Coal Power Plants and water use in Maharashtra

Conflicts over water diversion during the drought

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Drought in Maharashtra- the worst in 40 years

Maharashtra is experiencing a drought this year and the worst in 40 years after the triennial drought of 1971-73. The Governor of Maharashtra in his address to the state legislature in March this year had stated that more than 11800 villages are facing drought due to the acute water shortage. The official status from the state cabinet decisions puts the impact at 3184 villages and 7650 hamlets. More than 800 fodder camps have been started and at least 6 lakh cattle have been surrendered to these camps. There has been a huge increase in the enrolment of the employment guarantee schemes across the drought hit districts. Lakhs of farmers and farm labourers are dependent on them hoping that the rains will come this year in good time and they can regain their livelihoods. This serious crisis has thrown up questions on water management in the state that are critical for the government, policy makers and industry to address.

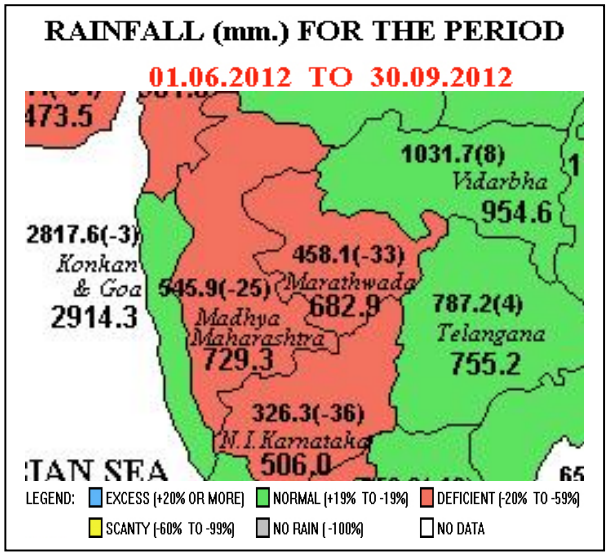
Is this drought completely unexpected?

The chief culprit for a drought is lack of rainfall. But the difference between drought which creates water scarcity and a famine is active human intervention. With adequate planning, forecasting and policies that enable mitigation, drought can be managed.

Some of Maharashtra's districts are generally prone to drought because of the unpredictable rainfall pattern - Ahmednagar, Aurangabad, Beed, Nanded, Nashik, Osmanabad, Pune, Parbhani, Sangli, Satara, Jalna and Solapur were generally identified as drought-prone areas even before independence. The last official report[1] from the government in January also indicates the same regions. On-ground reports claim that other areas like Nashik, parts of Amravati, Buldhana and Jalgaon are also affected.

Monitoring reports of rainfall in 2012 show that central Maharashtra and Marathwada regions had registered a lower than usual rainfall - about 33 % less and 25 % less respectively. The national crop forecasting centre

[1] Maharashtra Government Resolution, Revenue and Forest Department, क्र. एससीवाय /प्र . क्र . ४/म -७ , 21st January 2013.



inaugurated by Mr. Sharad Pawar in April 2012, had also predicted[2] in September 2012 that 11 districts would face drought this year.

The situations at taluka level is more distressing with at least 23 talukas having registered less than 50% of the normal rainfall last year. However, in the last 6 years, from 2005 to 2011, Marathwada and Vidarbha have-recorded a constant deficit in rainfall – in some regions lasting at least 3 years at a stretch.

Maharashtra has a total of 1845 large dams and more than one –third of the number of large dams in the country. And yet due the reduced rainfall in the last two years the storage levels of the dams in the drought hit regions are fast approaching dead storage levels.

Some of the largest dams like Jayakwadi in Aurangabad and Ujani in Solapur have reached the dead storage levels two months back in March. Almost all major dams in Beed, Osmanabad and Parbhani are dry and many reservoirs in Nasik region are fast depleting their storage levels. Considering that rainfall has historically been low in these regions, and moderate droughts have been encountered in the past (for example, in the years 2007-2009), it leaves a lot of room for debate on whether this year's severe drought can be attributed to only one factor -- rainfall.

Table 1: Storage volumes of reservoirs in the drought hit regions of Maharashtra as on May 2013

Region	No. of major dams	Total storage capacity In Million cubic metres	Storage capacity as of 6th may 2013 In million cubic metres	Percentage of storage remaining
Marathwada	11	5142	242	5
Pune	27	8245	1444	18
Nasik	18	3143	305	10

The thirst of Thermal power plants:

Coal-based thermal power is an extremely water-intensive way to generate energy. A typical thermal power plant operating in India consumes 5000-7000 litres of water per MW per hour. Power plants built more recently will use 3500-4000 litres of water per MW per hour and this means a 1,000 MW plant will consume water that could be used to irrigate up to 7,000 hectares of agricultural land each year[3] or drinking water for 8 lakh people for a year[4].

As of December 2010, 71 new thermal power plants were in various stages of approval in Vidarbha, and about 22 across the rest of Maharashtra which are expected to generate about 80,000 MW in total. Many of these plants are actually proposed in the regions where the drought has affected this year.

[2] http://www.ncfc.gov.in/
[3] Taking 5000m^3 as the irrigation water for one hectare of single-cropped land.
[4] Taking 135 LPCD for a person per day according to the Indian Standard Code of Basic Water requirement of water supply, drainage and sanitation (Indian Standard:IS1172:1983)

Table 2: Thermal power plants that are presently operating in the drought hit regions of the state of Maharashtra.				
Thermal power plant	**Location (district)**	**Capacity MW**	**Water source**	**Generation status as of May 2013**
Bhusawal thermal power station, operated by Mahagenco	Jalgaon	1420 (unit 2, 3, 4 and 5)	Hatnur dam on Tapi river.	Operational at 50.7 % PLF* , generation at 720 MW in March 2013
Paras thermal power station, operated by Mahagenco	Akola	500 (unit 3 &4)	Two barrages- Lower Mun barrage and upper Mun barrage near Balapur.	Operational at 87.63 % PLF, generation at 462 MW in March 2013
Parli thermal power station, operated by Mahagenco	Beed	1130 (unit 3 4 5 6 and 7)	Khadaka barrage on Godavari river, Parli taluk, Beed district.	Stopped, due to water shortage from February 2013
Nasik thermal power station, operated by Mahagenco	Nasik	630 (unit 3 4 and 5)	Sewage treated from Nasik Municpal corporation via the Gangapur dam.	Operational at 80% PLF, generation at 476 MW in March 2013.
Total		3680 MW		* Plant Load Factor

Presently there are 4 power plants that are operated by the state power generation company MAHAGENCO in the drought hit regions. Their water requirement is taken from nearby dams, draining the water that could be lifesaving as drinking water and fulfil agricultural needs of the parched villages in the regions. Since the specific water consumption of each power plant is not documented and is unavailable, we can assume a rate of 4500 litres of water per MW per hour as an acceptable figure for these plants.

Apart from the existing power plants, there are 4 new power plants which are proposed in the region. Two private companies, Indiabulls and Shirpur power have proposed power plants in Nasik and Dhule districts. Indiabulls is reported to have completed construction and ready to start power generation.

Mahagenco has plans for one new power plant in Dhule district and expansion plans for all the four existing power plants. The national power generation company, NTPC has a plant under construction south of Solapur city near Hudgi town. The total capacity of these new additions is about 9500 MW. The state water resources department has allocated water for all these plants from the various reservoirs and barrages in the region. Table 3 provides details of these power plants and their water allocations.

	Table 3: Thermal power plants that are proposed in the drought hit regions of Maharashtra.			
S. no	**Thermal power plant**	**Location (district)**	**Capacity MW**	**Water source in MCM MCM- million cubic metres**
1	Dondaicha Thermal Power Station, Operated by Mahagenco	Dhule	3300 MW (5 units X 660 MW each)	WRD has accorded approval (in general) for reservation of 40 MCM. Water from Nimna Tapi project on Tapi river for 2x660 MW (Stage-I). Tapi Irrigation Development Corporation has informed that additional 45 MCM of water for 3 x 660 MW (Stage-II) could be made available from Nimna Tapi project on Tapi river.[5]

[5] http://www.mahagenco.in/uploads/projects/Future-projects-english.pdf

2	Nasik Thermal Power Project, Operated by India bulls.	Nashik	2700 MW	43.8 MCM will be provided for stage 1 from Nasik municipal corporation sewage. [6] 30 MCM for stage 2 also will be provided from Nasik municipal corporation.
3	NTPC Solapur	Solapur	1320 MW	52.6 MCM per year will be obtained from Ujani reservoir through pipeline over a distance of 110 km.[7]
4	Bhusawal thermal power station, operated by Mahagenco	Jalgaon	660 (unit 6)	13 MCM per year can be made available from Hatnur Dam & Sudhgaon Bandhara and the balance water requirement of 7 MCM per year from Ozerkheda Dam. (near Dindori, Nashik.)[8]
5	Paras thermal power station, operated by Mahagenco	Akola	250 (unit 5)	Water supply for the future expansion is also available from the upper Mun barrage in Balapur, Akola.[9]
6	Parli thermal power station, operated by Mahagenco	Beed	250 (unit 8) – on going	The water requirement is fulfilled by the Khadaka barrage on Godavari river about 22 KM away from the power station. The raw water booster pump house is located at Naikota about 10 KM away.
7	Nasik thermal power station, operated by Mahagenco	Nasik	660 (unit 6)	WRD has, vide letter dtd. 12th Jan.2011, approved reservation of 6.5 MCM per year of additional water. [10]
8	Nardana power station (Operated by Shirpur Power Limited)	Dhule	300 Mw	10 MCM from Sulawade Barrage on Tapi river, Sindhkheda Taluka, Dhule district. [11]
	Total		9440 MW	

Analysis of water consumed presently by power plants in the region

As mentioned before, of the four power plants which are operational at present in the region, Parli power plant in Beed District has already been shut down. The other three power plants, Bhusawal, Nasik and Paras require water from the dams in the region.

The following table lists the water consumed by these power plants in two categories- from January to March 2013 and from April to June 2013. Since the data for April to June 2013 was not available at the time of writing this report, we have assumed it to be the same generation capacity as the first 3 months. This is likely to be an underestimate as normally power demand is greater in summer months and it usually requires more generation.

[6] High powered committee minutes of meeting no. 14. Dated 14th March 2008.
[7] High powered committee minutes of meeting no. 16, Dated 28th May 2008
[8] Same as ref. no. 2
[9] Paras Thermal power plant in Akola district gets its water from two barrages on Mun river Barrage near Balapur town. The Mun River is a tributary of Purna which joins Tapi in Jalgaon district. Four medium dams, Mas (15 MCM), Mun (36.8 MCM), Utawali (19.79 MCM) and Nirguna (28.84 MCM) in the region feed the barrages downstream. Most of these medium dams serve the irrigation needs of tehsils in Akola and Buldhana District.
[10] Same as reference no. 6. Additional water may be from Gangapur dam
[11] From documents obtained under right to information act 2005.

Table 4: Water consumption by operational power plants from January to June 2013.				
Power plant	Actual Total generation from January to March 2013[12] Million units	Total water consumed for January to march 2013	Total water expected to be consumed from January to June 2013 (assuming same generation requirments)	Total water consumption between January and June 2013 for generation at 75% PLF (National Average)
Bhusawal thermal power station	1354 MU	6093 Million litres	12186 Million litres	20991 Million litres
Paras thermal Power station	946.48 MU	4257 million litres	8514 million litres	7391 Million litres
Parli thermal power station	535 MU	2407 million litres	2407 million litres	16704 Million litres
Nasik Thermal power station	1088.25 MU	4897 million litres (recycled water)	9794 million litres (recycled water)	9312 Million litres (recycled water)
Total	3923.73 MU	17654 Million litres	32901 Million litres	54401 million litres

The approximate water requirement of some urban cities and towns in Maharashtra are provided in table 5. While this indicates normal requirements, many towns have restricted water supply to due to scarcity. A simple comparison shows that the volumes thermal power plants have consumed are no way negligible and could help augment the water supply of cities or villages during a drought. For example, the total water consumed by the power plants (excluding Nasik) from January to March is about 12800 million litres. This is sufficient to supply water for about 53 days for Solapur city.

Table 5: Approximate water supply requirements in some cities in Maharashtra[13]	
City	**Water requirement in Million litres a day**
Greater Mumbai	3967
Thane	1206
Pune	820
Solapur	240
Jalna	19
Sangli-Miraj-Kupwad	66
Kolhapur	115
Nasik	299
Amravati	113
Nagpur	438
Aurangabad	208

Relief efforts for water supply using water tankers are on in almost all the districts. However media reports also indicate that this effort does not cover all tehsils and villages despite the commitment of the government.

While providing the urban water standard of 135 LPCD is not feasible with tankers, statements[14] of relief and rehabilitation department secretary Milind Mhaiskar reported in the media indicate that people in the drought affected regions are getting around 20 litres per day. Needless to say that this is barely sufficient for drinking and cooking purposes.

[12] Based on information from Maharashtra State Load Dispatch Centre Kalwa. http://mahasldc.in/

[13] Data from several sources: Maharashtra Jeevan Pradhikaran , http://mahaurban.org/
http://www.academia.edu/528143/Drinking_water_supply_management_in_municipal_corporations_of_Maharashtra
http://indiagovernance.gov.in/files/ppp-water-ind_0.pdf

[14] http://www.hindustantimes.com/India-news/Maharashtra/Maharashtra-State-of-despair/Article1-1034878.aspx

Parli power plant – a case in point

The volumes that are consumed by power plants are not insignificant in the face of the drought. Take the case of Parli power plant in Beed district. Our assessment predicts that for two months before it had to shut down due to lack of water in February, the plant had consumed about 2407 million litres of water. But even before this, in December 2012[15], Parli's own Khadka barrage had become dry and could not support power generation any further. But in a last attempt to run it for some more time, 5 Million cubic metres of water was provided[16] from Mudgal Barrage in Parbhani District for the use of Parli. With this water Parli could generate for another two months till in mid-February when one by one its units were forced to shut down completely. The water could have provided for more than 6 lakh people for 30 days by the Indian standards of 135 LPCD.

The decision was taken by the government, when drought alerts were issued at least 3 months prior and large reservoirs upstream like Jayakwadi and Majalgaon's water levels were nearing dead storage already. **Thus, the government seems to be ensuring that even in the face of a drought, drinking water and irrigation priorities of farmers will not be prioritised over thermal power plants and industries.** This is not just in breach of the Maharashtra's water policy but also against any principles of natural justice. We can only wonder what would be the decision of the government when almost 10,000 MW of proposed power plants would demand water against a similar drought situation imminent in the future.

Present Status of the reservoirs feeding power plants

Of the three power plants that are presently generating power, Nasik power plant receives its water from the sewage treatment plants of the Nasik municipal corporation. Since it's is not clear whether this is sufficient for the generation requirements today, it will most likely be insufficient for both the expansion plans of Nasik power plant and the upcoming Indiabulls power plant in Sinnar Taluka.

The Bhusawal power plant is strategically located right near the Hatnur dam and receives its water from its storage. At the present generation capacity, there seems to be enough water for the plant to continue to generate power well beyond the drought period. But the Hatnur dam also provides irrigation and drinking water supply to the drought prone district of Jalgaon. Similarly, the Paras power plant in Akola which receives its supply from the two barrages built exclusively for the purpose, is presently in control of water that can support power generation for at least 3 months[17].

However, the assessment that really needs to be done here is not whether the plants have enough water but whether the people in the region do.

The last assessment of water scarcity by the government done in January does not mention anything about these districts affected by the drought. But real data shows that rainfall has been quite low in these areas last year[18]. While Akola district's water scarcity is comparatively less severe, Buldhana district, from where the

[15] http://www.thehindubusinessline.com/economy/water-woes-plague-parli-power-plant-in-maharashtra/article4093497.ece
[16] http://articles.timesofindia.indiatimes.com/2012-12-20/aurangabad/35934351_1_irrigation-department-water-release-power-station
[17] Based on conservative estimate as information on live storage of these barrages are not available in public domain.
[18] Based on taluka wise rainfall data from http://mahaagri.gov.in/rainfall/index.asp

Table 6: Present status of the Reservoirs feeding the power plants			
Name of reservoir	Power plant involved	Remaining water in May 2013 in MCM	Water remaining for days of operation. (assuming no drinking water or irrigation needs are met)
Hatnur	Bhusawal power plant	53	26 months
Upper Mun Barrage	Paras Power plant	n.a (total 10)	106 days (assuming half capacity)
Lower Mun Barrage		0.7 (total 12)	14 days

rain waters reach Paras's barrages, is in a severe drought. At least 10 of the 13 talukas received less than 700 mm rainfall that Buldhana gets in a normal monsoon season.

Similarly, the highest rainfall recorded in Jalgaon district is in Parola taluka and was just 553mm and most of the areas averaged at around 400mm of rainfall last year. Jalgaon city's major water sources Girna dam and Waghur dam have already hit dead storage levels. While the city is grappling with the worst water shortage this summer Bodwad, Pachora, Bhadgaon, Jalgaon, Chalisgaon, Jamner, Amalner and Muktai Nagar Talukas have been declared as drought hit.[19] In Buldhana, Deulgaon Raja, Sindkhed Raja, Motala, Malkapur and Nandura talukas are the worst hit by the drought.

Power losses to the state if these power plants had to stop due to scarcity of water:

As of March 2013, the power plants (excluding Parli power plant) collectively generated around 1195 Million units of power for the month. This corresponds to a total capacity of 1658.5 MW. From the reports of the State load dispatch centre, the state required about 10900 Million units during April 2013 which is an average of 364 Million units each day. The industrial sector (39 %) is generally the largest consumer of the electricity in the State, followed by domestic sector (22.96 %) and Agriculture sector (17.59 %)[20]. Just to put in perspective, a loss of 1195 million units in the state roughly corresponds to a power shortage of about 45 minutes a day across all sectors. The domestic requirement can be kept intact if industrial consumption can be curtailed down as a measure to tackle the drought and to provide water for the affected regions.

Water policy and prioritisation

Maharashtra's water policy has been in a state of constant change. During the years 2003-2011 the State's water policy had a priority to serve industrial needs rather than agricultural needs.

In 2011 the state government changed the priority in a surprise move to reflect a priority of agriculture over industry. Later in May 2011, the high powered committee which has been making decisions from 2003 on water diversions to industry- defying the law which only accords the right to the Maharashtra Water Resources regulatory Authority (MWRRA)- was replaced by the cabinet. An amendment to the MWRRA Act was also passed in the assembly which ensured that all the old allocations to thermal power plants and industries will not be reviewed. The high powered committee was headed by the former water resources minister Mr. Ajit Pawar apart from five other ministers of the state. These changes were all cosmetic as a bulk of the water had already been diverted to thermal power plants and industries by the time the policy was changed. The High powered committee is now replaced by the state Cabinet by the amendment but it still overrides the duties of the MWRRA.

[19] http://ejalgaon.com/today/jalgaon%202013%20news/january%202013%20news.html
[20] http://115.124.127.110/MEDA/ES-Maharashtra.aspx. Total of **79139 million units for 2010**

Government resolution on 21st January 2013:

In January, the government assessed the drought situation in the state and brought out a list of villages which are affected by the drought based on the 'paisewari' (visual averaging of crop yields less than 50% on a ten year average) assessment of the districts and talukas. Later in a government resolution[21], it announced that 3,905 villages are affected with less than 50% paisewari yields. It also stated that all the small, medium, and big irrigation projects in these affected regions should be reserved for drinking water purposes with effect from 21st January 2013.

It is clear from the case of Parli Power plant that this resolution was violated as Parli continued to use the water from Mudgal barrage till February 17th when it was forced to shut down. In any case, the water sources of Paras power plant and Bhusawal power plant continue to be used for power generation even after talukas around the plant have reported water scarcity. In effect, this government resolution was never complied at all and did not in any way help the drought affected regions in Beed, Jalgaon or Buldhana.

Water allocations to industry needs to be reviewed

The increasing demand of water amongst its various uses will deepen the water conflicts among the domestic, industrial and agricultural sectors. It is predicted that across India, drinking water need will rise by 44 percent, irrigation 10 percent, industry need by 81 percent respectively by 2025.[22]

Maharashtra is preparing to commission more than 80,000 MW power plants across the state. Most of them are in land locked regions in the state with no access to water other than rivers and reservoirs and will demand their share of water once commissioned. Studies conducted last year by IIT Delhi on the water availability of the Wardha and Wainganga rivers in Vidarbha conclusively prove that the additional demand imposed by the large cluster of thermal power plants in Vidarbha reduces the future water availability for irrigation and other uses in the region by as much as 40% in Wardha and about 17 % in Wainganga. Most of these water allocations were done during the years 2003- 2011 when the state had misplaced prioritisation of water resources by prioritising industry over irrigation, which were legalised in 2011 by shrewd politics with no regard to the welfare of farmers of the state.

The drought which is affecting Maharashtra today cannot be attributed only to the lack of rainfall in the state. Mismanagement of the state's water resources has continued beyond the allocation of water to thermal power plants to a situation where people's drinking water needs are deprioritised over thermal power plants even during a drought. Maharashtra's water managers have placed an undue hope since last year on the certainty of the south west monsoon in June 2013 and a much needed precautionary approach is missing. The combination of a missing precautionary approach and disregard to farmer's welfare may just well be called negligence.

Long term planning is key to prevent a water and power crisis. The following are a few steps in this direction.

[21] Government Resolution, Revenue and Forest Department, क्र. एससीवाय /प्र . क्र . ४/म -७ , 21st January 2013.
[22]http://pib.nic.in/newsite/erelease.aspx?relid=95884

1. A cumulative water impact and availability assessment in the river basins of the state should be conducted so that water is not diverted without considering the needs of drinking water and irrigation.
2. The government should immediate halt of all the water diversions and allocations to the in the drought affected regions of Maharashtra and the proposed coal power plants in Vidarbha and rest of Maharashtra.
3. Maharashtra should actively promote an energy policy that takes water impacts into account. Energy Efficiency measures and Renewable energy technologies have a potential to deliver on the power needs while saving water for irrigation and other purposes, and should be actively considered in place of water guzzling Thermal Power plants. [23]

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[23] The state is one amongst the top five in the country which have high wind energy potential and has comparably high solar radiation levels (almost 6KWh/Sq.m). Recent reports have shown that the total wind energy potential could be well above 2,00,000 MW even at 80m hub heights.