



Fly Ash Disposal in Mine Voids and Low-Lying Areas

Report of a Field Visit to Bokaro

Summary

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Background

The Ministry of Environment, Forest & Climate Change (MoEFCC) issued an Office Memorandum (OM) on 28th August 2019, permitting the use of flyash in filling abandoned mine voids, in low lying area reclamation and as soil conditioner in agriculture. Though the Fly Ash Notification 1999 (and amendments) had always permitted these uses of fly ash, the Environment Clearances of various thermal power plants since around 2012 have had conditions prohibiting the use of ash via these modes, or allowing it in specific cases in a very controlled manner. This OM has now directed that the prohibiting conditions be replaced with conditions allowing use of fly ash in mine voids/low lying areas / in agriculture. Along with the OM, new guidelines have also been issued by the Central Pollution Control Board (CPCB) which are to be followed when dumping fly ash in mine voids/low lying areas.

The OM and the Guidelines provide a list of conditions that power plant and land owners need to comply with before and after the 'reclamation' of low-lying areas and filling of mine voids using ash. The OM and Guidelines can be accessed here. [Give Links]

Objectives of the Visit

Even though the MoEFCC and CPCB are promoting these methods of ash disposal, there are questions about their environmental safety, about how local communities view these methods of ash disposal, whether these methods help ameliorate the tremendous problems caused by ash ponds, or whether they are themselves creating others issues of concern for the local people.

As part of our research in the efficacy of these methods of ash disposal, and to study these and related questions on the ground, we visited Bokaro, Jharkhand from 6th - 9th April 2022. Thermal power plants around Bokaro have been disposing fly ash in mine voids and on low lying areas for several years.

We visited the following sites along with Gulab Chandra of the Damodar Bachao Abhiyan, who has been active on issue of impacts of coal mines and power plants in the area.

1. Quarry No. 1, Kargali OCP (Central Coalfields Limited)
2. Bokaro OCP Phase 2 (Central Coalfields Limited)
3. Low lying area dump site near Konar Dam
4. Bokaro TPS Ash Pond
5. Tenughat TPS Ash Pond
6. Low lying area dump site near Lalpaniya, Tenughat TPS

Bokaro TPS, Kargali and Bokaro OCP

The Bokaro Thermal Power Station (BTPS) 'A' has one unit of 500 MW capacity, whereas Bokaro Thermal Power Station 'B' had three units of 210 MW capacity each and is owned by the Damodar Valley Corporation. As the Table 1 shows, virtually all ash "utilisation" by BTPS has actually been disposal in low lying area or in mine voids of Central Coalfields Ltd. (CCL) Power plant authorities have been trying to get permission to dump ash in more mine voids for the last few years

The Kargali Opencast Project (OCP) as well as the Bokaro OCP comes under Bokaro & Kargali Coalfield owned and operated by Central Coalfields Limited and are situated in Bokaro district, Jharkhand.

Table 1: Ash Utilisation Data of BTPS for Last Four Years

Year	FY 2017 - 2018	FY 2018 - 2019	FY 2019 - 2020	FY 2020 - 2021
Fly Ash Generation (MT)	0.8753	0.8274	0.6681	0.7973
Fly Ash Utilisation (MT)	0.7391	0.2989	1.0464	1.0243
Percentage Utilisation- Total (%)	84.44	36.12	156.61	128.47
Mode-wise Utilisation as % of total utilisation				
In manufacture of cement	0	0.93%	4.24%	4.86%
In construction of Highways and roads including flyovers	0	0	14.12%	0
In reclamation of low lying area	0	0	81.64%	95.13%
In mine void filling	98.6%	99.02%	0	0
In agriculture/waste land development	1.40 %	0	0	0

(Source: Central Electricity Authority)

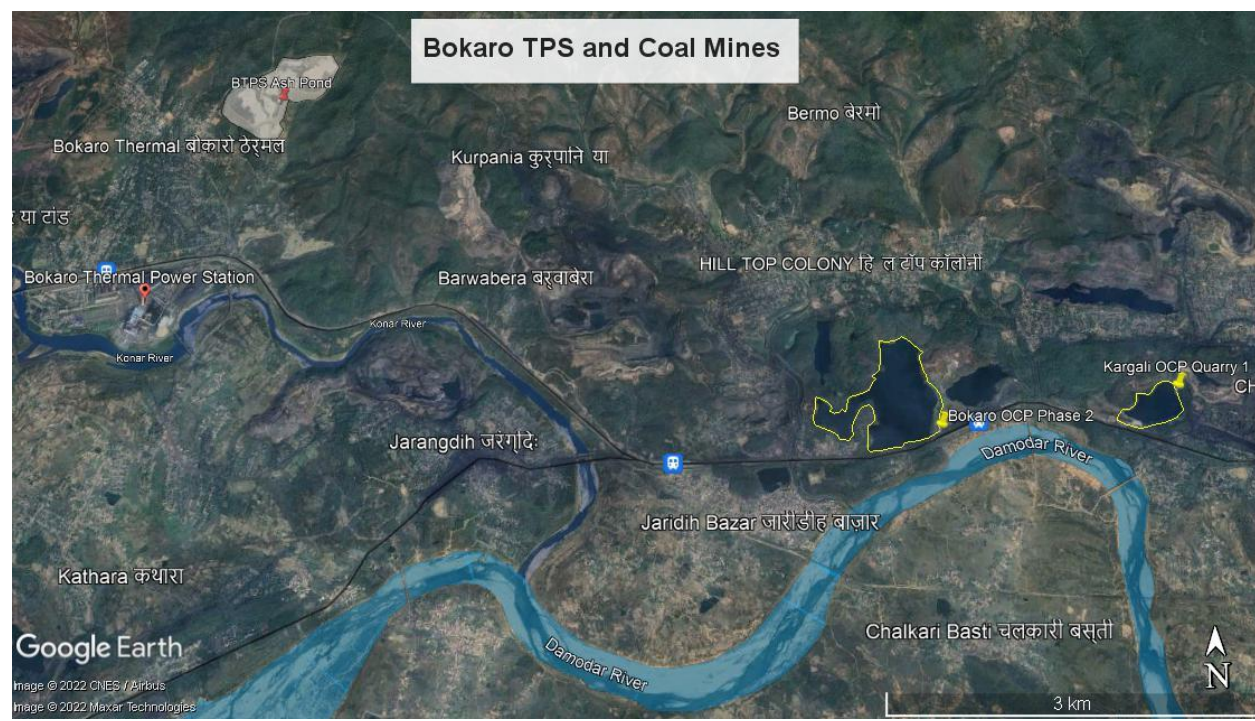


Figure 1: Map 1 - Bokaro TPS and surrounding coal mines

Ash dumping in mine voids by Bokaro TPS

Quarry No. 1, Kargali OCP

Quarry No. 1 of Kargali OCP is located approximately 0.5 km away from Ram Vilas High School in Bermo, Bokaro district. It has been non-operational for some years now, and its quarry 1 is filled with water. As told to us by the local activists, a segment of this mine void was filled with ash and covered with soil about 7-8 years ago. This segment appears now as compacted, with vegetation growing on top of it.



Figure 2: Quarry 1, Kargali OCP- Newly dumped ash in the mine void and another segment with vegetation on top visible

The other segment of the void is currently being filled with flyash from DVC's Bokaro Thermal Power Station (BTPS). We saw the mine being filled with ash. Ash is brought to the mine in covered trucks, after which, the covering is removed, and ash in dry form is directly dumped into the section being reclaimed. The section of the mine being filled is an almost 45 m strip from the edge of the mine. The ash is dumped into the depths of the mine and then as the dumping reaches the surface, a layer of soil is put on the top of the ash. We were told the ash has been dumped here since the last two years.



Figure 3: Quarry 1, Kargali OCP - Mounds of flyash and soil placed along the void



Figure 4: Quarry 1, Kargali OCP - Ash filled trucks unload ash into mounds along the edge of the void



Figure 5: Quarry 1, Kargali OCP-Ash filled trucks unload ash into piles along edge of mine void

Abandoned mine voids act as reservoirs of large quantities of water (though this may need treatment before allowing any human use). Gulab Chandra explained that given the state of depleting ground water levels, many locals see the mine pit water as an important potential water source, and fear that filling up abandoned mine voids with ash could contaminate this source badly, depriving them of a valuable resource. A February 2020 report by the Central Ground Water Board (CGWB) *Report on Dynamic Ground Water Resource of Jharkhand (2020)* states that out of a total 249 administrative blocks in the state, only 3 are classified as “over-exploited”, the highest level of depletion, and Bermo block is one of the three. (Page 49).

Bokaro OCP Phase II

The Bokaro OCP Phase II is located about 1.8 Km kilometers away from Quarry No. 1 of Kargali OCP. but the process has stopped several years ago. The void contains large quantities of water, and the local activists told us that the depth of water in the void would be approximately 80 feet. One segment of the void has been filled with ash and covered with soil, and plantation had been done about a year back, as per the board put up at the site. We were told that the species planted were *Acacia* and *Chakaundi* (local names) as well some *sheesham* and *amla*.



Figure 6: Bokaro OCP II - Water in the mine void, ash dump on opposite mine wall visible

Though ash filling by BTPS began here in 2014, with plans of filling the entire mine void, vocal opposition from local civil society group Damodar Bachao Abhiyan resulted in halt of the activity. They argues that a large source of water which could be used for the people of the district could be lost if filled with ash, and groundwater recharge points in the region might also be impacted.



Figure 7: Bokaro OCP II- Plantation on the top of ash dump

The Jharkhand Government's Department of Agriculture, Animal Husbandry and Cooperative (Fisheries Directorate) lists 1741 'Coal Pits and Mines' as an aquaculture resource in Jharkhand. According to Gulab Chanda, the Jharkhand State Government's Fisheries Department has been assisting people to carry out fishing (*machlipalan*) in the water in the void for the last 6-7 years. However, the fish grown in the void is often sold at cheaper rates in the market than other fresh water fish, with the reason given that it is grown in the mine void. This shows that mine voids are considered important fishing resources in Jharkhand, and filling abandoned voids with flyash can pollute the water and potentially contaminate the fish, threatening livelihoods that are and can be supported by these fisheries.



Figure 8: Bokaro OCP II - Abandoned quarry filled with water, vegetation growing on opposite side



Figure 9: Bokaro OCP- Old voids of Bokaro OCP completely 'reclaimed' using ash, houses constructed on top of the filling

Ash dumping in 'low-lying' area near Konar Dam by BTPS

We visited a large ash dump, approximately 30 ft. in height (as estimated by us) and spread over 5.76 acres area (measured using Google Earth Pro), at a distance of about 0.5 Km from the Konar Dam reservoir boundary wall. Along the way, several small to medium dumps of flyash were also seen. The ash has been dumped on this large area and compacted, and covered with soil. Pits have been dug at regular intervals with what appears to be the intention of planting trees on this dump. According to Gulab Chandra, the ash here is also from BTPS. The way to the dump is lined with old trees throughout, and the ground below the dump (i.e., ground on lower height as seen from on top of the dump) is also covered with trees. Satellite imagery from the last five years shows dense tree cover which has been cleared to make way for this ash dump.



Figure 10: Ash dumps near Konar Dam - Several small to medium dumps can be found on roads around the Konar Dam

A boundary wall that has been constructed along the bottom of the ash dump possibly to preventing ash from flowing with rain water into local water bodies. However, ash that has been carried by water flow has accumulated at the wall, and it's only a matter of time before the ash laden waters will start flowing over the wall contaminating local water bodies.



Figure 11: Ash Dump near Konar Dam -Large ash dump covered with soil, with pits at regular intervals for plantation; photo taken from on top of the dump

A report by Regional Office (Ranchi) of the MoEFCC in November 2019 has also documented rampant flyash dumping near Konar Dam and related violations of the Environmental Clearance conditions of BTPS. The report states that additional land than permitted area (up to above ground level) is being used for ash dumping near Konar dam without protection measures; that there is no impervious lining for the dumping near Konar dam; that at the time of MoEFCC authorities' visit, ash was found to be spreading with the rain, and that water from the ash dump was flowing into surrounding areas. During our visit, almost all these concerns of ash dumping near Konar dam without much protection could still be observed, even though more than two years have passed.



Figure 12: Ash dump near Konar Dam -Cracks in ground reveal layers of ash among layers of soil; flyash piles in the background also visible



Figure 13: Ash dump near Konar Dam- Boundary wall along the edge of the dump at the bottom; ash reaching the level of the boundary wall and trees in surrounding areas also visible



Figure 14: Ash dump near Konar Dam - Piles of ash visible around/on the way to ash dump area near Konar Dam



Figure 15: Satellite Image from 2016 shows dense tree cover



Figure 16: Satellite Image from 2019 shows large ash dump



Figure 17: Satellite image from 2020 shows ash dump increase in size

Tenughat TPS

Tenughat TPS (TTPS) is owned by the Jharkhand state government's Tenughat Vidyut Nigam Limited. It is located in Lalpaniya in Bokaro district, with an installed capacity of 420 MW. The plant is located near Tenughat reservoir. The TTPS has been dumping ash at many locations around the plant on low-lying areas. As Table 2 shows, this is its only way of "utilisation" of ash. . We visited one such location.

Table 2: Ash Utilisation data of Tenughat TPS for four years

Year	FY 2017 - 2018	FY 2018 - 2019	FY 2019 - 2020	FY 2020 - 2021
Fly Ash Generation (MT)	0.6034	0.4931	0.6842	0.5194
Fly Ash Utilization (MT)	0.5373	0.6419	0.4517	0.4773
Percentage Utilisation - total(%)	89%	130%	66%	92%
Mode-wise Utilisation as % of total utilisation				
In reclamation of low lying area	100.00%	99.68%	100.00%	100.00%
Other modes of utilisation	0.0000	0.31%	0.0000	0.0000

(Source: Central Electricity Authority)



Figure 18: Map 2- Tenughat TPS, ash pond and some surrounding ash dumps which were visited by us

Ash dumping in 'low-lying' areas by Tenughat TPS

A settlement named *Jhari basti*, located along the railway tracks passing through Lalpaniya, is surrounded by large ash dumps. The dumping has been done in what is called 'low lying area' by the plant authorities, and appears to be dumped over several years. Where previously people cultivated crops, now there is grass, on land raised about 25- 30 feet above 'ground' level – essentially large dumps of ash covered with soil. Old ash dumps covered with layers of soil can be seen on either side of the railway tracks, and are less than 1 Km from residential buildings.



Figure 19: Tenughat Low Lying area ash dumps - Flyash and soil covered ash dump visible near residential buildings

There are about 15-20 houses on one side of the railway line, with families who have been living there for over a decade and have experienced the impacts of excessive flyash dumping all around their land. They say that the ash dumping has made their land non-cultivable, '*banjar*', over time, and that they haven't been able to successfully farm for 3 years now, the time from when the ash dumping started near their *basti*. Airborne flyash from ash mounds located few kilometers away as well the local dumps settles on the standing crop, people's homes, vehicles, water storage materials etc. Ash has even deposited in the village well. 3-4 buffalos have died after getting stuck in the ash slurry during monsoon time. When it rains, the ash mixed with water flows and eventually makes its way to the Tenughat reservoir. About 12-13 families have been resisting the impact of pollution on their lives by writing to local authorities (SDO), but they have not received relief so far.



Figure 20: Tenughat Low Lying area ash dumps - Ash laden road on the way to Jhari Basti; photo taken from on top of ash dump

The locals also mentioned that such dumps are common— around 13 other such large dumps, i.e, ‘low lying land reclamation’ are spread across the region.

The objective of filling up low lying area with ash is typically to fill an area which is in lower elevation to bring it to the surrounding ground level. However, the dumps seen by us at Lalpaniya seemed to be large dumps jutting out above ground level.



Figure 21: Tenughat Low Lying area ash dumps-Ash routinely covers the grazing land in vicinity of Jhari Basti

An EAC sub-committee report from MoEFCC dated December 2017 also confirms the extent, the illegality and the impacts of these fly ash dumps which we saw and which the people told us about. The report notes excessive dumping of flyash around plant areas, overflow and visibly exhausted capacity of ash pond, as well discharge of water (the plant has a once through cooling system) into nearby water bodies and the Tenughat reservoir without any treatment or regular monitoring.

The report also mentions that, *“This open dumping of flyash poses serious threat to the water reservoir as the runoff during monsoon will carry flyash and heavy metals and eventually joins the reservoir.”*

Most importantly, the sub-committee had recommended that all ash dumped in open areas be removed immediately. However, over four years after the recommendation of the sub-committee report, excessive flyash dumps in surrounding areas remain as they are, as observed by our team.



Figure 22: Tenughat low lying are ash dumps - Photograph of large ash dump near Jhari Basti above; Satellite Image of same ash dump below (Figure 22)



Figure 23



Figure 24: Satellite Image from 2019 shows ash dump visited by us



Figure 25: Satellite Image from 2021 shows increase in area of ash dump as well as another ash dump in the vicinity



Figure 26: Satellite Image from 2022 shows spread of the ash dumps and proximity to residential colony and Jhari Basti

The team also visited the TTPS ash pond. We found ash slurry being disposed of in the ash pond in one part. At another part, we also saw pond ash being removed and taken away in trucks. We were told that this ash is being taken to be disposed in the dumps like the one which we had visited, as there is no space in the ash pond for more ash if existing ash dumped here is not removed.



Figure 27: TTPS Ash Pond - Ash slurry flowing into pond, TTPS chimney visible in background



Figure 28: TTPS Ash Pond- Trucks stationed for loading with flyash at one section of ash pond

BTPS Ash Pond

The ash pond of Bokaro Thermal Power Station breached in September 2019 flooding 20 DVC quarters and nearby farmland with ash slurry. We spoke with locals in Bazar Tand, and a senior villager told us he had still not been compensated for the damage caused by the ash slurry breach to his standing crop (rice). Parts of his agricultural land, and that of several others cannot be used like it was before, as it was not adequately cleaned in the aftermath of the breach – all this over two years after the incident occurred. The locals mentioned that ash carrying trucks pass through their village throughout the day, covering the terraces of all homes in a 1 inch layer of ash. Even though they clean their houses in the morning, by the evening, the house floors and insides also get covered in ash.



Figure 29: BTPS Ash Pond - One section of ash pond with BTPS visible in background

During the visit to the ash pond, we also had a meeting with the BTPS ash pond's Site In-charge (SI). He confirmed what the villagers had alleged after the breach – there is no space for the large quantity of ash that gets generated daily on a continuous basis. In response to an RTI application filed by us, DVC authorities have provided copies of their letters urgently requesting CCL for mine voids for ash filling, in which they state that the BTPS units' operations will have to be stalled if they do not find place i.e., mine voids, for dumping the ash. The SI also informed that as recently as January 2022, the plant had to be temporarily shut down due to lack of space in the ash pond to dump the ash. According to the Central Electricity Authority, between March 2019 and March 2022, different units of BTPS have been reported as shut down due to 'ash handling system problem' 5 times, sometimes for over 30 days at a time.

Findings: Gross Violations & Environmental Risks

Our visit has revealed that the Bokaro TPP as well as the Tenughat TPP are disposing off ash in minevoids and in low-lying areas in gross violation of various related norms as well as in breach of the orders given by the official agencies like EAC and MoEFCC. Further, though such disposal started well before 2019 – the year in which MoEFCC issued the OM and Guidelines – it is clear that after 2019 the

guidelines given by CPCB along with the OM should be followed for use of ash in low lying area reclamation or mine void filling. We found many of these being violated.

Pre-2019 Ash disposal in Mine Voids and Low-lying areas

1. The disposal of ash in the quarries of Kargali and Bokaro OCP is directly leading to the contamination of the mine water. This could pose serious risks if the water is used for human consumption, producing crops, fishing etc.
2. The disposal of fly ash on large areas of so called low-lying land is threatening contamination of water resources around. This specific disposal has been highlighted as a violation of one of the Conditions of Environmental Clearance given to the BTPS by the EAC.
3. EAC has also highlighted that the ash dumps near Konar dam are dumped without any protective measures, ash was found spreading with rains, and effluents are not in control.
4. The disposal of fly ash in dumps around the Tenughat TPS is having a serious impact on the health, lives and livelihoods of local communities, and also leading to contamination of water and soil. These local communities are raising these issues with the authorities from time to time but are not getting any satisfactory response.
5. The MoEFCC regional office has also noted in its inspection visit to the Tenughat TPS, ash pond and nearby areas that the ash pond is leading to severe air, water and land pollution.
6. The MoEFCC Regional office has also noted the many ash dumps all around the Tenughat TPS area, and has warned that this open dumping of flyash poses serious threat to the water reservoir as the runoff during monsoon will carry flyash and heavy metals to the water body. It has also recommended that these waste dumps shall be immediately removed and kept in a controlled pond.

Post 2019 Ash Disposal in Mine Voids and Low-Lying Area

The violations and severe environmental risks noted above remain a concern even for the disposal going on today. After 2019, such ash disposal needs to follow the OM and the Guidelines, and we noted several violations of the conditions / processes given by the OM and Guideline.

Conditions Given in Guidelines/OM and Their Implementation in Bokaro

S.No.	What it says in OM or Guidelines	Violation/ Deviation from Guidelines
1.	Minimum 500 m distance from river/water body to maintained for ash disposal in abandoned mine voids	Distance between both Kargali Quarry 1 (currently ash from BTPS is being dumped) and at Bokaro OCP –II is less than 500 m from Damodar river
2.	Adequate drains to be provided around mine voids to prevent surface runoff of water mixed with ash	We could not see any drains around Kargali Quarry 1 or Bokaro OCP Ph -II
3.	Prevent pollution during excavation of pond ash, filling area and ash transportation for low-lying area reclamation	There are no arrangements around areas “filled” with ash at near Konar dam or Tenughat TPS to prevent ash run-off with rain water, or to stop ash being blown in the wind. At Tenughat ash pond, we saw fly ash being transported from ash pond to disposal sites in uncovered trucks .
4.	Flood plain area, Ecologically Sensitive Areas, agricultural land, forest land, gochar	The large ash dump near Konar dam has been made after clearing of dense tree cover. In Jhari

	kishan land are not permitted to be reclaimed using ash	Basti, cattle grazing area and agricultural fields have been affected by ash dumps that are surrounding them – even if one says that the dump itself is not in agricultural land, all the agricultural/grazing land near it is being affected, so the spirit of the guidelines is still being missed.
5.	Fruit bearing species are to be avoided for plantation purpose on top of mine voids reclaimed using ash	Amla is a fruit bearing tree, which is being grown on ash reclaimed land at Bokaro OCP II.

KEY INSIGHTS

The activities of using ash to fill empty mine voids or low-lying areas in Bokaro, Jharkhand raise several questions about environmental and social impacts.

1. Empty mine voids have capacity to store large quantities of water. In a region where the water sources are already stressed due to over exploitation and pollution from multiple industries, filling the voids with flyash, which is known to contain several toxic heavy metals, risks contamination of a water source. This is a fear that the local communities have also raised.
2. There seems to be lot of fishing activity in different coal mines/pits in the state of Jharkhand with potential for more. Ash dumping could lead to fishing being disallowed in the mine voids, potentially impacting livelihood opportunity.
3. The various ‘low lying area reclamation’ we saw that were filled using ash of BTPS and TTPS, all seemed more like dumps than reclaimed lands. These dumps are having serious impacts on local communities, their livelihoods, health as well as contaminating local water and soil resources.
4. It is not clear whether the studies that are mandated by the 2019 guidelines are being carried out, as the ash filling has been going on since before 2019. However, with the new procedure in place, the authorities will have to carry out these studies before going ahead further with the ash disposal. They cannot use it as an excuse to avoid the studies needed as well as the various permissions needed.
5. The impacts due to fly ash disposal in mine voids or on low lying areas on the environment can be reported to the Jharkhand State Pollution Control Board, and any deviations from the guidelines are to be treated as violations of the Water Act (1974) and Air Act (1981). However, it does not appear that the JSPCB has taken cognizance of these issues.

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