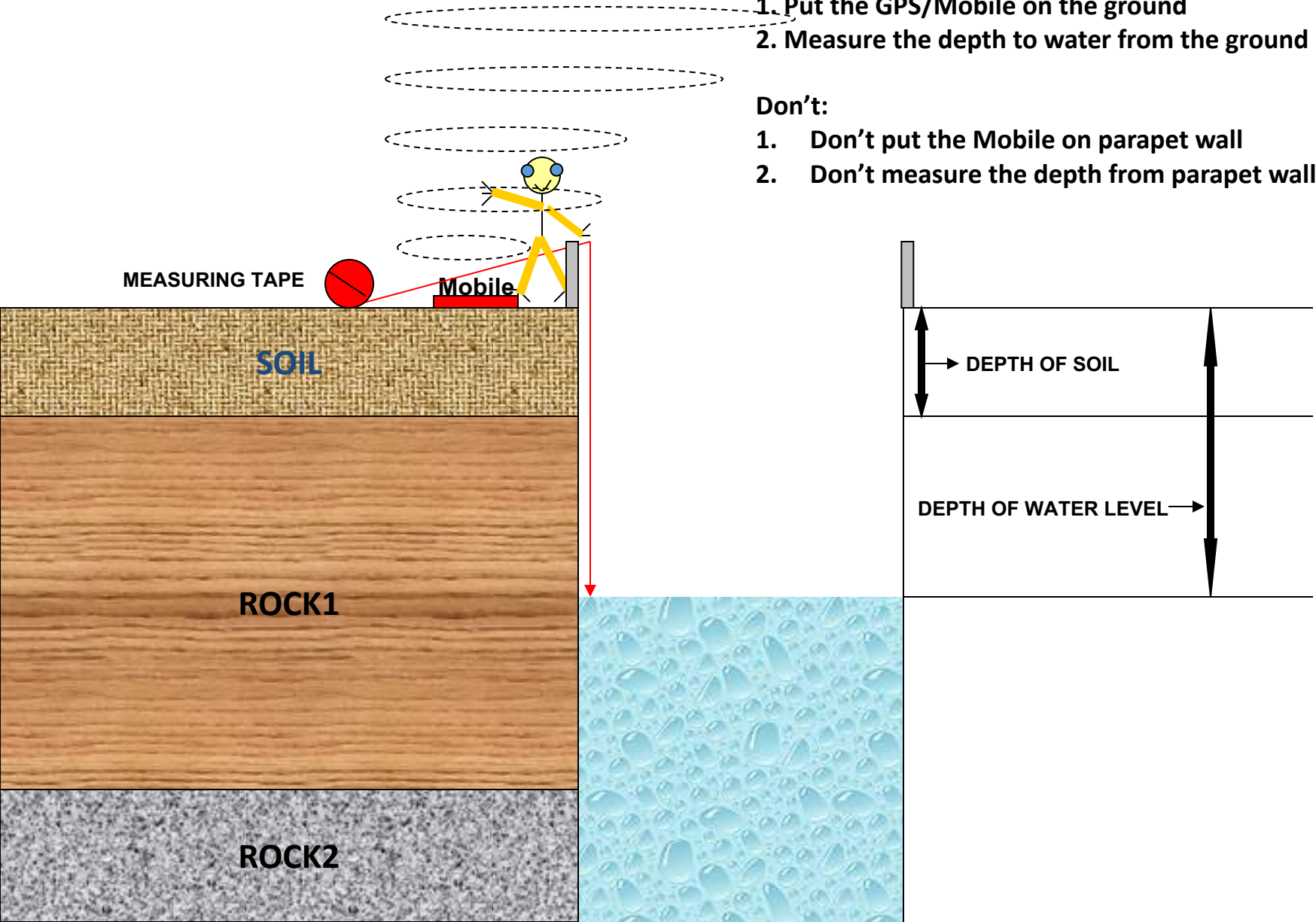
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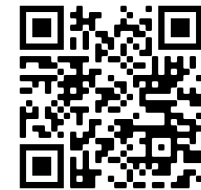
## Application Features

1. Offline data collection tool
2. Capturing geolocation, photograph
3. Data visualization and synchronization to portal



## Web Features

1. Data archiving, filtering and download in excel
2. Data visualization through on the fly map
3. IEC materials



TOOLS

DATA PLATFORM

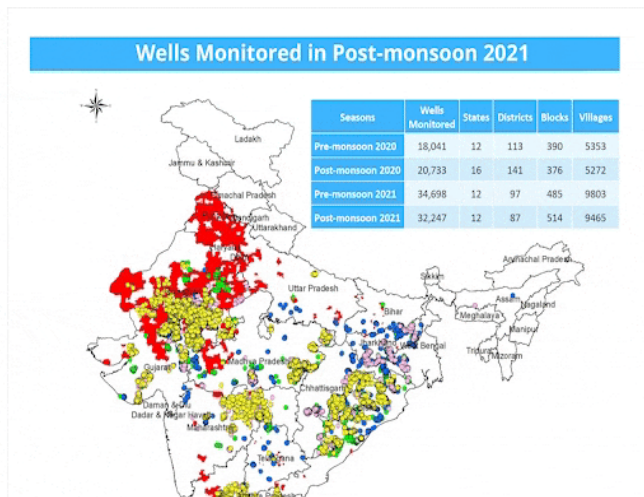
IBIS

CONTACT US

GET STARTED

## Groundwater Monitoring Campaign 2022

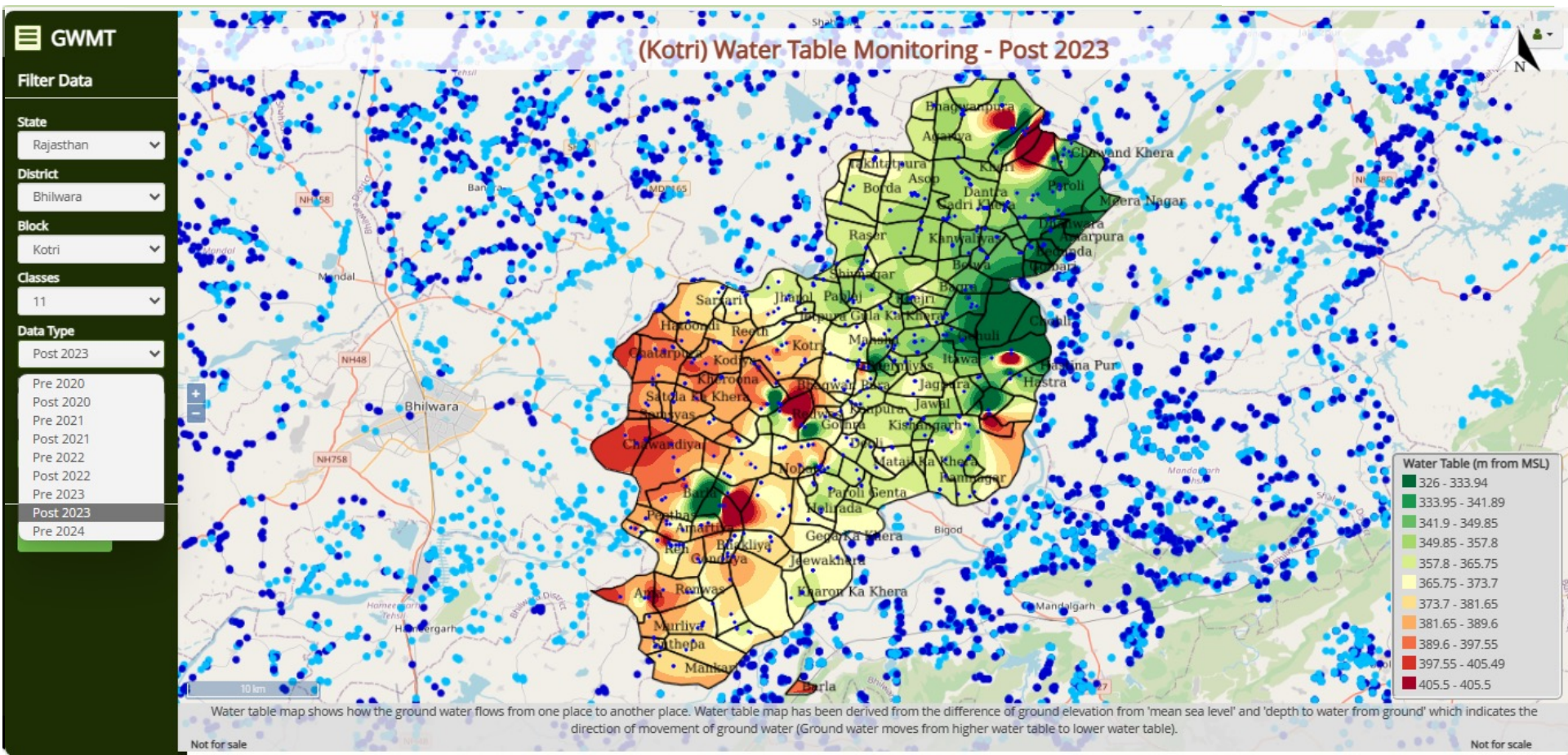
**What gets measured, gets managed!**



The Groundwater Monitoring Campaign - Napo Jal Bachao Kal aims to map at least 1 well in each village of India. The plan is simple: measure the wells and upload the data via the Groundwater Monitoring Tool (GWMT) to understand the status of our groundwater resources and make informed decisions for its better usage, governance and management.

 [Download GWM App](#)

One stop portal for data visualization, data download and map making



# Challenges



- Crowd sourcing of data --Post processing of data
- Analysis of the data – Platform enables
- Scale up the model – Govt of India's *Jaldoot* now covering 450,000 villages from 2023





Thanks

