

POLICY *Brief*

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Fire Alert in Coal Mines

An assessment of India's preparedness to deal with Coal Mine Fire and the strategy forward

India officially, for the first time, reported incidence of coal mine fire in Jharia coal mine at Bhowrah Colliery located in the eastern state of Jharkhand in the year 1916, since then more than 70 fires were underway in 1980s and no action was taken by the authorities to control them. The discussion on coal mine fire even today is largely focused around the economic loss to the country and the environmental damage caused by it is entirely overlooked. Big mine operators like Coal India Limited (CIL) or Bharat Coking Coal Limited (BCCL) have never considered or understood the importance of formulating a control mechanism, neither have they bothered to undertake environmental restoration activities or the need to provide compensation to affected people. The numbers of coal mine fires are constantly expanding and it is high time now that the government consider the need to formulate an action plan to deal with these fires

Introduction

Coal mine fires are the underground smoldering of coal deposits, which frequently occur in coal mines. Coal mine fires can occur at any location in active or abandoned mine areas, can quickly grow beyond control, and they threaten the welfare and livelihood of the entire underground workforce.¹ Since fuel sources are typically distributed throughout a mine, a fire can spread quickly over large lateral distances.² Among the causes of coal mine fires, insufficient techniques used in coal mines like conversion of underground coal mines into opencast coal mines and burning of stubble, weeds or trash in close vicinity of a coal mine are the most imperative causes.³

Massive Economic and Environmental Loss

Uncontrolled coal fire occurrences pose multiple threats to the environment and economy of countries. Besides causing enormous wastage of natural resources, coal mine fires lead to land subsidence and air pollution. The effects of air pollution caused by coal mine fires can be traced as far as 400 km from the source region.⁴ The emissions from coal mine fires mainly consist of various greenhouse gases which are chiefly responsible for contributing to global warming. According to the paper “Potential health impacts of burning coal beds and waste banks” by R. B. Finkelman of the U. S. Geological Survey, air pollution is one of the main problems caused by surface and underground coal mine fires. Air pollution along with it brings health hazards. According to Anupama Prakash, a geologist at the University of Alaska, who has conducted extensive research on coal mine fires, pollution from the burning coal beds causes people to suffer from asthma, chronic bronchitis, skin disease and lung disease.

The contribution of coal fires to the global pool of atmospheric CO₂ is little known but potentially significant. The fire in coal mines emits greenhouse gases, like carbon dioxide (CO₂) and methane

¹ Understanding mine fires by determining the characteristics of deep seated fires by The National Institute for Occupational Safety and Health (NIOSH), in partnership with the Mine Safety and Health Administration (MSHA), accessed on <https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/umfdb.pdf>

² Edwards, J.C., and C.C. Hwang, 2006. CFD Modeling of fire spread along combustibles in a mine entry. In: SME Annual Meeting and Exhibit. Preprint 06-027. Littleton, CO: Society for Mining, Metallurgy, and Exploration, Inc., pp. 1–5.

³ *Extreme Science: Town On Fire*, Popular Science,(July 15, 2015), Available at <http://www.popsci.com/extreme-science-centralia>

⁴ Debi Goenka et al., *Regulating Air Pollution from Coal Fired Power Plants in India*, Economic & Political Weekly (2015)

(CH₄) as well as mercury (Hg), carbon monoxide (CO) and other toxic substances⁵. Other potentially harmful coal-fire emissions include benzene, toluene, ethyl benzene, xylene isomers (BTEX) and polynuclear aromatic hydrocarbons (PAHs). BTEX compounds are known to be carcinogenic and PAHs are known to have carcinogenic, mutagenic and teratogenic effects.⁶

Some of the problems associated with the issue of coal mine fires are lack of action taken by the authorities, a shortage of data on the extent of damage done, the lack of a fire detection mechanism, continued mining operations despite fire occurrences and the absence of a task force to tackle them.

Lack of Action by the Authorities

Despite the seriousness of the problem, no significant action has been taken by authorities to tackle the problem of mine fires. The first incidence of coal mine fires in India was reported back in 1865 in Raniganj coal field, whereas the first official record of coal mine fire is traced back to 1916 in Jharia mine at Bhowrah Colliery.⁷ By the 1980s more than 70 fires were underway and no action was taken to control them by the authorities; they were left to smolder in the hope that they would burn out but the opposite happened and more fires sprouted. As a result, the economic loss has been tremendous.

According to Glenn Stracher, Professor Emeritus of geology & physics

at East Georgia State College, more than 37 million tons (worth billions of dollars) of coal has been lost at Jharia coal mine and 1.4 billion metric tons became inaccessible due to fire.

Jharia coal mine continues to remain an environmental hazard with neither Coal India Limited or Bharat Coking Coal Limited officials coming to a decision on how to control these fires despite Prime Minister Narendra Modi's announcement

Lack of Data

There is no definite data on the extent of property and health damage that has occurred till date from mine fire. India lacks data on the geological condition of the underneath seam as well. The

⁵ Alan Kolker and Mark Engle, *Emissions from Coal Fires and Their Impact on the Environment*, Available at: <https://pubs.usgs.gov/fs/2009/3084/pdf/fs2009-3084.pdf>

⁶ Stracher et al., 2004; Pone et al., 2007; Zhao et al., 2008; Carras et al., 2009; Hower et al., 2009; O'Keefe et al., 2010, 2011; Engle et al., 2011, 2012

⁷ *India creates a record, allows Jharia coalmine fires to burn for a century*, Times of India (February 10, 2016), Available at: <http://timesofindia.indiatimes.com/city/kolkata/India-creates-a-record-allows-Jharia-coalmine-fires-to-burn-for-a-century/articleshow/50928024.cms>

analysis of coal mine fire impact is largely focused on the economic aspect, and lacks data with respect to the effect on public health or the environmental damage caused from it. The situation is worsened in absence of any uniform database, as various research papers and web-links give different data for the same mine field.⁸

Lack of Fire Detection Mechanism

Early detection of fire hot spot is also not practiced here in India. There is a need to improve in this direction, as by now there is enough evidence, which shows that delayed identification of fire point in an underground coal mine can be disastrous. Use of infrared sensors for detection of hot spot in pillar, continuous monitoring of carbon monoxide in segments of mine airway and environmental tele-monitoring system are some of the proven mechanisms for early detection of heating⁹.

Continued Operation despite Fire Occurrence

Companies involved in mining often continue working in adjacent mines even after reported incidence of fire occurrences, which in turn increases the potential hazard cycle. Such an approach conveys a disregard for the gravity of the situation with respect to the large environmental harm caused as well as the safety of the laborers working in the mines. Additionally, continuous expansion or change in the operation mode of mines, such as shifting from underground to open cast mining practices in those mines which are already under fire, causes the fire to spread at an advanced rate rather than diminishing. A study titled, "Spontaneous heating and Fire in Coal Mines" by Ran Vijay Kumar Singh also substantiates the fact that, immense heat trapped in the strata causes the fire to flare up as soon as any excavation is attempted.¹⁰ In Jharia, according to the local activist Ashok Agarwal, as soon as large scale opencast mining was started in the area, the face of underground

⁸ Fred Pearce, *The Human Cost Of India's Push to Produce More Coal*, Yale Environment360, Available at http://e360.yale.edu/features/on_burning_ground_human_cost_indias_push_produce_more_coal

⁹ A Zutshi, S.K. Ray et al., *Indian Coals vis a vis Spontaneous Heating Problems*, Journal of Mines, Metals & Fuels. Available at: <http://cimfr.csircentral.net/194/1/4.pdf>

¹⁰ Ran Vijay Kumar Singh, *Spontaneous Heating and Fire in Coal Mines* Procedia Engineering 62 (2013), Available at: https://ac.els-cdn.com/S1877705813012289/1-s2.0-S1877705813012289-main.pdf?_tid=f66de048-b2f4-11e7-9a53-00000aacb35f&acdnat=1508215263_5c18b844518f30c122684b62bf038da3

galleries containing small pieces of coal was opened up, leading to free flow of air inside. As the fires got exposed to the open air, its speedy spread becomes an issue.¹¹

When attempts to bring the fire under control fail, and the fire is likely to endanger the safety of people, sealing of the fire is the only solution, However, this technique has been avoided, allowing the fire to spread more, so as to mine more coal, thereby causing a large loss to the environment as well as humans.

Constitution of Task Force

India does not have a task force to monitor the operation of a coal mine, so as to enable timely identification of the potential of fire occurrence and to take immediate action for mitigation of the same.

CONCLUSION

The coal mine fire incidence has always been looked at from the perspective of economic loss to the country. The damage to the local ecology, air pollution potential, health impacts are some of the matters which have received very little attention, as evident from the instances of mine fire that have persisted for nearly a century now.

Mining operations in mines where coal fires are burning should be immediately shut down, and the fire extinguished completely, before resuming mining operations. It is also imperative that no environmental clearances be granted for expansion of mining projects, or opening new mining activity in areas in close vicinity of mines that are in close vicinity of mines that are on fire.

Formulation of a time-bound national level action plan for controlling the fire incidence, imposition of fire detection mechanism and constitution of task force to exclusively deal with such fire occurrences are the needs of the hour. The State Pollution Control Boards in the relevant regions should also monitor the Ambient Air Quality as provided under the Environment Protection Rules, 1986 and ensure that these standards are complied with.

A detailed research of geological characteristics of the seam must be carried out, so as to identify and subsequently isolate the susceptible seam which may catch fire.

¹¹ *India: The Burning City*, Al Jazeera (January 5, 2017) available at <http://www.aljazeera.com/programmes/peopleandpower/2016/07/india-burning-city-160711081146127.html>