



Socio-economic and Environmental Impacts of Stone Mining in Shivpuri District, Madhya Pradesh, India

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Case Study

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ABSTRACT

This paper examines the socio-economic and environmental impacts of stone mining in Shivpuri district. A large number of people are dependent on stone mining activities for carrying their livelihoods as stone mining is one of the most economic activities after agricultural practices in Shivpuri district. A high quality stone belt is spread around 100 km area from west to east. Meanwhile, about 60% stone mines are located in the Madhav National Park and other forest areas of the district. Due to large-scale extraction of stones from the forest area, depletion of biodiversity resources was enormous. And as a result, the mining practices were banned and this led to worst socio-economic conditions of the poor rural people. This study also attempts to penetrate the exclusive solutions that support both mining activities for carrying livelihoods and environmental restoration through large-scale plantation campaign. It reveals that if appropriate measures are taken place, mining practices and environmental restoration can go parallel. This study was conducted through collection of data from the primary sources. A case study of the five villages through household level survey was conducted during the years 2009-2011.

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1. INTRODUCTION

Environmental conservation and economic development are the two entities of the same coin. They are the two major issues to be considered exclusively while framing the policies of area development. This has become a greater issue particularly under the wake of high-level of environmental degradation and regional disparities in socio-economic development. Every developmental activity has a significant impact on the economic growth and on the environmental degradation. Economic activities improve socio-economic status and poised national income, they also degenerate the natural environment of their surrounding areas.

Mining has been practicing everywhere in the world's countries from time immemorial. It is a major economic activity in many developing countries [1,2]. The areas where mineral and power resources are found abundantly, mining activities have largely been carried out. This has led to high economic growth in these areas through increase in per capita income and thus increase in regional and national income. Meanwhile, along with economic growth, mining activities raised concern on environmental conservation. Large-scale degradation of environment due to mining activities put many questions forward on whether or not the mining activities should be continued. Operations, whether small or large-scale, are inherently disruptive to the environment [3], producing enormous quantities of waste that can have deleterious impacts for decades [2]. The environmental deterioration caused by mining occurs mainly as a result of inappropriate and wasteful working practices and rehabilitation measures [4]. Several authors [1,5] have commented on the potentially-adverse impacts of mining. As at present, the entire Earth is passing through the menace of global warming and climate change and this situation has mainly appeared due to the tremendous economic activities. Among them, stone mining is one.

The areas where agricultural practices are dominating in economic development, the means of livelihood of the populace are not sufficient. Many developing and underdeveloped countries are characterized by food insecurity and malnutrition and thus, they have the other options of mining if, mineral reserves are available. The area, which has been taken for the

study is economically backward and stone mining is the backbone of economy. Thus, this paper examines the socio-economic and environmental impacts of stone mining while suggesting appropriate measures for economic development and environmental conservation.

2. MATERIALS AND METHODS

2.1 The Study Area

Shivpuri district is located in the northwest part of Madhya Pradesh state. Its geographical area is about 10278 km². Out of the total area, 45% land is forest cover. Faunal and floral biodiversity is very high. The Madhav National Park (MNP) and Karera Bird Sanctuary are located in this district. Further, Kuno-Palpur wild life sanctuary is located in its neighbouring district, Shyampur. All these three parks obtain national importance. The economy of the District lies on the output from agricultural practices and from forest products. Agricultural land is limited to only 11% of the total geographical area; and it is rain-fed. Production and per ha yield of crops depend on the timely arrival of monsoon and fertility of soil. Crops are grown mostly during the monsoon season and in winters as kharif and rabi crops respectively. Wheat, barley, soyabean and groundnuts are the major crops. Some fruits: guava, papaya and mango are grown but they are consumed domestically. Dependency on forest resources is high for fuel-wood, fodder and food. About 40% of the total population is tribal, which constitutes mainly Sahria and Bedia tribes. The people of Saharia tribe are forest dwellers and they are fully dependent on forest products for running their livelihoods. Due to establishment of Madhav National Park, the whole forest area is protected and these tribal people meet their demand from the forest illegally. This has led to the people-park conflict.

Stone mining¹ is the largest activity and a major source of livelihood. The economically sound people owned the mines and tribal people work in these mines as labour. There is a 100 km long stone belt spread from Pohari in the west to Pichhore in the east. Quality of stone varies from place to place but, there are some stone mines where the best quality stones are extracted and exported to Arab countries. The main problem

¹ Economically viable stones such as marbles, are extracted from the mines, used in decoration of building

associated with extracting stones from the mines in a large quantity is their location as many mines are located in or surroundings of MNP and forest areas. There has already been high level forest degradation due to mining activities. The climate of the region is semi-arid. During the winter season, temperature recedes below 10°C and during the summer season, temperature accedes above 40°C. During the recent past, temperature has been increased upto 45°C. Rainfall is very scarce (average 100 cm annually). Monsoon rain normally occurs only in the two months: from mid-July to mid-September. During December-January, rainfall occurs due to the western disturbances, which is nomenclature as 'Maatha'. But, it is insufficient. About 40% land is stony and barren.

2.2 History of Stone Mining in Shivpuri

Stone mining in Shivpuri district has a long history. It has been practicing in a small-scale from the British period in India and was the main source of income of the poor rural people. Along with expansion of mining technology, presence of high quality precious stone reservoir and availability of market, mining activities gained tremendous momentum and that was resulted in the economic development of the region as mining activities augmented employment and generated income. The local people involvement, particularly of tribal community, in the stone mining is as an owner of the small mines, employees and workers. The mining activity provides a suitable base for their livelihoods. In the beginning of the 1990s, mining practices had been accelerated, and output from it was very high. As more than 60% population composition is of Scheduled Tribe (ST) and Scheduled Caste (SC)² people and among them, many households are landless, thus, they had the opportunity to work in these mines as unskilled labour. Primarily, the mines were given to ST and SC people in lease but, they were unable to run these mines due to lack of money as there are lots of infrastructural facilities required for mining and these people were economically very poor. Therefore, the economically rich people from other castes took over these mines from them. Even under such circumstances, the ST and SC people were happy and they were quite able to run their livelihoods while working as labours in these mines. As population grew, pressure on mining activities has increased. This situation led to illegal mining in the forest and park areas and as a result, large-scale forest depletion and loss of biodiversity took place. By the end of 1990s, a

group of conservationist moved to the Supreme Court of India to ban mining activities. Public interest litigation was filed that explained about large-scale environmental degradation due to mining in Shivpuri District. The Supreme Court has verdict in favour of the petitioners and imposed ban on mining activities in and surroundings of forest and park areas. Some stone mines, which are located in the revenue land, were also closed due to dispute between revenue and forests departments on the ownership. This all together created a situation of acute atrocity and anarchy as the local people were utterly discontent. The tribal community with the support of local people agitated against this decision for a long time but they remained unsuccessful. The people suffered with unrest in the society, poverty, malnutrition and starvation and this is continued. There are total 23 mining areas Table 1. Out of these, mining is practiced only in 6 areas, which come under the revenue department. Those mines, which are located in MNP and forest areas, are completely closed.

2.3 Data Collection

Data were mainly gathered from the primary sources through conducting case study of five villages where stone mining activities is the main occupation of the people. These villages are: Majhera, Jhirnia, Raja Budhonpur, Barodi and Sevda. A structured questionnaire was prepared for the household level survey. Further, 40 households of Majhera village were surveyed to know their major economic activities and sources of income. A survey of stone cutting and polishing industries was also conducted in the different roadside towns. Input-output analysis was done and changes in production of stone, before and after ban on mining operations, were penetrated through exclusive interview. Participatory observation approach was used after rapid field visits. Secondary data were also collected from the district mining department, located in Shivpuri town. A qualitative approach was adopted to carry out this study. Data were interpreted through various statistical tools such as SPSS and MS Excel.

3. IMPACTS OF STONE MINING: A CASE STUDY

Mining activities have both socio-economic and environmental impacts. In Shivpuri district, it was a major source of livelihoods before imposing ban on its practices. It has also led to environmental degradation, as large-scale forest

depletion and various pollutions. The details on socio-economic and environmental impacts of mining in Shivpuri districts are illustrated in the following paragraphs:

3.1 Socio-economic Impacts of Mining

Mining has very strong implications on the socio-economic development of Shivpuri district. As, it is the second major source of livelihoods of the people; many people are engaged in its practices and able to carry their livelihoods sustainable. In the study area, a large proportion of farm less unskilled labour, is working in the mining and it is their second important occupation. Table 2 shows occupation structure, yearly income and number of persons working in different activities. The total 40 people were interviewed from Majhera village. The main occupations of these people are agriculture, stone mining and collection of forest products. Out of the total people working in different activities, 15% people are agricultural workers and their annual income is <20,000 to 30,000 INR². About 20% people are working in stone mining and their income is 20,000-40,000. The people engaged in forest products collection have <20,000 to 30,000 annual income (22.5%). There are 42.5% people who have not any income source. Although, the highest number of people working in collection of forest products yet, their yearly income are less than the people those are working in stone mining.

Five villages – Jhirnia, Rajapur, Majhera, Sevda and Barodi – were studied Table 3. After ban on extraction of stone from the mines, stone mining practices are restricted only to these villages and their surrounding areas. Monthly income and employment from stone mining is the highest in Jhirnia village followed by Rajapur and Majhera. Barodi village has the lowest income and employment from the mining activities and it is seconded by Sevda village. The present situation is different in the villages as the mining activities were decreased significantly during the last two and half decades. Household level survey shows that in Sevda village, there are now 4 stone mines where mining is carried on. The area under these mines is 38 ha, where total 1200 workers are engaged. Production from these mines is 16 trucks per day; major stone type is high quality marble and mines are located in the forest area. In Majhera village, there are 7 mines in 14 ha land. Daily workers are above 1000. Per

day production of stone is 22 trucks. Six mines are located in the revenue land and only one mine is in the park area. In Barodi village there are 500 small pits in 5 sq km. Total 250 workers are working and 50 trucks stone is extracted daily. Stone mining is carried out in the revenue wasteland. Budhon-Rajapur is the second largest stone mining area where 135 ha land is under mining and 3400 workers working daily. All stone mines are located in the revenue land³. The last case study village is Dongri-Jhirnia, which is the largest stone mining area. About 245 ha land is under stone mining where about 500 workers are working daily. In terms of daily wages, it is about 100 INR per day and stone type is marble.

Fig. 1a, b shows income and employment from stone cutting and polishing industries between 1990 and 2009. It was noticed that during the last two decades, income and employment from these industries has decreased about 54.2% and about 54.2% respectively.

3.2 Environmental Impacts

Population growth, economic development and environmental degradation are interlinked with each-other. The high growth in population speeds-up economic activities. Meanwhile, it also deteriorates environment as for the high level of economic development, plenty of natural resources are exploited. Similarly, mining activities have considerable impacts on environment [6]. The most important environmental problems from the mining activities are mercury pollution, cyanide pollution, direct dumping of tailing and affluent into river [7]. These environmental problems from mining activities are the global phenomena. In the study area, stone mining activities have very adverse impact on the environment. It does not only degrade the land and forest areas but also, it affects the air, water and health qualities. Faunal and floral depletion, due to mining activities, is also enormous. Shivpuri district is known for its rich biodiversity resources. A large part of the district is covered by the dense monsoon forest. Stone mines are largely spread in the dense forest areas. Earlier, due to stone mining activities in forest areas, depletion of forest biodiversity resources was high. Environmental impacts due to mining activities was manifested as water pollution, land degradation, loss of biodiversity, air pollution, increase in health related problems, occupational noise pollution,

² 1USD = 60 INR (as on August, 2014)

³ A land that is under the control of revenue department

vibrations, land subsidence and landslides. These problems are elaborated below:

Table 1. Major stone mining areas in Shivpuri

S. no.	Name of stone mines	Area in Ha	Land category/location	Current status
1.	Khutela	369.2	Forest area/Shivpuri Taluk	Closed
2.	Majhera	182.3	Revenue area/Shivpuri Taluk	Open
3.	Karmai Kalan	105.4	Forest area/Karera Taluk	Closed
4.	Lada Rajpur	103.3	Park area/Shivpuri Taluk	Closed
5.	Mohammadpur Bhurkuli	103	Forest area/Shivpuri Taluk	Closed
6.	Khada	99.2	Forest area/Shivpuri Taluk	Closed
7.	Budhonrajapur	63.6	Revenue area/Pichhor Taluk	Open
8.	Parasari	44.2	Park area/Shivpuri Taluk	Closed
9.	Berkudi	37.3	Park area/Shivpuri Taluk	Closed
10.	Pati Ghati	37.2	Forest area/Shivpuri Taluk	Closed
11.	Sujiapura	25.0	Forest area/Shivpuri Taluk	Closed
12.	Tehata	25.0	Forest area/Shivpuri Taluk	Closed
13.	Sukha Kho Bhasora	20	Forest area/Shivpuri Taluk	Closed
14.	Perko Balarpur	16.9	Park area/Shivpuri Taluk	Closed
15.	Kalapani (Karmai Ahmadpur)	16.3	Forest area/Shivpuri Taluk	Closed
16.	Loharchha	10.0	Revenue area/Pichhor Taluk	Open
17.	Bhilati	10.0	-	-
18.	Pathko Manki	10	Forest area/Shivpuri Taluk	Closed
19.	Lamba Ko Mudkheda	7.1	Forest area/Shivpuri Taluk	Closed
20.	Gopalpura	4.1	Forest area/Shivpuri Taluk	Closed
21.	Barodi	1.4	Revenue area/Shivpuri Taluk	Open
22.	Dongari	-	Revenue area/Shivpuri Taluk	Open
23.	Jhirnia	-	Revenue area/Shivpuri Taluk	Open

Source: Office of the Divisional Forest Officer, Shivpuri (MP)

Table 2. People involved in major economic activities and their annual income

Occupation	Income (annual)			Total persons	Score
	<20,000	20,000-30,000	30,000-40,000		
Agriculture	2	4	-	6	15
Stone mining	-	3	5	8	20
Collection of forest products	4	5	0	9	22.5
Total persons	6	12	5	23	
Score	15	30	12.5		n=40

Source: Data were collected from the interview of 40 people

Table 3. Area, workers involved, production and location of mines

Mining area	Area (ha)	Total worker involved	Production (truck)	Location of mines
Jhirnia	245	500	62	Revenue and forestland
Rajapur	135	3400	65	Revenue land
Majhera	14	1000	22	Revenue and forestland
Sevda	38	1200	16	Forestland
Barodi	500 small pits (5 km ²)	250	50	Revenue land

Source: Primary collection through case study of five mining areas

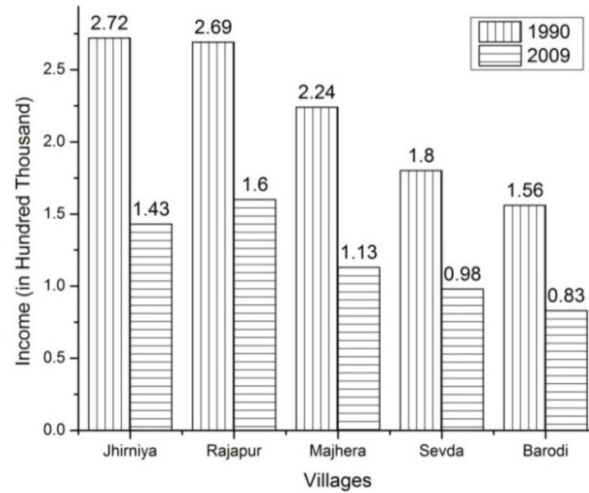


Fig. 1a. Income from stone cutting and polishing industries (1990 and 2009)

Source: Data were gathered from the interview of the owner of mining industries

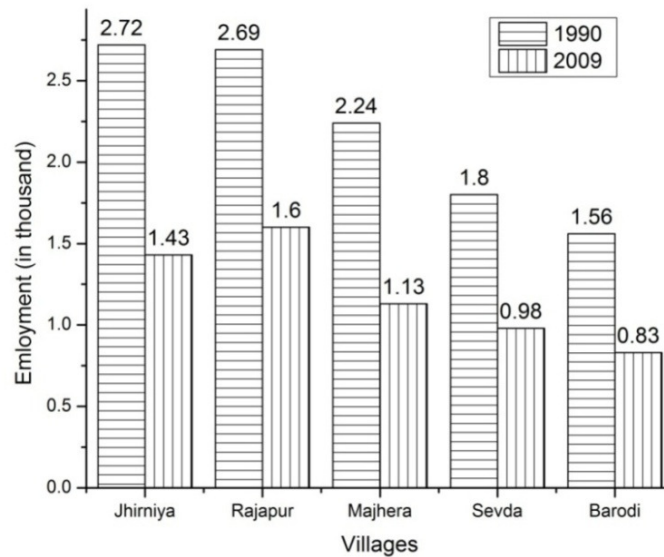


Fig. 1b. Employment from stone cutting and polishing industries (1990 and 2009)

Source: Data were gathered from the interview of the owner of mining industries

3.2.1 Land degradation

Land degradation is one of the significant impacts arising out of mining and quarrying activity which is mainly in the form of alternation of land structure due to excavation, stacking of top soil and loss of land due to dumping of mine waste and overburden soil. Stone and sand quarrying causes damage to property, depletion of ground water, loss of fertile top soil, degradation of forest land, adverse effect on the biodiversity and public health. The land

degradation due to mining and storage of waste like overburden soil and mine tailings was estimated in the case study mining areas (five mines with area vary from 2 ha to 50 ha). All these five mines are currently in operation. Rests of the mines (20), which are located in the park and forest areas, are closed. However, around 15% of land in the mining areas is degraded in the study area. It was noticed during the field visit that only 30-40% material (stones) is usable while rests of material is waste, which is dump up

near the mining pits. This dump up material degrades land and the surrounding areas.

3.2.2 Forest depletion and loss of biodiversity

Mining and quarrying, either open cast or underground, destroys landscape and forest ecosystems. The waste materials that remain after the extraction of usable ores are dumped on the surrounding land, thus causing loss of top soil, nutrients and supportive micro flora and vegetation. As about 70% stone mines are located in the park and forest area in Shivpuri district, forest depletion is obviously high. A large part of the forestland in the surrounding of mining areas is severely depleted. Although, most of the mines in the forestland are closed yet, their impact can be noticed in the remnant areas. Decrease in biodiversity – floral and faunal is also prominent as many species are endangered or on the verge of extinction. In the MNP, Kardhai forest is abundantly distributed is very useful and economically viable species. Due to mining activities, about 30% Kardhai forest is degraded [8].

3.2.3 Air and noise pollution

Air pollution, due to dust from the mines, is a common environmental problem in mines and quarries especially open cast operations. The villages located in the vicinity of mines are suffering from air pollution. Many people are suffering from asthmatic and lungs problems. During the household level survey, the local people informed that about 5 people die due to tuberculosis annually in Sevda village due to food scarcity and malnutrition because the outcome from the mining activities is very less to meet the daily food requirement, as these people are unskilled workers and many mines are closed. Many areas, where mining is being operated manually, noise impact is comparatively less. In the other areas, where the movements of trucks – 5 to 10 everyday and the machines using for mining, noise pollution is high.

3.2.4 Surface and ground water pollution

Water pollution is a major concern in mining operations, where ore is being processed in slurry form to enrich the low quality ore. In village Majhera, water crises prevail in entire year therefore, the people use rainwater, even for the drinking purposes. They also use water that is stored in the mining pits during the monsoon seasons. It causes for poor health conditions.

Both surface and groundwater is highly contaminated in Shivpuri district and percentage of fluoride in ground water is very high [9,10].

4. CONCLUSION AND SUGGESTIONS

Stone mining in Shivpuri district obtains a significant place in economy and employment of the rural people. Owing to lack of agricultural practices (only 11% land is arable), the people were largely dependent on the stone mining and its allied practices – cutting, polishing and exporting of stones. Whole district occupies a number of precious stones reservoirs. Now, a large group of rural people, mostly ST and SC, has been deprived due to close of stone mining in this region. The socio-economic conditions of these people are critical and many of them are facing malnutrition, starvation and food insecurity. Social unrest is the other major problem. Environmental deterioration, largely due to mining activities in the forest areas, is high, as long track stone mines are found in the forest areas. A large-scale stone mining has already been done in these mines during the past.

Under such circumstances, this study suggests some measures to enhance the income and economy of the rural poor people and restore the environment. It is concluded that the outcome from the mining practices can assist to enhancement of livelihoods, if the mines are optimally operated. For the short term policy measures, the involvement of economically backward people in stone mining, from working as unskilled/skilled labours to ownership of mines should be ensured. As many stone mines are located in MNP and forest areas are banned but, the land is barren. These mines can be reopened. The mines, which are operated once can be continued because, whatever the environmental losses have been occurred cannot be replaced immediately. The previous policy of allotting mines to the poor inhabitants should be renewed and a complete set of infrastructural facilities should be provided to them. For the long term, large-scale plantation of native trees should be done to compensate the environmental loss and to restore environment. The possibility of employment in other sectors such as village level based small-scale entrepreneurs should be sought out. Irrigation facilities can be increased through rainwater harvesting to food-grain cultivation. Because, the level of education is low, compulsory and free education should be granted to the youth of these villages so that they can find job in other side the region.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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