

ENERGY - WATER NEXUS INDIA

An Insight Into Water & Coal Power Linkages in India



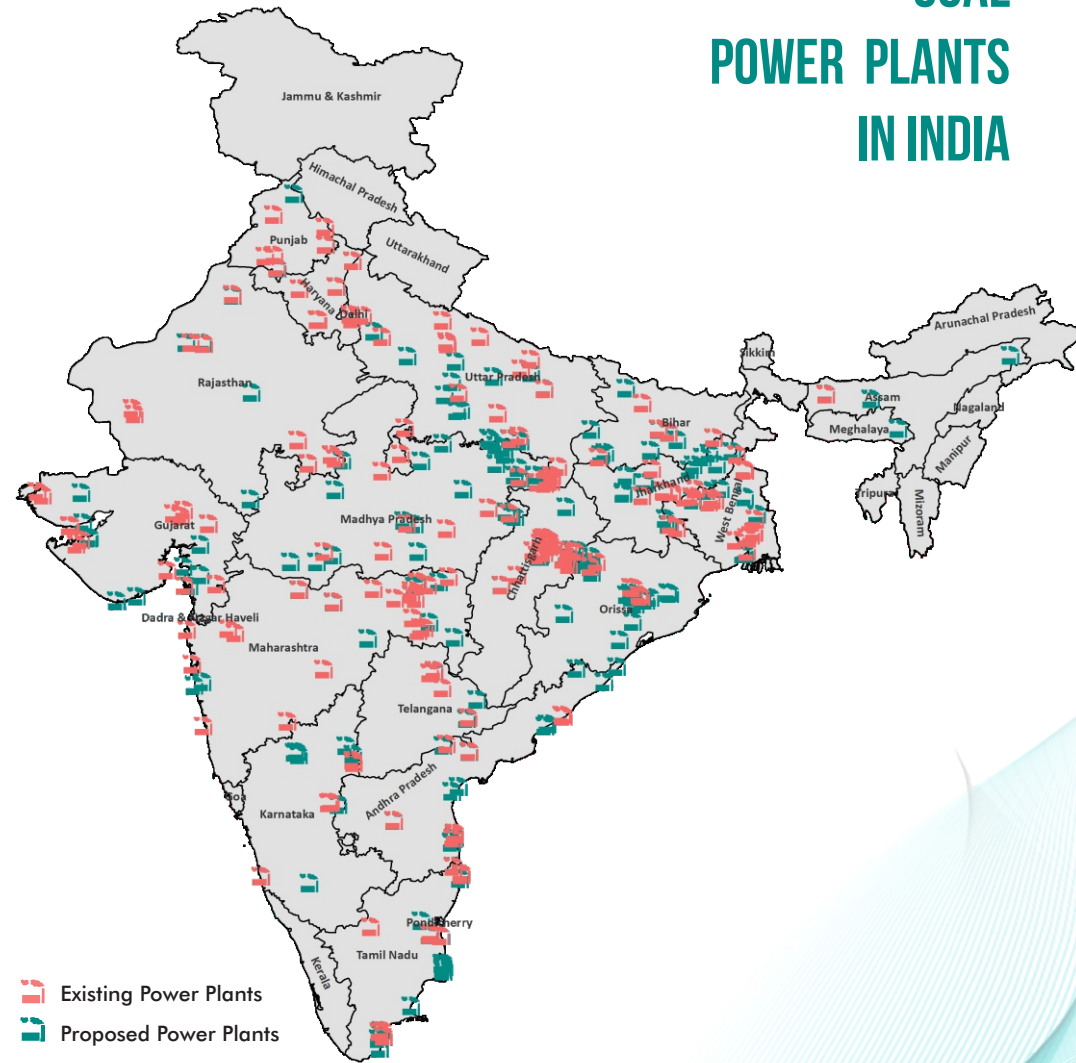
HEINRICH BÖLL STIFTUNG
INDIA

Coal Power Plants are water intensive and require water for various processes.

Between 2012 & 2017 water scarcity was reportedly responsible for coal power losses of 5 billion kWh/year.

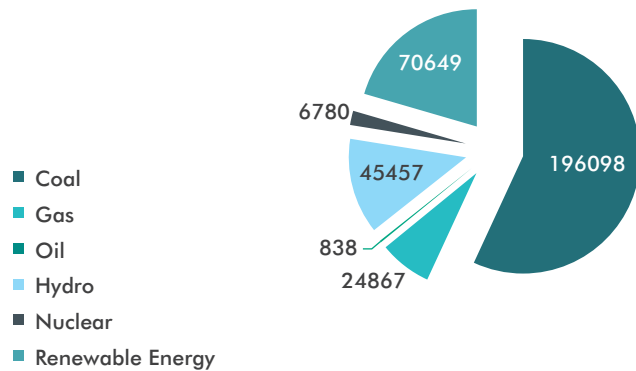
13 Coal Power Plants with a cumulative installed capacity of 12948 MW were shutdown in the year 2016-17 for various periods of time due to water shortage.

COAL POWER PLANTS IN INDIA

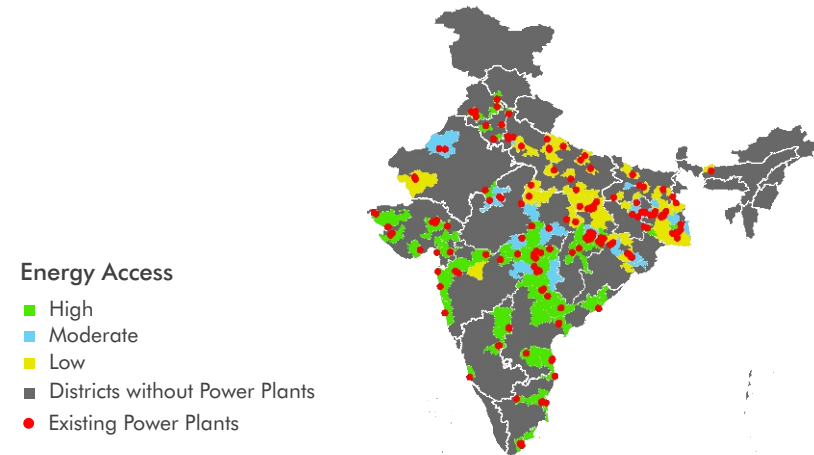


IS ADDING COAL POWER PLANTS ADDRESSING THE ISSUE OF ENERGY ACCESS?

Electricity Generation (Installed Capacity) in India as on 31st August 2018 (in MW)



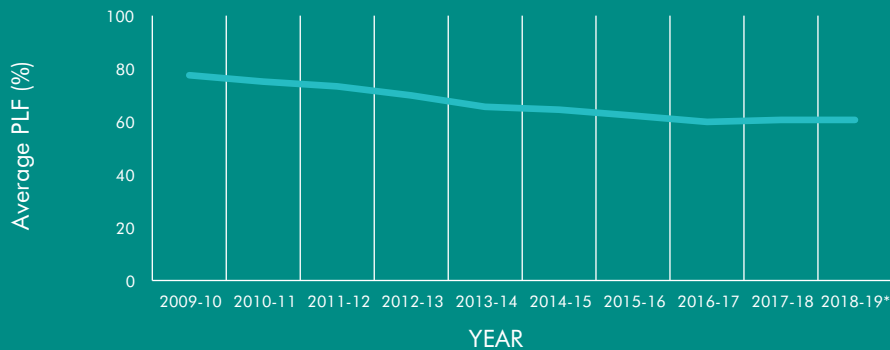
Distribution of Coal Power Plants and Energy Access in India



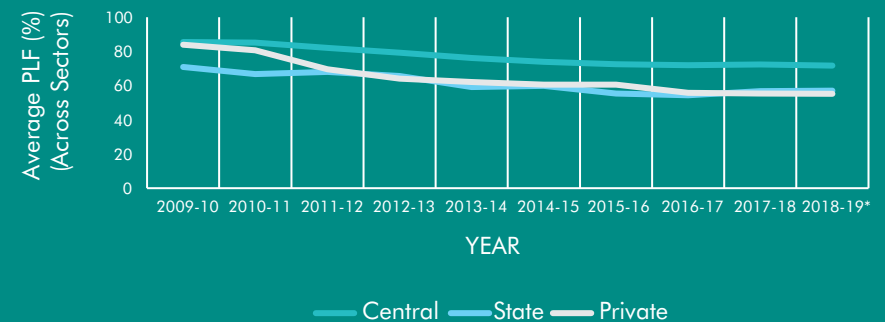
Note: Data compiled only for districts where coal power plants are located.

HOW ARE COAL POWER PLANTS PERFORMING?

Trends of Plant Load Factor (PLF) of Coal Power Plants in India (2009-10 to 2018-19)

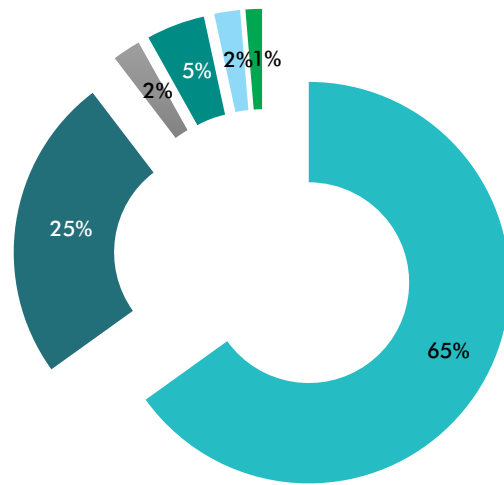


Sector Wise Performance (PLF) of Coal Power Plants in India (2009-10 to 2018-19)



THE WATER LINKAGE

Estimated Process Wise Water Consumption in Coal Power Plants per hour (m³/MW)



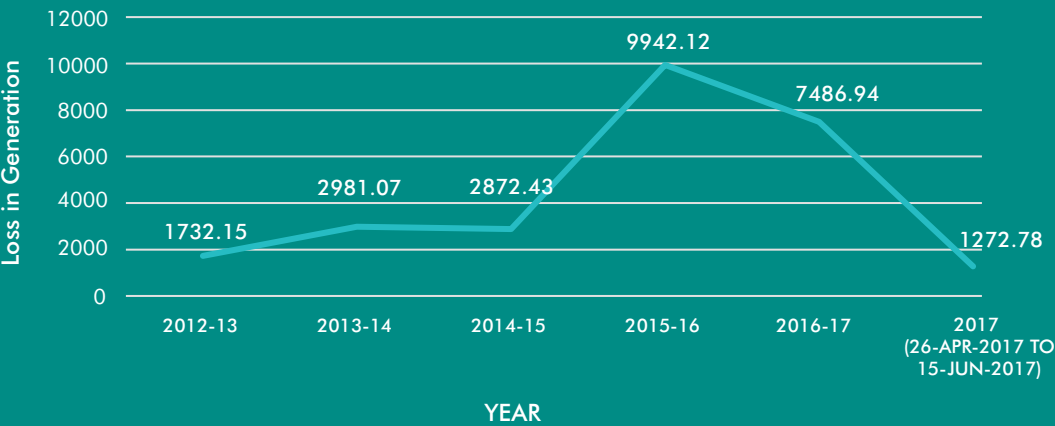
CEA estimates that Coal Power Producers in India used 80m³ of water per MW as against the usage of Developed Countries Coal Power Producers of 10m³ per MW.

Indian power plants use an average of 4m³/hour/MWh of water, while the average water consumption in Chinese plants is 2.5 m³/hour/MWh.

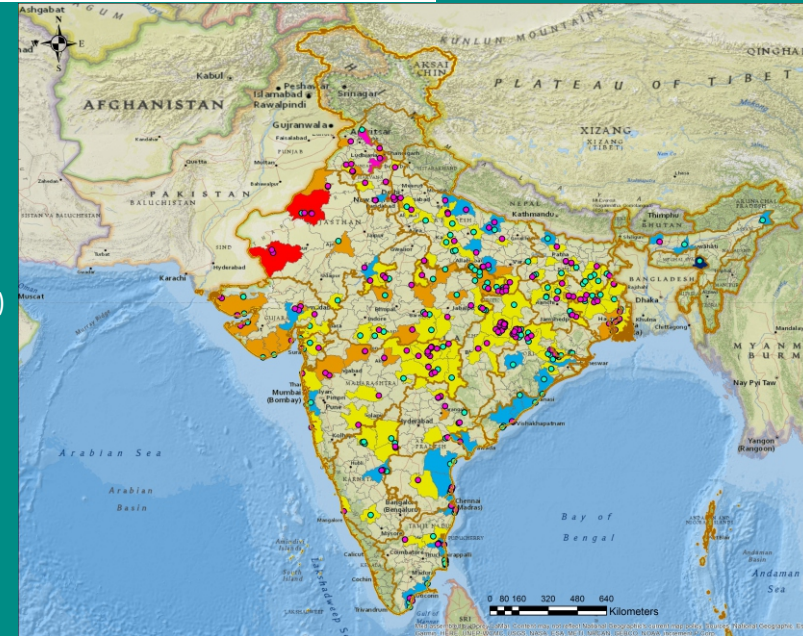
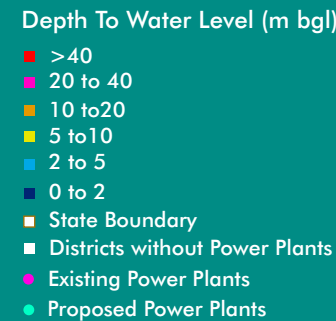
Source CSE report on "State of our Power Plants" (<https://cdn.cseindia.org/userfiles/booklet.pdf>)

Source: CEA Report on Water Consumption of Coal Plants (http://www.cea.nic.in/reports/others/thermal/tetd/min_of%20water_coal_power.pdf)

Loss in Generation due to Raw Water Unavailability (2012-13 to 2017) (in Million kWh)



Pre-Monsoon Depth to Water Level (2016-17)

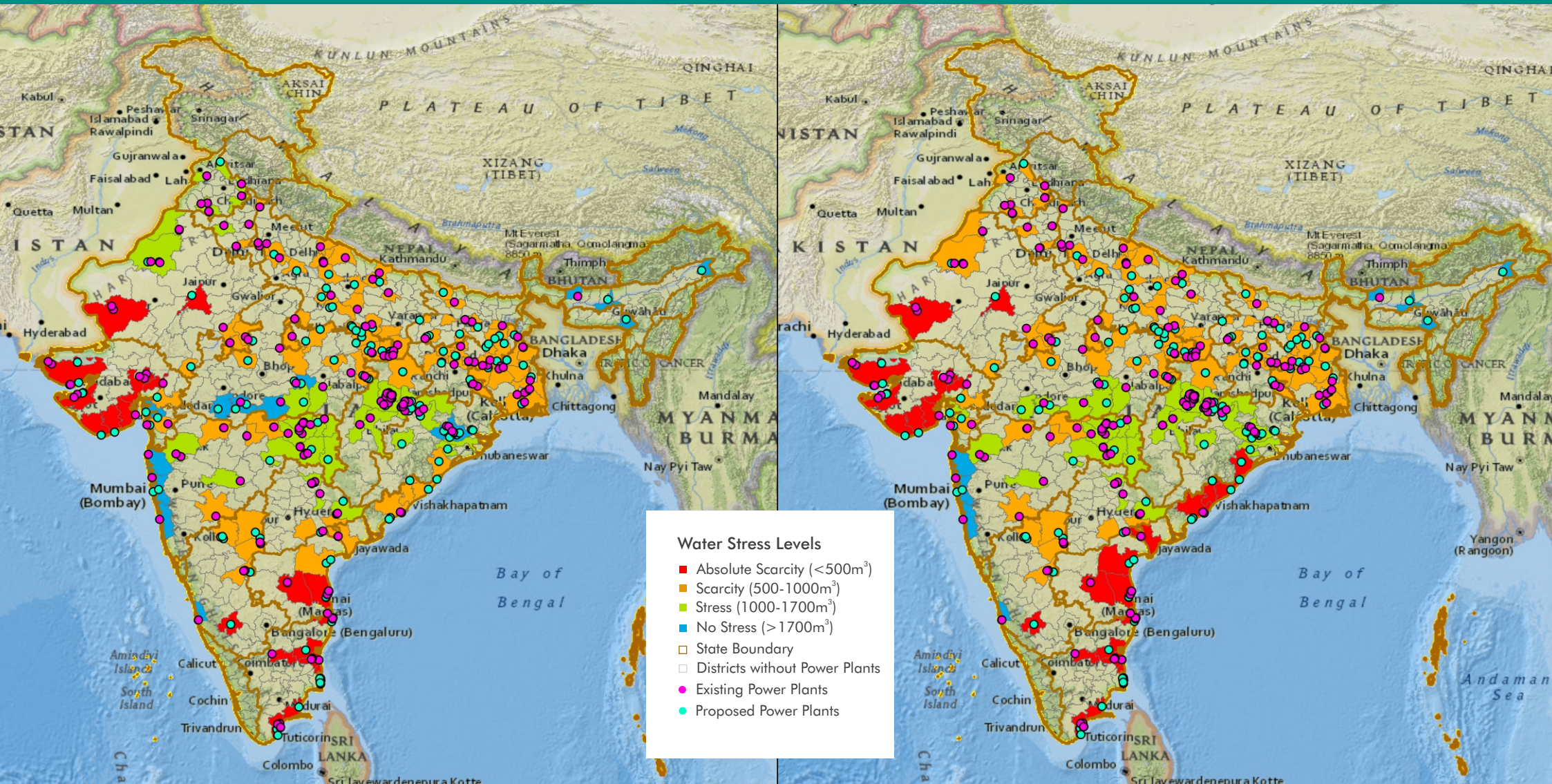


WATER STRESS

As compared to 2010, more areas are projected to be "Water Stressed" and the Water Scarcity Levels further intensify in 2050 as compared to 2025.

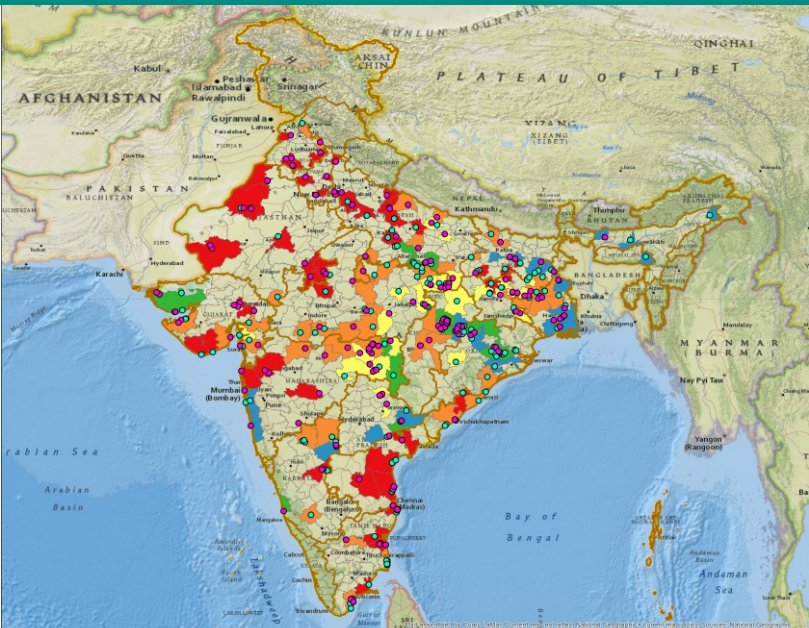
Water Stress Levels Based on CWC Parameters (2025)

Water Stress Levels Based on CWC Parameters (2050)

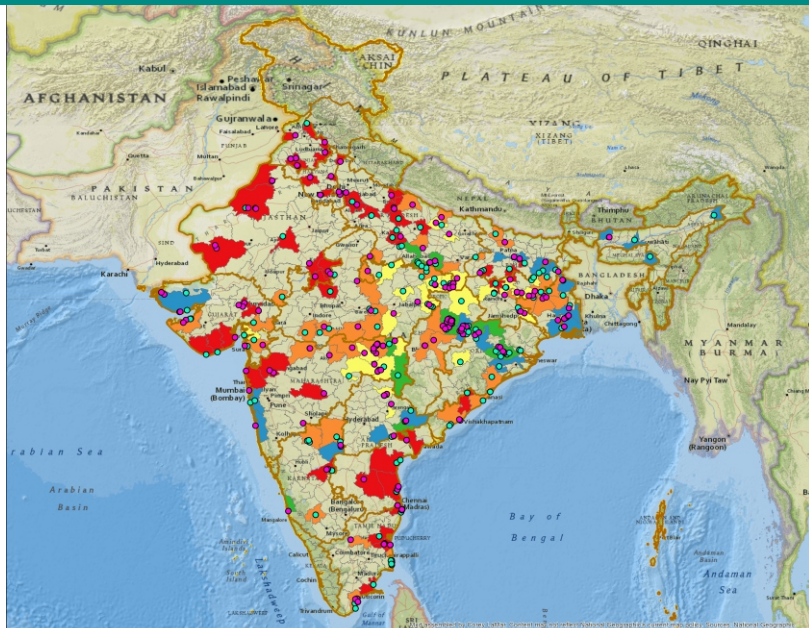


Aqueduct Water Stress Projections 2020
Optimistic (Climate Scenario)

Aqueduct Water Stress Projections 2020
Business as Usual (Climate Scenario)

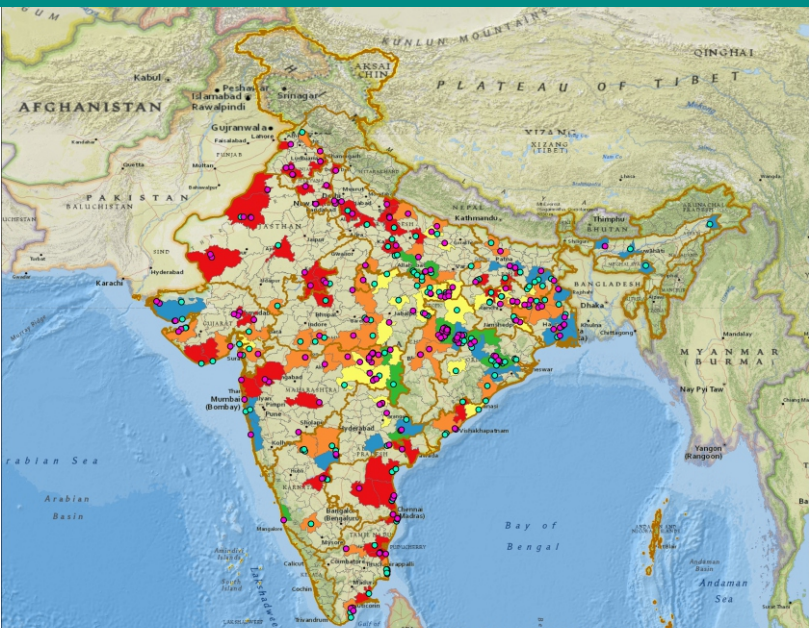


Aqueduct Projections corroborate CWC Projections on Water Scarcity Levels but are grimmer.

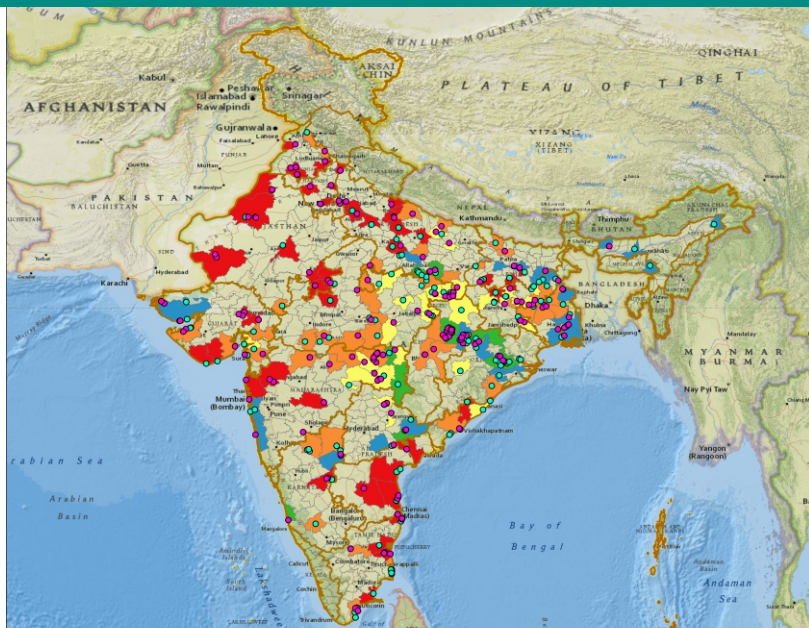


Aqueduct Water Stress Projections 2030
Optimistic (Climate Scenario)

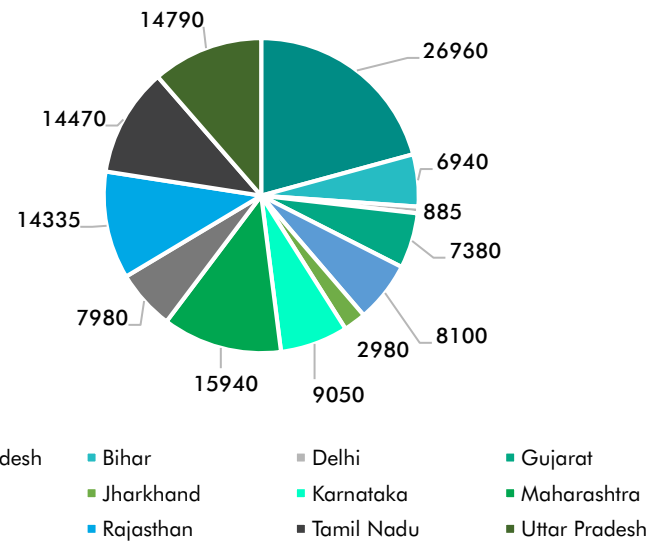
Aqueduct Water Stress Projections 2030
Business as Usual (Climate Scenario)



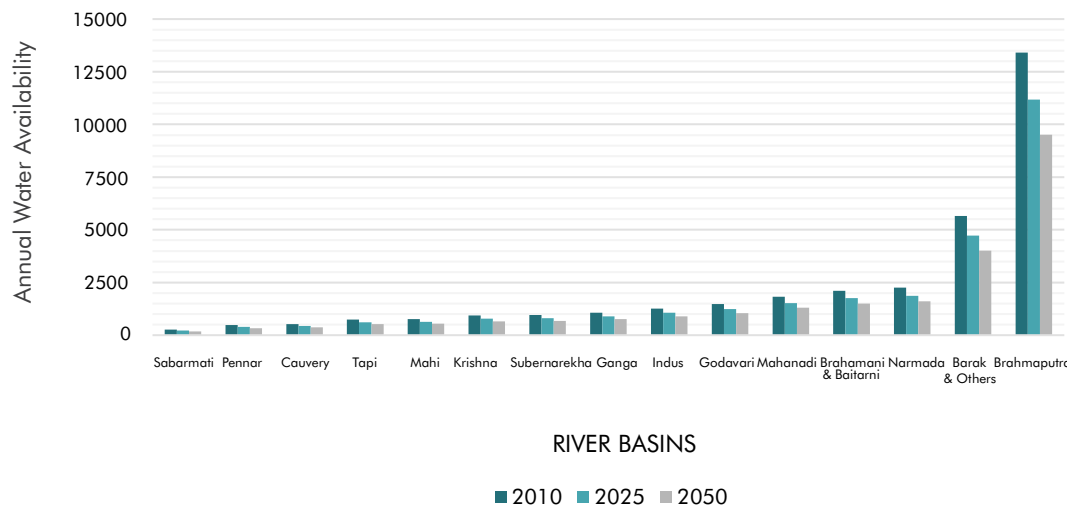
- Water Stress Levels**
- Extremely High (>80%)
 - High (40-80%)
 - Medium-High (20-40%)
 - Low-Medium (10-20%)
 - Low (<10%)
 - State Boundary
 - Districts without Power Plants
 - Existing Power Plants
 - Proposed Power Plants



State Wise Total Capacity in MW (Installed and Proposed) Under Extremely High Stress Condition in 2020 as per WRI Aqueduct Tool

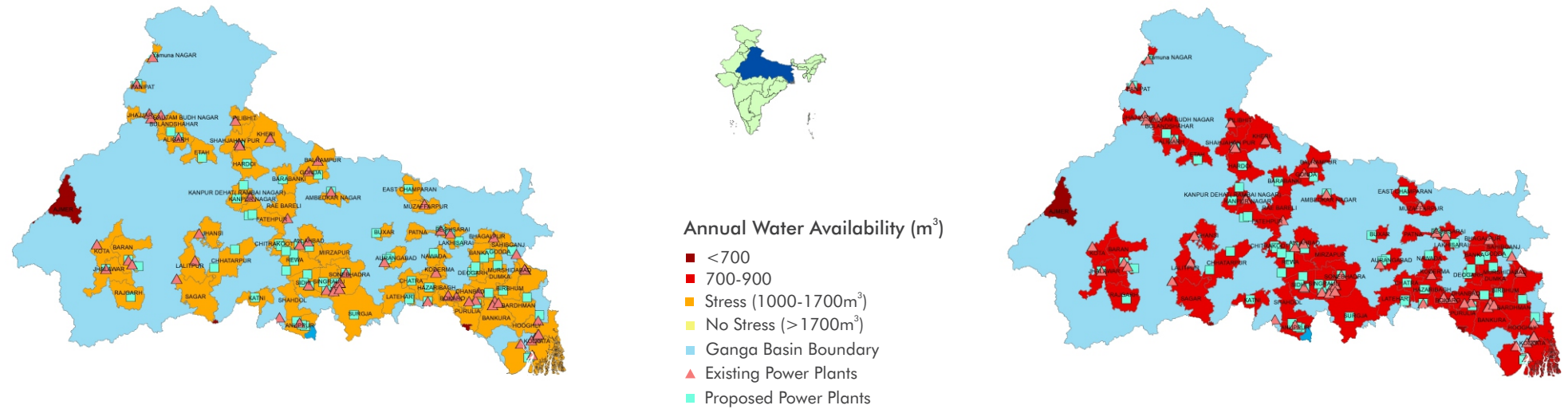


Estimated Per Capita Average Annual Water Availability (m³) in Different River Basins During 2010, 2025 & 2050



Per Capita Water Availability (2010) of Districts with Coal Power Plants under Ganga Basin

Per Capita Water Availability (2025) of Districts with Coal Power Plants under Ganga Basin



CASE STUDY

COMPETING DEMAND FOR WATER POWER PLANTS VS PEOPLE A CASE OF CHANDRAPUR, MAHARASHTRA

Chandrapur district which hosts more than 18% of Maharashtra's existing power plants is also in the list of drought-struck districts.

Most of these plants source water from the Wardha river and Erai Dam, with their linkage to the Godavari river basin. The CWC projections for Godavari river basin indicate a decline in the estimated per capita average annual water availability for the years 2025 and 2050. The future looks dismal, for an already water stressed situation that the communities are facing.



Chandrapur Super TPS | Installed Capacity of 3340 MW

While Coal Power Plants are impacted by scarce water, the following pictures bring in the human & social element of how scarce water resources & usage by power plants are impacting lives of people on the ground.

Visit to Chandrapur and Wardha Districts

Hand pumps, wells and other sources of water have run dry.



The Erai river used to be a source of water for drinking & irrigation is now highly polluted due to mines and coal power plants in the district.



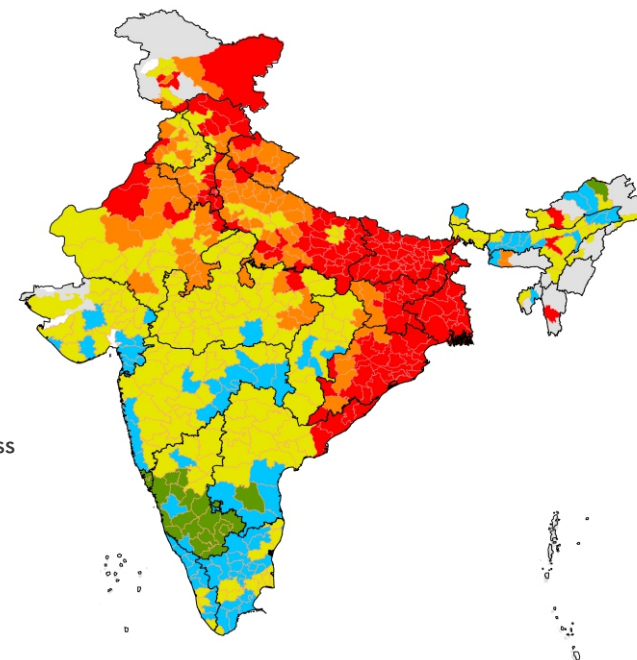
Due to lack of water along with change in land use pattern, the once agricultural land, growing wheat, jowar, paddy, pulses and cotton has now become arid.



Extent of Dryness and Wetness in Districts Across India (Jan to March 2018)

Amongst the states badly hit, by drought due to deficient rainfall, Karnataka and Maharashtra reported 23 out of 30 districts and 32 out of 36 districts as being drought declared, respectively.

Extent of Dryness and Wetness



Source: Adapted from IMD Data

CONCLUSION AND RECOMMENDATIONS

Evident from the information hitherto, most parts of India have been predominantly drought prone in the last few years. This year alone, despite unprecedented rainfall in some parts of India, 251 districts out of a total of 718 districts were declared “rainfall deficit” as per data accessed from the Indian Meteorological Department.

With declining per-capita water availability and many river basins that are either water stressed or likely to be water scarce, there is likely to be increasing and competing water demand, with the demand-supply gap widening. In the backdrop of information that Coal Power Plants are already consuming over half of India's estimated domestic water requirement, any large-scale additions to the coal power plant capacity will have a further detrimental impact on water availability.

- Accord permission for new power plants based on a detailed assessment of water availability amongst others.
- Priority needs to be given to power plants that are less water intensive. For instance, wind and solar electricity generation are not water intensive.
- Permissions for setting up electricity generation capacity addition needs to be in line with projected demand.
- The government needs to enforce stringent water consumption norms for current and pipeline power projects.
- Introduce rational water tariffs for all industrial supply, with water audits mandatory.