



## **Socio-economic Impact of Unsystematic Mine Closure: A case of Kolar Gold Fields**

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### **Abstract**

This paper aims to study the Socio-Economic impact of unsystematic mine closure on the community and the neighborhood which is completely dependent on the mining. The sudden closure of the mines will affect the community's entire livelihood and has counter effect on health, employment, environment, population and economy. India as a developing nation with its rich minerals content contributes sufficient towards the economic growth of the mining industry but the livelihood of the mining workers and their family are always kept in high level of risk. The policies and acts to control unplanned mine closure and counter its effects on the community should be made strong by the government. Kolar Gold fields, Karnataka (KGF) which holds a history of 120 years of mining and second deepest mine in the world has been chosen for the study. It is one among of the mines in the country which experienced the unsystematic closure in 2001 and facing its effects due to mill tailings, land contamination and loss of employment till date. These issues and challenges faced by the people of KGF will be addressed and can be improved if the government, mining company and people show their support and interest for reviving the town.

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### **Keywords**

Mining; Socio-economic; Mine Closure; Un-employment; Economic decline; Degradation of land; KGF

### **1. Introduction**

Globally India a country with rich culture and heritage, adding to it nation holds a base of diversified minerals. This diverse base which uphold the mining sector contributes about 2.5% of GDP in overall industrial sector's GDP of 10%, which is comparatively less but the impact it creates on the environment and people is high. (Mining in India, 2012). Especially in the case of abandoned mines, which have unplanned/ unsystematic mine closure. This unplanned closure is one among the reason for degradation of land, environment and people's livelihood.

As per United Nations Convention to Combat Desertification (UNCCD) by 2045, globally, 135 million people will be displaced and 12 million hectares (mha) of land will be degraded. (United Nations convention on combating desertification, 2001) India, a developing country with world's 2nd largest population, will get affected in its per capita land holding, which will further affect agriculture and trigger migration. The per capita land holding in India was 1.4 hectares (Ha) in 2001 and 1.3 Ha in 2011. The desertification or degraded land status in India as per ISRO it is about 96.40 mha that is about 29.3% of the total geographic area. (ISRO land degradation atlas, 2016).

The reason for land deterioration can be categorized into two, Natural and Man-made activities. The degradation which happens because of man-made activities are due to Mining, Industrial activities and Waste dumping has more effect in the respective order. The effects which is created by the mining is because of leaving the mining site

abandoned. There are about 81 abandoned mining sites in the country which are closed before the amendment of mine closure plan in 2003 (Abandoned Mines list, 2003).

### 1.1. Mining in India

India is a mineral-rich country, with more than 20,000 mineral deposits. The country produces about 90 minerals, which include four fuels, 10 metallic, 50 non-metallic, three atomic and 23 minor minerals (Mining in India, 2012). It is the second largest producer of chromite, barytes and talc in the world, and ranks third in production of coal and lignite, and fourth in production of iron ore, kyanite, andalusite and sillimanite (Mining in India, 2012). In 2010-2011, India produced mineral value of 2lakh crore. It was more than the previous year value 1.7lakh Crore in 2009-2010. The total GDP share from Industrial Sector is 10 %, from the Mining and Quarrying industry is 2.25% (2011), which less than the previous year value 2.5% (2010) (Mining in India, 2012).

### 1.2. Major issue

The stripping ratio, which is the volume of waste generated for per ton ore extraction. In India, we have faced a huge issue because of it. The amount waste generated is 1.15 to 1.5 times more than the ore extracted. For example, to extract one ton of iron ore the waste produced here is 1.15 tones and in Australia is 0.13 tones. These generated tailing forms a big pond / heap of dump near the mining site which creates a huge kiosk during the monsoon and heavy winds. These tailing pond/ dumps is always left as it is after the closure of mine and no proper measures are taken to dispose it from the site.

### 1.3. Mining legislation in India

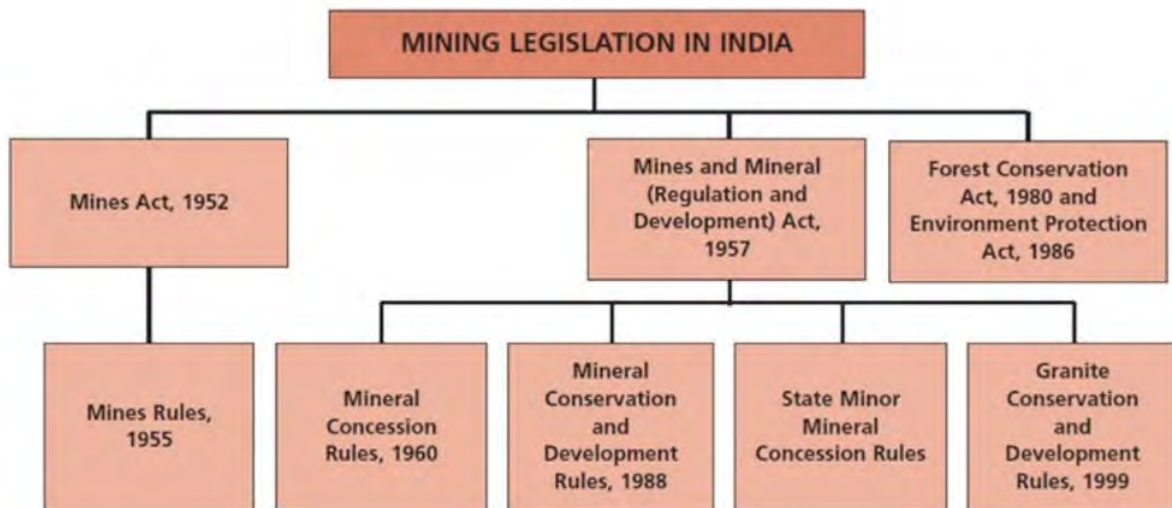


Figure 1. Mining Legislation in India.

From the Fig.1, the rules and acts which have been amended in past years talks more about the resource's conservation, environmental protection, forest conservation. But, as per Hoda and Shah commission under Ministry of Mines says there is no inclusive addressing of social, economic and environmental issues. Even after introduction of Mine closure plan,2003 it has found 81 mining sites are abandoned in the country and the number is still counting it clearly says that still law should be made much strong and reinforced. This will help to lessen the impact on the community and the land getting abandoned.

## **2. Literature Study**

### **2.1. Abandoned mines**

Abandoned mines are sites where mining activities happened, but considerable mine closure and reclamation did not take place. It contributes to the environmental degradation left by significant mining activities which occurred before mine closure regulations were developed.

### **2.2. Desertification of land**

As per UNCCD, Desertification is the continual degradation of land under the impact of natural and man-made activity in arid, semi-arid and dry-sub, humid climatic region. It affects two third countries of the world and one third of the earth's surface.

#### **2.2.1. Global scenario**

As per UNCCD, it is said that 135 million people may be displaced by 2045, about 12 million Ha of land will be decertified and there will be need for more 70% agricultural practices to feed everyone by 2050.

#### **2.2.2. India's land degradation scenario**

As per ISRO 2016 Atlas on land degradation, 96.40 mha of land is degraded (29.32%) of Total Geographic Area. In 2011, it was 23.95%. India occupies 2-3% of the total Global land area and accommodates 16% of the global population. India comes under very poor category in terms of per capita land holding Globally is about 3.7ha/ capita (2011) and in India is about 1.4 ha (2001) and 1.3 ha (2011). We can see decadal decline of about 7%.

### **2.3. Planned and unplanned mine closure**

Planned mine closure is an act when the leased company/ person takes the responsible to recover the lost ecology, treated waste disposal and reuse of the land for the public benefit. This will not harm the surrounding and environment after the time of closure with a prior intimation. This will help to recover/ restore the lost ecology of the place which was disturbed during the course of mining.

Unplanned closure of mines is when a company closes its mine without any prior intimation and leaves the environment, waste without any consideration to reduce the further effect. This will leave the ecology of the place disturbed and pollutes the surrounding even after shutting down of mine.

### **2.4. Mill tailing/ dump**

The waste/ slag which is generated from the processing of ore to extract the minerals. The waste generated is usually dumped near the site in a million tons of heap or pond without any treating and it will decay the land, environment surrounding it

### **2.5. Effects of unplanned mine closure**

The unplanned mine closure majorly affects the community on three parameters likely physical, environmental and socio-economic. Each of this parameter have sub-considerations.

- Physical: Health, Safety, Visual impact and Dust problems.
- Environmental: Air, Water and Land pollution.
- Socio- economic: Loss of employment and Business activity

Mitigations for these issues can be done through reclamation/ restoration for Physical and environmental parameter and it's a lifelong process. To tackle the issues related with socio-economic parameter will be addressed through rehabilitation strategies which bring new land use, employment, character and vibrancy to the place which has been lost. So, it's more important to consider the socio-economic at top position because the other two parameters come along the cycle of reviving.

### 3. Site and its importance

The site chosen for the study is Kolar gold fields (KGF), Karnataka. The approximate co-ordinates 12.9585° N, 78.2710° E. It is a mining region and taluk, in the Kolar District of Karnataka state, India. Robertsonpet is the headquarters of KGF. It is about 30 kilometers from Kolar and 100 kilometers from Bangalore. Bharat gold mining limited (BGML) and Bharat earth movers limited (BEML) are the major two industries set up in KGF. Population of the place is 1,62,000 (As per 2011 census); Area under KGF Municipality is 58.12 square kilometers.

The town was known for gold mining for over a century. This place has biblical reference and evidence for availability of gold. It is believed that mining started here in 4000 BC and gold articles from Harappa and Mohenjo-Daro were made of gold taken from KGF. Formal gold mining started in 1880 by MS. John Taylor & Co., under the British rule. Later it was undertaken by Indian government and separate organization BGML was formed.

This was the first place in the country to get electricity, rail network, telephone connection, golf course, KGF Club and First grade college before independence. Robertsonpet the town headquarters was the first planned layout in the nation which was developed by the Britishers for people who came from other places to start business and support the mining community will all these developments even before independence this place was called as "Little England".



Figure 2. India map showing Karnataka

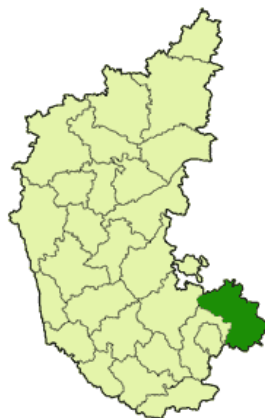


Figure 3. Karnataka map showing kolar district



Figure 4. Kolar district map

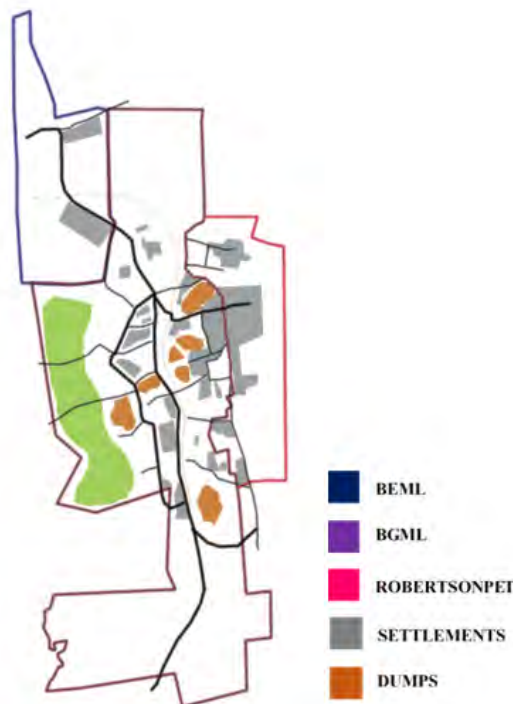
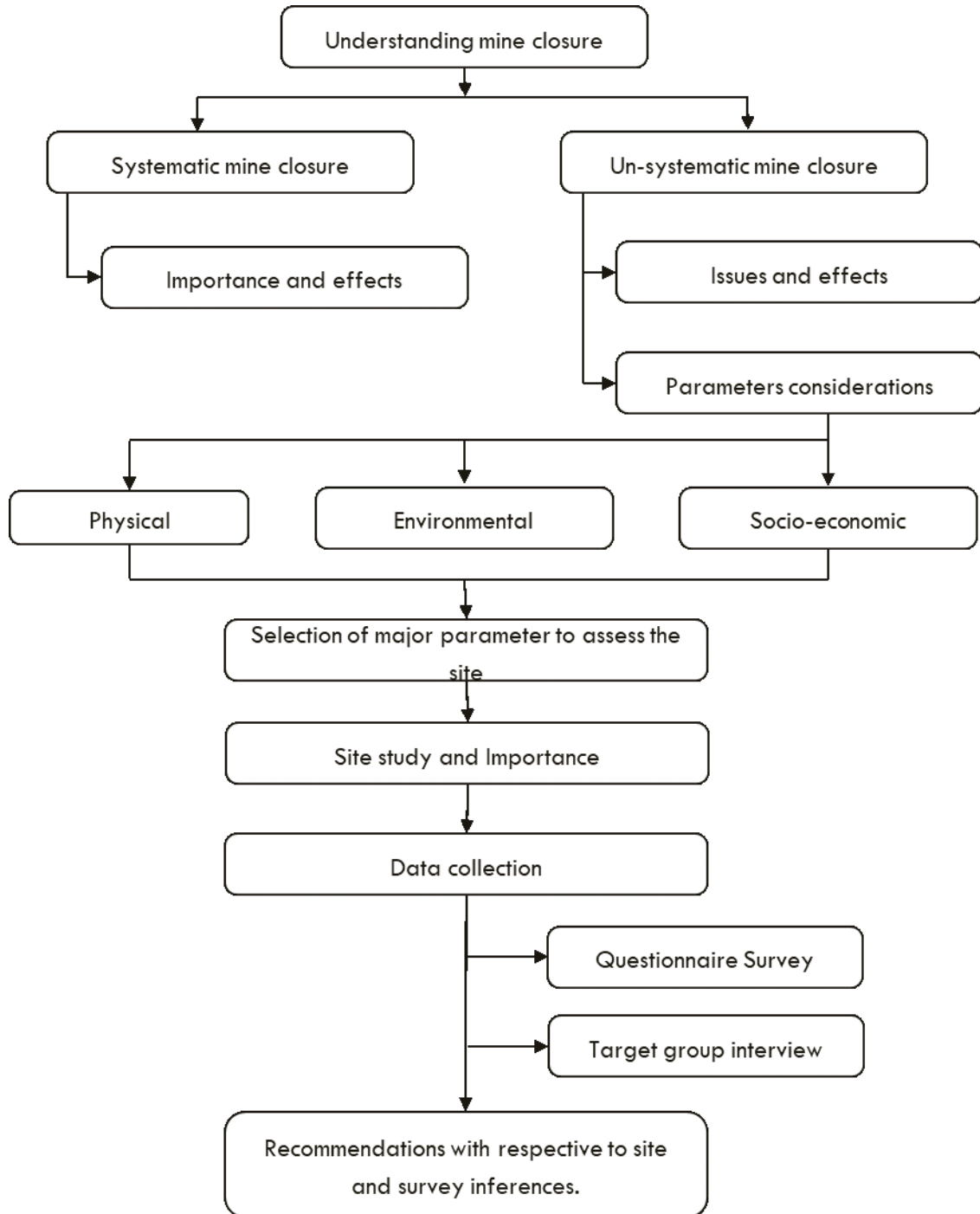


Figure 5. KGF Map

#### 4. Methodology

The study first understands the difference between systematic and unsystematic mine closure then the major impacts/ issues because of the unplanned mine closure. Various parameters which gets affected due to the mine closure is studied. Out of identified parameters the study will be focused on the most affected one and literature case studies will be seen on the same lines. Sub-parameters identified from the literature case study will be applied on the site chosen for the study. After understanding the site-specific issues related to the identified parameter strategies/ recommendation to overcome such issues will be given at the conclusion.



#### 4.1. Aim and objective

This paper aims to study the severity of mining industry’s socio-economic impact on community and the surroundings. The specific objective of the study is

- To understand the importance of systematic mine closure.
- To come up with the strategies/ recommendation specific to the site.

## 4.2. Study Area

The area chosen for the study is the mining area in the town which is of about 4327 Ha (Fig.5) and currently belongs to the BGML and holds a population of 62000 (As per 2011 census) who belongs to the mine workers of the place. The entire mining area is divided into three regions namely ooragumpet, champion reef and Marikuppam. This part of the land is left abandoned since 2001.

## 4.3. Data collection and analysis

Data for the study is taken from both primary and secondary sources. Primary data is collected through questionnaire survey in all the three mining areas with a sample count of 20 in each area. Interviews with the officials from various department of KGF, BGML and Indian Bureau of mines are carried out. Questionnaire survey with 60 sample counts has been carried out in KGF headquarters Robertsonpet also to know the counter effect of mining area.

## 5. Data Analysis and inferences

The data collected can be analyzed in three parts, that is in i) Mining area, ii) Non- Mining area and iii) Common effects/ problem faced by both.

### 5.1. Mining area

In this area the major socio-economic status of the community after the closure of mine with various parameters like current employment, income level, period of stay and mine worker from the family is studied.

#### 5.1.1. Current Employment

Till the closure of mine these people have been working in the mines in various grade according to the experience and education level. From (Fig.6) it is clearly seen that after the closure of mine about 54% of the people started profession as auto drivers and doing small business (like petty shop) with in the community. Even the unemployment is more within the women's in the community.

#### 5.1.2. Income level

During the operation of the mines even the income level was more are less similar to the current income level but the basic needs like food, stay, services were provided by the company itself for a low price. After the closure these people are mostly employed as daily waged labors in various industries. Fig.7 gives us the current income level of the people. The most expenses go for the traveling because people travel daily till Bangalore for their work and about 12,000 people commute through train every day.

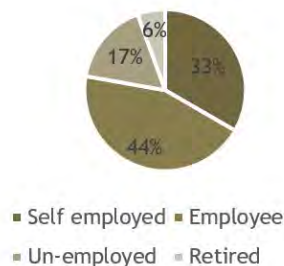


Figure 6. Occupational structure.

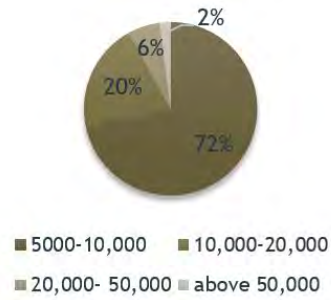


Figure 7. Monthly Income.

5.1.3. Mine worker from the family and period of residence

From Figs.8 & 9 we can infer that most of the people who reside now are third or fourth generation of the mine worker. Most of them was born and brought up in KGF, but they ancestors were not origin of KGF. The quarters allotted to the mine workers were sold back to them for less price after the closure to compensate salary settlement this is one of the main reasons for many people to stay back. From Fig.10 we can infer that Tamil and Telugu is spoke predominantly it is because their ancestors were migrated/ brought from Tamilnadu and Andhra-Pradesh for working in the mines.

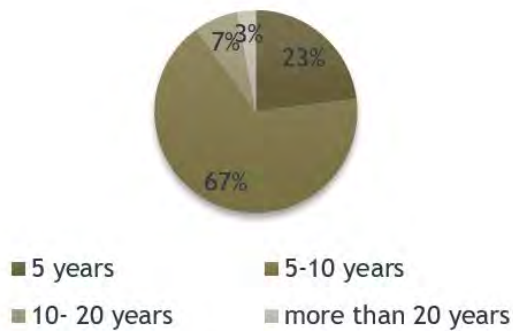


Figure 8. Period of residence

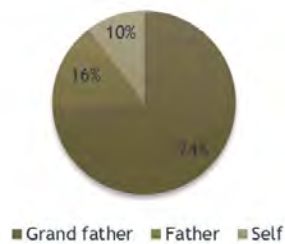


Figure 9. Mine worker in the family.

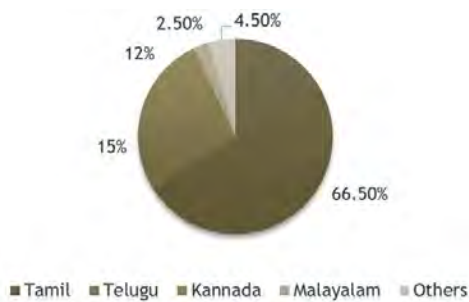


Figure 10. Linguistic composition.

**5.2. Non-Mining area**

People stay in the town headquarters Robertsonpet has been interviewed to know the counter effect of mine closure. People live in Robertsonpet were also from neighboring state Tamilnadu, Andhra Pradesh. They have started their business in the economic center of KGF. These people still withstand with their business because of the neighboring villages and institutions. Fig.11 & 12 says about the period of residence and occupation of the people in Robertsonpet.

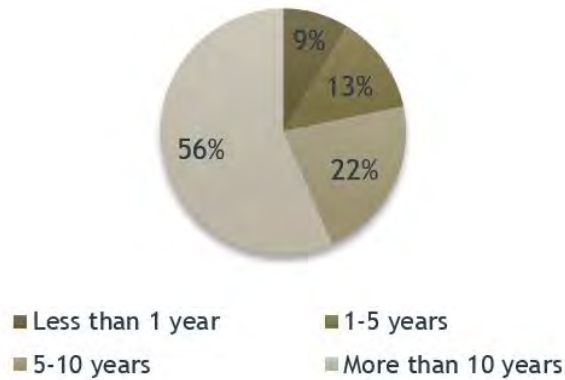


Figure 11. Period of residence.

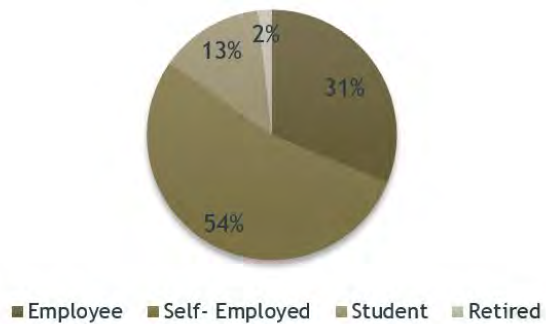


Figure 12. Occupational structure

**5.3. Issues faced by both the community**

This section talks about the issues faced commonly by both the communities due to mill tailing/dump, water and heath related issues.

**5.3.1. Issues due to mill tailing/ dump**

In the past 120 years of mining, the place has generated about 35 million tons of dump/ tailings from the ore processing. Out of that 3 tons were utilized between 1980 and 2000 to backfill the shaft. It is said that these dumps have cyanide contain in it, which is used in the processing of ore. But the latest article by National Institute of Rock Mechanics (NIRM) says that due to the volatilization of cyanide maximum cyanide has been evaporated (Gupta, 2012). These dumps have nearly 56% of silica content in it which can be used as substitute for manufacturing cement and glass. Fig. 13 & 14 shows the mill tailing dumped in the center of the town over a century.

### 5.3.2. Issues with ground water

In general, it is said that contamination of water is seen due to the leaching of dump during the monsoon and post monsoon. But report from the NIRM on ground water evaluation says that there is no major traces of cyanide in ground water. The various samples from different location says the groundwater has high turbidity, Chlorine concentration and electric conductivity. Which can be purified by simple reverse osmosis process or Electrolysis (Gupta, 2012).



Figure 13. Milltailing/ dump and abandoned processing unit.



Figure 14. Panoramicview showing dump and settlement.

### 5.3.3. Health related issues

Diseases like silicosis, lung cancer are very common near the gold mining area. It was observed in people only during the operation of mines and with employees who worked underground. Later years it was not seen among the people and even no medical records from KGF hospital and civil hospital, KGF (BGML, 1990). But still the fear of cyanide in-haling is seen among the people because the settlements are very close to the huge dump, and they face sand erosion during summer towards the town.

## 5.4. Inferences

From the socio-economic survey we can infer the effects made because of unsystematic mine closure on both the communities. In mining area we can see that about 62,000 people still live on the abandoned mining land, and they travel up to Bangalore for daily work which is 100 km from KGF. Huge part of their income is spent for traveling if more than one person in the family is working. Even the literacy rate is comparatively high the unemployment rate equals it. The workforce participation of female is less. Many people have started driving auto and petty shops in KGF itself. Many huge industrial building and British bungalows in a derelict condition. One can't sense the flavor of prosperity the mine had when it was in working condition. The out migration is high with people of 3<sup>rd</sup> or 4<sup>th</sup> generation people in the family. The present condition not only making mines abandoned, the entire site has the same texture allthrough.

Even the mine was closed and huge population was affected people in robertsonpet don't face much effect on their livelihood because since from the Britishers time till now it acts as the major commercial hub for the surrounding villages. The commercial value of the place is not much affected as mining area. Many residential development from government and private boost the real estate market of the place. Where this can be appropriate location for many from Bangalore who are willing to own a property because of high rates in Bangalore.

When looking in to the common issues faced both the community lack very much in social infrastructure like parks,

hospitals, theaters. The mining dump in the middle of the town affect the air quality much in the summers. The groundwater is not contaminated with cyanide leaching but it has high turbidity and electro-conductivity due to the location problem. Even the place experiences annual rainfall of 800-1000 mm because of no proper catchment areas this place face water scarcity.

## 6. Conclusion and Recommendations

The impact of mining is seen very visible on the site, this is majorly because the site was not cared/ abandoned for almost 16 years. Even the machineries, British bungalows, industrial buildings are also left abandoned. On the other hand this site has potentials like excellent rail and road connectivity, vast amount of land for new development, the heritage and value of the place shows us that the “Little England” can be revived.

The strategies for development can be looked at three different levels. The initiative should be taken from Government, company and people to redevelop the place which will in return benefits all the stakeholders involving for the redevelopment of the place.

The strategies that revive and regenerate the lost economy by promoting this place as one more industrial corridor or as economy hub through the state’s various industrial development policies and initiatives, looking this place as a potential satellite town for Bangalore, considering the reviving of mine as per supreme court order on July’ 2010, support from NGO’s to meet people need on basic infrastructure will bring back the vibrancy, financial stability and the lost glory to the place. So, this site says us the need and value of systematic mine closure. If the owning company had come up with various other initiatives considering the potential of the site, available infrastructure and man power during the time of closure this town wouldn’t have faced the consequences which it has been undergoing for last 17 years.

## 7. Acknowledgments

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## 8. References

1. A.G.N.Kitula. (2006). The environmental and socio-economic impacts of mining. *Journal of Cleaner Production*.
2. (2003). *Abandoned Mines list*. Indian Bureau of Mines.
3. Authority, U. D. (2011). *Revised Master Plan-2031*. KGF: UDA.
4. BGML. (1990). *Centenary Souvenir*. Kolar gold fields.
5. Gupta, P. (2012). *Evaluation of Spatial and Seasonal Variations in Groundwater Quality at Kolar Gold Fields, India*. National Institute of Rock Mechanics. Kolar gold fileds,India: American Journal of environmental Engineering.
6. (2016). *ISRO land degradation atlas*. ISRO.
7. Karnataka, G. o. (2016). *Invest karnataka-2016, District Profile-Kolar*. Bengaluru.
8. KGF to be developed as new city to de-congest Bengaluru. (2017, March 07). The Hindu.
9. (2012). *Mining in India*. Center for Environment and Science.

10. Ministry of Water resources. (2012). *Ground water information booklet-kolar district*. Bangalore: Ministry of Water resources.
11. NCAR. (2003). *The soils of kolar district for land use planning*. Nagpur: National Bureau of Soil Survey & Land Use Planning .
12. Overview of Mining and its Impacts. (n.d.). In *Guidebook for Evaluating Mining Projects EIA's* (pp. 1-16).
13. *Queensland Resource Council*. (n.d.). Retrieved from [www.qrc.org.au](http://www.qrc.org.au): <https://www.qrc.org.au/rehabilitati-on-case-studies/>
14. Rajasekaran, D. (2007). *ENVIRONMENTAL POLLUTION BY GOLD MINING – A CASE STUDY OF ROBERTSONPET (K.G.F.) URBAN AGGLOMERATION, KARNATAKA*. Technoscience Publications.
15. Robertsonpet, P. o. (2018, February Saturday). Socio economic impact of mine closure. (Karthikeyan.K.H, Interviewer)
16. Sharma, D. (2003). *A statistical study in mining exploration as related to the Kolar gold fields (India)*. Hyderabad: Elsevier.
17. Srikumar.S. (2014). *Kolar gold field- Unfolding the untold*. Partridge.
18. Thengummoothil, G. (n.d.). *Kolar Gold Fields-The forgotten Era of India*.
19. (2001). *United Nations conventon on combating desertification*. United Nations.
20. White, B. (2010). *Kolar Gold Filds, Down Memory Lane*. AuthorHouse.