Energy - Water Nexus

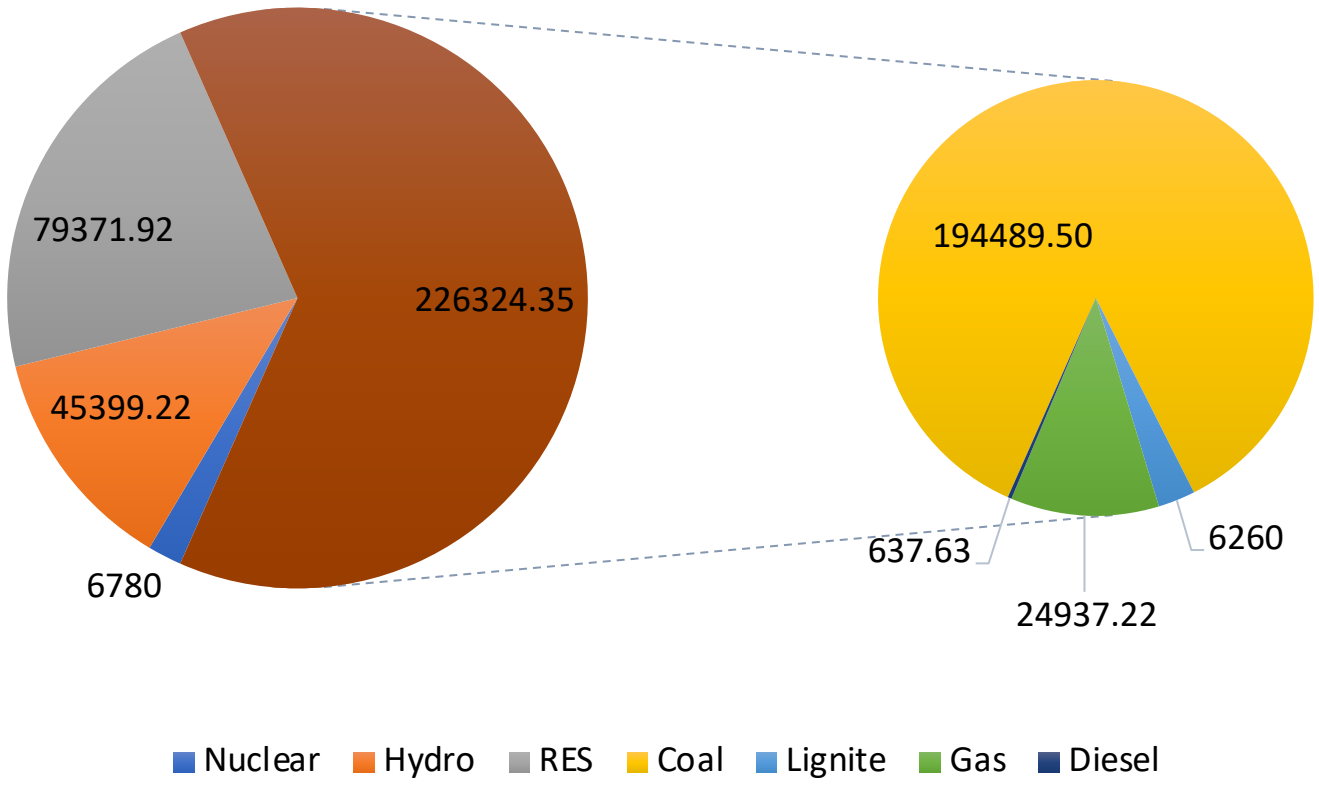
INDIA

An Insight Into Water & Coal Power Linkages in India

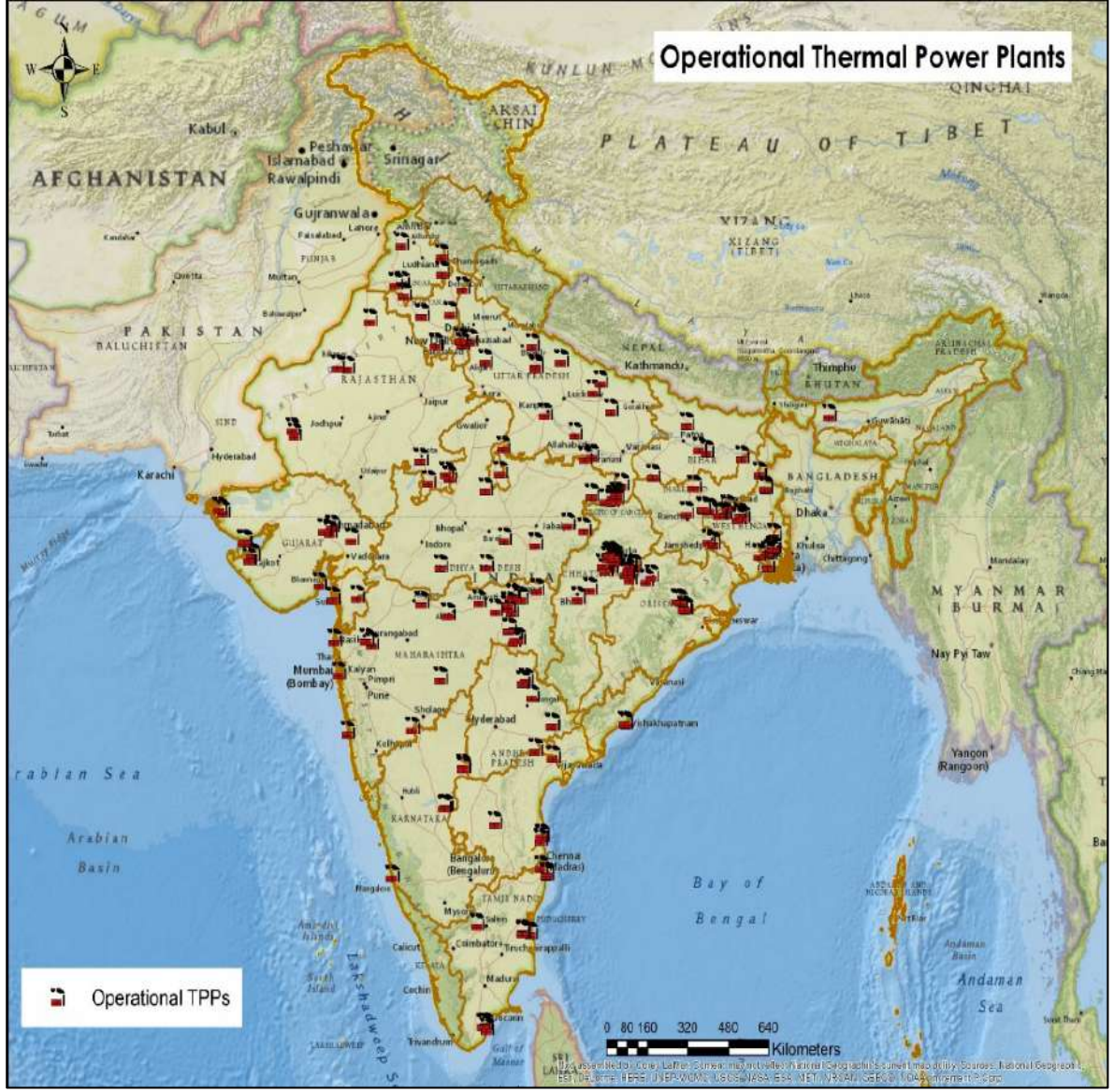
VASUDHA FOUNDATION
Green ways for a good earth!

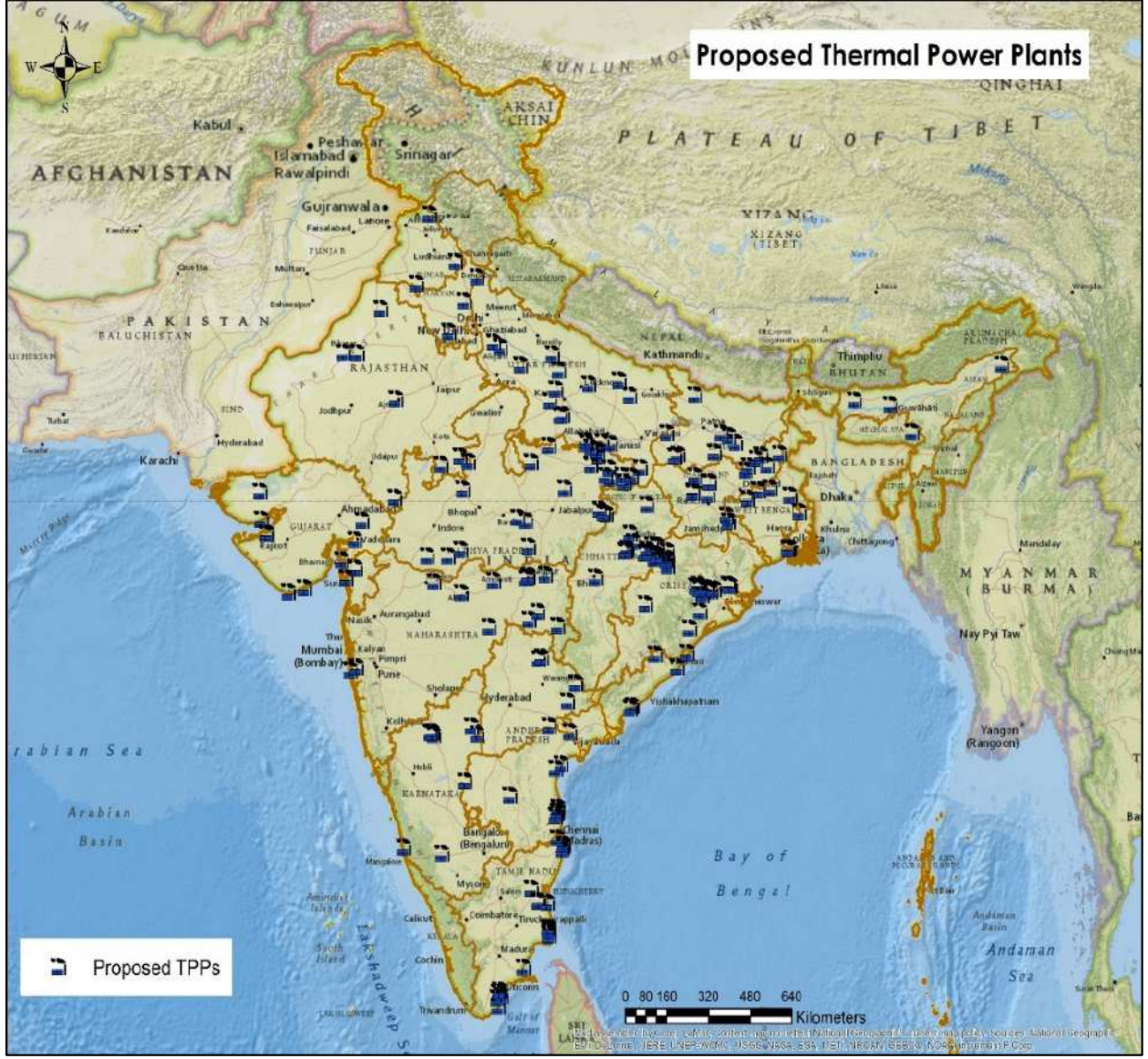
INDIA' CURRENT ELECTRICITY GENERATION MIX

Electricity Generation (Installed Capacity) in India as on 30th June 2019 (in MW)



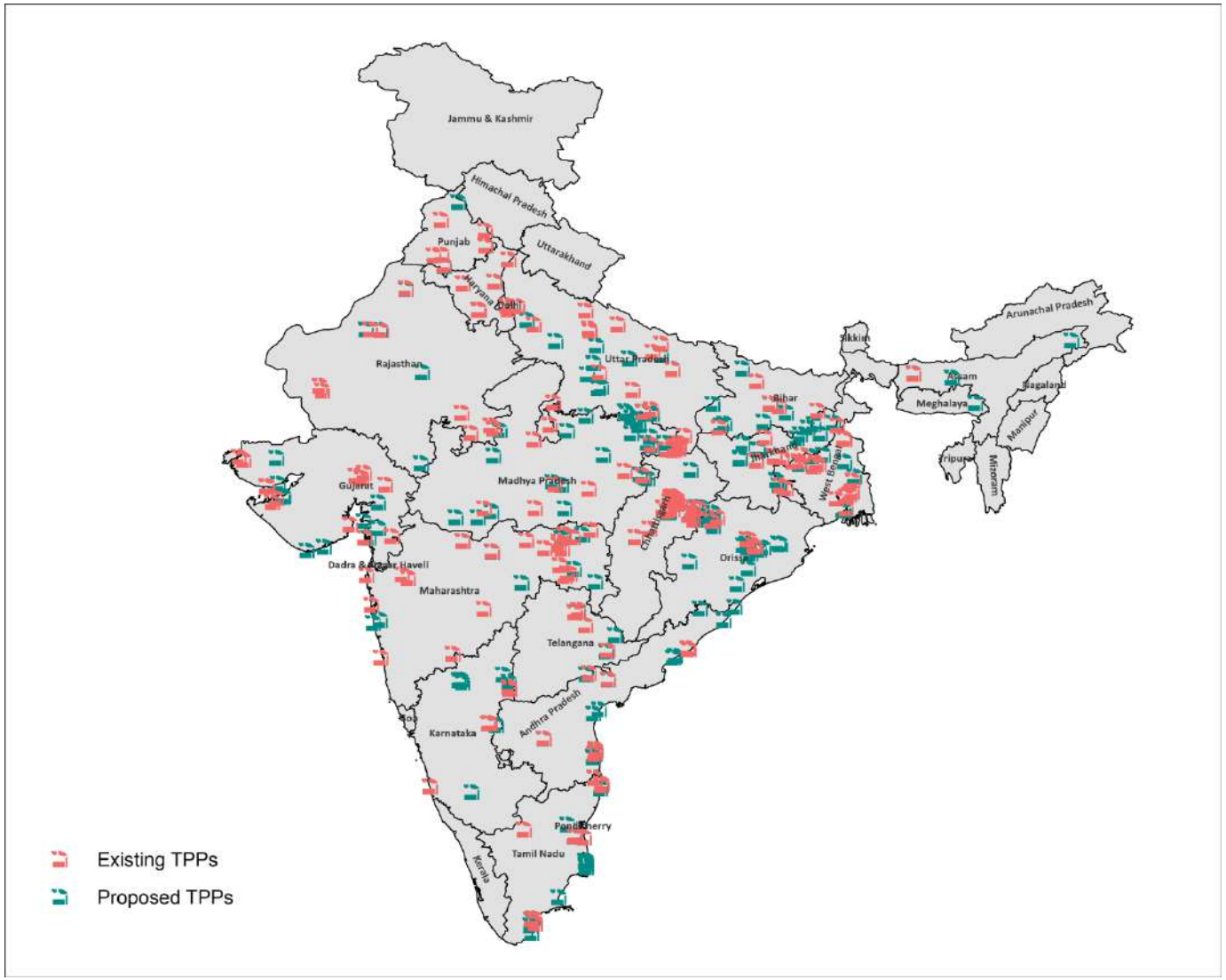
357875.49 MW





- As on 30th June 2019 India has 194489.50 MW of operational coal power plants
- 435 coal power plant units with a cumulative proposed capacity addition of 316278 MW in Pipeline

COAL POWER PLANTS IN INDIA

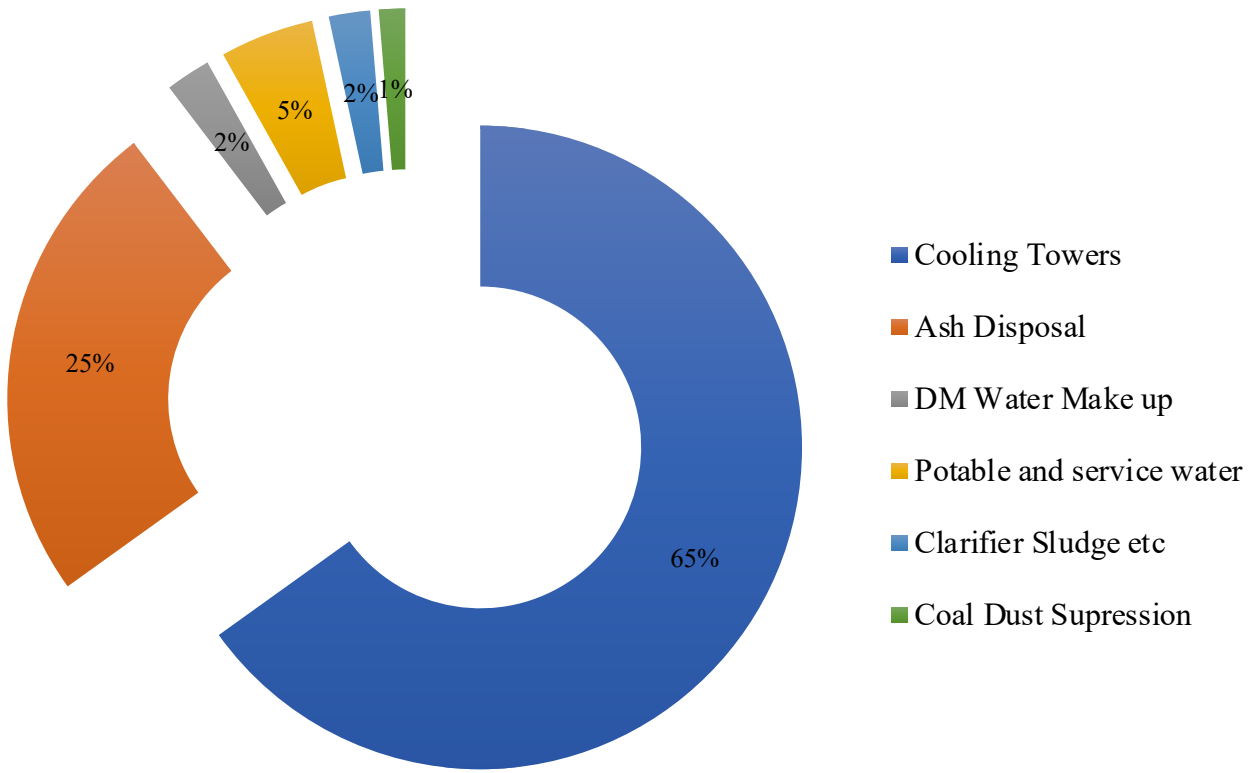


- Coal Power Plants are water intensive and require water for various processes.
- Between 2012 & 2019 water scarcity was reportedly responsible for coal power generation losses of 6 billion kWh/year.
- 4 Coal Power Plants with a cumulative installed capacity of 2260 MW were shutdown in the year 2018-19 for various periods of time due to water shortage.

Source: Vasudha Foundation

The Water Linkage

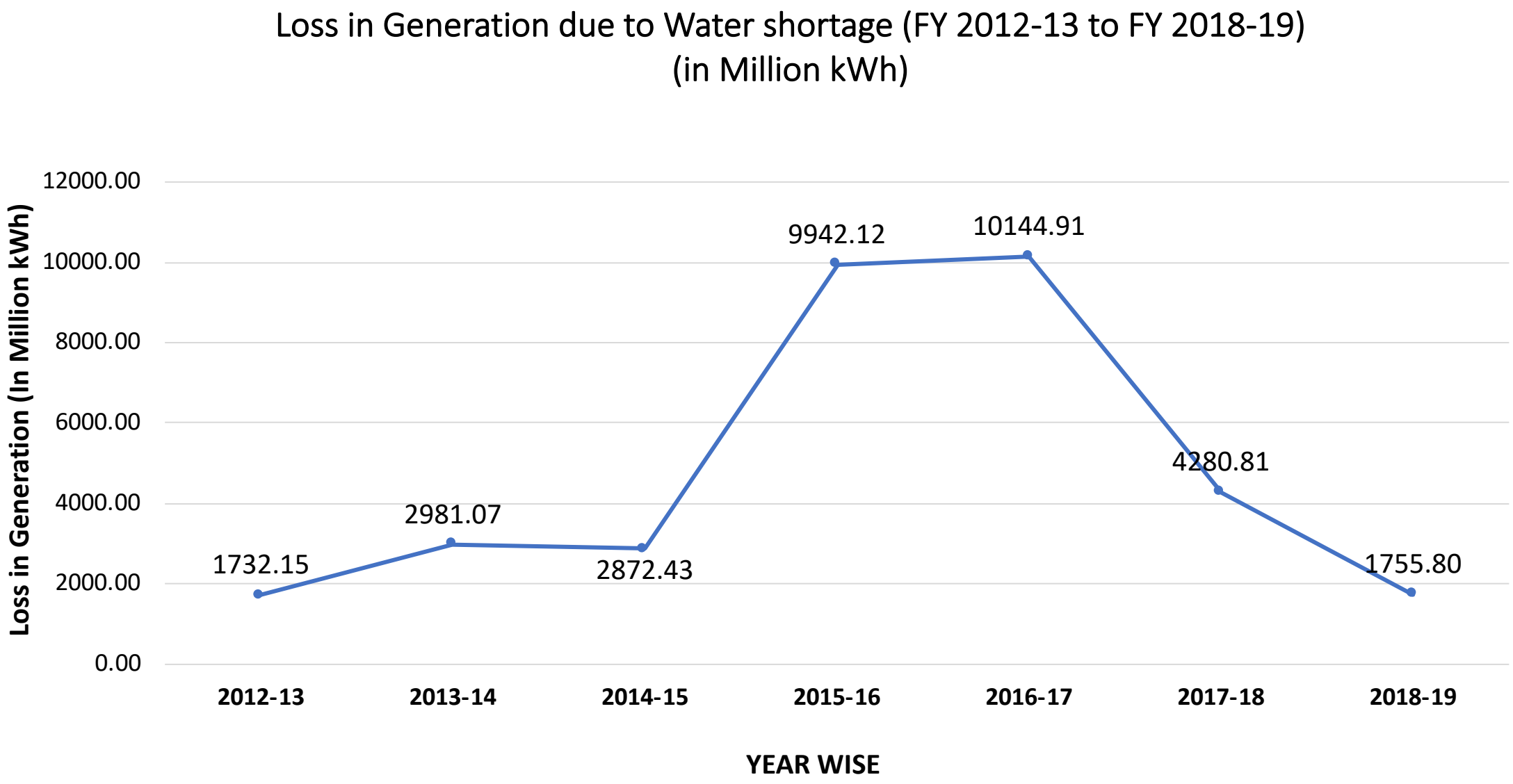
Estimated Process Wise Water Consumption in Coal Power Plants per hour (m^3/MW)

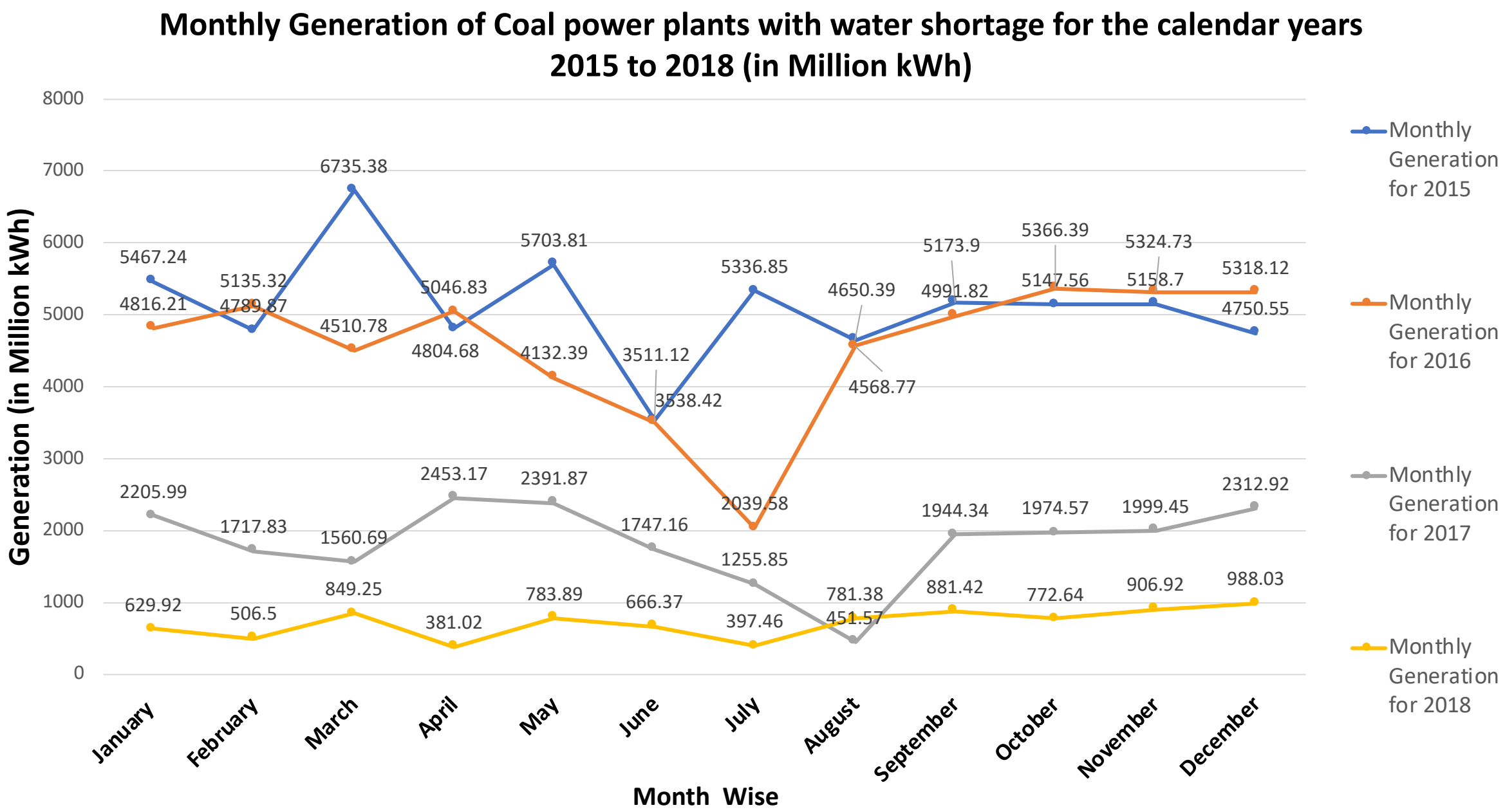


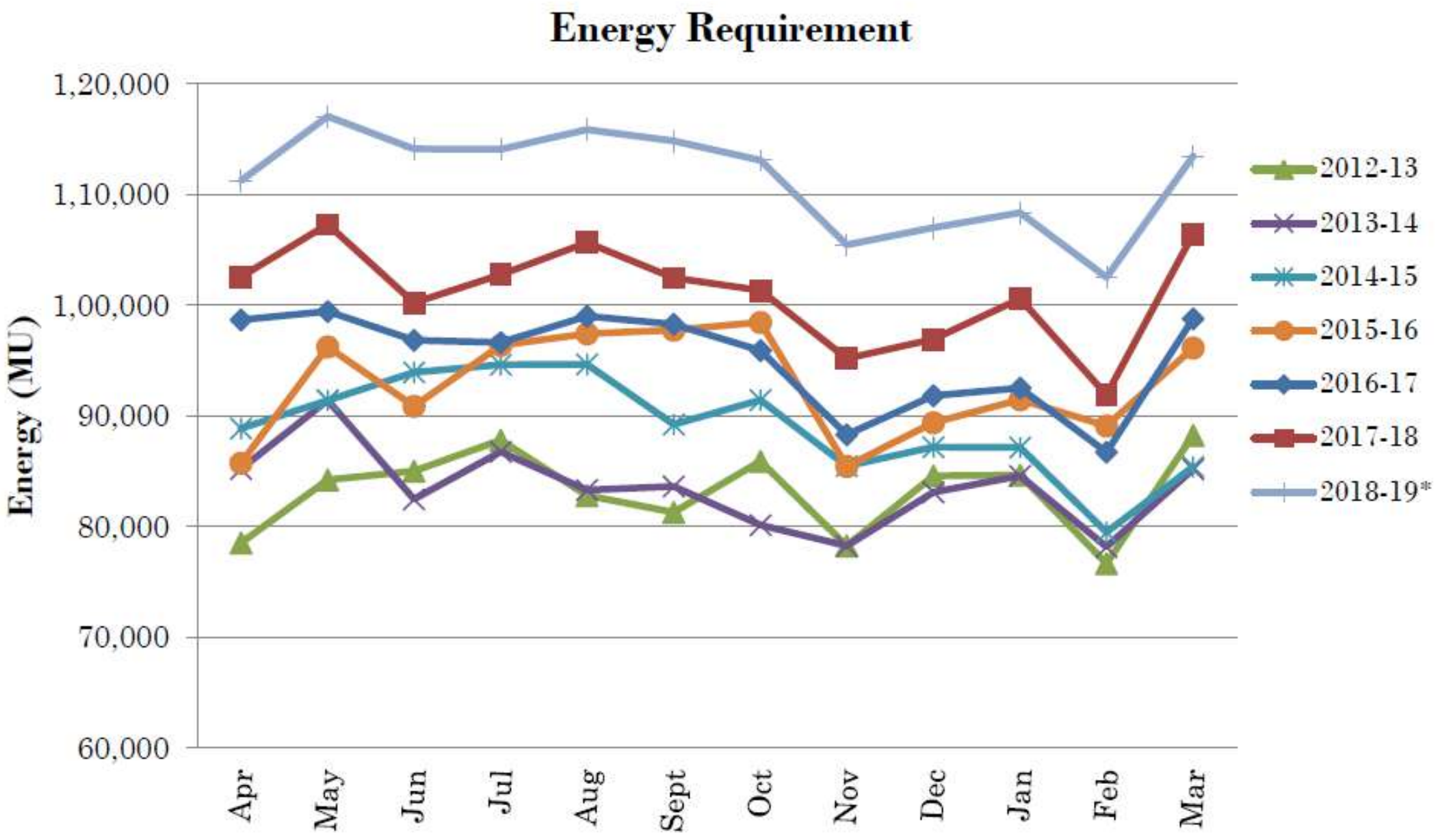
- CEA estimates that Coal Power Producers in India used 80m^3 of water per MW as against the usage of Developed Countries Coal Power Producers of 10m^3 per MW.
- Indian power plants use an average of 4m^3/hour/MWh of water, while the average water consumption in Chinese plants is 2.5 m^3/hour/MWh.

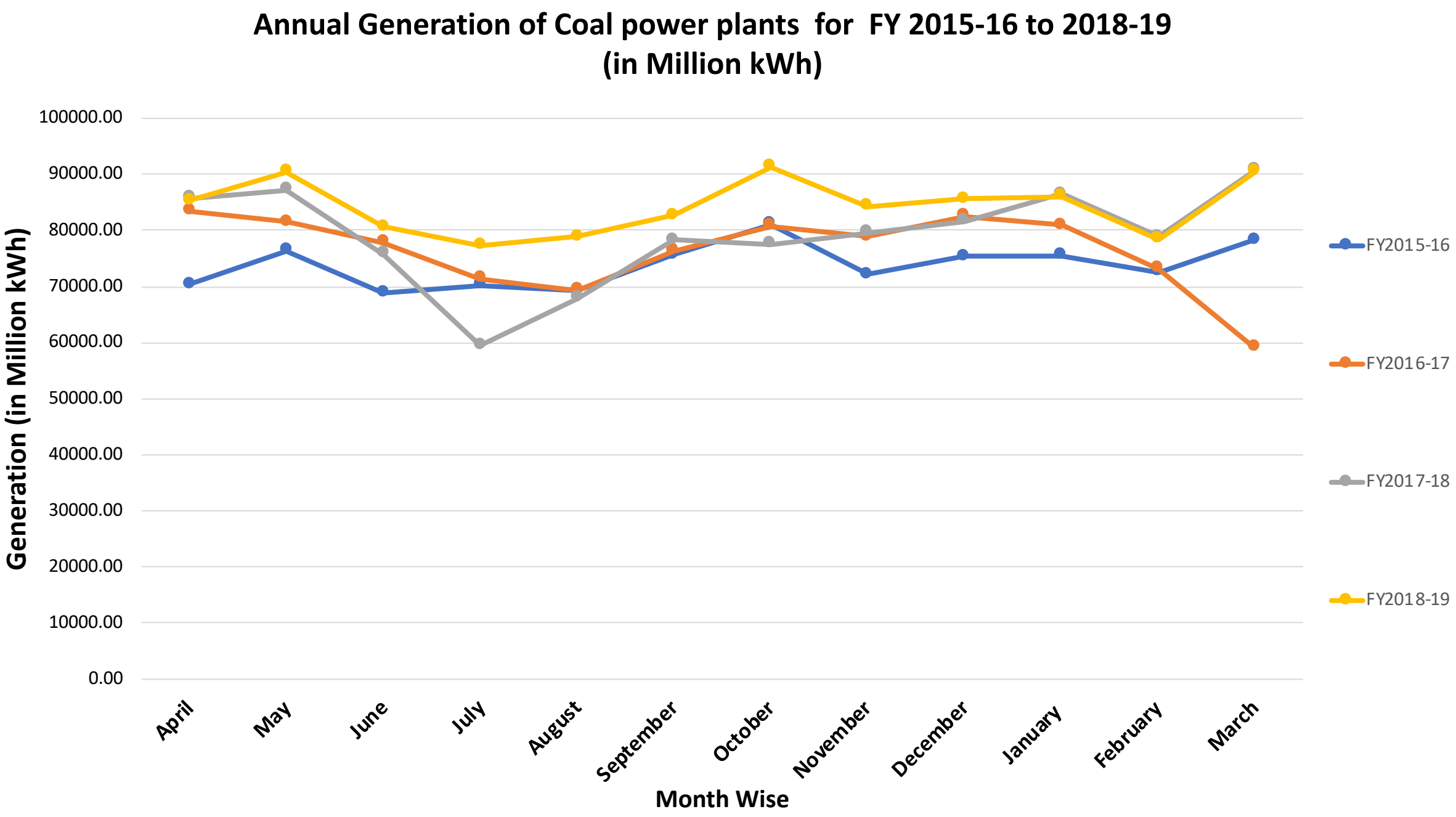
Source: CEA Report on Water Consumption of Coal Plants (http://www.cea.nic.in/reports/others/thermal/tetd/min_of%20water_coal_power.pdf)
Source CSE report on "State of our Power Plants" (https://cdn.cseindia.org/userfiles/booklet.pdf)

The Water Linkage



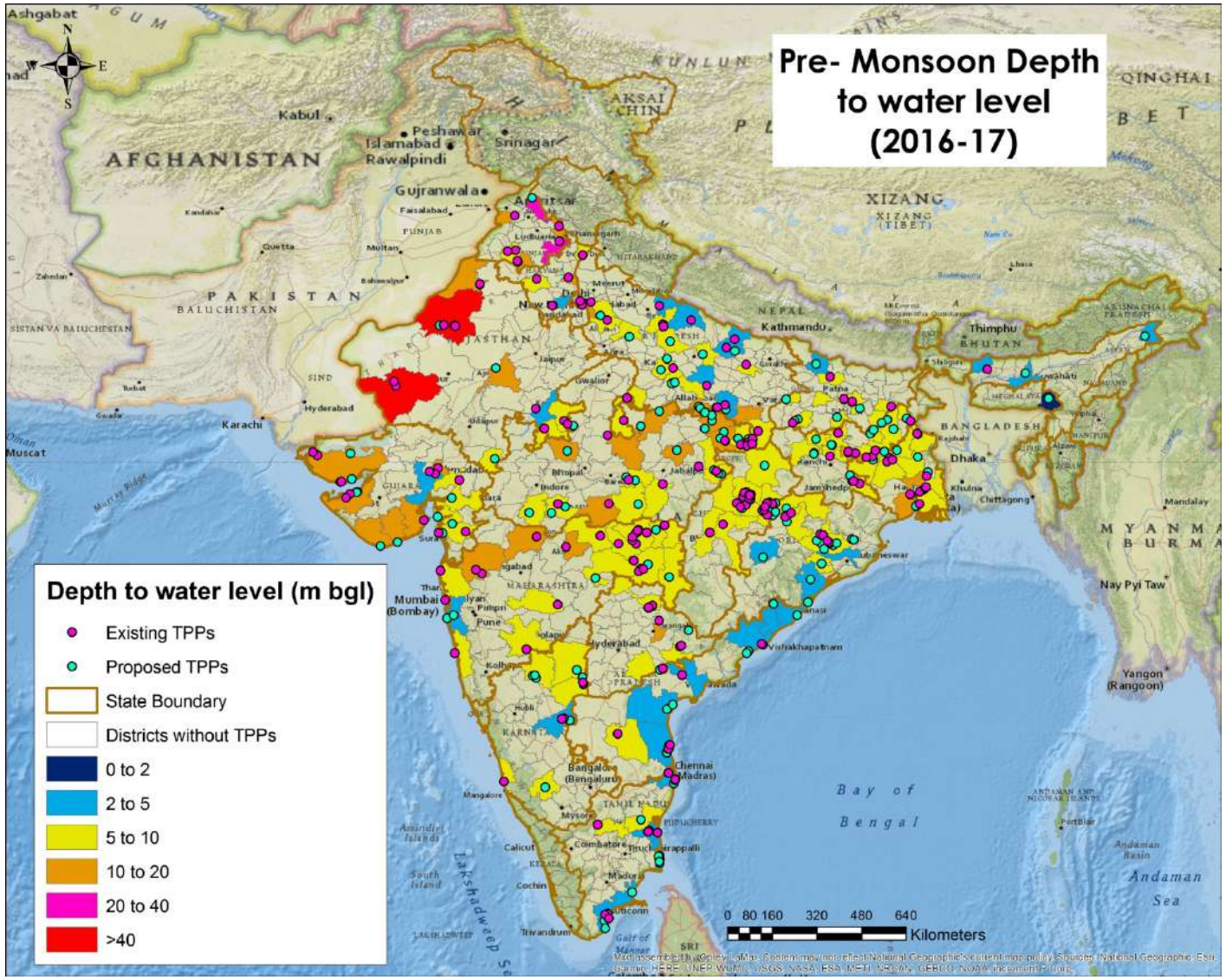

Monthly Generation of Coal power plants with water shortage for the calendar years 2015 to 2018 (in Million kWh)
Generation (in Million kWh)
8000
7000
6000
5000
4000
3000
2000
1000
0
5467.24
5135.32
6735.38
5046.83
5703.81
3511.12
5336.85
4650.39
5173.9
5366.39
5324.73
5318.12
4750.55
4816.21
4789.87
4510.78
4804.68
4132.39
3538.42
2039.58
4568.77
4991.82
5147.56
5158.7
2205.99
1717.83
1560.69
2453.17
2391.87
1747.16
1255.85
781.38
1944.34
1974.57
1999.45
2312.92
629.92
506.5
849.25
381.02
783.89
666.37
397.46
451.57
881.42
772.64
906.92
988.03
January
February
March
April
May
June
July
August
September
October
November
December
Month Wise
Monthly Generation for 2015
Monthly Generation for 2016
Monthly Generation for 2017
Monthly Generation for 2018


Energy Requirement
Energy (MU)
1,20,000
1,10,000
1,00,000
90,000
80,000
70,000
60,000
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
Jan
Feb
Mar
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19*


Annual Generation of Coal power plants for FY 2015-16 to 2018-19
(in Million kWh)
Generation (in Million kWh)
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
April
May
June
July
August
September
October
November
December
January
February
March
Month Wise
FY2015-16
FY2016-17
FY2017-18
FY2018-19

The Water Linkage

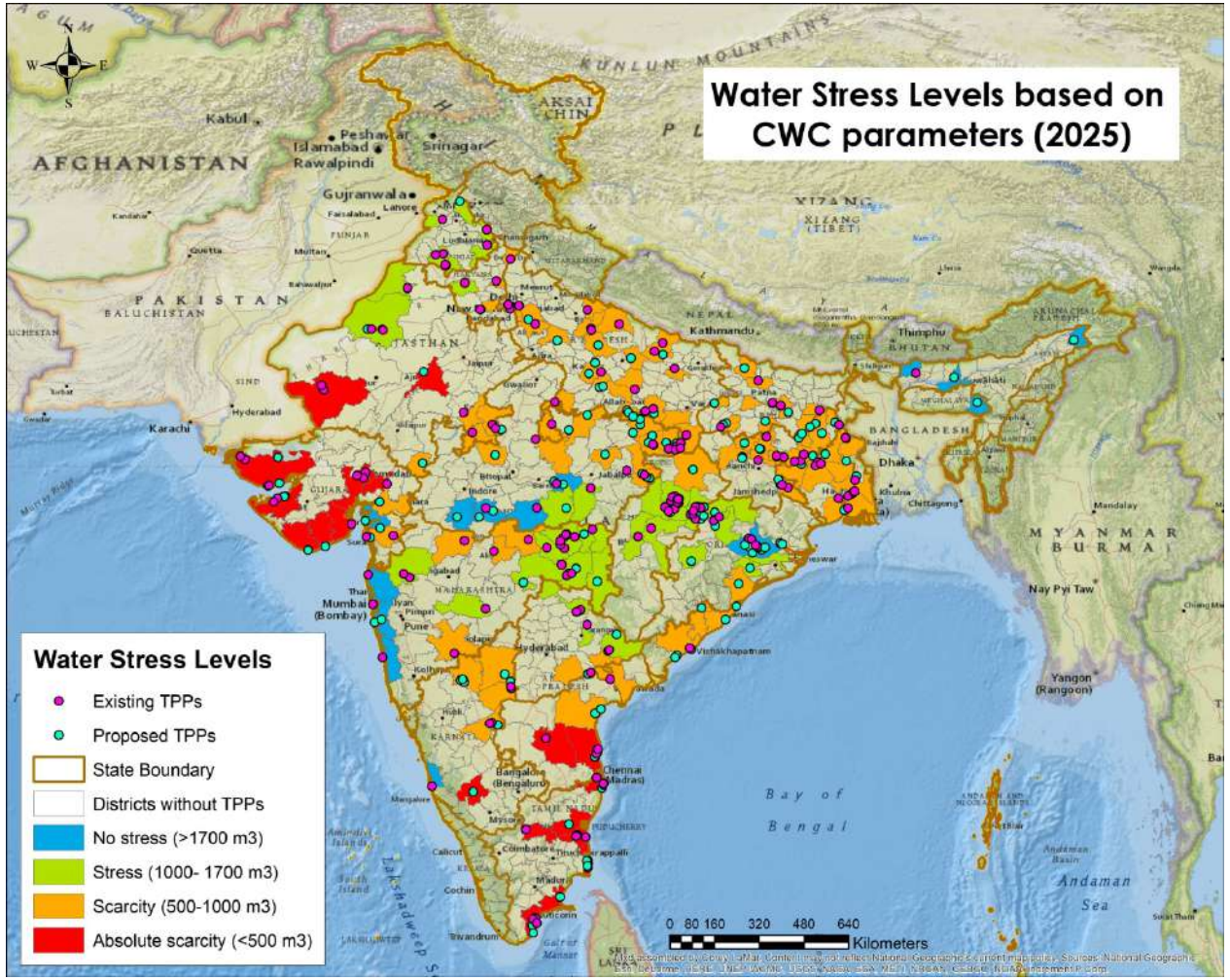
Pre-Monsoon Depth to Water Level (2016-17)



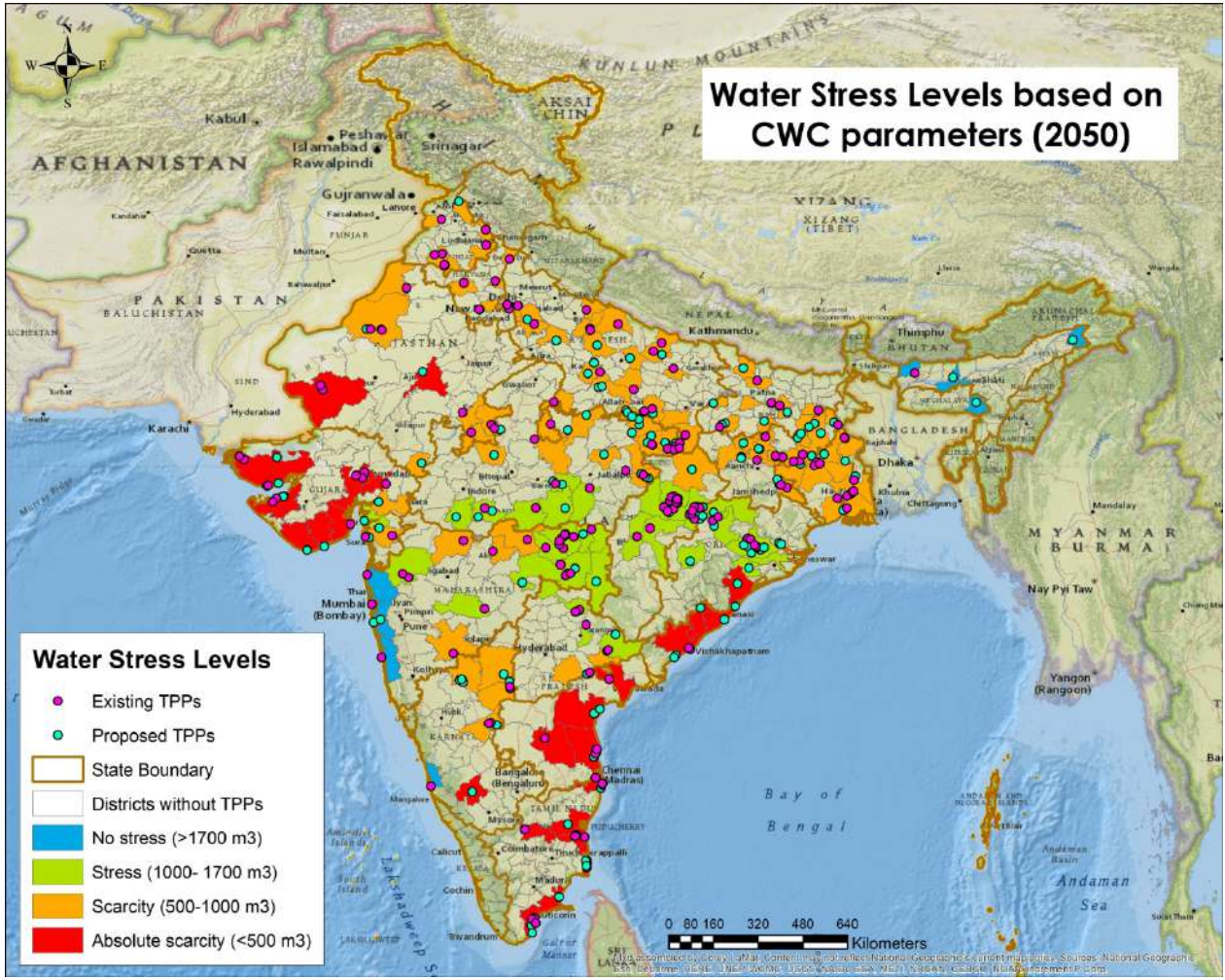
Water Stress

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)

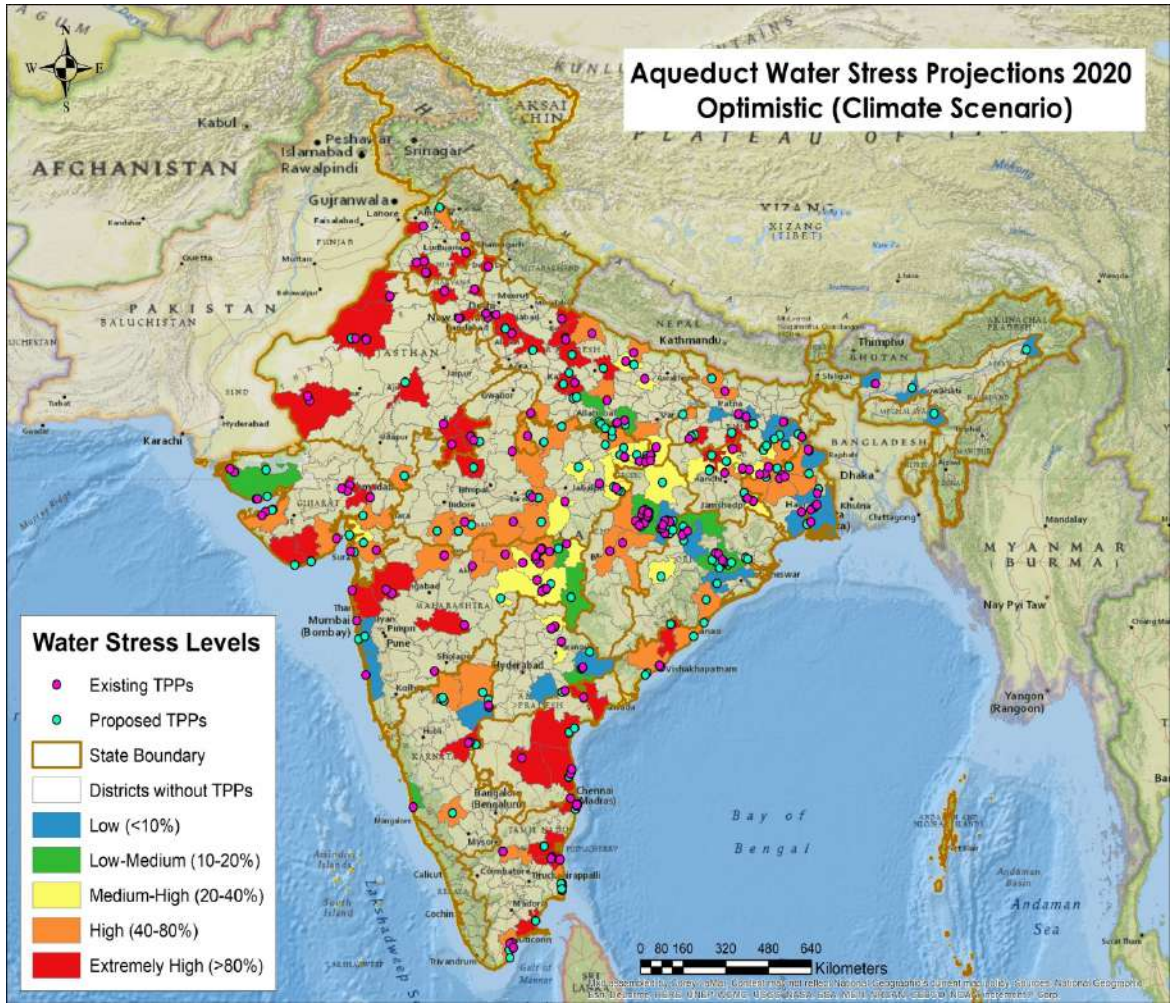


Water Stress Levels Based on CWC Parameters (2050)

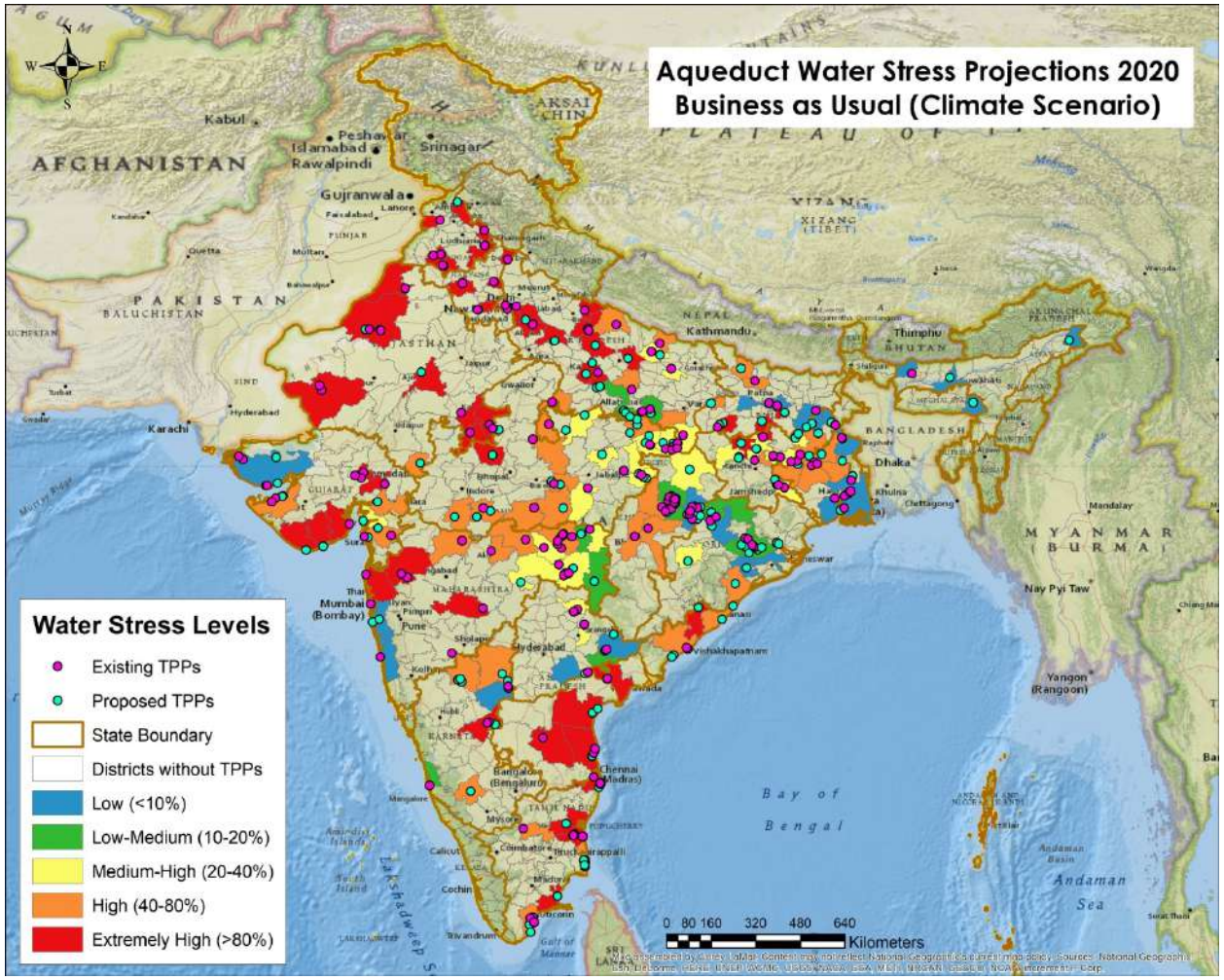


Water Stress

Aqueduct Water Stress Projections 2020
Optimistic (Climate Scenario)



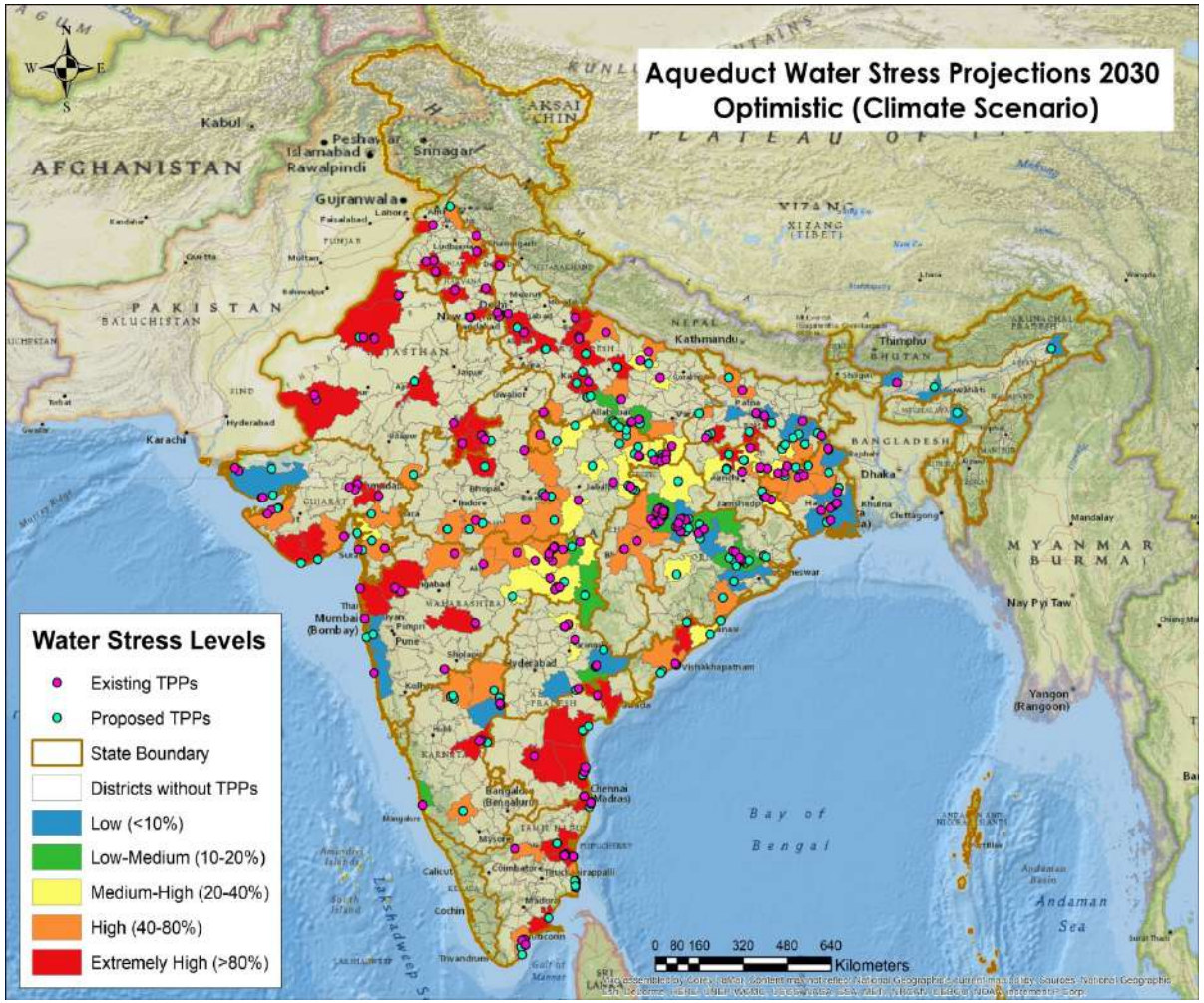
Aqueduct Water Stress Projections 2020
Business as Usual (Climate Scenario)



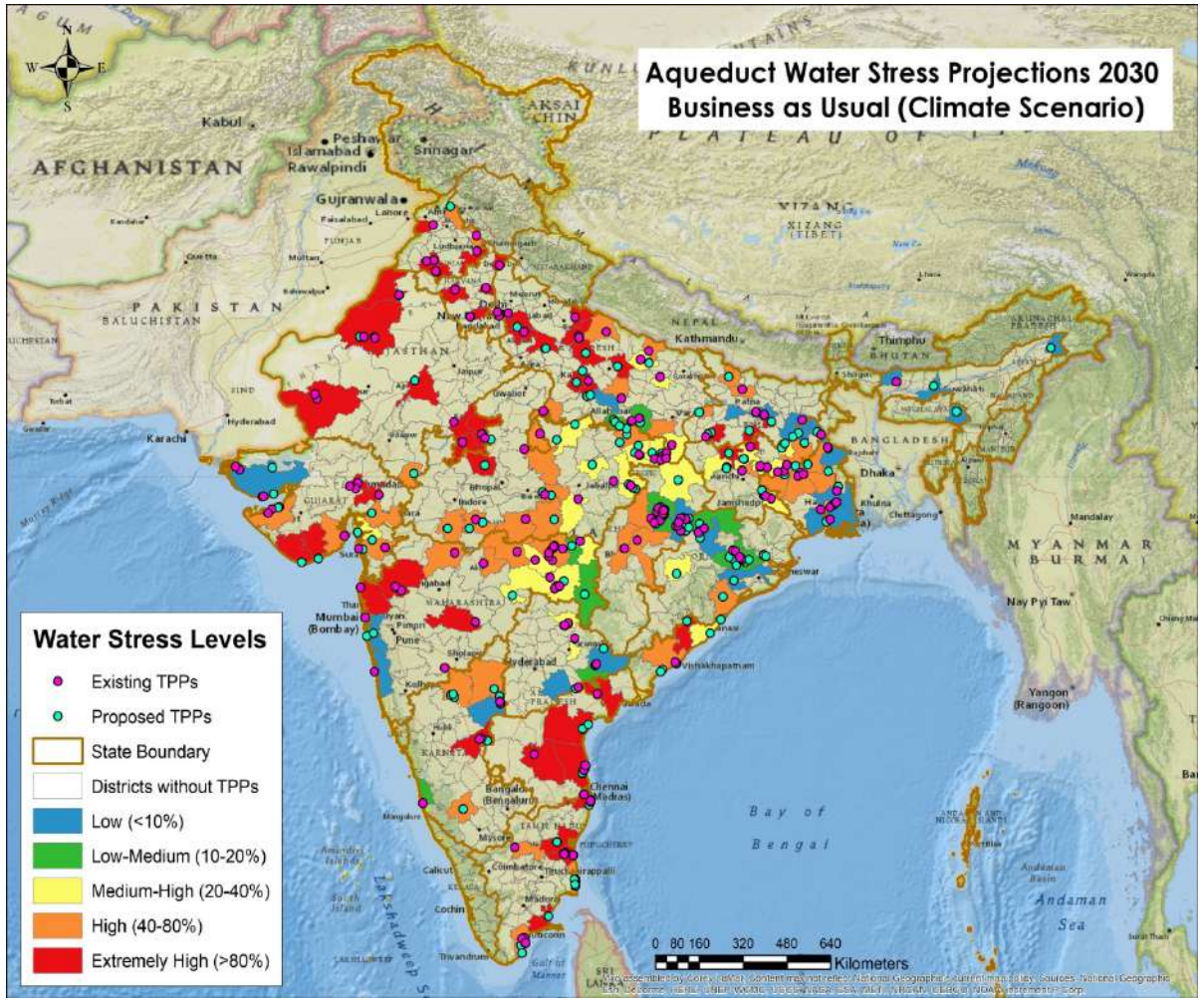
Aqueduct Projections corroborate CWC Projections on Water Scarcity Levels but are grimmer

Water Stress

Aqueduct Water Stress Projections 2030
Optimistic (Climate Scenario)

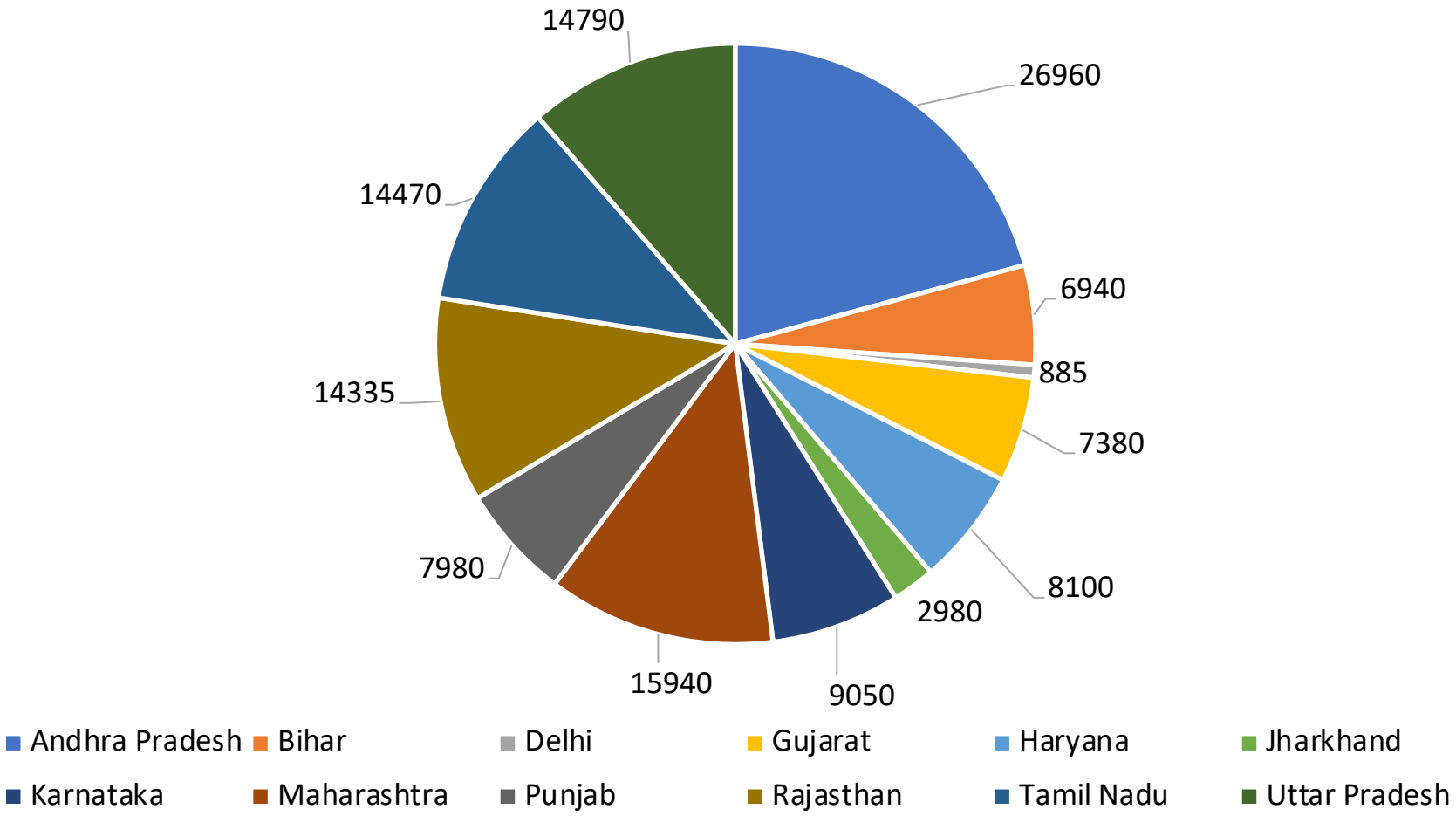


Aqueduct Water Stress Projections 2030
Business as Usual (Climate Scenario)

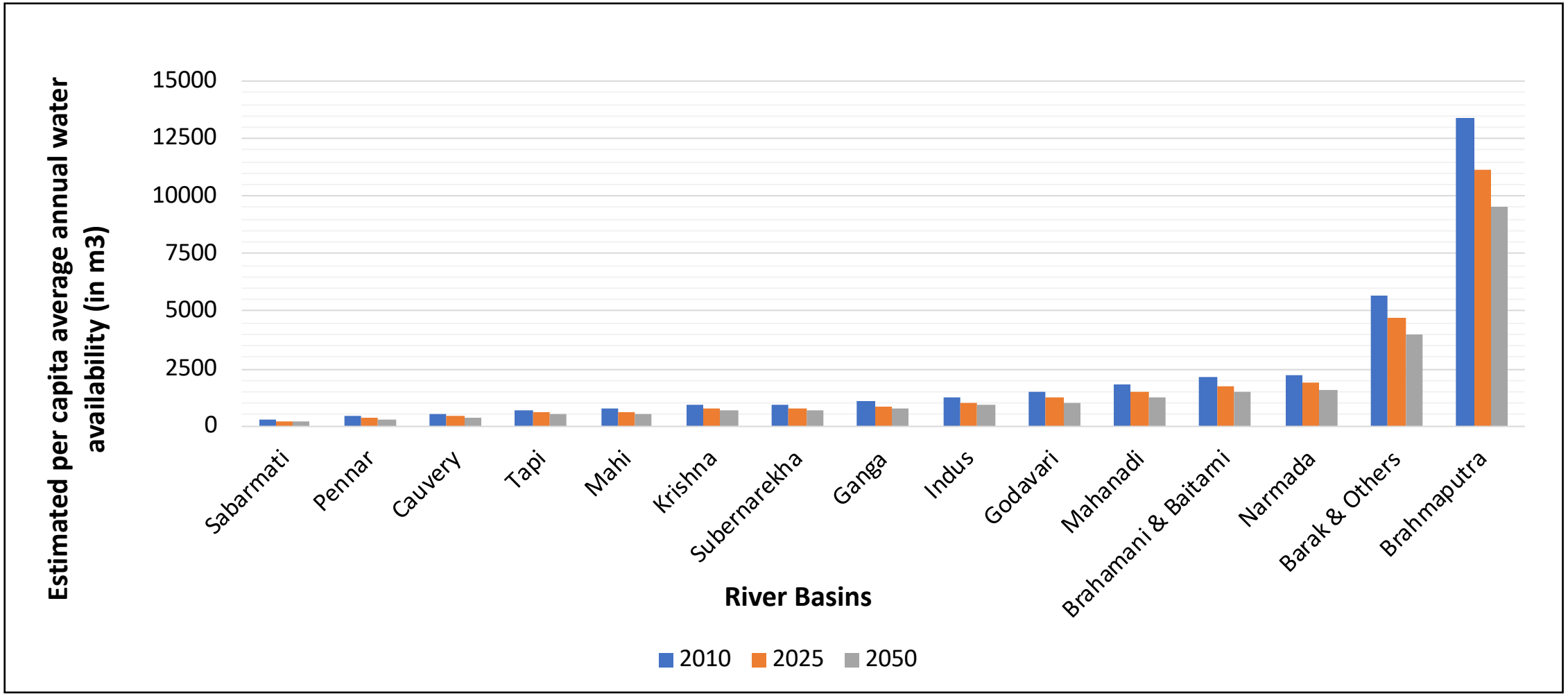


Water Stress

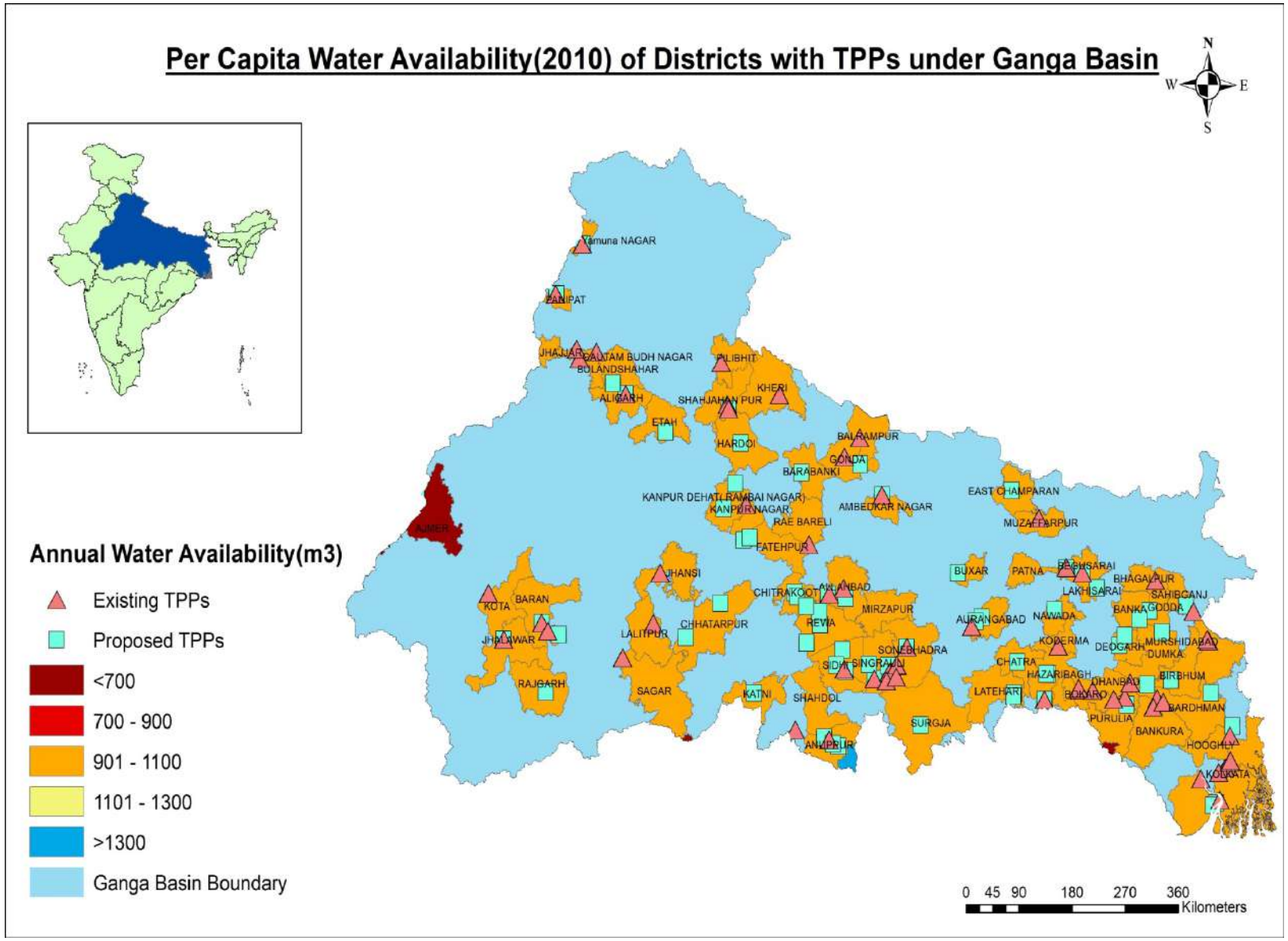
State wise total capacity in MW (installed and proposed) under extremely high stress condition in 2020 as per WRI Aqueduct tool



Water Stress

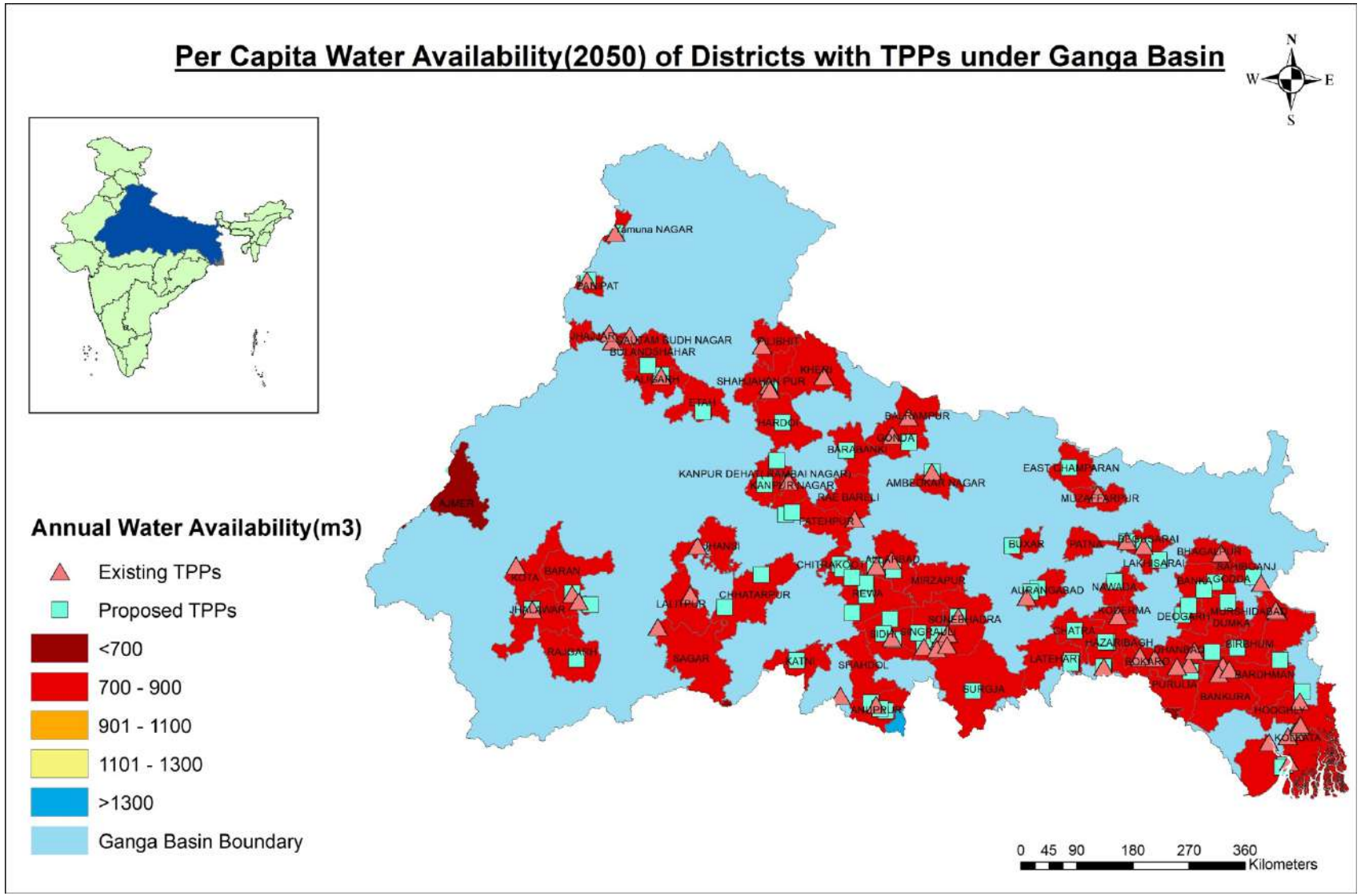


Water Stress



The Ganga basin is the home 70,039 MW of Power Plants, comprising of 36.01 percent of the total current India installed electricity generation installed capacity of Coal Power Plants.

Water Stress



The basin is also expected to be the home for an additional capacity expansion of electricity generation of Coal Power Plants to the extent of 100810 MW.

Competing Demand for Water : Power Plants vs. People
A Case Study 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.

- 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.

Chandrapur Super TPS | Installed Capacity of 3340 MW

Competing Demand for Water: Power Plants vs. People
A Case Study of Chandrapur, Maharashtra

H a n d p u m p s, 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.

Conclusion and Recommendations

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

https://www.vasudha-emi.in

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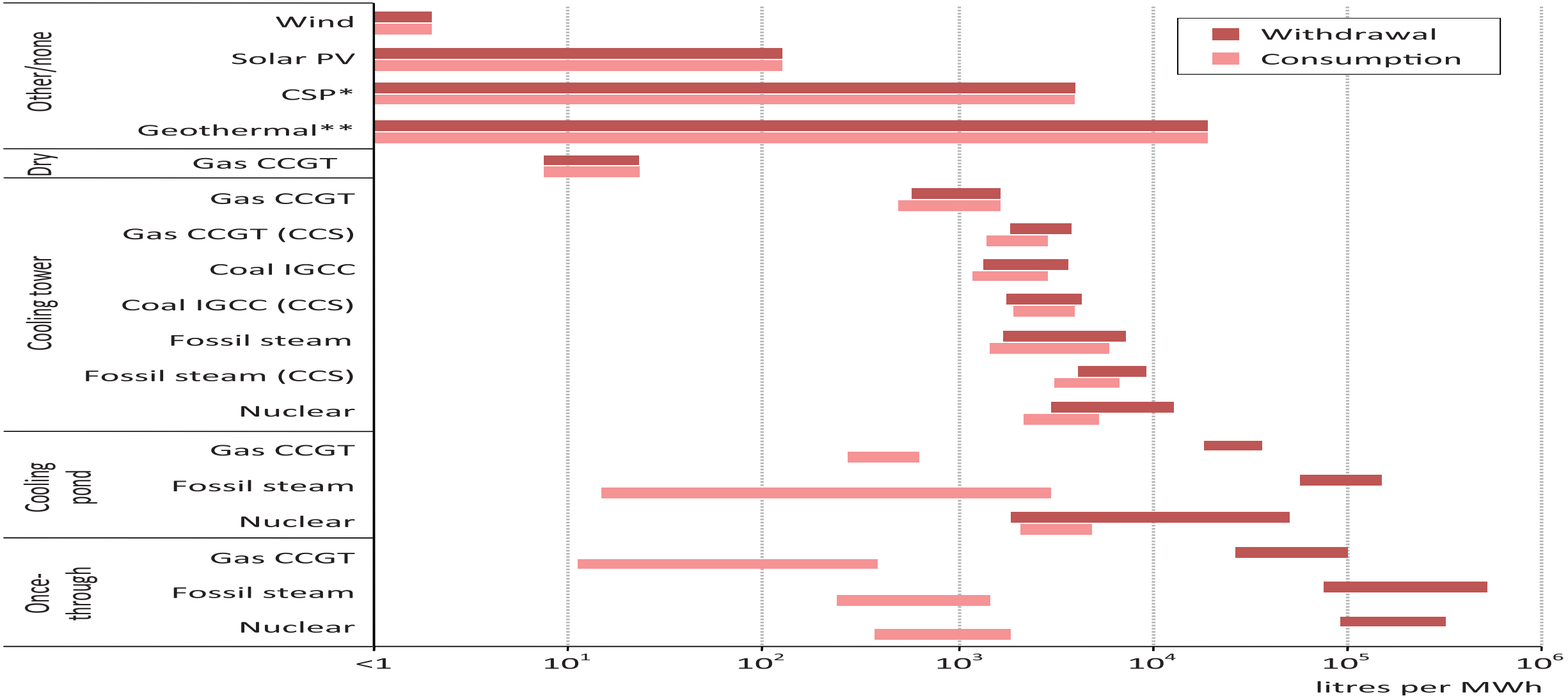
Data Overview

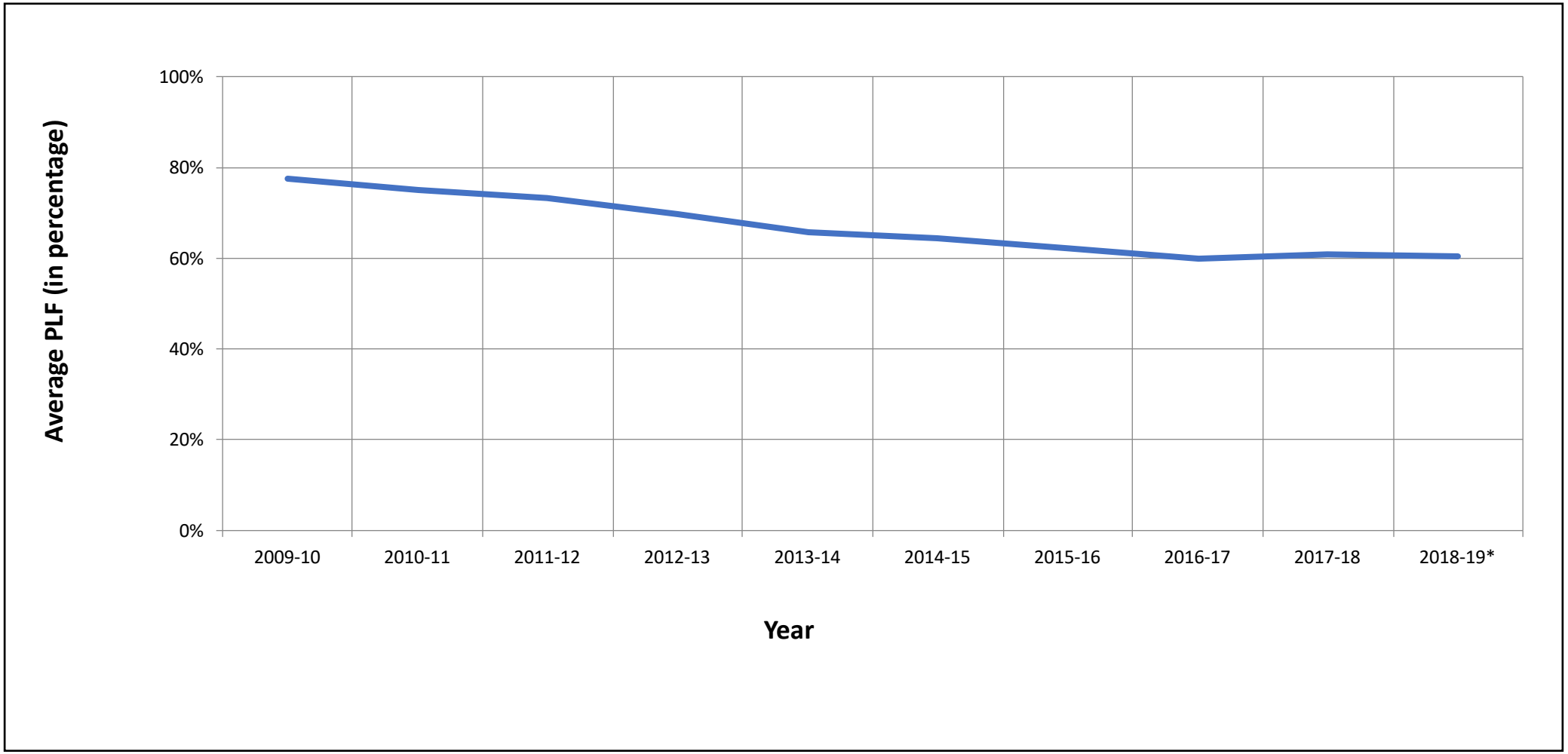
THANK YOU

Possible Options/Alternatives



https://www.ecn.nl/publications/PdfFetch.aspx?nr=ECN-E--14-046

How are Coal Power Plants Performing?



How are Coal Power Plants Performing?

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