Studies On The Impact Of Bauxite Mining Activities On Environment In Kolhapur District

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Abstract: -

The Western Ghats, one of the 34 global biodiversity hotspots, retain more than 30 % of all plant, fish, herpetofauna, and mammal species found in India. This ecologically sensitive and fragile region in Kolhapur district has now been subjected to developmental activities such as dams, mining, road construction, sugar industries, etc. Bauxite mining is one such major open cast mining activity which has significant negative impact on the local environment. The major threats of this activity are dust pollution, vegetation loss, forest fragmentation and biodiversity loss, negative impact on water resources, generation of wastelands and social impact.The study revealed that the legal and illegal mining activity has initiated serious environmental degradation in the region. Though mining initially provided job opportunities for limited inhabitants and generated revenue to Government, it would last only for a short period. However, the damage caused to the local ecology as a result of the changed land use is permanent.

Keywords: - Western Ghats, Bauxite mining, Environment

Introduction:

Since prehistoric times minerals have been extracted from the earth and the history of society and industrial development has been linked with man's ability to harness and use the resources available to him. Minerals are indispensable inputs in economic sectors such as aerospace industry, agriculture, construction and civil engineering, defence, energy, information and communication technologies, health and transport (Christman, 2010). Mining is the extraction of valuable minerals or other geological materials from the earth, from an ore body. The nature of mining processes creates a potential negative impact on the environment both during the mining operations and for years after the mine is closed. Accordingly, mining inevitably alters the environment and so has an environmental impact. The degree of impact can vary from more or less undetectable to highly disturbing and depends on the mineral worked, the method of working, and the location and size of the mine (Bell and Donelly, 2006).

India being a country rich in minerals has more than 20,000 mineral deposits all over. For example in 2010-2011 the country produced 84 minerals, valued at '2,00,609 crore. Mining and quarrying sector accounted for 2.26 per cent of the total Gross Domestic Product (GDP) (at constant prices) in 2010-11 at '1,10,482 Crore. However, the contribution of the sector to GDP has stood at about 2.2-2.5 per cent in the last decade. The number of reporting mines in India was 2,628 in 2010-11 as opposed to 2,999 in 2009-1011. The royalty collected from non-coal minerals in the country was '4,470 Crore in 2010-11(Bhushan, 2011).

The Western Ghats (WG) are one of the 34 'hotspots' of global biodiversity supporting a variety of rare and endemic species of plants and animals which are threatened due to human activity. The height of the crest of the Northern Western Ghats in Maharashtra is around 900-1000m above Mean Sea Level (MSL), reaching to 1400m at some places (e.g. Mahabaleshwar). The plateau region in the northern sector of the Western Ghats and the Konkan lies approximately between $15^0$60' E - $20^0$75'N and is composed largely of Deccan flood basalts, except in the southernmost tip of Konkan. Many of the plateaus in the region have undergone heavy weathering and have well formed soil layers supporting woody or forest growth. Most plateaus have rocky surface exposed as a result of lateritisation. In some parts the laterite cap has eroded exposing the basalt in the form of rocky plateaus. The distinctness of rock outcrops from the surrounding is a major factor which leads to exclusivity of the unique plant diversity on them (Watve, 2010). Hence, they have been described as "terrestrial habitat islands" and the microhabitats on them as "islands upon islands" (Porembski et al.2000). Now the Western Ghats are under a tremendous pressure. Activities such as deforestation, shifting cultivation, dam construction, mining, industries, hunting, roads, and unplanned tourism are having a negative impact on the eco-sensitive Western Ghats. Given the environmental sensitivity and ecological significance of the Western Ghats region and the complex interstate nature of its geography, the Ministry of Environment & Forests constituted Western Ghats Ecology Expert Panel (WGEEP) headed by eminent ecologist Prof. Madhav Gadgil in March 2010.The panel was asked to identify the Ecological Sensitive Areas (ESAs) along the Western Ghats and suggest

how to manage them (Gadgil et al.; 2011). On the basis of careful and extensive compilation of information, and wide-ranging field visits, consultations and analysis, the WGEEP designated the entire Western Ghats into three categories as Ecologically Sensitive Area (ESA) and assigned three levels i.e., Ecologically Sensitive Zone (ESZ) I, ESZ II and ESZ III of Ecological sensitivity to different regions of it (WGEEP, 2011). Subsequently MoEF formed a high level working group under Dr. K. Kasturirangan to take the individual states opinion about ESZs and its implementation.

Kolhapur district forms an important part of the Western Ghats. Out of the many developmental activities ongoing in the Western Ghats region of Kolhapur district, mining for bauxite is one of the major activity which has direct relevance to ecology of the region. The present study is an attempt to find out the direct and indirect effects of bauxite mining activity on environment in the ecosensitive region of Western Ghats in the district.

Material and methods

Study area

Kolhapur district is situated in the extreme southern part of Maharashtra State. It lies between 15° 43' and 17° 17' north latitudes and 73° 40' and 74° 42' east longitudes. The Sahyadri hill ranges to the west and Varna river to the north, and hilly boundaries of Goa and Karnataka in the south and Karnataka Deccan plains in the east define the borders of Kolhapur district. The district has an area of 7,685.00 sq.kms. and population of 3,523,162 people (Census 2001). The bauxite deposits in Kolhapur district are much more uniform and extensive so as to be called blanket type. The study area includes 8 ongoing, 4 potential and 1 abandoned bauxite mining sites in the Kolhapur District (Figure 1, Table 1).

Sr. No.	Bauxite mining sites	Total Rainfall (2003-2012) in mm			MSL in m	Mining Area in Ha
		Max	Min	Mean		
1	Mine Site 1, Taluka.- Shahuwadi	3450.5	1620.6	2199.3	1022	776.78
2	Mine Site 2,Udgiri, Tal.- Shahuwadi, Kolhapur	3450.5	1620.6	2199.3	909	254.51
3	Girgaon, Taluka-Shahuwadi	3450.5	1620.6	2199.3	990	140.20
4	Burambal Taluka-Shahuwadi	3450.5	1620.6	2199.3	1002	243.72
5	Dhangarwadi, Taluka-Shahuwadi	3450.5	1620.6	2199.3	1015	122.60
6	Durgmanwadi,Taluka-Radhanagari,	5424.0	2834.0	4068.1	989	204.56
7	Kasarsada,Village Bhogoli , Taluka-Chandgad	3586.0	2054.0	2883.4	1040.0	210.99
8	Minche Budruk, Taluka-Bhudargad	2758.4	1277.4	1751.1	1004.0	98.00

Table 1:-A detailed profile of the Bauxite mines in the study area

Figure 1:- Location map bauxite mining sites in the Kolhapur district

Methodology:-

The paper is part of Ph.D. dissertation and is based on field observations, interaction with locals and communication with Government officials and mine owners. Extensive site specific photo documentation was done and Google images were studied to identify the actual environmental impacts of bauxite mining. Secondary data was collected from relevant sources such as Dept. of mines, Collector Office, Kolhapur, Department of Geology and Mining (DGM). Extensive review of literature was also carried out.

Results and discussion:-

It is evident from the study that the current mining activity is grossly detrimental to the environment in the ecosensitive Western Ghats. The major threats of mining are dust pollution, vegetation loss, forest fragmentation and biodiversity loss, negative impact on water resources, generation of wastelands and social impact.

Dust pollution:-

It was observed that the entire bauxite mining area and all roads leading to mines, ones denuded of forest have become dusty due to increased dust pollution. Blasting, drilling and transportation activities are found to be the major source of dust pollution. The intensity of movement of ore transporting vehicles varied from one site to other. This continuous movement of heavy vehicles such as dumpers and trucks generate large amount of dust which settles on the surrounding vegetation which has caused stunted growth and even death of some trees (Plate 1, figure 1). The mandatory sprinkling of water on the roads and mining sites to prevent dust pollution is either insufficient or lacking. During summer months, due to scarcity of water in the region, this problem becomes more serious. Presence of all weather asphalt road leading to bauxite mines at sites namely Durgamanwadi and Kasarsada, the level of dust pollution is reduced to some extent.

Loss of vegetation, forest fragmentation and biodiversity loss:-

Bauxite ore is often confined to the top of different chains of plateaus located between 700m to 1100 m above MSL (Table 1). These outcrops are frequently termed by developmental agencies as "wastelands", a terminology that reflects relatively barren and unproductive landscape. However these habitats are "special habitats", which harbour a variety of flora and fauna. Watve (2010) recorded 360 species of Phanerogams (angiosperms and Pteridophytes) from rocky plateaus sites in Maharashtra of which 146 were endemic. It was observed that many plateaus in the study area have undergone profound weathering and have formed soil layers which support woody or forest growth. In some parts the laterite capping has eroded to expose the basalt again in the form of rocky outcrops. Bauxite ore usually occurs 5 to 8m below the upper lateritic layer which is also called as 'overburden'. To access these deposits the above ground vegetation needs to be completely removed in the 'opencast' type of mining operation practiced in bauxite mining. Large scale deforestation was observed at all bauxite mines in the study area. The vegetation adjoining the bauxite mines was also found to be affected due to the dumping of overburden on it.

The natural vegetation in and around the mine sites, plateaus, slopes or nearby areas is diverse and consists of evergreen, semi-evergreen, and moist and dry deciduous and sub tropical hill forest. The Chandoli National Park boundary in the north is adjoining the Udgiri bauxite mine while the Radhanagari Wildlife Sanctuary borders the bauxite mine at Durgamanwadi. It was also found that a number of reserved forests are within the 10 km buffer of each bauxite mine. Much of the un-mined land with the respective companies has good vegetation cover adjoining to the forest. Most importantly the bauxite mines located at Udgiri, Girgaon, Burambal, Dhangarwadi and Durgamanwadi are located along the dense patches of forests which act as a narrow wildlife corridor between two very important Protected Areas in the northern Western Ghats i.e. Chandoli National Park and Radhanagari Wildlife Sanctuary. The proposed Sahyadri Tiger Reserve also falls under this area. Also most mines fall in Eco Sensitive Zone (ESZ) I category as per the WGEEP (2011) recommendations. The Committee has also suggested no new mining lease and total phase out of ongoing mining by 2016 in this zone (WGEEP,2011).

The roads leading to bauxite mines often go through the dense forest (Plate 1, figure 2). Before the mining activity the roads were narrow and used by the locals. With the bauxite mining activity now the roads have become much wider adding to increased deforestation and forest fragmentation. The road leading to Udgiri bauxite mining site is nearly 30 Km in length from the State highway and passes through very dense forest. At Dhangarwadi bauxite mine a completely new road is under construction which is not even useful for the locals. The truck and dumper transport has caused canopy opening of forests which is affecting the local movements of wildlife. The noise generated by blasting and movement of heavy machinery and transport of ore by roads through the pristine forest has caused serious disturbance to the behaviour of wildlife. Road kills due to accidents is common especially during night time.

Impact on water resources:-

All bauxite mines in the study area are located at high altitudes which receive high annual rainfall in the range of 1000 to 5500 mm. The details of location of mine sites and site wise maximum, minimum and mean rainfall are given in table 1. Several springs, streams and rivulets originate and flow through these bauxite mining sites. Near all mining sites, within a radius of 10 Km distance, there are more than one dams which may be a medium or major irrigation project. The details of streams/rivers and dam projects in the upper catchments are provided in table 2.

Name of the mining site	Dams within 10 Km radius border from bauxite mine	Stream/River
Udgiri	Warna dam-major dam(N)□ Kansa-Minor dam(S)□ Kandvan-Medium dam(S)	Kansa river origin□ several streams of Warna river
Girgaon	Kasari-medium dam(NW)□ Paleshwar-medium dam(N)	Several streams of Kasari and Shali river
Burambal	Kasari-medium dam(NW)□ Paleshwar-medium dam(N)	Several streams of Kasari and Shali river
Dhangarwadi	Kasari-medium dam(SW)□ Paleshwar-medium dam(SE)□ Kasarde-minor dam(NE)	Several streams of Shali and Kadavi river
Durgamanwadi	Radhanagari-major dam(S)□ Tulshi-major dam(NE)□ Kumbhi-medium dam(NW)□ Dhamni(under progress)(N)	Several stream of Dhamni river and Radhanagari dam
Minche Budruk	Dudhganga-major dam(W)	Several streams of Dudhganga river and Morvholoda Nala
Kasarsada	Phatakwadi-medium dam	Several streams of Ghataprabha and Tamraparni river

Table 2:- Dams and stream/river in the 10 Km radius border from the bauxite mine

The bauxite mining activity taking place in the upper catchment of the rivers is seriously affecting the water resources in the study area. It was observed that at all sites the mining activity has highly negative impact on both the groundwater as well as surface water. Bauxite mining and associated activities like blasting, removal of ore, movement of heavy vehicles has adverse impact on small springs and streams which supply water to the main river thus disturbing the flow rate of river. The overburden stored on nearby slopes also contributes to the increased level of soil erosion. Often the retaining walls, if constructed, are not of proper height and strength (Plate 1, figure 3). It was observed that the turbidity in these streams and rivers, especially during the rainy season, is very high on account of intense soil erosion. This has led to increased run-off, degradation of aquatic habitats and contamination of drinking water supplies. Rathore and Wright (1993) concluded that increased runoff, erosion and sedimentation, increased concentrations of chemical constituents and decreased quality of aquatic habitat are negative effects of surface mining. As the study area receives high rainfall the mobility of pollutants from ore deposits may increase to a large extent. Impacts to water include the build-up of sediments that may contaminate with heavy metals or other toxic products. The use of water for ancillary activities such as dust suppression on roads, plantation and domestic consumption puts an additional pressure on the scarce water resource.

Generation of wastelands:-

The bauxite mining activity has led to formation of large areas of wastelands in the ecosensitive Western Ghats (Plate 1, figure 4). Most mines lacked the mandatory operation standards and restoration efforts and have failed to ensure proper mining on scientific basis. The plantation carried out by some companies is only patchy, demonstrative and superficial which is often carried out with the exotic species. The phased reclamation and restoration management plan has remained on the paper with very little of its implementation. This has caused a high negative impact on the biodiversity, land use, hydrology, soil conservation and aesthetics of the region.

Social impacts:-

It is often claimed by the mining companies that mining provides employment to the locals. However, it was observed that the employment potential of the mining was much less than claimed and very few locals are actually benefited. Most mines had workers from other areas which has caused influx of labours from outside. This migration has caused increased pressure on the locally available natural resources such as water, fuel wood etc. Also the areas have experienced large number of truck accidents, even fatal causing serious discontent and agitations among the locals. Repeatedly this becomes a law and order problem.

Conclusion:-

The bauxite mining activity in the in the eco-fragile Western Ghats on many counts is detrimental to the environment. There is lack of strong and effective measures for the reclamation and restoration of mined land by the respective companies. Mining being a temporary economic activity leaves long term socio-economic and environmental footprints. Though it provides employment to some locals it is only for a short period of time till the deposits last. The real beneficiaries are outsiders and the company owners. There are incidents of illegal mining operations in the region. The Western Ghats region in which the bauxite mines fall is very ecosensitive as per WGEEP but now it is considered as a "World Heritage Site" by UNESCO. The already abandoned mine in the district (i.e. Nagartaswadi) without restoration is an example of how mining should not be done. Therefore attempts to be made to close all ongoing mines at the earliest by sound scientific measures and restored to the near natural conditions as per the mandatory norms. No new mining activity should be allowed in the ecologically fragile and vulnerable region.

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Plate 1

1) Negative impact of dust pollution on vegetation at Udgiri (Kolhapur)

2) Disturbance to Wildlife due to truck transport through dense forest at Chandgad (Kolhapur)

3) Absence of retaining walls, enhancing soil erosion. Girgaon

4) Generation of Wasteland due to abandoned mine at Nangartaswadi