Role of Thermal Power Plants and Coal Mining in Local Area Development and Addressing Regional Imbalance: Conditions and Processes

Submitted to Government of Maharashtra's Committee to study 'Alternative Approaches to Balance Regional Development in Maharashtra State', headed by Dr. Vijay Kelkar, submitted on June 2012

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Abstract

Large number of thermal power plants, totalling to about 40,000 MW capacity, are in pipeline in Vidarbha. One of the reasons offered for these thermal power plants is that they are a means to ensure local development using local resources, primarily the resources of coal, water and land. They are also being seen as vehicles to address the regional developmental imbalance. However, the nature of the developmental imbalance, the experience of the existing thermal power plants and coal mines in the area and other evidence of the impacts of thermal power plants and coal mines shows that there are several problems with these claims. Such claims for thermal power plants need to be reassessed. Moreover, other developmental options, including agricultural development and water resources development may be more effective options for the region. It is important to examine and prioritise amongst such options. If such a process also suggests that thermal power plants should be built, then this should follow certain conditions and processes, outlined in the note, to ensure minimisation of damage and optimal developmental impacts.

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1. Background and Context

In August 2011, Prayas Energy Group, Pune released a report on the large number of thermal power plants (TPPs) being proposed in the country. This report, titled "*Thermal Power Plants on the Anvil: Implications and Need for Rationalisation*" highlighted that close to 700,000 MW of thermal – coal and gas based – capacity addition was in the pipeline, in various stages of the environmental approval cycle of the Ministry of Environment and Forest. This is a huge capacity, and the proposals have many implications for power sector planning and functioning, for the environment and ecology of the areas where these plants are to come up, for local communities subjected to displacement and pollution, for the opportunity costs of the resources that are to be used, namely, coal, gas, land, water etc. and for the economy as a whole.

Maharashtra is the number one state in terms of the projects in pipeline, with a total of 89,269 MW. Most of these plants are being planned in Vidarbha (41,195 MW) or Konkan (30, 978 MW). This has serious implications for the issue of balanced development of the state.

In December 2011, Prayas made a presentation on the above-mentioned report to the Kelkar Committee, set by the Government of Maharashtra to study 'Alternative approaches to balance regional development in Maharashtra State'. This presentation, while giving an overview of the Indian situation, was focussed on the projects in pipeline in Maharashtra and their implications.

Subsequent to that, the Kelkar committee requested Prayas to make a more detailed submission on the issue of proposed thermal power plants in Maharashtra. This note is in response to the request.

As a part of the data gathering for this note, a team of Prayas members also visited some parts of Vidarbha, mainly Chandrapur, Ghuggus and Warora to look at the coal mining and thermal power plants and their impacts. The team met people of the area including common citizens, affected people, journalists, activists, mine and power station workers, experts etc. as well as officials. We are thankful to all of them even though we are not able to acknowledge their assistance individually. While this note focuses on the thermal power plants vis-à-vis Vidarbha, we believe that its major findings and the suggestions offered are also relevant for other areas where such power plants are being proposed in large numbers.

2. Structure of this Note

This note is organised as follows. The first section, *Introduction*, briefly presents the resentment and protests around the existing and proposed thermal power plants and coal mines in Vidarbha, why this presents a dilemma for developmental choices and hence the importance of addressing the question of thermal power plant development in the region.

The next section takes note of *An Irony*, that while thermal power plants in Vidarbha are being promoted as a means of using local resources (essentially local coal) for local development, most of the proposed power plants are based on coal sourced from a long distance, and not on locally produced coal. Some possible reasons for such a situation are put forward; along with a concern that one of the

reasons could be that the thermal power plants are being used as a means to grab the land and water resources of the region.

The section after this discusses in detail the *Coal and Thermal Power Development* in Vidarbha, presenting information about existing coal mines and their production, existing thermal plants, their generation and the proposed mines and thermal power plants.

The next section presents the *Regional Developmental Imbalance* of Vidarbha, in comparison with other parts of the state. This discusses how Vidarbha lags behind the state in indicators such as per capita income, household expenditure, electrification, consumption of electricity for various uses, irrigation status etc. It also discusses the serious impact of pollution in areas where coal mines or power plants are already operational, the depletion of water resources, and the diversion of water from irrigation to non-irrigation use. It also presents other impacts of coal mining and thermal power generation in the area like social and environmental costs of coal transport and of transmission lines. Lastly, it also notes one of the most serious manifestations of the developmental imbalance, namely, the suicides of farmers on a large scale in several parts of Vidarbha.

The section on *Experience of Existing Plants and Coal Mines* follows, which focuses mainly on the economic impacts of these on the local area, the investments that are likely to flow into the local area due to these projects, the employment generation and so on. As the experiences related to pollution etc. have already been discussed in the earlier section, they are not considered in this section.

The section on *Role of Thermal Power Plants in Addressing Local Development, Balanced Development* discusses the issue of whether and how, under what conditions can thermal power plants and coal mines contribute to local development and whether and how they can address the developmental imbalance. One of the most important issues here is whether thermal power plants and coal mines are the optimal means of addressing the developmental deficit or whether other options – for example, water harvesting and agricultural development – should be prioritised over these to achieve the most effective interventions. This issue is fundamental and broader than the more specific issue of whether and how thermal power plants can contribute to the local area development. This issue is outside the scope of our note due to the constraints of time and expertise. Still, it is important enough for us to present some basic thoughts on this.

The note then moves on to its core, and lays out *A Suggested Approach to Thermal Power Plants and Coal Mines* in Vidarbha. This section outlines how the process of planning and building new thermal power plants and mines should go ahead if it is to be effective in creating local development and addressing the imbalance. The note advocates that the first step should be to clean up – address the problems of pollution, displacement and others caused by existing plants and mines – and enshrine mechanisms to better share the benefits with the local communities. It also presents some rough estimates for the costs of such a clean up. The note calls for a halt to construction of new plants and mines till this is done. For the new proposed projects, it advocates a process of carrying capacity studies, cumulative impact assessments along with river basin studies to determine the number of plants and mines to be built, and also recommends that the benefit sharing mechanisms be incorporated as an integral part of any new projects. This section also emphasises, with examples and references, that these requirements (of carrying capacity studies, river basin studies, benefit sharing) are already present in various forms in Indian legal and policy regimes, and they need to be brought together in a comprehensive manner to address the issue of how to develop thermal power plants and

mines. This is the only way to ensure that the projects contribute to a just, sustainable and equitable development.

The *Conclusion* summarises the findings and suggestions of the note.

A *Bibliography* is provided at the end of the note.

3. Introduction

A large number of thermal power plants (TPPs) – mostly coal based - are in the pipeline in the state of Maharashtra. In fact, it is the state with the largest thermal capacity in pipeline, at 89,269 MW[1]. This addition would amount to about 5 times the existing total capacity in Maharashtra, including hydro and nuclear. Most of these plants are coming up in Vidarbha (41,195 MW) or Konkan region (30,978 MW).

On the face of it, there is sound logic in these plans. In case of Vidarbha, they represent the actualisation of the principle of using local resources for local development.

Vidarbha, consisting of the Nagpur and Amravati Divisions of the state, is its eastern most part. It consists of 11 districts[2], contains 32% of the state's geographical area and has 20% of the state population. Vidarbha has significant coal deposits and good water resources in many areas. Thus, coal based thermal power plants appear to be a good developmental option for the area. Indeed, there is already significant coal based electricity generation capacity in Vidarbha, totalling to 5,260 MW, representing some 29% of total installed generation capacity in the state. Electricity is an essential element of modern life and its benefits have been widely accepted and acknowledged.

Yet, there is in general lot of resentment, scepticism and even opposition to plans for building new thermal power plants and expanding the coal mining in Vidarbha. Part of this is based on the region's experience with the existing thermal power plants and coal mines.

On one side, areas where such power plants and mines already exist face severe problems of pollution, displacement, drying up of ground and surface water sources, diversion of water from irrigation and drinking water needs, increase in health problems, fall in agriculture production and productivity and impacts on livestock.

On the other hand, and ironically, the region continues to face power cuts and lower levels of household electrification and electricity consumption in comparison to several other parts of the state. This includes consumption in household and agriculture sectors.

A feeling exists in the region that "our resources" are being used for development of the other areas of the state, while "we lag behind and are left to bear the burden of all the negative impacts".

This has raised serious questions on the contribution that the proposed thermal power plants can make. Will these plants usher in all round development in these regions? Do these plants represent the best use of local resources? Are they the optimum developmental intervention? Can they play a useful role in addressing regional imbalance, and under what conditions?

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[1] Figures based on data compiled by Prayas Energy Group from MoEF website, accessed on 12 May, 2011

"In Pipeline" means projects that are in the Environmental Clearance process of central MoEF. Thus, the actual planned projects are likely to be more than this.

[2] The Vidarbha districts are Akola, Amravati, Bhandara, Buldhana, Chandrapur, Gadchiroli, Gondia, Nagpur, Wardha, Washim and Yavatmal.

To address these questions, one needs to understand the experience of the thermal power plants and coal mines that have already been built and are operational in the region. Second, one also needs to understand the nature of the developmental imbalance. Last, but not the least, these questions need to be put in the context of the socio-economic-political realities of the region and the state.

This note tries to address some of these issues. While it looks at only the Vidarbha region, given the nature of the issues under discussion, we believe that most of our conclusions would also be relevant to thermal power plants proposed in large numbers in the other regions of the state.

4. An Irony

Before we go further to discuss this issue, we must note an irony. While the essential logic behind such large number of thermal power plants being planned in Vidarbha is the availability of coal in the proximity, the reality is that many proposed plants in Vidarbha are planned not on local coal but coal from long distance, like Orissa, Chhattisgarh etc. Even some existing plants are partially dependent on coal from a long distance.

Information regarding source of coal is available for the existing plants and 13,545 MW coal based thermal capacity that has secured Environmental Clearance out of the 41,195 MW in pipeline (Table 1). Out of this 13,545 MW, merely 420 MW will use coal from only WCL (the local source), 1,920 MW TPPs will use coal from WCL as well as other CIL subsidiaries (long distance) while 9,090 MW TPPs will use coal only from long distance sources like other CIL subsidiaries (SECL, MCL) and some captive mines from Maharashtra and Orissa. Indeed, even some of the existing coal plants get their coal from long distances. This undercuts the very basis of the argument that TPPs in Vidarbha represent local development based on local resources.

The reasons for this are not clear. One reason can be that since Western Coalfields Limited (WCL), the Coal India Limited (CIL) subsidiary that is the main coal producing company in the region, is not signing any clear Fuel Supply Agreement (FSA), the project promoters are only giving the names of other mines to acquire the Environmental Clearance (EC), but are hoping that afterwards they will be able to source their requirements from WCL. Another reason could be just a lack of rationalization in coal linkages and allocations nationally, that is resulting on such long distance coal links. Or, it could mean that the major motivation behind putting the TPPs in this region is because of the relatively easy availability of water and land resources. Some people also warn that this could be an attempt to grab and hold land (and water) resources, which could be put to speculative profiteering even if the plant does not come up.

It should be noted that many areas of Vidarbha have good water resources. There are a number of important rivers in the region like Wardha, Wainganga, and several of these are classified as normal, surplus or abundant[3].

In a reverse twist to this, significant quantity of coal is also being sent out from WCL mines to thermal power plants at a long distance. According to FSAs signed by WCL[4], about 5.25 million tons per annum of coal is being supplied to TPPs in Gujarat, Haryana, Karnataka and Uttar Pradesh. We have not counted in this the coal being sent a long distance to thermal power plants within Maharashtra like Nasik TPP.

[3] Government of Maharashtra, (2010b), page 6

[4] http://westerncoal.nic.in/sites/default/files/userfiles/fsa_status.pdf, accessed February 20, 2012

Table 1: Source of Coal for Existing and EC Granted TPPs in Vidarbha[5]

Status	Project Name	District	Company	Coal provider	
				Local	Long distance
Existing	840 MW Khaperkheda TPP	Nagpur	MAHAGENCO	WCL (MH)	MCL (Orissa) & SECL (Chhattisgarh)
Existing	1040 MW Koradi TPS	Nagpur	MAHAGENCO	WCL (MP)	SECL (MP/CH) & MCL (Orissa)
Existing	2340 MW Chandrapur TPS	Chandrapur	MAHAGENCO	WCL (MH) (80%)	Imported (20%)
Existing	540 MW Wardha Warora TPP	Wardha	WPCL	WCL (80%)	Imported (20%)
Existing	500 MW Paras TPP	Akola	MAHAGENCO	WCL	-
EC granted	1000 MW Exp. o f Chandrapur STPP	Chandrapur	MAHAGENCO	-	Captive (Machhakata-Orissa)
EC granted	1320 MW Tiroda TPP	Gondia	Adani Power	Captive block (rejected by MoEF, no alternative block yet)	-
EC granted	1320 MW TPP at Amravati	Amravati	Indiabulls Power Ltd.	WCL	SECL (MP/CH)
EC granted	1320 MW TPP near Mandva	Wardha	Lanco Mahanadi Power	-	SECL (MP/CH)
EC granted	1320 MW TPP Near Mauda (st. II)	Nagpur	NTPC Ltd.	-	MCL (Orissa)
EC granted	300 MW Phase-2 TPP in Warora	Chandrapur	GMR - EMCO Energy Ltd.	WCL	SECL (MP/CH)
EC granted	1980 MW Expansion of Tiroda TPP	Gondia	Adani Power	-	SECL (MP/CH)
EC granted	1600 MW Koradi TPS expansion	Nagpur	MAHAGENCO	-	Captive (Machhakata-Orissa)
EC granted	1000 MW Mauda TPP at Mauda	Nagpur	NTPC Ltd.	-	MCL (Orissa)
EC granted	600 MW Coal TPP in Tadali MIDC	Chandrapur	CESC Ltd	-	SECL (MP/CH)
EC granted	300 MW TPP at Butibori	Nagpur	Vidarbha Industries Power Ltd.	WCL	-
EC granted	270 MW TPP at MIDC Warora	Chandrapur	GMR - EMCO Energy Ltd.	-	SECL (MP/CH)
EC granted	300 MW TPP exp. Phase-II	Chandrapur	GMR - EMCO Energy Ltd.	WCL	SECL (MP/CH)
EC granted	120 MW TPP at Ghuggus	Chandrapur	Gupta Coalfields & Washery Ltd.	WCL (MH)	-

[5] Compiled by Prayas Energy Group from Environmental Clearance letters available on MoEF website and corresponding power generation companies' websites

WCL- Western Coalfields Limited is the CIL subsidiary, producing coal. WCL operates in Maharashtra (all its mines are in Vidarbha) and in neighboring districts of Madhya Pradesh. MCL and SECL are other subsidiaries of CIL.

5. Coal and Thermal Power Development in Vidarbha

Vidarbha region has significant deposits of coal.

The total geological coal reserves in Maharashtra are about 10.3 billion tons[6]. All of these reserves are concentrated in Vidarbha region. Out of this, about 33% are extractable[7]. Box 1 gives the details about geological coal reserves of Maharashtra.

Western Coalfields Limited (WCL), subsidiary of the state owned Coal India Limited (CIL) is the major coal mining company in Maharashtra. WCL mines in Maharashtra produced 36.93 million tons of coal in the year 2010-11. This is about 85% of total WCL coal production (remaining WCL production is in Madhya Pradesh) and about 7% of India's total coal production for the year 2010-11[8]. This entire coal mining activity is located in Vidarbha in the districts of Chandrapur, Nagpur and Yavatmal[9].

It is notable that WCL's coal production is almost stagnant or increasing at very slow rate for last 6-7 years. It has been in the range of 36-38 MTPA from the year 2005-06 till 2010-11 in Maharashtra[10]. This is in spite of the fact that WCL has already secured environmental clearance for mines with 48 MTPA capacities in Maharashtra[11].

The existing coal production in Vidarbha from WCL can support about 7,000 MW capacity while the production capacities that have secured environmental clearance can additionally support around 10,000 MW installed capacity, assuming that all coal goes only for thermal power plants and not for other uses like cement etc.[12]

Captive mining is having only a small part (7%) in current coal production of Maharashtra as well as of India. In Maharashtra, a total of 27 captive coal blocks have been allotted to power, steel, cement, sponge iron etc. having geological coal reserves of about 958 MT. Though all the 27 coal blocks were allotted between 2001 and 2009, only seven blocks are in production and will have production of 2.39 MT in the year 2010-11[13]. The reasons behind the delay are include delay in securing EC, Forest Clearance (FC), mining plan approval from state government, land acquisition, etc.[14]

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[6] CIL (2010), Page 58

[7] Proportion of extractable reserves to total geological reserves for Maharashtra is estimated by assuming similar ratio as for CIL coal reserves data. CIL has total 64.79 BT geological coal reserves, out of which 21.75 BT (about 33%) is extractible [CIL (2010) Page 78].

[8] WCL (2011a), Page 8 and Annual Report of Ministry of Coal, Government of India 2010-11, Page 34

[9] http://envis.maharashtra.gov.in/envis_data/files/envreportnagpur.pdf, http://bhandara.nic.in/public_html/imp_min.htm , Accessed on May 14, 2012

[10] WCL (2011a), Page 8

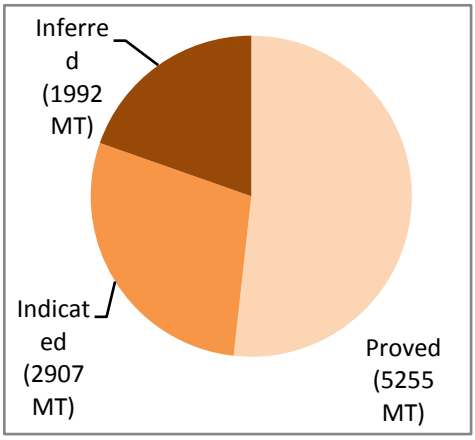
[11] http://westerncoal.nic.in/sites/default/files/userfiles/env_stat_clearance.pdf (January 2007- September 2011), accessed on April 2, 2012

[12] Calculated assuming Indian coal requirement of about 5 MTPA/1000 MW/year

[13] Metis Business Solutions Pvt. Ltd. (2011), Page 15

[14] Government of India (2011c), Annex XVI, Page 80

Box 1: Coal Reserves of Maharashtra



Source- http://www.coal.nic.in/reserve.htm

Proved Geological Reserves: Economically mineable part of measured geological reserves (GR)

Indicated Geological Reserves: The part of GR, for which quantity, grade and physical characteristics can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning & evaluation of & economic viability of the deposit.

Inferred Geological Reserves: The part of GR, of which quantity and physical characteristics, grade and mineral content can be estimated with a low level of confidence

Extractable Coal Reserves: The part of GR, for which extraction is established to be technically & economically feasible through mining studies (mine planning & feasibility studies).

(Reference: www.sebi.gov.in/dp/coaldrhp.pdf)

Vidarbha has 5,260 MW of installed coal based electricity generation capacity, which is about 29% of total installed capacity of 18,171 MW in Maharashtra[15]. Major thermal power plants in Vidarbha include the 2,340 MW Chandrapur thermal power station, the 1,040 MW Koradi thermal power station, the 840 MW TPP at Khaperkheda and the 500 MW TPP at Paras.

Table 2 below gives the list of existing thermal power plants in Vidarbha.

Table 2: Existing Thermal Power Plants in Vidarbha

Project Name	Plant capacity (MW)	District	Company	Ownership
Chandrapur TPS	2340	Chandrapur	Mahagenco	State
Khaperkheda TPP	840	Nagpur	Mahagenco	State
Koradi TPs	1040	Nagpur	Mahagenco	State
Paras TPP	500	Akola	Mahagenco	State
Wardha Warora TPP	540	Wardha	WPCL (KSK Energy)	Private

Massive expansion of the thermal capacity is on the cards now. As mentioned earlier, about 89,269 MW of thermal capacity is in the pipeline in the entire state of Maharashtra, with about 41,195 MW of this being in Vidarbha. The district-wise break up for Vidarbha is given in Table 3[16].

[15] CEA Report, "Energy wise - Performance Status All India – Region wise April 2010- March 2011" (May 2011). http://www.cea.nic.in/reports/monthly/generation_rep/tentative/mar11/opm_16.pdf, accessed on January 30, 2012 Total installed capacity includes coal, gas, hydro & nuclear power, excludes allocation from central and joint utilities.

[16] As per figures compiled by Prayas Energy Group from the web site of the MoEF, status as on 12 May 2011. http://moef.nic.in/modules/project-clearances/environment-clearances/, Accessed on May 12, 2011

Table 3: District wise Proposed Thermal Capacity Addition in Vidarbha (May, 2011)

District	Proposed Capacity Addition (MW)
Nagpur	10,350
Chandrapur	8,155
Gondia	5,940
Bhandara	5,280
Yavatmal	4,450
Amravati	3,450
Gadchiroli	1,990
Wardha	1,330
Akola	250
Total	**41,195**

Private / Public Distribution of Coal mines and TPP

One important characteristic of the proposed thermal capacity addition is the heavy dominance of private developers as against public entities. The existing thermal capacity in Vidarbha is overwhelmingly publicly owned (90%, with only 540 MW out of 5,260 MW privately owned) as Table 2 shows. In stark contrast, more than 80% of the proposed capacity addition is to be in the private sector. Table 4 gives details of the same.

Table 4: Ownership wise Distribution of Existing & In Pipeline TPPs in Vidarbha (MW)

Ownership	Existing TPP	In Pipeline TPP
Central	0	2,320
Private	540	33,415
State	4,720	5,460
Total	**5,260**	**41,195**

Coal mining is overwhelming in the public sector in Maharashtra. Out of the total production of 39.34 million tons in 2010-11, 93.9% was produced by WCL and another 5.8% by Government agencies allotted captive mines, making a total of 99.6% production in the public sector. The private sector produced about 0.3% of the total production via the captive mines allotted to them. Public sector in the form of WCL will still be the dominant player in the coal mines in pipeline (EC Granted), though the private sector contribution will go up to 3.7%. These figures are given below in Table 5.

Table 5: Coal Mining Production Capacity in Maharashtra (in MTPA)

Coal Producing Companies	Production (2010-11) in Existing Mines	EC Granted Production Capacity (2007-2011)
WCL	36.93	48
Private (Captive)	0.13	1.84
Other Govt. (KPCL) (Captive)	2.28	0
Total	**39.34**	**49.84**

6. Regional Developmental Imbalance

There are many ways in which the imbalance in the development of Vidarbha region and the rest of the state (or some parts of the rest of the state) is manifested. Some of them are:

6.1. Imbalance in Per Capita Income

District wise per capita income for Maharashtra in the year 2010-11 shows that there is huge disparity in the income (Figure 1)[17]. The per capita income for all of the Vidarbha districts (excluding Nagpur district) is between half and three fourth of the average of Maharashtra. The disparity does not change even if Mumbai, Pune and Thane are excluded.

Similar disparity is reflected in monthly per capita expenditure. As per National Sample Survey (2008-09) data, the 13 districts in Maharashtra with lowest per capita expenditure (for mixed recall period) comprise 8 districts from Vidarbha, whereas the top 10 districts include only 2 districts from Vidarbha (Figure 2).

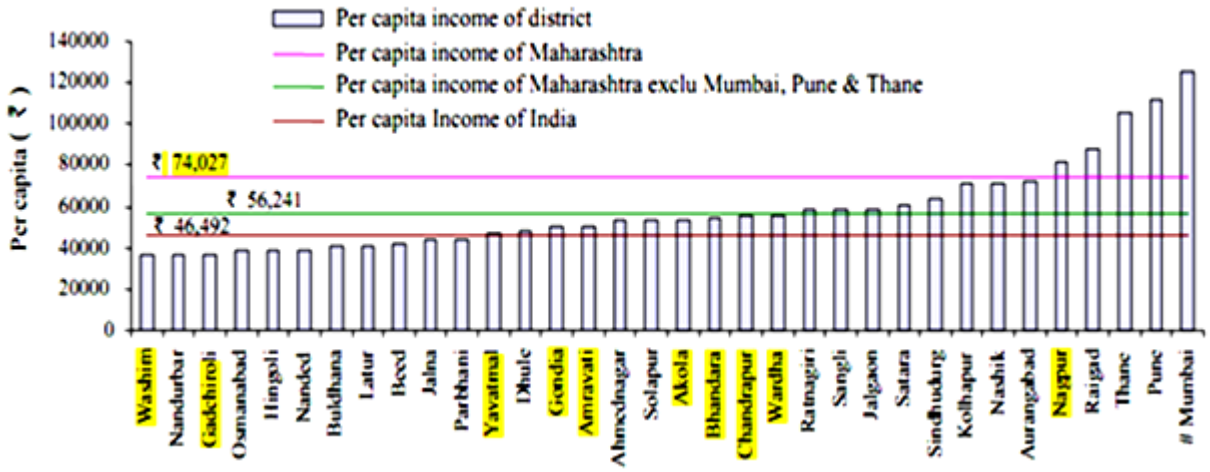


Figure1: District wise per capita income of the Maharashtra for year 2010-11

(Vidarbha districts names are highlighted)

6.2. Imbalance in Electricity Use

6.2.1. Electricity Consumption

Vidarbha contains about 29% of total installed capacity of 18,171 MW in Maharashtra[18]. In 2010-11, Vidarbha generated 24,757 Million kWh (million units) of electricity, which is about 28% of electricity generation in Maharashtra[19]. However its total electricity sale in the same year was only 11,555 million units, which is about 13% of total Maharashtra. This is also reflected in annual electricity sale per

[17] Government of Maharashtra (2011), Page 21

[18] CEA Report, "Energy wise - Performance Status All India – Region wise April 2010- March 2011" (May 2011). http://www.cea.nic.in/reports/monthly/generation_rep/tentative/mar11/opm_16.pdf, accessed on January 30, 2012 Total installed capacity includes coal, gas, hydro & nuclear power, excludes allocation from central and joint utilities

[19] CEA Report, "Energy wise - Performance Status All India – Region wise April 2010- March 2011" (May 2011). http://www.cea.nic.in/reports/monthly/generation_rep/tentative/mar11/opm_16.pdf, accessed on January 30, 2012

capita. The per capita electricity sale for Vidarbha in the year 2010-11 was about 65% (502 units) of the average for Maharashtra (774 units)[20]. It was also the least amongst all the regions except Marathwada.

Table 6 gives the sales of electricity to agriculture, industry and domestic sectors for the various regions of the state[21].

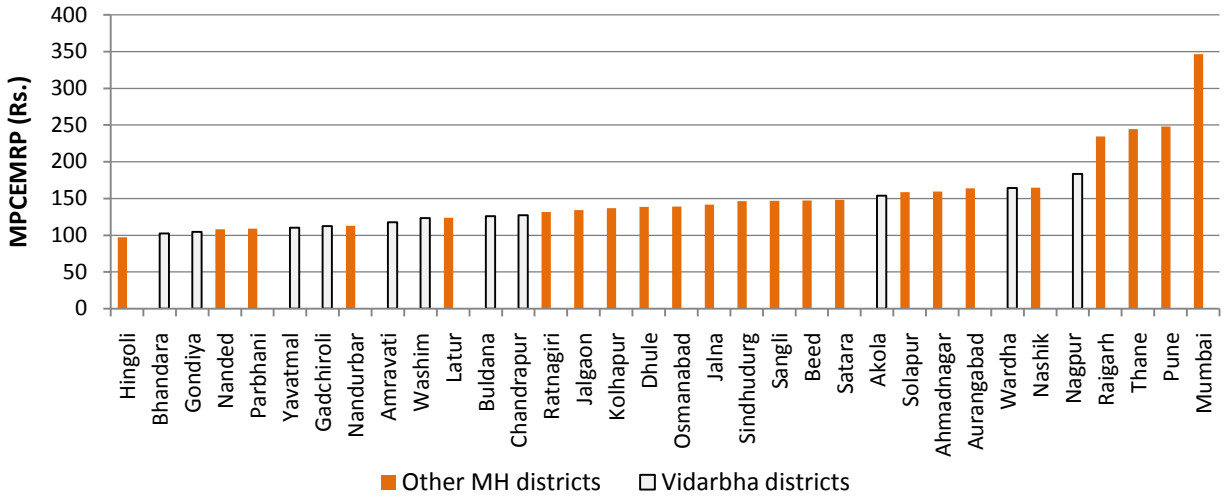


Figure 2: District wise Monthly Per Capita Expenditure[22]

Table 6: Sales of Electricity to Various Sectors in Maharashtra for 2010-11 (in Million Units)

Region	Agriculture	Commercial	Industrial	Other	Residential	Total
Khandesh & Northern Maharashtra	5281	483	3399	1304	1338	11806
Konkan	84	1263	10195	972	3397	15912
Marathwada	3796	336	2593	386	1082	8194
Mumbai*	1	5019	2490	844	7017	19650
Vidarbha	2436	815	4144	1289	2871	11555
Western Maharashtra	4699	1846	9197	870	3213	19825
Grand Total	**16298**	**9762**	**32018**	**5666**	**18919**	**86941**

6.2.2. Electrification

Latest figures show that several districts of Vidarbha lag behind in Household Electrification compared to the state. Data from the Census 2011[23] shows that several districts of Vidarbha have household

[20] Compiled from the data of electricity sales by MSEDCL (FY 2010-11) for the Tariff process, Tata Power [MERC (2010b)], R Infra [MERC (2010c)] and BEST [MERC (2011a)] for the year 2010-11

[21] Compiled from sales data (See previous foot note.) Total electricity sales includes sales from Tata for Mumbai region, which are not included in the sector wise figures. Hence, totals of sectors will not match the figures in the Total column for Mumbai.

[22] Government of India (2010)

electrification rates lower than the state average of 83.9%. These districts include Gadchiroli (59.2%), Yavatmal (69.7%), Washim (76%) and others. It's true that Marathwada fares worse than Vidarbha in this indicator, but the irony is that Vidarbha has such low rates of electrification in spite of generating so much electricity.

6.2.3. Load Shedding and Power Cuts

Vidarbha is no exception to the load shedding and unscheduled power cuts that plague rest of the state. Again, the paradox is that this is the situation when the area is producing so much power. When Prayas team visited some areas in Chandrapur district, we were told that villages face around 4-6 hours of power cuts. In an interesting twist, the team visited a village to see the CSR work of a private sector power company, but was not able to visit the computer centre run by them as the village was facing power cuts. In an acerbic comment, one citizen of Chandrapur told the team how the super thermal power station which is almost right in the town has changed the micro climate of the town, and it has become a heat island. Still, they face power cuts of 4 hours even as they were producing electricity right here. "They should give us power round the clock here, so that we can at least run the coolers", said this citizen.

6.3. Irrigation Development

Vidarbha also lags in development of irrigation. Overall, the region-wise development of irrigation in the state as of June 2009 is given in following Table 7. Thus, Vidarbha has a total of 10.6 lakh hectares of irrigation potential created. However, in 2009-10, the actual irrigation was only 3.27 lakh ha[24].

Table 7: Division wise Irrigation Potential Created till June 2009

Sr. No.	Division	Irrigation Potential Created till June 2009 (lakh Ha)
1	Konkan	0.9
2	Nasik	9.5
3	Pune	15.1
4	Aurangabad	10.2
5	Amravati	4.6
6	Nagpur	6.0
	State total	**46.3**

The Irrigation Status Report of Government of Maharashtra for 2009-10 notes that one of the important the reason for this low utilization of water in Vidarbha is the accumulation of sediments, soil, muck etc. in the canals and in the *malgujari* tanks[25]. However, the general reasons why the irrigation is

[23] http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Household_Amenities.pdf, accessed on April 16, 2012

[24] Government of Maharashtra (2010a), Page 16 and 18. Does not include local/minor irrigation i.e. projects with < 250 ha

[25] Government of Maharashtra (2010a), Page 45

less than potential created also includes the important reason of diversion of water from irrigation to non-irrigation uses including thermal power plants and industries[26].

According to a note prepared by the Vidarbha Statutory Development Board[27], 604.96 Million Cubic meters (MCM) of water from irrigation projects has already been sanctioned to be used for thermal power plants in Vidarbha including for existing power plants. Another 51.06 MCM has been sanctioned and 336.88 MCM has been proposed for use for thermal power plants directly from river flows. In all, 992.90 MCM has been earmarked for thermal power plants. As this is only for the thermal power plants, the diversion of water from irrigation to other industrial uses will increase this amount.

Even as far as groundwater development is concerned, most districts of Vidarbha lag behind, as the Figure 3 shows[28]. Many districts have less than 40% of groundwater resources developed, while only Amravati district, with 85% development is the highest, and also an outlier in the region.

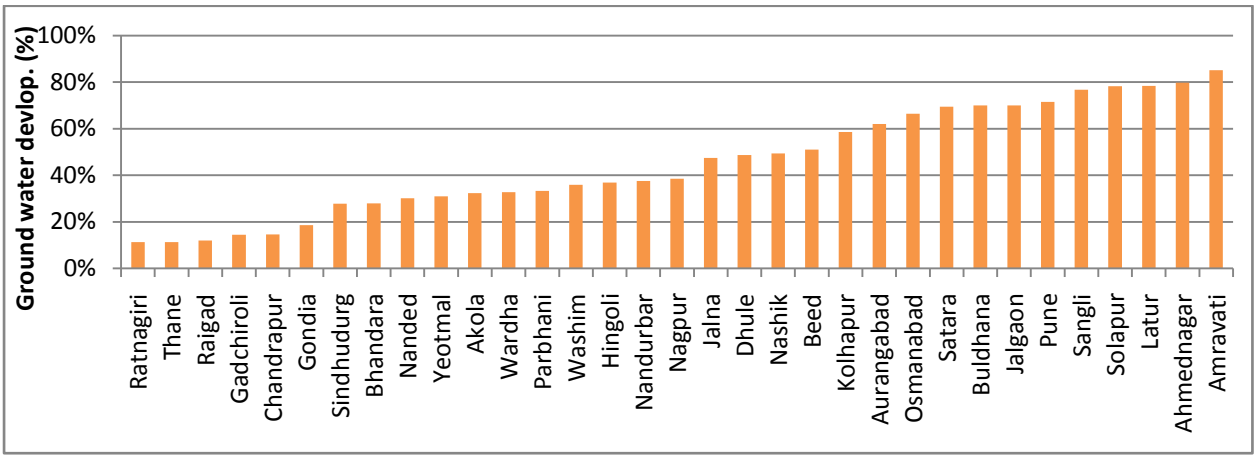


Figure 3: District wise Stage of Ground Water Development (%) for Maharashtra

6.4. Diversion of Water for Industries

Diversion of water for industries has other implications also. It creates pressure on water for other uses, especially during the summer months. In particular, thermal power plants as an industry use large quantities of water. Table 8 below gives the water requirements of TPPs in Vidarbha.

Table 8: Annual Water Requirement for Existing TPPs in Vidarbha

Name of Project	Plant Capacity (MW)	District	Water Requirement (Million m3/year)
Chandrapur TPS	2340	Chandrapur	35.0
Khaperkheda TPP	840	Nagpur	20.4
Koradi TPs	1040	Nagpur	29.2
Paras TPP	500	Akola	N.A.
Wardha Warora TPP	540	Wardha	13.3

(Source- Websites of respective companies)

[26] Government of Maharashtra (2010a), Page 42

[27] VSDB (2009b), Page 11-12

[28] CGWB (2009), Page 92

Apart from the overall annual requirement, the seasonal requirement especially in the lean months is critical.

In April 2010, several units of the 2,340 MW super thermal power station at Chandrapur had to be shut down due to a lack of water. Deficient rainfall had led to a severe water shortage, and the water in the Irai dam (the source of water for the plant) had to be reserved for drinking water purposes[29]. Now, an expansion by the 1000 MW capacity of the same plant is underway, which will also source water from the same Irai dam.

In Wardha River, there is practically no water in summer. As per what local citizens told the Prayas team, in summer of 2011, 25 industries had to be closed down due to water shortage. Now a large number of TPPs are being planned in the Wardha basin.

While sometimes, in times of great crisis, industries are being asked to shut down, in most cases, uses like daily needs of villages, small agriculture, irrigation etc. are silently bearing the brunt of the diversion of water for industries.

Such problems are likely to aggravate in the future. If all of the 40,000 MW of capacity in pipeline is to be added in Vidarbha, it would use about 1600 million cubic meters of water every year[30]. This is more than the entire quantity of water that was used in 2009-10 in Vidarbha for irrigation[31], and could provide close to 300,000 ha of additional irrigation[32].

It may be mentioned here that several districts of Vidarbha are facing the serious issue of farmer suicides due to debt and crop failure. Lack of water is one of the important reasons for this[33]. With large number of thermal power plants proposed in some of these districts, this impact is likely to worsen. In other districts, such a diversion of water to thermal power plants could create stress on available water resources.

6.5. Specific Impacts of Existing Thermal Plants and Coal Mines

A number of official and non-official agencies have documented the serious ill-impacts of thermal power plants and coal mines in Vidarbha region[34]. A team of Prayas researchers also visited some of these areas mainly around Warora and Chandrapur to get a first hand feel of these issues. The observations in this section are based on the trip as well as information from other sources.

[29] MERC (2011c), Page 4

[30] Using the thumb rule given by CEA that 3.92 million cubic meter of water, will be needed for every 100 MW per year. This thumb rule is given in NCIWRD (1999), Page 63

[31] Maharashtra, Government of (2010a) Page 12. It gives the total water used for irrigation in Amravati and Nagpur division as 1466 million cubic meters.

[32] Calculated using the rough estimate of 500 mm of delta for irrigation

[33] Planning Commission (2006), Page 55

[34] For example, MPCB (2006), MPCB (2010), Government of India (2003), NEERI report on "Post-Clearance Environmental Impacts and Cost-benefit Analysis of Power Generation in India", at http://mospi.nic.in/research_studies_post_clearance.htm, Mote et al. (undated)

6.5.1. Excess of Pollution

Vidarbha region is facing a serious problem of pollution, particularly in areas where coal mining, thermal power plants, cement industries etc. dominate[35]. Chandrapur industrial area comprising Chandrapur MIDC, Tadali, Ballarpur and Ghuggus is categorized as the 4th most polluted industrial cluster of India by Ministry of Environment and Forest in 2010[36]. This is based upon the Comprehensive Environmental Pollution Index (CEPI) calculated by considering air, water and land pollution. It can be said that the higher CEPI of the region can be due to large number of coal based thermal power plants, coal mines, cement plants and steel & iron industries[37] as these are considered as highly polluting industries[38].

6.5.1.1. Air Pollution

The ambient air of Chandrapur region has SPM (suspended particulate matter) and RSPM (respirable suspended particulate matter) more than or close to acceptable limits during most of the time of year[39]. The National Ambient Air Quality Standards' (NAAQS)-24 hours time weighted average standards for RSPM and SPM concentrations are 100 µg/m^3 and 200 µg/m^3 respectively for residential and rural areas ambient air quality. The same for industrial area are 150 µg/m^3 and 500 µg/ m^3 respectively[40]. As per Maharashtra Pollution Control Board (MPCB)'s guidelines for monitoring the ambient air quality,

"Whenever and wherever two consecutive values exceed the limit specified above for the respective category, it would be considered adequate reason to institute regular/ continuous monitoring and further investigations."[41]

At Ghuggus and Ballarshah in Chandrapur district, the SPM and RSPM concentrations exceeded the specified limits during most of the time from October, 2011 to March, 2012 for many consecutive days. At Chandrapur city and MIDC area, it exceeded for some days during the same period[42]. However there seem to be no further investigations for the higher concentrations of SPM & RSPM as the pollution are still persisting.

The visit by Prayas team to the area also revealed in graphic clarity the seriousness of the problems of pollution and other issues created by coal mines and TPPs. Ambient air had a lot of dust, including ash, soil dust from roads, and coal dust. The coal dust comes from the stock yards, the heavy and continuous transport of coal in the area and from fugitive emissions from coal handling. Also it was observed that the stacks of Chandrapur super thermal power station (CSTPS) were emitting particulate

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[35] This section deals only with areas around Chandrapur as Prayas team had visited this area. However, similar problems are expected in other areas where coal mines and thermal power plants come up.

[36] MoEF Office Memorandum for consideration of projects for Environmental Clearance (2010), (http://moef.nic.in/downloads/public-information/circ_EP_index.pdf), Accessed on May 14, 2012

[37] MPCB (2010), Page 32

[38] CPCB (2010), Page 37 & 38

[39] Ambient air quality monitoring data for Chandrapur (MPCB) (http://mpcb.omcommunication.net/envtdata/envtair_neww.php), Accessed on May 14, 2012

[40] MPCB (undated a), Page 48

[41] MPCB (undated a), Page 48

[42] Ambient air quality monitoring data for Chandrapur (MPCB) (http://mpcb.omcommunication.net/envtdata/envtair_neww.php), Accessed on May 14, 2012

matter in a visibly significant quantity despite having electrostatic precipitators (ESP). The Prayas team was told by Mahagenco that this was mainly due to higher ash content in the coal supplied by WCL[43].

This dust and ash is being deposited on leaves of trees and crops in the surrounding region. Local people informed the team that it was affecting crop production to a huge extent. In the vicinity of coal mines, this impact on crop production was compounded by the falling groundwater levels.

It was also observed that many mine labourers living on the outskirts of Chandrapur city were using coal for daily cooking. This also adds smoke to the ambient air.

6.5.1.2. Water Pollution

Thermal power plants can lead to serious pollution of water resources. One of the main concerns is the leakage of ash slurry to water sources either due to overflow or breach of ash ponds, and seepage and leaching of heavy metals and other contaminants from ash into the groundwater.

According to Central Ground Water Board report, ash from Chandrapur TPP is high in heavy metals and fluoride[44]. While the same report asserts that seepage is not possible into groundwater from the Chandrapur ash pond due to the geological strata, this will not be the case for ash disposal ponds of others plants. Even for Chandrapur, it is difficult to see how seepage will not take place when the reservoir is spread over 2600 ha.

Water pollution can also take place due to the run-off of effluents from coal mines, deposition of ash and dust into water bodies etc. All these were observed by the Prayas team in the region.

During the Prayas visit, the following things were observed:

i. Presence of ash in some natural water bodies near the ash pond of Chandrapur STPS. The locals said that sometimes the ash was observed on the banks of Irai river, either due to leakage from ash pond or due to dumping of ash there. It was observed that the ash was present below a thin layer of soil on the bank.

ii. Narrowing of the riverbed of due to run-off of overburden from Lal Peth mines

The issue of leaching and seepage of contaminants from ash ponds is aggravated when such ponds are not lined at the bottom, as is the case for example with the 2600 ha Chandrapur TPS ash pond.

6.5.2. Health Impacts

Natural fallout of the air and water pollution, dust emissions etc. is the impact on health of the people. In all the local meetings that Prayas team had, people complained about the increase in the diseases like asthma and other respiratory diseases. However, there is no systematic study of the same.

People also complained about the lack of adequate health facilities and facilities that are affordable and accessible for the common people.

[43] Mahagenco officials told Prayas team during the visit that the ESPs were designed for 25% ash content of coal, whereas they were receiving coal of ash content of 40%.

[44] CGWB (2002), Page 26

6.5.3. Impacts on Livestock

A number of people told us that the air and water pollution has had serious impact on livestock. An increase in problems like abortion in cattle, buffaloes has been observed in many places. Another problem is that accidents are common in excavated area. Poultry is also affected by diseases. Last, but not the least, the decline in availability of water and the decline in production and productivity of agriculture has made it difficult to maintain livestock for farmers, due to lack of fodder and water. This has also led to decline in livestock numbers. Farmers in village Shinada, close to a coal mine and itself slated to be displaced for coal mining, told the Prayas team that earlier, there were many cattle in the village, but now that has drastically come down.

6.5.4. Depletion of Ground and Surface Water Resources

One of the most serious impacts on water resources observed by the team was the drying up of ground water sources like wells and tube wells in the vicinity of coal mines. The digging to very low levels for extraction of coal (about 100-200 feet for opencast mines and about 300-400 feet for underground mines) disrupts groundwater aquifers and groundwater flows, and as a result, wells and tube wells in an area of 4-5 km radius have either totally dried up or dry up soon after the monsoon. Even surface water sources like nallahs and tanks / ponds face similar problem. Villages are now facing difficulty in even meeting daily water needs while agriculture is also severely impacted.

Another problem in this regard that was mentioned by the local villagers was that even wild animals get affected by this and when they don't find water they come to the mines where they themselves often get killed and also become a risk for the local populations.

6.5.5. Transport and Traffic

A major issue in the coal mining and thermal power plant area has been the traffic of heavy vehicles and trucks. It was observed that due to heavy traffic of coal transporting trucks, roads were deteriorating. Thus, ostensibly, the mines and thermal plants are supposed to bring in infrastructure like roads, but in reality, they end up leading to the deterioration of the roads available to people. At the same time, the heavy load of large trucks etc. has made roads unsafe for ordinary traffic. In addition to this, the transport of coal is leading to coal dust emissions, a problem we have already described above.

6.5.6. Impact of transmission lines

One of the least recognized impacts of the thermal power plants is the impact of its transmission lines. While the displacement due to the plant and coal mine is recognized, this is not the case with the transmission lines. Only a right of way is acquired. The Prayas team was informed by a retired MSEB engineer that proposed 20,000 MW capacity additions will require around 50,000 hectares as right of way in Vidarbha for transmission lines.

People complained that very little compensation is paid to them and that too only for the area under the tower. However, while they are allowed to use the land under the lines, they are not allowed to grow tall trees on it. A no-development zone of 52 m is there along the 400 KV transmission lines. No non-agricultural activity is allowed in this zone. They also complained that the productivity of crops beneath the lines is lesser than normal and they suffer due to this. The sag, the team was informed, can be as low as 8 m.

People who the Prayas team met also complained that metal equipment they handled under or close to the transmission lines gave them electric shocks – for example, riding on a motorcycle under the lines.

6.5.7. Displacement

Both coal mines and thermal power plants need large quantities of land, and thus result in the displacement of large number of villages and people. Unfortunately, the record of compensation, resettlement and rehabilitation is not encouraging at all.

According to the Annual Report of WCL 2010-11, WCL had acquired 7222.22 ha of land for its 33 ongoing projects, while it requires a 9687.32 ha for these projects. The report also says that WCL had been able to take possession of only 2546 ha of the acquired land[45].

The massive expansion of power plants will also require more mines to be opened. We estimate that the land required for mining the coal needed for the projects in pipeline, considering only those projects with EC granted (total capacity of 13,545 MW) would be around 15,350 ha for a 30 year life of these projects[46].

Land is also needed for the actual plant. The 5,260 MW of existing installed thermal capacity in Vidarbha has taken up about 5660 ha of land[47]. For the proposed plants, we use a thumb rule provided by the Central Electricity Authority, which puts the land needed for thermal power plants at 1.42 ha per MW[48]. Thus, the land that would be needed for the proposed thermal power plants – again, considering only the plants with EC granted, would come to about 19,000 ha.

Thus, the total land required for these proposed thermal power plants (only those with EC granted, but land including plant and mine area) would be close to 34,000 ha. If we consider all the projects in pipeline (close to 40,000 MW) the land needed would be a huge 90,000 ha. It should be noted that this does not include land for dams for supply of water to the plants (for example, the dam on Irai river supplying water to the Chandrapur plant, and the Gosikhurd dam from which water will be drawn by several thermal power plants), for roads, transmission lines etc. Also, if we include the impact of falling land productivity due to declining water levels and dust pollution, impacts of land acquisition for other industries, curtailment of access to land due to National park etc, the actual impact on communities will be much higher.

The rehabilitation process leaves much to be desired. The main issue is that of replacing livelihoods. Land for land is not provided for such projects, and while the coal mines have a policy of providing one job per two acres acquired, there are many problems with the structuring and implementation of the policy. In the new mines, jobs are also harder to come by as they tend to employ less people. Ultimately, much of the compensation and supposed livelihood replacement comes in the form of cash compensation. However, cash compensation has rarely proved to be effective rehabilitation and the

[45] WCL (2011), Page 11

[46] Calculated by Prayas using the assumptions of 0.7 kg of coal per KWh, and based on the estimate given by Centre for Science and Environment of 7.5 ha land needed to yield one million ton of coal over the mine life [CSE (2010), Page 140]

[47] As per their own figures, based on company websites and other company sources

[48] CEA (2012), Page 22. The land requirement is total (main plant, ash dyke & colony) for a 2 x500 MW plant using indigenous coal

history of rehabilitation and resettlement is littered with the serious problems caused by cash compensation. These stem mainly from the fact that people dependent on agriculture do not have the experience to handle large sums of money and put them to long term productive use, resulting in spending the money on consumption activities.

Even such cash compensation has been meagre in the past. Coal India has proposed a new R&R policy[49] which has enhanced the cash compensation given in lieu of employment, but this is likely to further aggravate the problems associated with cash compensation.

A visit by the Prayas team to one of the villages whose lands are being acquired for coal mines showed the reality of all these and other problems. This was the village Shinada, Taluka Chandrapur, about 1-2 km from Durgapur Padmapur coal mines of WCL. Some of the issues raised by the people included:

i. They are being paid Rs. 35,000 per acre as compensation for the land acquired, a price that will be highly inadequate for buying replacement land.

ii. Offer of jobs as compensation (one job per 2 acres) is made orally, and when the officer changes, the new person does not respect the promise.

iii. Even if jobs are given, they are often given in very difficult areas like underground mining (even though their lands have been taken for open cast mining) and hence many people cannot continue with the jobs. The company then gives the excuse that the person did not complete the training/probation and dischargers them. Sometimes job is refused on medical ground.

iv. Even graduates and post-graduates are given jobs with manual labor and so they leave.

v. Once a person leaves (or is fired) the entitlement of job is gone. He cannot get another opportunity nor is any other member of the family taken up instead.

vi. House plots being given of only 1100 sq ft, people want larger plots.

vii. The resettlement land is not of their choice, no facilities of water, road etc. at the site

viii. Depreciation is being deducted from the compensation for houses, so it is not possible to rebuild the houses from the compensation.

ix. Fund from Minerals Development Fund are being used only to develop mining or in WCL colonies, not for affected villages.

Two other important issues were also raised by the oustees regarding land compensation. a) The gap between the time of land valuation and actual compensation is quite big, often a decade or more so that the compensation is very meagre compared to actual land value and b) The prices of land near the location to which displaced villagers are shifted shoots up the moment it is known that a displaced village will move there – again making it impossible to buy equivalent land based on the compensation. Both these points reinforce the point that land-for-land is better than cash-for-land.

These complaints show the serious problems both in the provisions of the rehabilitation and their implementation. No wonder, WCL finds acquiring land very difficult[50]. There is an urgent need to revamp the compensation and rehabilitation provisions and also their implementation. In particular we

[49] CIL (2012), Page 8. Monetary compensation is 5 lakhs/acre or 12.4 lakhs on pro rata basis (if not eligible for employment)

[50] WCL (2011), Page 32

urge that land-for-land and jobs-for-land be the principle means of compensation and livelihood restoration.

The team was not able to look in detail into the issues of resettlement of people displaced by the thermal power plants.

6.5.8. Farmer Suicides

In recent years, one of the most serious problems to have emerged in the state is that of suicides by farmers. This is at once a problem by itself and a symptom of another deep rooted problem of crisis in agriculture.

Unfortunately, this problem is most serious in Vidarbha[51].

In Maharashtra, about 50,500 farmers have committed suicides during 1995-2010.[52] In Vidarbha, farmers mainly from Yavatmal, Amravati, Akola, Buldhana and Wardha districts from Vidarbha committed suicides. During Nov. 10 to Nov. 11, 1065 farmers committed suicides in the Vidarbha region[53].

The Prime Minister of India visited the areas affected by farmer suicides in July 2006. In his press release, the Prime Minister mentioned the causes of the crisis as follows[54]:

"The farmers who form the backbone of the economy of these districts [Amravati, Wardha and Yavatmal], are in acute distress forcing many of them to take the extreme step of committing suicide when they see all avenues for relief blocked.

"The causes of the crisis seem to be many. The primary ones seem to be continual crop failure, low yields, poor irrigation, medical expenses, cost of weddings in families, delays in getting electricity connections, and un-remunerative prices. These have pushed many farmers deep into debt and my heart was moved when I heard the harrowing tales of suicide affected families who were struggling to educate their children."

Other agencies also report similar reasons[55] including availability and the utilization of agricultural credit, high cost of cultivation, and need for water.

A number of thermal power plants are being planned in some of these very districts (See Table 3) like Yavatmal (4,450 MW) and Amravati (3,450 MW). Thermal power plants – by competing directly for the water, and through the impacts of pollution – are likely to aggravate the conditions that have led to the problem of farmer suicides in these districts, and could create water stress in other districts of Vidarbha.

All this indicates clearly that the basic issues to be addressed to correct the developmental imbalance in Vidarbha must include employment, agricultural distress, health, education, access to basic services like electricity, roads, water etc. and the control and prevention of severe air, water and land pollution.

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[51] http://sanhati.com/excerpted/4504/, Accessed on April 13, 2012

[52] http://sanhati.com/wp-content/uploads/2012/02/farmer_suicides_data.xls, Accessed on March 31, 2012

[53] http://vidarbhacrisis.blogspot.in/2011/11/record-1065-vidarbha-farmers-suicides.html, Accessed on May 14, 2012

[54] Press Statement of Prime Minister Shri Manmohan Singh dated 1 July 2006, http://www.pmindia.gov.in/speech-details.php?nodeid=336, Accessed on May 14, 2012

[55] Planning Commission (2006)

Let us now look at the experience of the thermal power plants and coal mines that are already operational in the region, to understand their impacts and whether and to what extent they can help address the imbalance.

7. Experience of Existing Plants and Coal Mines

Vidarbha, with 5,260 MW, already has significant thermal (coal) based capacity in operation. The impacts of these belie the promise of growth and development.

Thermal power plants involve large investments, and then recurring revenues. They also yield significant royalties and taxes for Governments. Some of these investments and revenues go to the local area in form of employee salaries and wages, purchase of goods and services, while some of them go outside the local area into the larger economy. The flows into the local area, apart from the direct impacts also have significant spin-offs, indirect impacts and multiplier effects. However, there seems to be little rigorous understanding or quantification of these indirect impacts. A quick literature survey by Prayas showed little literature on these indirect impacts of such projects, or indeed, even the direct impacts, on the local area. One of the recommendations we have made in this note is to carry out such studies.

However, an analysis of the direct impacts of such investments on the local area is also important, and we have carried out such an analysis here.

7.1. Investment

We find that while thermal power plants involve large investments and significant recurring revenues, an analysis of direct investments and revenues shows that much of this does not come into the local area. Thus, while such investments may boost the larger national economy and help the local economy indirectly, the direct impact is relatively small. An example will help us understand this.

Consider the expansion of the Paras (Akola) thermal power plant by 250 MW. The capital investment approved by the Maharashtra Electricity Regulatory Commission (MERC) for this is Rs. 1333.25 crores. The break-up is given in Table 9[56]. Annexure 1 presents the same information in a chart form.

It is seen that more than half the investment has gone for equipment, generally sourced from outside the area, often even from abroad. (In this case, 56% of Capex is for main machinery and 7% for BoP.) Very limited part of this will go to any local suppliers. Civil works constitute about 27% of the Capex. We can assume that a fair quantity of this will go to the local economy for local material, labour etc. though here also, often the civil work contractors bring large number of labour from outside. These proportions are likely to be similar in most thermal power plants. This will be the one-time impact on local economy.

During the operational phase, the plant generates power and earns revenues for power sold. The break-up of this, for the 250 MW plant is given in Table 10[57].

From this, we see that a massive chunk of 48% of the revenue generated by the plant goes for paying for the fuel, which may indirectly boost local economy if the coal mines are local (but there again, how much of the coal mine revenue goes to local economy and how much outside needs to be studied.

[56] MERC (2011b), Page 40-41

[57] MERC (2011b), Page 48-56

Moreover, as seen earlier, significant part of new capacity addition seems to depend on coal from outside the region). Return on equity – which goes to the owners – is about 8%, and payback on loan is 30%. Even if we assume that all the employee expense and O&M expense and administrative expense, and some other variable costs goes to the local economy, this comes to about 9% or 44 crore rupees per annum. Actually, significant amounts of these can go outside the local economy if the O&M etc. are out-sourced. For example, the KSK plant at Warora has contracted out the O&M to a Korean company.

Table 9: Item wise Break Up of Capital Investment for Paras TPP Approved by MERC

Package	Cost Approved By MERC (Rs. Crores)	Cumulative Cost (Rs. Crores)
Contract Price (BHEL)	632.41	
Spares for Main Equipment	35.49	
ETC	76.95	
Total Main Equipment		744.85
BoP (Mechanical)	79.62	
BoP(Electrical)	19.02	
Total Cost (Plant & Machinery)		843.49
Civil Works	358.69	
Cost of Infirm Power	1.02	
Land Cost	4.38	
Total Work Cost		1207.58
Overheads ex. Infirm	55.06	
Total Hard Cost		1262.64
IDC & FC	156.89	
LD Recovered/ Withheld	-86.28	
Total Project Cost		**1333.25**

Table 10: Item wise Break Up of Operation Cost for Paras TPP Approved By MERC

Head	Expense (Rs. Crore)	% of Total Revenue Going towards the expense
Employee Expenses	18.53	4%
A&G (Admin and General)	2.5	0%
R&M (Repair and Maintenance)	20.84	4%
Total O&M		
Fuel Cost	242.09	48%
Other Variables (Water, Lubricants etc)	2.79	1%
Interest on Working Capital	15.67	3%
Return on Equity	40.83	8%
Income Tax	8.14	2%
Depreciation	46.85	9%
Interest on Long Term Capital	107.64	21%
Total	**505.89**	**100%**

Thermal power plants and coal mines also generate large amounts of revenue for the state. Taxes and duty on electricity generation collected by the state government during FY 2010-11 was Rs. 3,800 crores as per the budget estimate[58]. WCL paid a total of 851.50 crore in the form of royalty and taxes to Maharashtra state government 2010-11 year[59]. Out of this, the royalty was Rs. 499.82 crores. A sum of 10% out of the total mineral revenue collected during the immediate preceding year is earmarked as Mineral Development Fund[60]. However, this fund seems to be for helping further development of the mining itself, rather than infrastructure that would be of use for common people.

7.2. Displacement and Pollution

We have already seen the huge impact of the existing plants in terms of displacement of population, pollution, land degradation, diversion of water from agriculture and other needs, destruction of ground water resources, damage to infrastructure like roads etc. The project promoters and operators have not been successful in controlling, mitigating or avoiding these impacts, nor has the Government been able to ameliorate the impacts.

As more thermal power plants and coal mines come up, these impacts are likely to aggravate further.

7.3. Employment

Thermal power plants do generate employment, but the direct employment after the construction stage is relatively small – around 0.8 to 1.5 employees per MW. Many of these positions require technically qualified people and these mostly come from outside the area.

For example, the 2340 MW Chandrapur thermal power plant employs 2740 people including about 1200 people employed in outsourced tasks of cleaning and coal handling[61]. KSK's 540 MW Wardha Thermal Power Station at Warora has 227 direct employees, and 222 work with the O&M sub-contractor and another 233 with the outsourced coal and ash handling[62].

CEA has also prepared some norms for manpower requirements for various types of power generation plants both during construction phase and for the subsequent operation. The norms for thermal power plants are as follows[63]:

During Construction Phase: 8 people per MW, phase expected to last 36 months

For operation and maintenance – 1.1 person per MW

If we look at the proposed thermal power plants in Vidarbha that have secured environmental clearance or are awaiting EC, the employment creation with the above norms is likely to be as Table 11.

It is also thought that the newer plants will be based on ever more automation and will require fewer people.

[58] Government of Maharashtra (2011), Page 55

[59] WCL (2011b), Page 27. A portion of this is on account of central taxes and clean energy cess.

[60] Government of Maharashtra (undated), Page 11

[61] Information given to Prayas team during visit to Chandrapur thermal power plant

[62] Information given to the Prayas team during visit to the KSK plant

[63] CEA (2012a), Page 164

Table 11: Calculation of Manpower Requirement for TPPs in Vidarbha

Status	Capacity MW	Manpower Requirement for TPPs	
		Construction (for 36 months)	Operation & Maintenance (for 25-30 years)
Existing	5,260	Not applicable	5,786
EC granted	13,545	108,360	14,900
EC awaiting	2,010	16,080	2,211

In case of coal mining by WCL, employment generation is about 807 persons per MTPA production level[64], whereas for CIL, the number is slightly higher i.e. 888 persons per MTPA[65]. But the major portion of the workforce is from other states/regions.[66] The National Electricity Plan – Generation, 2012 prepared by CEA notes that:

"With increased use of state-of-the-art technology and sophistication, more automation & computer control in coal mining operation, less manpower deployment will be required in the new mines and thus there will be less job opportunities".[67]

Thus, the promise of employment generation through thermal power plants has only limited potential particularly for the less technically specialised local people.

8. Role of Thermal Power Plants in Addressing Local Development, Balanced Development

Having seen some aspects of the nature of developmental imbalance in Vidarbha vis-à-vis the rest of Maharashtra, and the impacts of existing thermal power plants and coal mine, we are ready to examine the issue of whether thermal power plants can address the imbalance and under what conditions.

Total thermal capacity of 41,195 MW is in the MoEF pipeline for Vidarbha[68]. The basic rationale for new thermal power plants to come up in Vidarbha region is the availability of coal in the area. Yet, most of the new capacity is not based on local coal. Details of the coal sources for existing and EC granted TPPs have already been given earlier Section 4. However it is worth re-emphasizing the same here. This undercuts the very basis of the argument that TPPs in Vidarbha represent local development based on local resources.

Moreover, much of the investment in and revenues from a thermal power plant flow out of the local area. Employment is generated, but much of it is more of a kind that needs specialised knowledge and training.

Thus, while thermal power plants in Vidarbha are being projected as use of local resources for local development, and as a means of addressing the developmental imbalance, the above discussions

[64] Calculated from WCL's coal production for 2007-08 [WCL (2011a), Page 8] and employees in coal sector in Maharashtra for 2008 [India, Government of (2012)].

[65] Calculated from CIL's coal production for 2010-11 and CIL employees in 2011 as per http://www.coalindia.in/Performance.aspx?tab=0, accessed on May 14, 2012.

[66] As per information given by coal mine workers to the Prayas team during the visit.

[67] CEA (2012b), Page 179

[68] As per figures compiled by Prayas Energy Group from the web site of the MoEF, status as on 12 May 2011. http://moef.nic.in/modules/project-clearances/environment-clearances/, Accessed on May 12, 2011

indicate that they are not likely to fulfil these functions. Therefore, there is a need to re-assess this claim and role of thermal power plants.

Thermal power plants also result in competition for local resources like land and water, and also have serious impacts in terms of pollution. Hence, the contribution that thermal power plants can make needs to be seen in the context of competing use of resources of coal, water, land, investment etc. This is what can be called the opportunity costs. Given the various other uses for these resources, thermal power plants may not be the highest priority options for the region.

So before we look at whether thermal power plants and coal mining can address the developmental imbalance, and to what extent and under what conditions, an important question needs to be answered: Do thermal power plants and coal mines represent the best and most optimal interventions in Vidarbha to address the regional imbalance? This is a discussion that is really beyond the scope of this note. At the same time, since it has such important bearing on the issue of region imbalance and the problems of Vidarbha, we feel it is important to at least mention some key aspects.

The nature of the imbalance in Vidarbha and the fact that employment is to be created for large number of people, and that it is agriculture that employs the largest number of people implies that investments and interventions in agriculture may be the most effective means of addressing the imbalance.

The Approach Paper for the 12th Five Year Plan[69] prepared by the Planning Commission notes that,

"Global development experience, especially from the BRIC countries, reveals that one percentage point growth in agriculture is at least two to three times more effective in reducing poverty than the same magnitude of growth emanating from non-agriculture sector."

According to the World Development Report 2008, Agriculture for Development published by the World Bank[70],

"The potential of agriculture to contribute to rural poverty reduction differs across countries. In China, where land is relatively equally distributed, the reduction in poverty was almost four times higher from GDP growth originating in agriculture than from GDP growth originating in industry or services… In India and Indonesia, however, growth in rural services was estimated to contribute at least as much as growth in agriculture toward reducing poverty.

"In India the poverty-reducing effects of non-farm economic growth are greater in states with higher initial levels of farm productivity and rural living standards. Growth in rural non-farm employment in many cases remains closely linked to growth in agriculture, as agriculture becomes a larger supplier of intermediate inputs to other sectors such as processed foods (forward linkages)"

This clearly brings out the central and greater role that agriculture plays in addressing the issues of poverty, rural employment and equity. Since these are very much the relevant issues in large parts of Vidarbha, investments in agriculture – and in development of local water resource, which are critical to agriculture - are likely to be more effective. There may be other options too which are optimal for the region, we have only discussed agricultural as an indicative example.

[69] Planning Commission (2012a), Page 7

[70] World Bank (2008), Page 37

The fact that agriculture, which employs the largest number of people, is facing severe distress, and that thermal power plants compete for water resources, also suggests that agriculture investments may be preferred over thermal power plants. At the least, it should be ensured that the latter are built in a way that the former do not suffer.

However, this issue of which should be the preferred investment and whether there is need to prioritise one over the other is out of the scope of this note. We leave the issue of whether thermal power plants and coal mines should be the preferred investments, or should other investments be prioritised, to a broader discussion that can do proper justice to the issue in terms of time and expertise.

Here, we address the question that if TPPs are to be built, then under what conditions should they be built, and in what manner so that they can best address the issue of balanced regional development.

9. Suggested Approach to Thermal Power Plants and Coal Mines

With this in mind, and against the background of the discussion above on the nature of the developmental imbalance and the impacts of thermal power plants and coal mines that are already in existence, the following approach is suggested. We would like to state that most of the elements of what is being proposed already exist in the legal and policy regime of the country and state, though they may not be present together as a package. We suggest:

i. Clean up the impacts of the existing power plants and coal mines, including the outstanding resettlement and compensation issues, pollution, other impacts and reclamation of completed mines.

ii. Introduce measures to share the benefits of existing TPPs and coal mines with local communities to create better local impacts.

iii. Do not allow any new plants and mines till this clean up is done effectively.

iv. For the new plants and mines proposed, first undertake a carrying capacity study that will determine how many power plants and mines the local environment will be able to carry.

v. This should be done along with a River Basin Study for each of the rivers / basins / sub basins, to determine the water availability and usage.

vi. The capacity that can be added should be determined based on the 4 and 5 above.

vii. The proposed new capacity addition should be assessed for social and environmental impacts both individually and for cumulative impacts.

viii. The new capacity should incorporate the benefit sharing mechanisms (point 2) which have been tried out and found useful.

We would like to emphasise that these measures need to be taken together as a package and not be implemented in a selective manner. We would also like to emphasise that point number 3 (not allowing new plants or mines till all this is done) is critical as experience till date shows that unless such a leverage is applied, there is little chance of the right approach being implemented.

Each of these points is described in detail below.

9.1. Clean Up Existing Impacts

There are three important reasons to address the impacts of existing thermal power plants and coal mines. First of all, the ill-effects of existing plants and mines are manifested in terms of direct impacts like health impacts of pollution and indirect impacts of lower agricultural yields and opportunity costs of investments.

Secondly, only when the existing impacts are addressed in a meaningful and just manner will the Government be able to gain trust and credibility to implement new projects. Addressing outstanding impacts of existing projects is necessary to build the credibility of promises accompanying new projects. Lastly, it is also an issue of justice- that is, if an intervention creates negative impacts on an individual or community then it is only fair that this impact is mitigated or compensated.

What needs to be done to address the existing impacts is fairly well known, but it is not being implemented due to lack of political will and resources. The resources will necessarily have to come from the projects themselves. As we show below, such measures should not cause too much burden on the projects. Based on the suggestions made by various people, we outline below a process to clean up existing impacts.

i. First of all, it is necessary to document in detail the impacts being faced by the people due to thermal power plants and coal mines. This should be done by reputed and independent agencies with impeccable credentials. Agencies like the Tata Institute of Social Sciences should be considered for this.

ii. Such documentation should also include suggested measures to avoid, mitigate, ameliorate and compensate various impacts, and the costs and time lines involved.

iii. Such an exercise must involve the local communities fully in its preparation.

iv. The actual implementation of the cleaning up measures should be done in a time bound manner under the supervision of a committee that includes representatives of local people. These should not be limited to elected representatives but should also include respected citizens, environmental and social activists.

v. In particular, separate committees to monitor pollution should be set up which include independent experts, representatives of the MPCB, local self government institutions and citizens. These committees should have the power to recommend stopping work of any plant if pollution norms are not being met. MoEF itself has tried this idea in several places. For example:

   Paryavaran Vahini Scheme was launched by MoEF in 1992 at district level. It comprised of local people (individuals and NGOs). Their main objectives were environmental awareness creation, reporting of illegal forest and environmental activities, monitoring of ambient air and water pollution etc.[71]. This type of local people's monitoring can be further strengthened by giving it the authority to stop/restrict such illegal activities.

   MoEF has in March 2012 constituted a committee of non-official members having expertise in the area of Environment, Forests & Wildlife to supplement the inspection and monitoring

[71] http://www.envfor.nic.in/citizen/envedu/vahini.html, Accessed on April 17, 2012

system in certain regions[72]. Such mechanism along with local people's participation can be evolved for Vidarbha region.

vi. Work on new coal mines and thermal power plants should not be undertaken unless this cleaning up is carried out.

Estimating Clean up Task and Costs

Estimating the costs for a clean up – that is, addressing the outstanding social, environmental, health and other impacts of existing coal mines and thermal power plants – is a process that involves detailed studies and assessments. Preparing and implementing such a clean up plan requires extensive participation of local communities and inputs from multi-disciplinary group of experts. All these are beyond the scope of this report. That is why one of the main recommendations of this report is to carry out precisely such a study and participatory preparation of a plan.

However, for the purpose of arriving at some very rough and ready estimates of the kind of tasks involved, the funds needed etc, we have attempted to put together a broad estimate as given in Annexure 2. We would urge that this be treated only as a first, very rough approximation particularly since we have not been able to estimate the cost for all required activities.

Considering only those activities, whose costs we could assess, we estimate the clean up costs to be about Rs. 1400 crores of capital investment and Rs. 370 crores as annual expenditure. If we phase the capital expenditure over four years, then we will need roughly a total of Rs. 720 crores per year.

The resources for the documentation and for the implementation of the suggested clean up measures can easily come from the projects themselves. Vidarbha region produced 39.34 million tons of coal in year 2010-11[73], and generated close to 24,756 million KWh of electricity in the year 2010-11[74]. A charge of 20 paise per unit of electricity would generate close to Rs. 495 crore per year and a charge of Rs 100 per ton of coal can generate Rs. 393 crores. Thus, we would generate about Rs. 880 crores per year, which would be able to meet the above mentioned requirement. Given that we have not included costs for many of the clean up activities, the actual cess would need to be higher than this. In this case, the government can also think of allotting for the clean up some part of the revenues collected by it through the taxes and royalties on electricity and coal, which are substantial, being greater than Rs. 4000 crores per year.

The Government of Maharashtra collects close to Rs. 3800 crores from taxes and duties on electricity[75] and about Rs. 851.5 crores as royalties and taxes from coal mining major WCL in Vidarbha[76]. Royalties constitute about Rs. 500 crores of this Rs. 851.5 crores. A sum of 10% out of the total mineral revenue collected during the immediate preceding year is earmarked as Mineral Development Fund[77].

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[72] Office Memorandum of MoEF for constitution of the committee (2012), http://moef.nic.in/downloads/public-information/om-20032012.pdf, Accessed on April 17, 2012

[73] WCL (2011a), Page 8

[74] CEA Report, "Energy wise - Performance Status All India – Region wise April 2010- March 2011" (May 2011). http://www.cea.nic.in/reports/monthly/generation_rep/tentative/mar11/opm_16.pdf, accessed on January 30, 2012 Total installed capacity includes coal, gas, hydro & nuclear power, excludes allocation from central and joint utilities.

[75] Government of Maharashtra (2011), Page 55

[76] WCL (2011b), Page 27. A portion of this is on account of central taxes and clean energy cess.

[77] Government of Maharashtra (undated), Page 11

Rightfully, the objectives of cleaning up pollution, restoration of completed mines and other outstanding social, environmental and health issues must have the first charge on these funds.

Thus clean up cost can be met through a combination of a special cess on electricity and coal and a share of the revenues and royalties already been collected by the government.

9.2. New Thermal Power Projects and Coal Mines

As mentioned earlier, a large number thermal power projects of about 41,195 MW are in the pipeline in Vidarbha. In view of the impacts of existing plants, it is a moot question whether the region can sustain such a massive increase in capacity without serious aggravation of impacts. That's why it is important to assess the carrying capacity of the region before proceeding with the construction (or environmental clearance) of these plants. Indeed, the carrying capacity study must be used as a strategic assessment tool to determine how many TPPs and coal mines can actually be allowed to come up in the region. The planning and the final determination of the new capacity (extent, location etc) should be based on these carrying capacity studies. The concept of these assessments is explained briefly below.

9.2.1. Comprehensive Carrying Capacity Studies

Any given region, with its specific ecological, environmental, geographical and social resources and characteristics will have limits to how much activity it can sustain. This is represented by notion of Carrying capacity. Carrying capacity is defined by the MoEF as[78]:

"The concept of sustainable development is closely linked to the carrying capacity of ecosystems. Ecosystems carrying capacity provides the physical limits to economic development and may be defined as the maximum rate of resource consumption and waste discharge that can be sustained indefinitely in a defined planning region without progressively impairing bio-productivity and ecological integrity."

Carrying capacity can be understood in two senses – the supportive capacity and the assimilative capacity.[79] The supportive capacity is broadly a measure how much activity a region can support through provision of resources (e.g. the amount of coal deposits). The assimilative capacity is the amount of pollution load that can be discharged in the environment or environmental interference in a system that can be carried out without damaging the eco-system[80].

MoEF further elaborates[81]:

"…the single vital resource or function in least supply ultimately determines carrying capacity. Working within the limits of carrying capacity does not, however, preclude some unavoidable environmental damage in the course of development."

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[78] http://moef.nic.in/divisions/cltech/concept.htm The link is on the home page of the Division of MoEF dealing with Carrying Capacity Based Regional Development Planning, at http://moef.nic.in/divisions/cltech/index.htm. This page gives the concept, framework and methodologies for carrying capacity analysis and also details of specific case studies initiated and carried out under the aegis of MoEF.

[79] http://moef.nic.in/divisions/cltech/framework.htm, Accessed on May 14, 2012

[80] http://moef.nic.in/divisions/cltech/ac.htm, Accessed on May 14, 2012

This page explains the concept and ways of assessing the Assimilative Capacity.

[81] http://moef.nic.in/divisions/cltech/concept.htm, Accessed on May 14, 2012

For example, in an arid environment, water may the constraining resource that will determine the carrying capacity.

Ultimately, the carrying capacity study would have the following elements:

i. A statement of the supportive and assimilative capacities of a region with respect to a certain set of activities

ii. Identification of the critical or constraining resource(s) or function(s)

iii. The measure of environmental (and social) damage due to various levels of these activities

iv. A clear articulation of the trade-offs involved in carrying out a particular level of any activity, and

v. A decision regarding the level of various activities to be undertaken based on these and clearly defined criteria

The entire process of carrying capacity studies needs to be carried out with the full participation of the local communities and their meaningful involvement at all stages including in the decision making.

Several carrying capacity studies have been carried out in the country. As a part of its Sustainable Development & Clean Technology Initiative[82], MoEF has funded multi-institutional studies for Carrying Capacity Assessment for various regions. The studies are within the basic framework that is developed by MoEF but differ in focus as per the priority issues in the regions. These studies, spanning diverse regions and addressing diverse issues include the Doon Valley - an ecologically sensitive area, the National Capital Region (NCR) which is suffering from air and water pollution as well as congestion, Damodar River Basin which is very rich in natural resources and yet has extensive environmental degradation, Tapi estuary which represents the problems in the coastal region both for water and land development, and the Greater Kochi Region, a fast developing industrial and agricultural region on the southern coast[83].

Apart from these initiatives MoEF has also initiated Carrying Capacity Assessment Studies in response to environmental concerns raised by various public agencies and in context of certain developmental projects.

One such study was the carrying capacity study of Teesta Basin in Sikkim, commissioned by Ministry of Environment & Forest while issuing environmental clearance to NHPC's Teesta Stage-V hydroelectric project. The EC has a stipulation that "no other project in Sikkim will be considered for environmental clearance till the carrying capacity Study is completed."[84] Another example is the assessment of Western Ghats by Western Ghats Ecological Expert Panel constituted by the MoEF on February 4, 2010[85].

These cases by the MoEF provide important principles and methodologies for carrying out carrying capacity studies, the kind of trade-offs encountered, and the criteria used for arriving at decisions. These will provide useful guidance in carrying out the studies for Vidarbha region. For the thermal power plants in Vidarbha, water will be a likely critical resource on the supportive side due to current

[82] http://moef.nic.in/divisions/cltech/Default.htm , Accessed on April 27, 2012

[83] http://moef.nic.in/divisions/cltech/ct.htm, Accessed on May 14, 2012

[84] Centre for Inter-disciplinary Studies of Mountain & Hill Environment (2006)

[85] Press Statement (New Delhi 4 February 2010). http://moef.nic.in/downloads/public-information/Announces%20Establishment%20of%20Expert%20Panel.pdf, Accessed on April 27, 2012

scarcity of water in some regions, where new TPPs are proposed. On the assimilative side, pollution is likely to be a constraining parameter.

9.2.2. River Basin Studies

Since water is such a critical resource, decisions regarding how much water can and should be allocated for thermal power plants (and other uses) should be taken on the basis of river basin studies. River basin studies or river basin (sub-basin) plans can be considered as a special case of carrying capacity studies, focussed on the river basin as a unit. It should be noted that in Maharashtra, the Maharashtra Water Resource Regulatory Authority Act 2005 (MWRRA Act[86]) effectively makes it legally mandatory to carry out River Basin (and Sub-basin) studies and all water allocations are to be made only in accordance with such basin plans.

The Act mandates preparations of the State Water Plan which in turn is to be prepared based on the River Basin Plans prepared by the River Basin Agencies. The RBAs are statutory bodies created under the Act for each of the major river basins in the state.

Clause 15 (3) of the MWRRA Act requires that

"The [State Water] Board shall prepare a draft Integrated State Water Plan on the basis of basin and sub-basin wise water plans prepared and submitted by the River Basin Agencies."

The State Water Council, headed by the Chief Minister is then to approve this draft Plan, with modifications as necessary, and such a Plan becomes the Integrated State Water Plan. [87]

The Regulatory Authority then approves individual projects in accordance with the Integrated State Water Plan, subject to the Governor's directives with respect to Vidarbha and Marathwada. Clause 11 (f) of the Act confers this power, and duty on the Authority:

"(f) to review and clear water resources projects proposed at the sub-basin and river basin level to ensure that a proposal is in conformity with Integrated State Water Plan and also with regard to the economic, hydrologic and environmental viability and where relevant

"Provided that, while clearing the new water resources projects by the concerned for construction proposed by River Basin Agencies, the Authority shall ensure that Governor's Directives issued from time to time, relating to investment priority for removal of regional imbalance are strictly observed;

"Provided further that, in respect of the projects situated in Maharashtra and Vidarbha Regions, the powers to accord administrative approval or revised administrative approval, under this clause, shall in accordance with the Governor's directives, be exercised by the concerned River Basin Agency."

This means, in effect that it is legally required that the water allocation for thermal power plants be made (only) based on River Basin Studies. Such studies for the Godavari basin are being carried out by the MWRRA and are still under progress.

An amendment to the Act passed by the State Assembly on 21 April 2011 removes the powers of the Authority to make allocations and instead, gives the State Cabinet blanket powers to determine the sectoral water allocation. However, considering that this power is given to the Cabinet under Clause 16 (under the newly introduced Clause 16 A (1)), and Clause 16 still requires the State Water Council to

[86] The Act is available at http://mwrra.org/Document%207.pdf .

[87] Clause 16(4) of MWRRA Act

approve and finalize the State Water Plan, we can safely read into the amendment that the powers of the cabinet to make sectoral allocations are not arbitrary and unbound, but that the Cabinet is also bound to the make the allocations as per the State Water Plan, which in turn has to be made based on the river basin plans. The part of the Act mandating river basin plans and the State Water Plan based on them has not been done away with in the new Amendment and continues to be valid.

Pricing of water for thermal power plants would also be a very critical issue. Water has multiple uses and dimensions, ranging from the very survival needs of living beings to commercial uses. Pricing of water needs to take into consideration this diverse nature of water. As the Chawla Committee Report points out, "there are multiple dimensions of water use and allocation, with the primary use being that of life-support"[88]. It further talks about harmonizing these different roles – agricultural, industrial, other economic purposes – "vis-à-vis the fundamental right as life-support". Reflecting such a fundamental role for water in life support, we suggest that pricing of water for needs of drinking and domestic use, for needs of livestock, for livelihood support and for achieving the national goals of food and nutritional security should not be guided by commercial and financial considerations. For other uses of water, including uses like thermal power plants, pricing can follow commercial criteria.

Currently, water is being given to thermal power plants at the relatively low price of Rs. 32-64 per 10,000 liter[89]. Using the higher figure, this means that thermal power plants are paying less than 4 paise per unit of electricity generated towards cost of water[90]. In comparison, water used in production of wheat would cost around 21 paise per kg of wheat[91]. Given the criticality of water for life and livelihood support, price of water supplied to the thermal power plants does not reflect either the opportunity cost or the scarcity value of water.

9.2.3. Cumulative Impact Assessments

When the carrying capacity studies are done, they will provide an overarching framework to determine the levels of various activities, in this case, the thermal power plants and coal mines.

Meanwhile, it is also important to carry out assessments of impacts of each of the proposed individual projects, both, in themselves (the conventional EIA) and taken together (Cumulative Impact Assessment or CIA). The last point is very important. In India, environmental impact assessment has essentially always been carried out for individual projects in isolation. This often leads to gross underestimation of project impacts, especially in case of "clustering", that is, where several projects are coming up together in close or interlinked areas[92].

In case of Vidarbha, with large number of thermal power plants and coal mines being planned in clusters or close to each other, cumulative impact assessment becomes critical. In fact, the clearance to

[88] Government of India (2011d), Page 131

[89] MWRRA (2011), Page 1 (pdf page 9)

[90] Considering that roughly every unit of electricity generated uses about 5.5 liter of water, based on CEA thumb rule of 3.92 MCM of water per year for every 100 MW

[91] At the water tariff of Rs. 470 per ha for wheat (MWRRA (2011)) and taking yield of wheat in 2007-08 at 2202 kg/ ha (Source - http://planningcommission.nic.in/sectors/agri_html/selagri/T1.19.xls, accessed on June 7, 2012)

[92] Cumulative impact assessments are definitely required when projects are close to each other. However, in some cases, even projects not close to each other can require cumulative impact assessment, if they are "connected". For example, dams on the same river.

individual projects should be given only with reference to a cumulative impact assessment (and of course, carrying capacity studies).

There is a wrong notion that cumulative impact assessment is not a legally mandatory requirement. It is very much required by law but has been neglected so far[93].

The MoEF notification of 2006 governs the EIA and the legally mandatory environmental clearance process in India[94]. An application seeking prior EC in all cases is to be made in the prescribed Form 1 and Supplementary Form 1A, if applicable, as given in Appendix II of the notification.

Section II of Form 1 lists various elements of the project and activities allied to them which will impact environment. Point No. 9 in this list talks about cumulative impacts of the project activities. Table 12 gives details of this point.

Table 12: Consideration of Cumulative Impacts in EIA Notification 2006

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality			
Sr. No.	Information/ Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting, lities, (sic) ancillary development or development stimulated by the project which could have impact on environment e.g.: • Supporting infrastructure (roads, power supply, waste or waste water treatment etc.) • Housing development • Extractive industries • Supply industries • Other		
9.2	Lead to after-use of the site, which could have an impact on the environment		
9.3	Set a precedent for later developments		
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects		

(Source: EIA Notification 2006)

Thus, cumulative impact assessment is expected in the EIA process, but it has been grossly neglected.

The National Environmental Appellate Authority[95] has expressed the need for

"…advance cumulative study of series of different Dams coming on any river".

[93] The inputs of Advocate Ritwick Dutta for this section are gratefully acknowledged.

[94] Government of India (2006)

[95] NEAA (2007).This was an appeal filed under section 11(1) of the National Environment Appellate Authority Act, 1997 against the order of the Ministry of Environment and Forests, Government of India, dated 07.12.2005 granting Environmental Clearance to Uttaranchal Jal Vidyut Nigam Limited, for setting up of Pala – Maneri Hydroelectric Project (416 MW) in Uttarkashi District of Uttaranchal.

In effect, it has not only called for cumulative impact assessment for several dams being planned on one river, but has asked that these be done prior to the decisions on the projects. Other legal authorities like the recently constituted National Green Tribunal (which replaces the NEAA) and the Centrally Empowered Committee appointed by the Supreme Court have also upheld the requirement of cumulative impact assessments.

Given all this, cumulative impact assessment is a necessity not only from the point of view of avoiding social and environmental impacts, and from the point of good planning, but also from the point of legal compliance.

9.3. Some Other Suggestions

Apart from this overarching process, there are several other suggestions, made by various experts, local citizens etc. to address the issues raised by thermal power plants and coal mines. Some of these will need further study; some can be implemented right away. These include:

i. While a comprehensive impact assessment has already been suggested above, there are several important studies that need to be done either as a part of the comprehensive assessment or partly within the comprehensive study but also as more detailed separate studies. We suggest at least 3 such studies that are of critical importance that address areas not properly looked at. (i) Study of health impacts of coal mining, thermal power plants and other industries in the region on the general population and on the mine and TPP workers. (ii) Impacts of thermal power plants and coal mines on the local economy in terms of the direct job creation and economic development, and indirect multiplier effects, spin-offs etc. (iii) Impacts of transmission lines including displacement, land loss, loss of agricultural productivity, health impacts etc.

ii. Use of air cooled condensers for thermal power plants to save water. This is becoming more and more important due to scarcity of water in certain areas. For example, a proposed 240 MW captive coal based thermal power plant in Sonebhadra district (UP) is planning to use air cooling for condensers. It claims reduction of the water requirement to only about 10% of that required in conventional Water Cooled Condenser[96]. The trade-offs need to be examined in detail. The National Electricity Plan, 2012 brought out by the CEA[97], notes that,

    "CEA has set up a committee with members drawn from NTPC, BHEL, RRVUNL, MAHAGENCO, CESC and TCE to examine the issue of dry cooling system for condensers in thermal power plants. The committee is expected to suggest available options of dry cooling systems for thermal power plants keeping in view various techno- economic aspects involved."

    The report of this committee has been recently published and needs to be studies.

iii. Build plants of smaller sizes, say not greater than 100 MW each.

iv. Build the thermal power plants closer to the load centre. This suggestion was based on the logic that many plants proposed for Vidarbha are sourcing coal from long distance, and are exporting power to the load centres. Hence, there is no rationale for locating them here. They can be located closer to the load centres, thus decreasing the pollution and other impacts in

[96] Government of India (2011c), Page 1

[97] CEA (2012b), Page 133

Vidarbha. The other part of the logic is that if the power is being used in the load centres, then they should rightfully bear the burden of the impacts too.

v. Explore the option to convert transmission of power to underground transmission cables, thus avoiding the impacts of overhead transmission lines. The cost benefits of underground transmission would need to be studied in detail, including cost, access to cables for maintenance, and restrictions of land use if any.

vi. Use technology to track pollution from individual industries. Thus, meters and monitors can be put on effluent discharges (and other pollutant discharge points) of each industrial unit separately and the readings can be put up on a website real time. Such individual tracking will help bring in accountability.

vii. Use of closed trucks for coal transport.

viii. Separation of the roads for used by ordinary citizens for their day to day usage from those used by the transport of coal, ash, other goods for the coal mines and thermal power plants, as the huge trucks for the latter not only damage the roads but also make them unsafe for public.

9.4. Enshrining Benefit Sharing Mechanisms

It is an irony that a region like Vidarbha that has large number of coal mines and power plants has low consumption of electricity and household electrification[98] in comparison to average for Maharashtra state. On one hand it bears the brunt of the problems like displacement and pollution, and on the other hand, is disadvantaged when it comes to enjoying the benefits of the projects. To address this, it is necessary that benefit sharing mechanisms be built into project design so that the local area is able to enjoy the benefits from these projects as much as any other region and it gets proper access to the benefits from these projects.

Before we detail out some possible mechanisms, certain general cautions are in order.

When we talk of benefit sharing mechanisms, we are not referring to measures for compensating those affected by the project. That is not benefit sharing; that is compensating a loss. Thus, the benefit sharing mechanisms are essentially over and above any compensation measures.

Benefit sharing mechanisms are not to be a substitute for measures to ameliorate direct impacts like pollution. For example, giving some percentage of revenue to the community affected by increased level of SPM in air cannot be called benefit sharing and we do not advocate such measures. We strongly urge that such negative impacts – especially impacts on health and livelihood – have to be addressed by removing/reducing them.

Having said that, we would like to emphasise two reasons why Benefit Sharing is so important.

First reason is that when any project is being taken up in larger public interest, when its purpose is development, then such development cannot bypass the local community where the project is located. We would not say that only the local community should have rights to the project benefits, but on the other hand, the local community cannot be left out altogether. In fact, we would argue that the local

[98] Out of 11 districts of Vidarbha, 8 districts (excluding Nagpur, Wardha and Gondia) are having lower proportion for households using electricity as primary lighting source compared to the Maharashtra average of 83.9%. (http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Household_Amenities.pdf)

community should be able to enjoy the benefits from these projects at least as much as any other region. This is the principle of equity, of justice and of inclusive development.

The second reason for enshrining benefit sharing is that while we emphasise that benefit sharing is not compensation for adverse impacts, the fact remains that it may not be possible to avoid or mitigate each and every impact. Even after full and sincere attempts have been made to avoid and mitigate all major impacts, some impacts may still remain. Thus, benefit sharing can help address some of the injustice that is born out of such residual impacts. We would like to emphasise once again the two sets of cautions mentioned above and say that this need to address residual impacts does not override the cautions mentioned earlier.

There are several kinds of benefit sharing mechanisms. Many of them are also incorporated or being incorporated in policy and legal regimes in India. Some of the key types of benefit sharing mechanisms are:

i. Sharing of benefits in kind: In case of a power plant, this can involve provision of free or cheap electricity to individuals, communities or select sectors from the electricity generated. Other examples include preferential provision of irrigation from irrigation projects, access to fishing rights in reservoirs etc. Some examples.

    a. Hydropower Policy of Government of India, 2008 provides for giving 100 units per month of electricity per affected family for 10 years[99]. While this is in the nature of compensation to affected families, the same can be extended to non-affected families, and it can assume the form of benefit sharing. However, care should be taken that even within the region, the most deprived communities / areas should be targeted, rather than those already relatively better off.

    b. A scheme for supply of electricity to all households in a 5 km radius of CPSU power generating companies was formulated by the Government of India100. While it will charge for the electricity, at least it will make the power available.

ii. Sharing cash value of the benefits: Sharing a fixed amount or a percentage of revenue or profits, or any other parameter, with individuals, communities, sectors, programs etc. Some examples:

iii. The Mines and Minerals (Development and Regulation) Bill[101] 2011 provides for 26% of profits of coal mines to go to a District Mineral Foundation. Part of these funds will then be used to make recurring payments to affected people. Again, here the payments are designated only for affected people, so it is more in the nature of compensation, but a true benefit sharing mechanism would make these payments to a wider group of people.

    a. Allocation of shares in the company

    b. Sharing of Opportunities created by the project: Reservations in employment opportunities, small (or big) contracts etc.

iv. Creating Community Facilities like roads, hospitals and infrastructure

[99] Government of India, (2008b), Page 36

[100] Letter No. No.44/7/2010-RE of 27 April 2010 from Ministry of Power, http://pib.nic.in/newsite/erelease.aspx?relid=61108

[101] Government of India, (2011a), Page 37

a. Hydropower policy 2008 provides that 1% percent of power generated be provided free for Local Area Development Fund. (This power will be sold and the cash will go to the LADF).

So the ideas for benefit sharing already exist in several current and proposed legislations and policies in India. Many of these have also been proposed and implemented to some extent in India and also abroad. But they need to be structured and implemented properly, well targeted and with built-in accountability towards the communities they seek to benefit. The advantage of such benefit sharing schemes is that they target the benefits of such projects to the desired sections of population, greatly enhancing the impacts of benefits. Local people are often aggrieved that while "their" resources are being used by such projects and they bear the brunt of the negative impacts, the benefits don't flow to them, except in an indirect manner through the overall impact on the larger economy.

Benefit sharing mechanisms should be put in place right away for existing power plants and coal mines in Vidarbha. This will have two advantages: First of all, it will address the sense of grievance that prevails in the area - the real and perceived injustices. Second, it will lend credibility for similar promises in relation to new plants.

How much of the benefit should be shared with the local community is an important question. A broad criterion for deciding this would be that the local community should benefit at least as much from the development of the local resource as others.

Current legal and policy regime can guide us to some extent. The Hydropower policy requires 11% of power to be given free to the State Government, but this is used for the benefit of the entire state, not just the local area. There is an additional 1% of power that is given specifically for local area development. But this we feel would be inadequate. The MMDR Bill has proposed 26% of coal mine profits to go to a District Mineral Foundation. Based on Coal India profits of 2010-11, we can work out that this arrangement would give Rs. 168 crores for WCL Maharashtra districts[102].

We feel that at least a 4-5 % of production should be set aside for benefit sharing for local communities. In the electricity sector, this could come in the form of a cess on the tariff, working out to about 15-20 paise per unit[103]. In the coal sector, a 5% allocation would correspond to 1.95 million ton coal per annum, and in rupee terms corresponds fairly well to the sum of Rs. 168 crores calculated above[104]. This sum could be collected partly in the form of such a District Mineral fund, or a cess or a direct allocation of coal for electric supply to agricultural consumers etc. (Detailed later).

[102]Coal India posted a profit of Rs. 14,788 crores in 2011-12 and Rs. 10,867.35 crores in 2010-11 http://www.telegraphindia.com/1120529/jsp/business/story_15544300.jsp#.T9GiHMVDuI8). With WCL production being 7% of Coal India, and WCL Maharashtra being 85% of total WCL production, WCL Maharashtra profits work out at about Rs. 646 crores in 2010-11. A 26% share of this works out to be Rs. 168 crores.

[103] Taking the production of 24,757 million units in Vidarbha in 2010-11, 5% of this comes to about 1237 Million units. If this can be sold at Rs. 3 per unit, it would generate Rs. 371.35 crores, which is equivalent to a cess of 15 paise per unit. If the electricity can be sold at Rs. 4 per unit, this would generate Rs. 495.14 crores, which is equivalent to a cess of 20 paise per unit. We emphasise the benefit share should be finally measured as a percentage of the actual electricity generated. If a cess is to be levied to facilitate the sharing of these benefits, its amount would depend on the price realised for this electricity. As an indication we have shown that how a cess of 15-20 paise per unit could meet the objective.

[104] Considering Rs. 1000 per ton as the average price of coal supplied by WCL, the total amount comes to Rs. 195 crores

The decision on how many new power plants to build and their locations would first have to be taken based on the carrying capacity, river basin and cumulative impact assessment studies. Benefit sharing mechanisms should be put in place for any new plants that are finally decided to be built.

The following benefit sharing mechanisms would be appropriate in case of Vidarbha.

i. A combined (from coal mines and thermal power plants revenues) Local Area Development Fund that will be used for building and running community infrastructure like roads, hospitals, health care, water supply, schools etc.

ii. Ensure electricity for all through provision of money needed for extension of network to all, or for installation of Distributed Decentralised Generation and also provision of actual electricity needed for this. The actual electricity needed for this would be very small. Considering the Rajiv Gandhi Grameen Vidyutikaran Yojana norms of 30 units per household per month, and the number of un-electrified households in Vidarbha[105], the total requirement comes to just 355 MU per year. This is a very small percentage of electricity generated in the region. Undoubtedly, 100% household electrification should have the first claim on the power generated. Indeed, this is such a basic need that we should not restrict this first claim only for Vidarbha, but the first claim on any power generated in the state should be for household electrification for the entire state. As per Census 2011, Maharashtra has overall household electrification levels of 83.9%, and 1400 MU would be need to supply to the entire backlog[106].

iii. Irrigation and water resources development is critical for the region. More agricultural connections and proper supply of electricity to agricultural pump sets for irrigation will boost groundwater development and agriculture. Even if additional electricity is to be supplied for this, the resources implications are not onerous. Currently, the total sales to agriculture in Vidarbha region are of the order of 2,436 MU per year. Such power is supplied on a subsidised basis so increasing it will put more burden on the system. We suggest that such a burden will not be too high, and is justified in view of the impacts the area is bearing. A surcharge on electricity generated, or earmarking some of the coal produced for such power will allow more power to be supplied to agriculture. Thumb rule calculations indicate[107] that earmarking 0.53 million tons of coal per annum can be sufficient to supply 500 MU more to agriculture. This is about 1.42% of the coal mined in the region. While this will not take care of the entire cost of supply, it would be sufficient to bridge the subsidy gap significantly. It may be mentioned that variable cost (mainly consisting of fuel cost) is close to 70% of cost of generation for the TPPs in Vidarbha[108]. So if these additional units are not to bear the cost of coal, their generation cost will come down substantially and hence the subsidy would be taken care of to a great extent.

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[105] Census 2011 data for household amenities: Source of Lighting, http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Household_Amenities.pdf, Accessed on April 16, 2012

[106] It is true that apart from the actual units of electricity, the extension of grid or other decentralized generation plants would also be needed to actually deliver the power to these households. As we have suggested, the cost of that can be met through existing outlays or through the surcharge on the power generated.

[107] Assuming a calorific value of 3300 Kcal per kg of coal, 25% T&D losses and station heat rate of 2618 Kcal/kWh (CEA's weighted average for 67 plants in the country for 2008-09; taken from the CEA report "Performance Review of Thermal Power Stations 2008-09: Highlights", (http://www.cea.nic.in/reports/yearly/thermal_perfm_review_rep/0809/Highlights.pdf)

[108] Audited cost of generation for 2010-11, in MERC (2010a)

a. At the state average rate of electricity use for agriculture, the 500 MU of electricity could support close to 115,000 new connections of 5 HP each[109].

iv. Supply of cheaper electricity to industry. However, once Open Access is fully rolled out, this may not remain as relevant since industry would be able to source power at the least cost from anywhere in the country[110].

The electricity and money required for all this can come by setting a charge on the electricity generated and coal mined. As we have shown earlier, a small charge can lead to a significant resource generation. It should be emphasised that this charge will be in addition to the charge for any clean up.

The charge we are proposing is not too high. Table A3 in Annexure 3 gives the increase in the cost of generation for major thermal power plants in Vidarbha from 2006-07 to 2010-11. Just within a span of 4 years, the cost of generation has gone up sharply. It has increase by 62 paise/unit for Khaperkheda plant and by Rs. 1.36 for Koradi plant. In percentage terms, the increase has been in between 28% to 71%. Thus, the kind of increases we are talking about for clean up and for benefit sharing – around 35-40 paise/unit – are not large at all in comparison and are not going to destabilise the viability of any of the plants.

We would like to reiterate here that to be really effective the benefit sharing mechanisms should be implemented as a part of the entire package starting from initial cleaning up, carrying capacity and cumulative impact assessments etc, and not as a standalone selective measure.

A comparison with the Prime Minister's Package to Vidarbha is also in order here. The Package announced amounted to some Rs. 3750 crores, divided broadly as shown in Table 13[111].

Table 13: Item wise Distribution of Prime Minister's Package for Vidarbha

Description of Package item	Package amount (Crores)
Interest waiver on debt	712
Scheme assistance (for major irrigation)	2,177
Micro irrigation	78
Watershed development, water harvesting etc	240
Others (related to agriculture, seeds, livestock)	543
Total Package	**3,750**

[109] As per the sales records of MSEDCL (http://www.mahadiscom.in), the agricultural connections in the whole state in 2010-11 were around 33, 52,178 connections for LT users and another 1609 HT agricultural connections. The LT connections included both metered and unmetered connections. If we take the data for the metered connections, the utilisation per connection was 4124 units per connection in the year, and connected load was 3.54 KW per connection. (Consumption by Poultry units not included in this)

At this state average rate of electricity use, the 500 MU of electricity could support 121,000 additional connections, at a load of 575,000 HP. This is close to 115,000 new connections of 5 HP each.

[110] It may be mentioned here that the Vidarbha Statutory Development Board also has similar demands [VSDB (2009a)]. Apart from asking that agricultural consumption of each district in the state should be in proportion to the cropped area, it has demanded that new generation plants should be compelled to reserve 10% assured power for area as compensation for the loss of agriculture land, water and causing environmental problems. This 10% power should be supplied to local area at reasonable rate, so that new industries may also come up.

[111] http://pmindia.nic.in/press_rel_01jul2k6-1.pdf, Accessed on May 14, 2012

Considering that the package was to be spread over several years, it would amount roughly to Rs. 1000 crores per year. On the other hand, the benefit sharing measures we are suggesting would be of smaller magnitude - some Rs. 400 crores per year, at today's level of electricity and coal production, but it would be for many more years and would increase if production increases. Moreover, if the other elements of the proposals are implemented properly, they would eliminate many of the causes for agricultural distress by stopping diversion of land and water, controlling air and water pollution and making more electricity available for agriculture. This also shows the importance of non-monetary measures suggested by us and by others.

10. Conclusions

A large number of thermal power projects are proposed to be built in Vidarbha region. The experiences of coal mining and thermal power plants already in existence in the region have given rise to many misgivings, resentment and unrest. There is a feeling that the resources of the region are being diverted to other areas without much benefit to the region, while it is left to bear the brunt of the impacts like pollution, displacement etc. There is certainly much truth in this feeling. At the same time, the region continues to suffer from a development deficit. An examination of this deficit shows that the people most affected are the poorest and the weakest, but other sections of the society are also bear its impacts. The developmental options to address this deficit would need to involve those that can reach directly to the worst off, the farmers, the landless and in a way that its increases the production and productivity of their livelihood resources and puts jobs directly in their hands. This indicates that investments in agricultural, irrigation, land and water development, soil and water conservation, water harvesting and agro-based industries would be crucial developmental options for the region.

Whether these need to be prioritised above thermal power plants and coal mines is a question beyond the scope of this note.

However, our study indicates that thermal power plants and coal mining can address the developmental imbalance only if undertaken under certain conditions and following certain processes.

First of all, while the picture presented is that these power plants represent "use of local resources for local development" as there are significant coal deposits in Vidarbha, the reality is that most of the proposed thermal power plant capacity is to be based on coal imported from long distance, and much of the power is to be exported to load centres far away. This fundamentally challenges the logic of the massive development of thermal power plants planned in the region.

Even if this factor is to be discounted, we suggest that any new development of coal mining and thermal power plant should be subject and conditional to first a cleaning up of the impacts of mines and plants already in existence. This cleaning up should be accompanied by putting in place mechanisms to share the benefits that are already being generated by the existing power plants and mines.

Secondly, comprehensive carrying capacity studies (including river basin studies) should be carried out in a participatory manner through credible agencies and the level of new activity permitted should be based on the results of these studies. Third, for the mines and thermal power plants that are planned subsequent to the carrying capacity studies, there should also be comprehensive environmental impact studies not only for individual plants but also cumulative impact assessments for the total development that is to unfold.

Fourth, benefit sharing mechanisms should be an integral part of any new mines or thermal power plants that are planned.

Moreover, all this needs to undertaken as a whole package and not in selective parts.

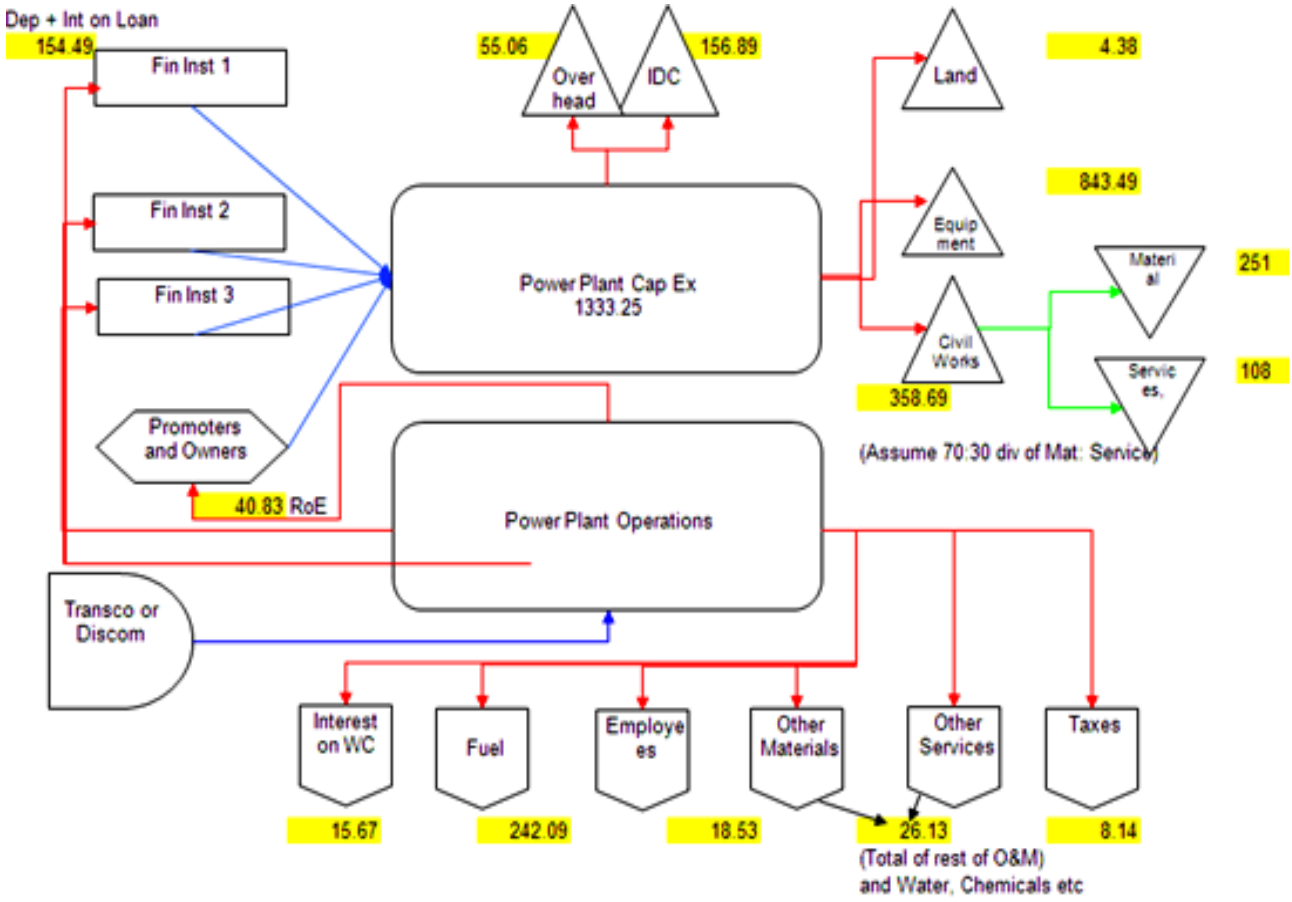
Last but not the least; this entire process needs to be implemented in a participatory manner, with a meaningful role for the local communities in the decision-making, monitoring and implementation of the same. We believe that only when the process is transparent, participatory and accountable will it work.

We would also emphasise that most of the provisions for such a process are already enshrined in the legal and policy frameworks of the country and the state. They only need to be brought together in a holistic and comprehensive manner, and put together for the region.

Unless undertaken through such a process, it is unlikely that coal mining and thermal power plants will be able to play useful roles in addressing the development deficit of the region and use local resources for local development; on the contrary, they are likely to end up aggravating the already serious impacts.

==========END==========

Annexure 1: Chart Showing Item wise Distribution of Capital Investment and Revenues for Paras TPP Unit-4 of 250 MW



As per MERC doc, O&M = Employee expense + Admin and General (A&G) and Repair and Maintenance (R&M). Page 49. We can take these heads or as per MERC.

Annexure 2: Estimating Clean up Task and Costs

Estimating the costs for a clean up – that is, addressing the outstanding social, environmental and other impacts of existing coal mines and thermal power plants – is a process that involves detailed studies and assessments. Preparing and implementing such a clean up plan requires extensive participation of local communities and inputs from multi-disciplinary group of experts. All these are beyond the scope of this report. That is why one of the main recommendations of this report is to carry out precisely such a study and participatory preparation of a plan.

However, for the purpose of arriving at some very rough and ready estimates of the kind of tasks involved, the funds needed etc, we have attempted to put together a broad estimate. We would urge that this be treated only as a first, very rough approximation. The decisions for any clean up charges/ cess and also preparations of clean up plans should be based on more detailed assessments.

Based on the issues identified by us in Chandrapur region, - we have prepared the following listing of some of the important problems that would need to be addressed in the clean up and their costs. The Table A1 below lists these, along with the assumptions and methodologies of these estimates.

Please Note:

1. Activity list is not comprehensive but includes only some key ones.
2. Estimates are only rough estimates.
3. Estimates are not available for all activities. However, we have still listed some important activities where we have not been able to arrive at estimates.
4. In several cases, money may not be the main bottleneck; rather ensuring compliance with existing laws may be more relevant and effective.
5. Methodologies and assumptions for each item given after the table for ease of reading

Table A1: Cost Estimation for Clean up Measures for TPPs and Coal Mines in Vidarbha

Sr. No	Problem	Clean Up Action	Cost (Rs. Crore)	
			Capital	Operational (Annual)
1	Dust deposits from stack emissions from 2340 MW Chandrapur TPP	Wash coal to reduce ash content and hence reduce stack emissions		152.1
2	As above, at other power plants	Similar action for another 1000 MW out of total existing capacity		65.0
3	Depletion of ground water due to coal mines; Water problem in surrounding villages	Assured, piped water supply schemes for all villages in 5 km radius of coal mines	269.0	26.9
4	Depletion of groundwater causes loss of agricultural productivity	Provision of irrigation through minor irrigation schemes	87.0	8.7
5	Roads being damaged, unsafe roads, coal dust emissions etc	Segregate heavy traffic carrying coal etc, have dedicated roads for these	1000.0	40.0
6	Abandoned coal mines	Reclaim and restore the coal mines where mining is over		72.0
7	Fugitive coal dust emissions from transport	Transport coal in covered trucks		

Sr. No	Problem	Clean Up Action	Cost (Rs. Crore)	
			Capital	Operational (Annual)
8	Fugitive emissions from stockyards etc.	Water sprinklers to be installed (where not done) and to be operated properly.		
9	Water pollution from Ash pond	Lining of Ash pond		
10	Health impacts of dust, SPM, water pollution, absence of health care. Key issues will be lung-skin-eye diseases, and heavy metal toxicity. Creation of preventive system, screening and early detection, early warning system and curative system	Dust control, Water pollution control (see other entries in this table)		
		Health Impact Assessment survey to gauge impact		
		Orientation and training of existing health system including PHCs, urban dispensaries and private practitioners to take account of health impacts of TTPs and coal mines		
		Provision of Primary Health Centre, Community Health Centre	63.0	6.3
		Speciality hospital or special facility in all major public health centres like taluka hospitals for likely health impacts of coal mines and TPPS, in particular respiratory diseases, skin ailments, eye diseases and for heavy metal toxicity		
		Ongoing health monitoring system for early detection and screening		
11	Ash dust leading to pollution, covering of plants etc	Reach 100% re-use of ash at the earliest, latest by 2014.		
12	Ash pollution	Reduce the extent of Ash pond and reclaim excess ash pond land		
13	Resettlement of displaced people remaining	Provision of livelihoods, land, jobs, amenities at resettlement sites etc.		
14	People affected by transmission lines – losing land and also restrictions on agricultural and other activities	Bring out a proper policy to compensate transmission lines affected people. Implement it.		
15	Smoke from coal chulhas especially in worker colonies	Provide easy access to workers to LPG, clean chulhas.		
16	Non implementation of laws to control pollution	Monitoring mechanisms including measuring meters at individual discharge points, real time data collection and display on the web, institutional mechanisms like monitoring committees, charges for experts, labs etc.		
	TOTAL (only where estimates are available)		**1419.0**	**369.0**

Methodologies and Assumptions for above Table:

1. Dust deposits from stack emissions from thermal power plant Chandrapur:

Wash coal to reduce ash content and hence reduce stack emissions: Coal washing fee of Rs. 130 per ton, for washing from 40% ash content to 25%[112]. Mahagenco, Chandrapur told Prayas that their ESP were designed for 25% ash content, actual content was 40%. Estimate for Chandrapur plant of 2340 MW, assuming 5 million ton coal/1000 MW/ year.

2. As above, at other power plants

Wash coal to reduce ash content and hence reduce stack emissions: Another 1000 MW capacity (out of total 5260 MW in Vidarbha) may need coal washing to cut ash content.

3. Depletion of ground water due to coal mines & Water problem in surrounding villages

Assured, piped water supply schemes for all villages in 5 km radius of coal mines: Using Planning Commission figure of Rs. 2500 per capita outlay for rural drinking water scheme. Population to be covered calculated based on area for 5 km radius of coal mines, population densities of the district, for total of 53 coal mines in Nagpur, Yavatmal and Chandrapur districts.

Assume 10% of Capital costs as cost of O&M per year.

4. Depletion of groundwater causes loss of agricultural productivity

Provision of irrigation through minor irrigation schemes: Assuming provision of irrigation to all villages in 5 km radius of mines, 53 mines, taking that 70% of the area needs to be provided irrigation, outlay of irrigation at Rs 3 lakhs/ha[113].

Assume 10% of Capital costs as cost of O&M per year.

5. Roads being damaged, unsafe roads, coal dust emissions etc

Segregate heavy traffic carrying coal etc., have dedicated roads for the coal transport: Assuming 200 km of road, using Planning Commission estimate for two lane road under central sector at Rs 5 crores/km[114].

Annual O&M costs at 4% of capital costs.

6. Abandoned coal mines

Reclaim the coal mines where mining is over: Assuming cost of coal mine restoration (for OC mines) at Rs 6 lakhs/ha[115]. Cost estimated for all the land that will be needed to support existing capacity of 5260 MW over 30 years of life[116]. Totals to Rs. 358 crores, and we assume this is spent over 5 years.

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[112] http://www.coal.nic.in/VALUE%20OF%20WASHED%20COAL-CAG%2003-24-11_DELHI.pdf, Slide 38, Accessed on May 30, 2012

[113] Planning Commission (2012b), Page 93

[114] Planning Commission (2012c), Page 10

[115] Government of India (2012b), Page 9

[116] Using estimate by Bhushan (2010), Page 140; which estimates 7.5 ha of land will be needed for producing 1 million ton of coal over mine lifetime and assuming 0.7 kg coal per unit of electricity needed. This gives 1.133 ha of mine area per MW. Total area to be eventually reclaimed would go to 5960 ha as per this.

Alternatively, as per WCL, for 10 major mine projects, excavated area is 57.11 sq km[117], i.e. 5711 ha. Though they claim it is being restored, Prayas visit showed ground reality to be different. Taking this figure will also give similar cost estimates.

7. Health impacts of dust, SPM, water pollution, absence of health care

i. Dust control (see points 1,2,5,7,8,10,11,15), Water pollution control (3,4, 9,10,12):

ii. Provision of Primary Health Centre, community Health Centre and Specialty hospital for respiratory diseases: NRHM estimates of how many PHC, CHC needed per population[118]. Taking population in 5 km radius of 53 coal mines, cost estimates for PHC, CHC from NRHM, total 54 PHCs and 13 CHC needed with cost Rs 35 and Rs. 28 crores respectively. Specialty hospital Rs. Crores. Annual O&M costs at 10% of capital costs.

The Table A1 shows that the clean up will require at least around Rs. 1400 crores of capital investment, and an annual expenditure of Rs. 369 crores. Since we have not been able to estimate the costs for many of the elements, the actual costs will be much higher than these.

However, let us just take these two estimates, and assume that these costs are to come from the electricity generated and coal produced. We also assume that the capital costs are spread over four years, thus needing Rs. 355 crores per year. With annual operation costs of Rs. 369 (neglecting that some of these operational costs will be needed only in the year that the facilities are created), we need about Rs. 720 crores every year for the first four years. After this, the requirement will go down.

The Table A2 shows one manner in which this can be loaded.

Table A2: Calculation of Amount Generated from Clean up Cess from TPPs and Coal Mines

Electricity Generated in 2010-11 (Million units) in Vidarbha	Clean Up Cess (Paise per unit)	Amount Generated (Rs. Crore per year)	Coal produced in the year (Million Tons, incl. Captive mines)	Clean Coal Cess (Rs. Per ton)	Amount generated (Rs. Crore per year)
24757	20	495.14	39.34	100	393.4

Thus, this loading will give about 880 crore rupees per year. Given that we have not included many clean up operations, the actual cess would need to be significantly higher than this. In this case, the Government can also think of allotting for the clean up, some part of the revenues collected by it through the cess, taxes and royalties on electricity and coal, which are substantial, being greater than Rs. 4000 crores per year. At the same time it should be emphasized that the mere allocation of funds is not sufficient and several other measures like monitoring and ensuring compliance are critical to the clean up.

[117] CMPDI (2012), Page iv

[118] Government of India (2011a), Page 3

Annexure 3: Cost of Generation for Vidarbha Thermal Power Plants

Table A3: Cost of Generation for Vidarbha Thermal Power Plants

Sr. No.	Station Name	Installed Capacity (MW)	Cost of Generation at Current Prices (Rs/ Unit)		Cost of Generation at Constant Prices (Rs./Unit, at 2010-11 prices, Using Energy WPI with 04-05 base)		Real Increase in Cost of Generation	
			2006-07	2010-11	2006-07	2010-11	In Paise/Unit	% Change
					WPI = 105.3	WPI =113.2		
1	Chandrapur	2340	1.66	2.64	1.78	2.64	0.86	48
2	Khaperkheda	840	2.02	2.79	2.17	2.79	0.62	28
3	Koradi	1040	1.78	3.27	1.91	3.27	1.36	71

Note- Cost of generation is at Bus Bar

Sources-

1. Installed capacity (2011) - http://www.cea.nic.in/reports/monthly/generation_rep/tentative/may11/opm_02.pdf
2. Audited cost of generation (2006-07)- http://www.mercindia.org.in/pdf/Public_Notice_09_01_08_71_of_07_MSPGCL_Eng.pdf
3. Audited cost of generation (2010-11)- http://www.mercindia.org.in/pdf/Order%2058%2042/Public%20Notice%20English.pdf
4. Energy Wholesale Price Index (WPI)- Energy Statistics, 2012, Ministry of Statistics and Program Implementation- http://mospi.nic.in/Mospi_New/upload/Energy_Statistics_2012_28mar.pdf

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Photographs

Photo 1: Stack Emissions from 2340 MW Chandrapur Super Thermal Power Station (Mahagenco)

Photo 2: Transmission Lines Network in Chandrapur District

Photo 3: Ash Pond of 2340 MW Chandrapur Super Thermal Power Station (Mahagenco)

Photo 4: Working Open Cast Coal Mine of WCL near Chandrapur

Photo 5: Dried Well in February, 2012 near Durgapur and Padmapur Coal Mines

Photo 6: Coal Handling Units and Coal Mines/Overburden in Proximity to Residential Area in Ghuggus

Photo 7: Heavy Transport of Coal Trucks and Roads in Bad Condition at Ghuggus

(All photos taken by Prayas Energy Group during Vidarbha Visit in February 2012)