# India

**Capital city:** New Dehli
**Inhabitants:** 1377 Million

## INSTITUTIONAL SETTING AND PURPOSE

India has a parliamentary form of government which is federal in structure with 37 states and union territories (UTs). Many of these states and UTs have their own groundwater departments and groundwater monitoring mechanisms. At the country level, Central Ground Water Board (CGWB) under the Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti is the apex organisation dealing with monitoring, assessment and management of groundwater resources. Groundwater monitoring is done by CGWB through its 29 field offices distributed throughout the country with headquarters at Faridabad, Haryana. There is active coordination between the groundwater departments of the States/UTs and the respective field offices of CGWB. The data and information collected as a part of the nation-wide groundwater monitoring programme and other related data help the government of India (the federal government) formulate policies and prioritise areas for management interventions.

## CHARACTERISTICS OF THE NETWORK

Groundwater level monitoring network of CGWB consists of nearly 23,000 monitoring stations (CGWB, 2019). Of these 23,000 stations, nearly 16,500 are open dug wells and the remaining 6,500 are purpose-built piezometers (Figure 1). While the depths of the open dug wells are mostly around 12 – 15 meters, the depths of piezometers vary from 50 to 300 m. Barring a few high frequency automatic measurements, water levels are measured from these monitoring stations four times a year and the measurements are done manually (steel tapes and sounders). The four-time measurements are done over a fixed period of time throughout the country. Such measurements are done during April/May, August, November, January along with collection of water quality samples during April/May for detailed water quality analysis. The measurement months are chosen as per the existing monsoon pattern in the country.

Under the World Bank assisted National Hydrology Project (NHP) efforts are being made to strengthen the network and automate water level monitoring with real-time/near real-time measurements by addition of more piezometers and installation of around 9000 automatic water level recorders with telemetry across India. Efforts are also being made to integrate monitoring data collected by CGWB and other state governmental organisations for better analysis and understanding of water level behaviour over the country on a single integrated platform.

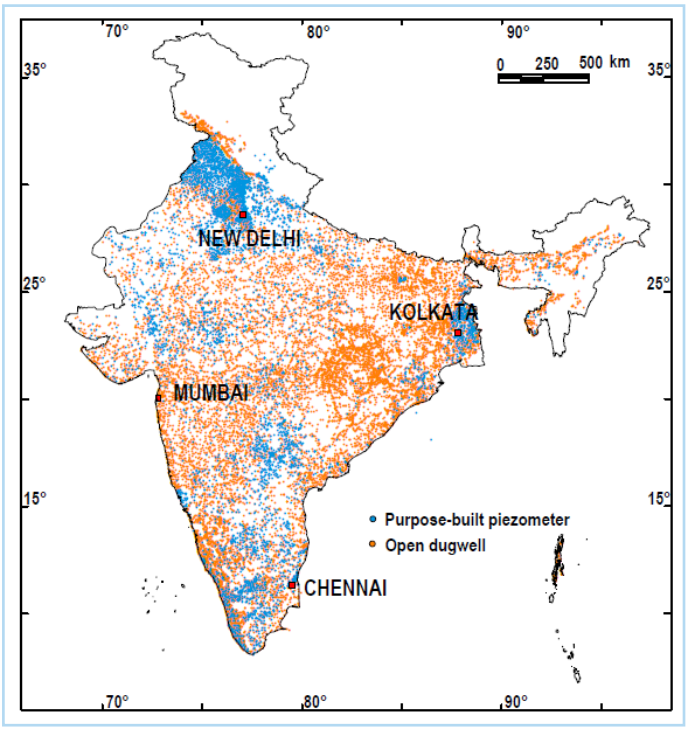


*Figure 1 – Distribution of groundwater monitoring stations (dug wells and piezometers) of CGWB. The blank areas on the north and the north eastern regions are part of the Himalayan terrain*

# PROCESSING AND DISSEMINATION

CGWB maintains a comprehensive database of water level measurements and groundwater quality done through its monitoring stations over a period of nearly 5 decades. The custom-made software Ground Water Estimation and Management System (GEMS) is used for storage, retrieval and analysis of all kinds of groundwater related data collected by the Board and few State Government organisations, including water level data. GEMS provides facility for statistical analysis, GIS based spatial analysis, timeseries analysis, trend analysis, comparisons, preparation of maps etc. Figure 2 shows a sample hydrograph with long term trends generated through GEMS. Results of periodic monitoring are documented and distributed in form of monitoring reports and groundwater year books. These reports are available on the official website of CGWB (www.cgwb.gov.in).

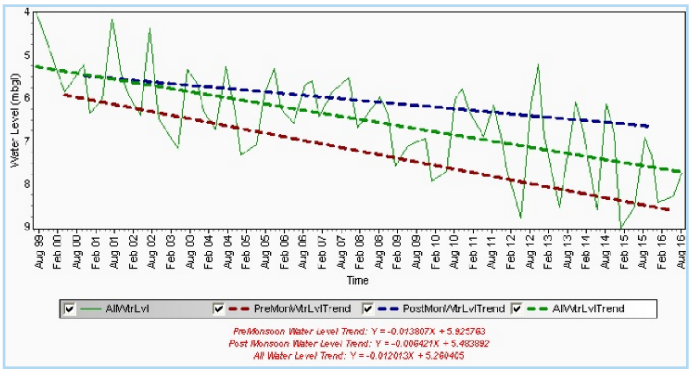


*Figure 2 – A sample hydrograph generated from Ground Water Estimation and Management System (GEMS). The hydrograph pertains to the piezometer tapping the deeper aquifer at Dawaleswaram (CGWB, 2017)*

Groundwater information in form of maps, hydrographs etc are also disseminated through India Water Resource Information System (India-WRIS), a web-based information system. India-WRIS provides a GIS based interface for visualisation and analysis of water level data. Sample outputs of India-WRIS portal are given in Figure 3, Figure 4 and Figure 5. The user can also overlay available GIS layers like administrative boundaries, basins etc. as per requirement. There is also provision in India-WRIS for downloading validated water level data with geographical coordinates of monitoring stations.

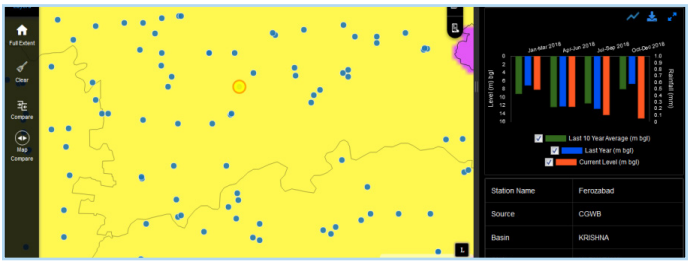


*Figure 3 – Sample output of web-based water resource information system of India (India-WRIS) showing comparison of current water level, water level in the previous year and decadal average water level for a selected well*

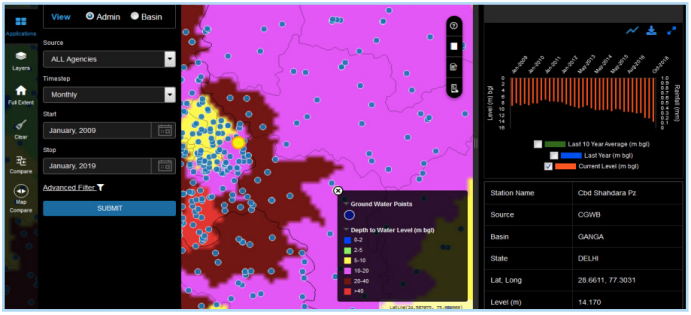


*Figure 4 – Sample output of web-based water resource information system of India (India-WRIS) showing long term water levels over a period 2009-2019 for a selected well*

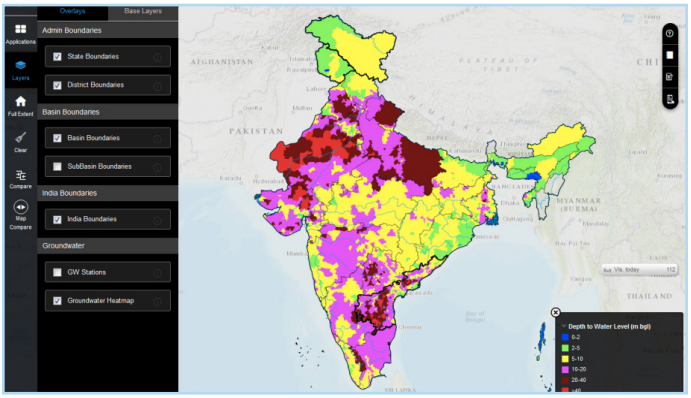


*Figure 5 – Sample output of web-based water resource information system of India (India-WRIS) showing spatial variations in depth to water level (groundwater heat map) for Premonsoon (April/May) period 2019*

# Sources


- **Central Ground Water Board (CGWB), Ministry if Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Government of India** - http://cgwb.gov.in;
- **Feedback from CGWB** - received on 10-04-2020;
- **CGWB (2019) Ground Water Year Book India 2018-19** - Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Govt of India, Faridabad;
- **CGWB (2017) Aquifer Mapping and Management of Ground Water Resources, East Godavari, West Godavari and Krishna Districts, Andhra Pradesh. Central Ground Water Board, Southern Region, Hyderabad** - http://cgwb.gov.in/AQM/NAQUIM_REPORT/AP/East%20Godavari,%20West%20Godavari%20and%20Krishna%20Districts,%20Andhra%20Pradesh.pdf;
- **Water Resources Information System, India-WRIS** - http://indiawris.gov.in/wris/#/; and
- **National Hydrology Project (NHP)** - http://nhp.mowr.gov.in/HomeNew/NHPIndexnew.aspx.