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ENVIRONMENTAL POLLUTION BY GOLD MINING – A CASE STUDY OF ROBERTSONPET (K.G.F.) URBAN AGGLOMERATION, KARNATAKA

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ABSTRACT

Man by his own activities, has jeopardized the ecological systems, upon which the very existence of humans depends, and has caused such a large scale environmental degradation which has posed a threat to his own survival. Among various anthropogenic activities, mining is an important activity which has lead to severe environmental degradation. The wastes generated by mining activities have to be disposed off in such a way that minimum impact is seen on the ecosystems. The study area namely Kolar Gold Fields (K.G.F.) presently called Robertsonpet Urban Agglomeration, has huge gold mining waste dumps resulted due to disposal of the mining mill tailing material. It is big problem and causes contamination of land, air and water. Present study highlights the impact of these huge mining mill tailing dumps, locally called cyanide dumps, on the township and its inhabitants. Study has also suggested some remedial measures to be taken to minimize environmental pollution in the study area.

INTRODUCTION

Direct threats to human health are most obvious aspects of environmental deterioration, and of these the phenomenon commonly lumped under the term 'pollution' is the most important. Pollutants reach us through the air we breathe, the water we drink, the food we eat, and the sound we hear.

The mining activities, whether open cast or underground, cause serious environmental problems. A certain amount of environmental degradation has to be accepted in mining industry or the society has to forego the industrialization and socio-economic change. Hence, with this background an attempt has been made to study the impact of mining and the consequential dumping of tailing materials in environment.

STUDY AREA

Kolar Gold Fields (K.G.F.) was a principal gold mining centre in the country during late 19th and throughout 20th century. K.G.F. Urban Agglomeration, presently called as Robertsonpet Urban Agglomeration (RUA), is located in Bangarpet Taluk of Kolar district which is in southeastern part of Karnataka State in India. The area lies between 12°, 13' and 13°, 30' north latitude, and 78°, 10' and 78°, 20' east longitude. The study area has an altitude of 884 meters above mean sea level and covers an area of 58.12 sq.km. Robertsonpet area has an undulating hilly topography. Robertsonpet was essentially a gold mining township and the mining activity is more than a century old.

According to 2001 census, the total population in the town of Robertsonpet Urban Agglomeration was 1,56,961. The decadal population growth was 0.14 percent. Density of population was 2,700 person per square kilometre. There is a slight increase in the sex ratio. The Sex ratio was 998 females per thousand males, and the total literacy rate was 89.36 percent. According to 2001 census, 24.39 percent people are categorized as 'main workers', 74.06 percent as 'non-workers', and the rest 1.53 percent 'marginal workers'. Mine workers migrated to this mining town as early as 1890s.

The main objectives of the study are:

1. To understand the environmental degradation of RUA which was once a principal gold mining town (K.G.F.) in the entire country.
2. To know the kind of environmental pollution that has taken place over the years in RUA. This objective encompasses the study of location and size of the gold mining waste disposal which are locally known as cyanide dumps.
3. To highlight the environmental hazards linked with gold mining over the years, which are causing health hazards in RUA.
4. To study run-off as the rainfall contributes to the washing down of mill tailings. This results in flooding of the low lying areas. This causes pollution of water bodies. The mixing of town's drainage with mining mill tailing dumps aggravates the environmental problems.

METHODOLOGY

In order to study the environmental degradation in RUA basic data related to origin and evolution of K.G.F. gold mining in Robertsonpet Urban Agglomeration, have been collected from Abhishankar (1968), Gupta (1980), Eswarappa (1989), Aga & Balinga (1989) & Saldana (1987). Other data on these aspects have been collected by field work during 2003-04.

Gold Mining Activity and Mill Tailing Dumps

The study area was explored for the presence of gold as early as 1802, and till 1880 sporadic workings were recorded. Later in 1880 John Taylor & Sons of United Kingdom, who were then pioneers in mining activity, were given the contract for exploration and in 1885 Kolar Gold Fields (KGF) was established. The mine was very profitable and it prospered till 1950. In 1956, it was nationalized and taken over by State Government and later in 1962 by Government of India. The gold production has come down drastically and the mining activity was closed on March 2001. Due to closure of gold mine, the historical name of Kolar Gold Fields (K.G.F.) has also disappeared from the census records of 2001.

The contribution from KGF was about 850 tons of gold to the country and along with it, the mill tailing dumps have increased in and around the mining township. There are 13 major dumps on the surface accumulating about 50 to 60 million tons of tailing materials occupying about 15% of the total land area in the town. Some of the cyanide dumps rise to a height of 35 to 40 meters above ground level amidst human settlement, thus altering the topography of the region and also a source for pollution (Fig. 1).

Land Use and Pollution

The total land area of RUA is 58.12 square kilometre. This has been broadly taken into consideration for the analysis of different land uses in the town (Table 1).

Land use simply means the utilization of land devoted to human activities. The activity of extraction of minerals from earth in the form of underground mining causes less damage to the environment compared to surfacial mining, but the main problem is the mining waste disposal. The scattering of fine powder containing deadly chemicals from the cyanide dumps of Bharath Gold Mining in KGF has created a 'dust hazard'. Over one hundred years of gold mining has created these man-made hillocks. They resemble small hills in Robertsonpet, Oorgaum, Marikuppam, Andersonpet,

Champion Reefs and Coromandal areas. Mine wastes have accumulated in these areas since 1880. After extracting gold, the residue, which is in slurry form, is dumped on the surface (Table 2).

The mill tailings contain sodium cyanide which is used (0.1% to 0.2%) along with lime to extract gold. Other additional chemicals used are copper sulphate and sodium silicate.

The cyanide dumps seen in the town are an eye sore causing health hazards. Due to these dumps, the township and surrounding areas are covered by cloud of dust with pungent smell of sulphur dioxide due to oxidation of sulphide associated with the tailing materials causing air pollution or dust hazard. In some low lying areas froth is seen on the surface due to acidification of the tailing materials of sulphide dust due to interaction with water. The dust particle size is less than 10μm and its inhaling causes health hazards. Though respiratory allergy is quite common in the town but a detailed multidisciplinary study can reveal the reason for the spurt in allergy.

The pollution of land and water is caused due to mine waste/mill tailing run off, thus resulting in silting up of water bodies, which is common feature in the study area. The siltation of tanks and land extends beyond 10 kms from these dumps.

The earlier land use was basically for agriculture in and around the mining area when tailing material was less. The production was stepped up with new deposits discovered which consequently increased the tailing material.

Table 1: Land use of Robertsonpet (KGF) Urban Agglomeration, 2003-2004.

Land Use	Area in sq.km	Percentage
1. Residential area	15.98	27.50
2. Commercial area	1.00	1.73
3. Public utility services	5.50	9.46
4. Mining related land uses	3.75	6.45
5. Mill tailings (Cyanide Dumps)	8.89	15.29
6. Industrial land use	3.75	6.45
7. Open space/arable land	19.25	33.12
Total Area	58.12	100.00

Source: Data collected and complied by field survey during 2003-2004.

Table 2: Gold ore, gold and mining waste in KGF Urban Agglomeration, 1881-1990.

Year	Gold Ore Production (Tones)	Gold Production (in Tones)	Mining Waste (in Tones)
1881-1900	61,00,000	89.6	6099910.4
1901-1910	69,00,000	170.8	6899829.2
1911-1920	59,50,000	125.5	5949874.5
1921-1930	64,40,000	117.0	6439883.0
1931-1940	51,00,000	99.4	5099900.6
1941-1950	52,90,000	63.3	5289936.7
1951-1960	45,40,000	54.1	4539945.9
1961-1970	36,40,000	32.5	3639967.5
1971-1980	35,20,000	19.4	3519980.6
1981-1990	30,00,000	11.7	2999988.3

Source: Data collected and complied from B.G.M.L. A Profile, Primary Census Abstract.

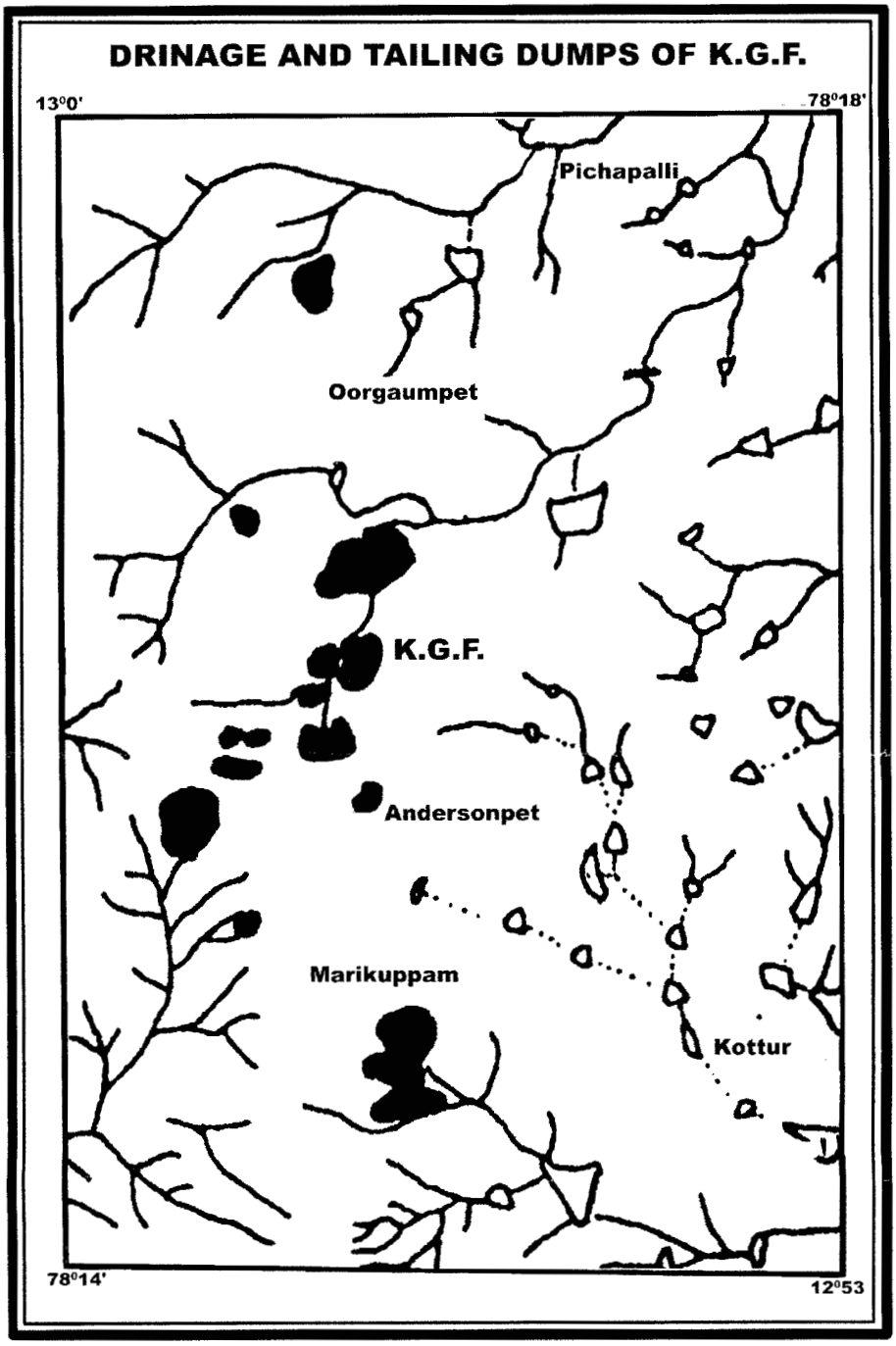

Fig. 1: Drainage and tailing dumps of KGF.

The study area was drained by three streams of which two are perennial due to mill water and city sewage flowing through the tailing dumps. They cause floods during monsoon and dump tailing materials into the tanks and to fertile agricultural lands. No bunding or other techniques were adopted to contain the encroachment. Even if a land is present, it is grossly inadequate, thus pollution of surface and water bodies is inevitable. The fertile land is lost due to such phenomenon in and around the mining area. It is in terms of hundreds of hectares, which was once used to grow vegetables, paddy, ragi, groundnut etc., but the land owners today have given up the agricultural practices as no crops grow on such contaminated soils. The other major problem is in the areas of cultivation of coconut trees. The trees have withered due to contamination by the encroaching tailing waste on fertile land. The agriculture of such crops uses tank/well water. But off late some of the tanks were silted up due to tailing wastes of the mine. The thickness of the flooded tailing material in some regions ranges from 2 to 10 m. An example to quote is of Lakshmisagar tank, which existed for decades, but is no more today due to filling of tailing material. Farmers having lands in and around this tank have become owners of the contaminated land. Such lands, containing high percentage of heavy metals, retard the growth of plants. In places where toxicity is high only few resistant shrubs and plants such as *Agave, Eucalyptus* and *Acacia* species thrive. Even the water in dug wells adjoining the contaminated lands have a colour tinge, and such waters used in agricultural practices have given either very low yield or found to be unsuitable for agriculture. Silting continues even today unabated, though few check dams have been constructed but they too got filled up during the first monsoon rains and are of no use.

STRATEGIES AND CONCLUSION

The materials present in the dumps are very fine grained, semi-consolidated, friable, uniform in texture and soft, hence they are more prone to easy dispersion by winds and other agents of denudation. The water that falls on these dumps infiltrates quickly leaving dry surface, which is susceptible to wind erosion. In case of water, gully erosion can be prevented by construction of check dams to prevent silting up of tanks and streams. Also, due to flooding, the encroachment of fertile land and residential areas can be prevented by these structures. Afforestation with trees, shrubs and grasses which thrive on such dumps, can be taken up on priority basis on all the dumps. Though, an attempt has been made in this direction on some dumps successfully, still there are cyanide dumps where such conservation measures are required. This will prevent the pollution due to both wind and water in coming years. As mining activity is closed there are chances of leaving these environmental problems unattended. This is a serious issue for the Robertsonpet town dwellers.

A pilot study was carried out a decade ago to use this huge quantity of tailing material for making building bricks with addition of suitable stabilizing agent, and the same was recommended but due to lack of proper initiative still it remains as a report. The other option, though very expensive, is to put back the tailing materials into old mines, which would permanently solve the environmental problems of the township. But it depends on complete closer of the mine. Some are of the opinion to revive gold extraction. Again, it depends on gold price and cooperation of local political leaders. It can be developed as an underground mining training or even tourism centre.

At present there is a lot of land used for mill tailing dumps, which often causes air and water pollution even after the closer of mining. There is a need to protect people and surrounding lands from the dust hazard. In this direction trees have already been planted. And apart from gold, some other trace minerals can also be extracted from these cyanide dumps, which would create additional jobs to manage the available land resources of the once famous gold mining town.

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