



Ministry/Organisation name  
**CENTRAL GROUND WATER BOARD, MINISTRY OF JAL SHAKTI**



Problem Statement

# Data Analytics to provide complete solution for groundwater management for the country



**Team Name : DataTech**

**Team Leader : Lal Babu Sah**

# BACKGROUND

1. The UNESCO World Water Development Report states that India is the largest extractor of groundwater in the world. Unfortunately, the groundwater levels in India has dropped drastically due to its overexploitation and contamination.
2. Groundwater supports livelihoods of over 26 crore farmers and agricultural labourers. It accounts for 63% of all irrigation water and over 80% of rural and urban domestic water supplies. Wells including dug wells and shallow tube-wells and deep tube wells provide about 61.6% of water for irrigation, followed by canals with 24.5%.
3. 21 major cities of India are expected to run out of groundwater as soon as 2020, affecting around 100 million people, the think tank's new report states.

# SOLUTION

1. Identified blocks/districts/states with critical/average/increased groundwater levels in the country.
2. Analyzed Pre-monsoon and post-monsoon groundwater levels in 2017 with respect to previous year i.e. 2016
3. Analyzed pre-monsoon and post-monsoon groundwater levels in 2017 with decadal mean (2007-2016)
4. Time series analysis of groundwater level from 1996 to 2018 for pre-monsoon and post-monsoon duration (using ARIMA [Autoregressive Integrated Moving Average] model and BI tool - Tableau)
5. Percentage increase and decrease in the groundwater level at various sites(bore well, dug well and tube well)

# TECHNOLOGY STACK

1. **Data Acquisition** : Python code to download data from the website of CGWA- IndiaWRIS (Water Resources Information System)
2. **Data Preprocessing**: Python (Libraries-Pandas, NumPy, Seaborn) on Jupyter notebook platform
3. **Data Visualization and Analysis**: Business Intelligence tool -TABLEAU
4. **Data Model**: Machine Learning model ARIMA (Auto Regressive Integrated Moving Average) for time series forecasting.

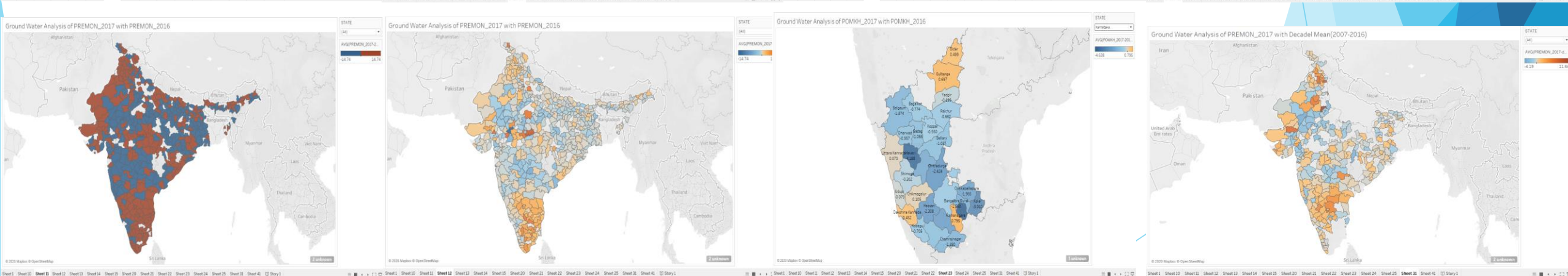
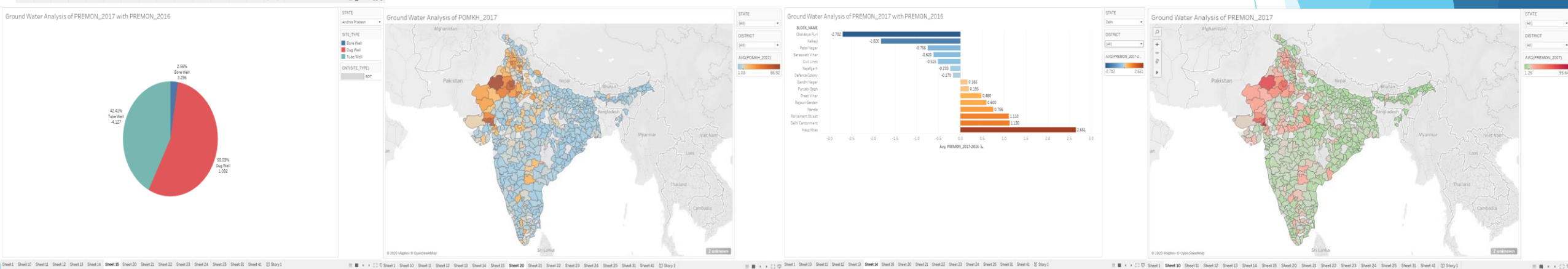
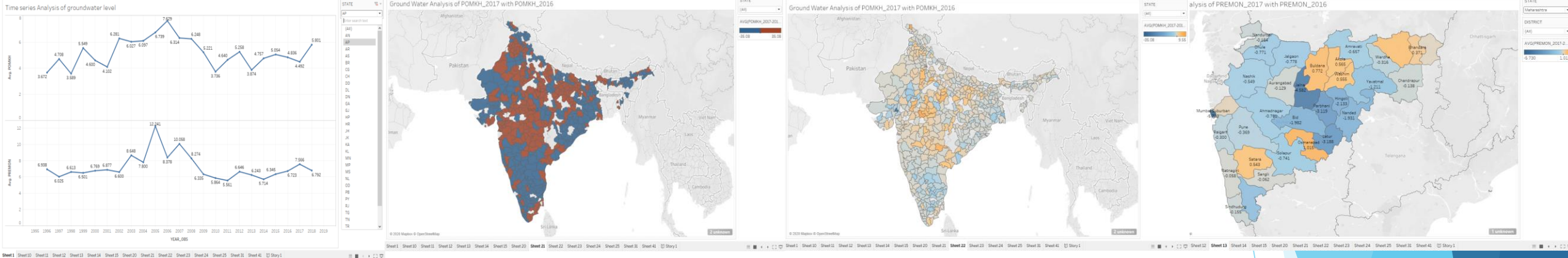
# USED CASES

1. The areas under critical condition can be identified.
2. The concerned authorities can now take necessary measures to tackle the issue in these areas.
3. The areas which are on the verge of getting hit by groundwater shortage can take up precautionary measures to restore these resources.
4. The solution provided will aid the government in formulating ideas and strategies to help people in groundwater depreciating regions.
5. Flexibility of ARIMA model will enable us to forecast groundwater level trends.
6. Prospect: Culminating the results of the analysis under a platform (website) for making it more comprehensible for any viewer.

# DEPENDENCIES/SHOW STOPPER

1. Dataset imported from CGWA-IndiaWRIS website.
2. Detailed and effective representation of data through maps (on Tableau - a Business Intelligence tool).
3. The data pertaining to many districts were unavailable for several years.





\*for clear and detailed view of these maps visit the links given in the next slide

For complete solution, visit these links:

- ▶ <https://public.tableau.com/profile/lalbabusah> (Visualisation and analysis through maps and graphs in Tableau)
- ▶ <https://github.com/lalbabusah/Smart-India-Hackathon-2020> (Jupyter notebook containing complete code for data analysis and modelling)
- ▶ <https://drive.google.com/open?id=1RsARaGnGOY5WyaezwhTaDavLRRjkgfUeX> (Tabulated data after analysis)