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Impact of Stone Mining on the Health and Environment: A Study of the Village of Mewat, India

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ABSTRACT

Haryana has been blessed abundantly with Stones and limestone reserves. Stone mining is carried out at both large- and small-scale levels. Some of the environmental implications of stone mining are loss of forest land, erosion of soil, degradation in agriculture, reduction in biodiversity, and instability of rock masses. In this paper, we have reviewed the environmental implications in one of the villages of Mewat, Ghatashamshabad, Haryana. Results on the impacts of stone mining on health and environment are summarized and discussed.

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Introduction

The exploration of rocks, stones, and minerals affects the environment in many ways, irrespective of the scale of mining [1-5]. Degradation of the forest, pollution of water, soil, and air, depletion of natural flora and fauna, reduction in biodiversity, etc are some of the environmental implications of mining. As reported earlier by various authors [1-8] both large- and small-scale levels of mining have some negative effects on the environment. In this paper, we have reviewed the environmental impact of mining in one of the villages of Mewat, Ghatashamshabad, Haryana. Results on the impacts of marble mining on health and environment are summarized and discussed.

Research Methodology

After a rapid field survey of small and large stone mining sites in Mewat one of the villages of Mewat, Ghatashamshabad, was studied for the environmental impact of mining. Here stone mining is continuing on a small scale. So the long-term impact of mining on the environment was studied in the region. Door to door survey of the local population was done keeping in mind that all sections of society from women, and children to elders and youth involved in mining. The secondary writings were also taken into consideration while analyzing the data. For analyzing the impact of mining in the selected areas water and soil testing devices were used and the implications on the local population were studied. The locations of selected sites were marked with Geographical Positioning System (GPS) and studied for soil-site characteristics. Soil profiles were dug to 1.5 m depth to study soil morphology and degree of soil development. Depth-wise soil samples were collected for physio-chemical analysis to access the salinity, alkalinity, and carrying capacity of soils. Soil samples for nutritional and microbiological properties were collected

separately. Few groundwater samples from nearby sources were collected for quality appraisal. Standard laboratory procedures were adopted in all analyses.

Location of Study Area

The stone mining site study has been mainly confined to old mines of the village Ghata Shamshabad in Mewat. Site characteristics of stone mine sites are presented below.

Name of Site	GPS Location	Soil Texture
Ghata Shamshabad (Mewat)	270 45' 398" N	Red sandy

Stone Mining in Ghatashamshabad in Mewat and Its Impact on the Local Environment

Mewat district with its headquarter at Nuh is largely occupied by alluvial plains, traversed by elongated ridges of Delhi quartzites. The groundwater in the district area is saline, and salinity increases with depth. The district is socio-economically backward. Agriculture, the base economic activity of the people is deprived of irrigation. There is no river and the area is drained by artificial drains namely Nuh, Ujina & Kotla drains. They carry rainwater into the Yamuna river. Gurgaon canal carries water to the area which is distributed through Nuh, Firozpur Jhirka, etc. Potable drinking water is still a problem except in the areas at the base of ridges and hillocks of the Aravalli in Mewat.

The climate of the district can be classified as tropical steppe, semi-arid and hot which is mainly characterized by the extreme dryness of the Air except during monsoon months, intensely hot summers, and cold winters. During three months of southwest monsoon from the last week of June to September, the moist air of oceanic origin penetrates the district and causes high humidity, cloudiness, and monsoon rainfall. The normal annual rainfall in Mewat district is about 594 mm spread over 31 days. The

southwest monsoon sets in the last week of June and withdraws towards the end of September and contributes about 75% of the annual rainfall. July and August are the wettest months. 25% of the annual rainfall occurs during the non-monsoon months in the wake of thunderstorms and western disturbances.

The quality of groundwater is not fresh in shallow as well as deeper horizons in most parts of the district. Larger parts of Nuh, Nagina, and Firozpur Jhirka blocks are underlain by brackish/saline groundwater even at shallow levels. The depth of the water table is between 5 to 29.0 m. In the central part, it is between 2 to 10 m. In the Taoru block, the depth of water varies from 12 to 29.0 mbgl. The shallowest water table is recorded to be 1.15 mbgl. Water logging and shallow water conditions occur in a large area in the central and southeastern parts of the district. The quality of groundwater is a major factor in the district for rising or stagnant water level trends, over 24 years. The area is having saline groundwater even at shallow depths.

Hydrogen ion concentration in Ghatashamshabad varies from 7.26 to 8.25 indicating the alkaline nature of groundwater. In the major part of the area hardness is more than 300 mg/l. hence groundwater in the district is hard to very hard. There are large areas in the district, especially in the north-central and southern parts showing high values of fluorides and exceeding the permissible limits of 1.5 mg/l. There is a wide variation of fluoride content in the district. The value of fluoride ranges between 0.17 to 8.80 mg/l.

The consumption of this water has led to dental carries, body pains, breathing problems, etc. among the population using high fluoride water for long periods. The presence of high fluoride is attributed to the proximity of Delhi quartzites and other formations which have concentrations of fluoride minerals that have got exposed to the nitrate contents in the groundwater varying from 0.7 to 2738 mg/l. The higher nitrate concentration may be attributed due to the combined effect of contamination from domestic sewage and runoff from mined fields. Higher nitrate values are observed in the selected site.

Ghata Shamshabad also showed high values of fluorides and exceeded the permissible limits of 1.5 mg/l. The consumption of this water has led to dental carries, body pains, breathing problems, etc. among the population using high fluoride water for long periods. The presence of high fluoride is attributed to the proximity of Delhi quartzites and other formations which have concentrations of fluoride minerals.

There are several reports on the environmental impact of mining in various villages of Mewat. The 5 blocks of Mewat Nuh, Taura, FP Jhirka, Punhana, and Nagina had been chosen by the Institute of rural development and research for the assessment of development indicators in rural Mewat. Also, the Environmental and legal prospects of illegal mining in the Aravali range have been reported in the area. Somehow, the research in remote villages such as Ghatashamshabad has been neglected, and therefore, we have chosen these villages to study the impacts of mining in these regions. There is a long-term environmental impact of mining in these regions that can be studied and addressed.

It's worth mentioning here that these villages are only a few km away from legal mining (stone mining) sites yet mining activities around these villages give rise to various environment-related problems. In these villages, we interviewed about 89 people with certain assumptions. Here are the reports on the Health of adults and children in these villages:

Table 1: For Adults

People suffering from different problems (All results in %age)

Name of Problem	In Males	In Females
Breathing	17.64	30.76
Vision	11.76	23.07
Asthma	05.88	03.33
Hearing	05.88	07.69
Headache	17.64	15.38
T.B	05.88	03.33
Tirelessness	15.38	06.60
Handicapped	15.38	06.66
Stomach (Not diagnosed)	05.88	03.33

Percentage of diseases in Adults out of total Adults 40.00%

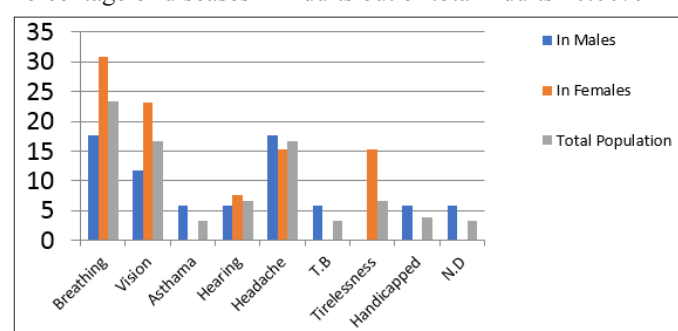


Table 2: For Children

Children suffer from different problems. (All results in % age)

Name of Problem	In Males	In Females
Breathing	05.88	02.33
Asthma	04.16	05.88
Headache	04.16	02.43
Handicapped	05.88	04.87
Stomach	04.16	02.43
Skin Diseases	12.50	11.76

%age of diseased children out of total children 19.51%

No. of population diseased /Total population 28.16%

No. of Families with skin-related diseases 45.45%

Diseases in livestock: 18.18%

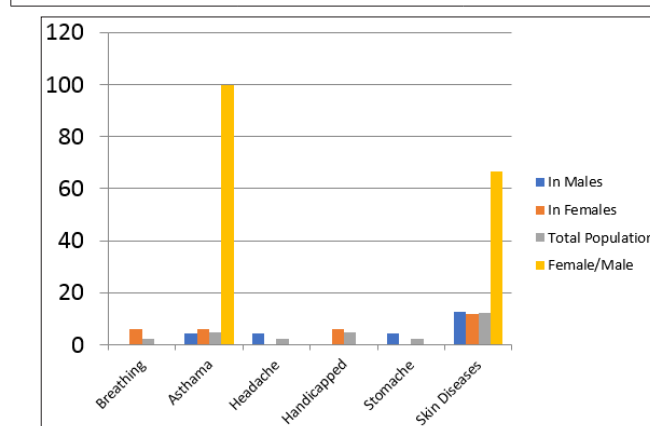




Plate: Stone Mining in Ghatashamshabad, Mewat

Health Hazard

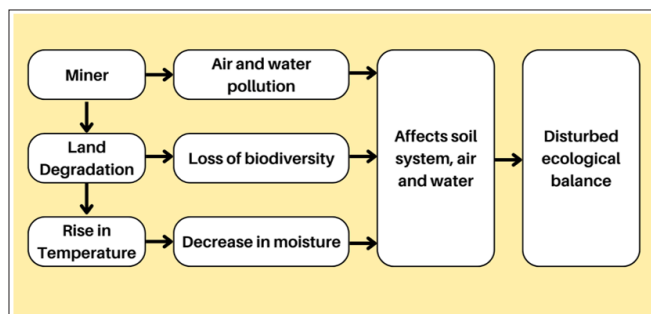
The local weather of the Ghatta Samsabad village was very much degraded. We, however, had no instruments to measure the local weather on a statistical basis but an on-field observational basis, it was full of dust, and very hot which is predictable as it was the middle of summer. The local people also pointed out harmful features of weather as follows.

1. As a result of the high concentration of dust particles in the weather people have a problem with vision. It minimizes the view of sight, also reducing the intensity of light.
2. Breathing problems in the local people are common there which the health data also confirm, due to the highly dusty local weather, and being close to the mining site.
3. As Dust is also a good preserver of solar heat we also suspect that it might increase the local temperature by 3-5 degrees, also as winds blow strongly people have admitted it is difficult to work outside and do their routine work in fields, etc.
4. Due to the regular high traffic of trucks the environment is highly noisy, people are also not sending their children to school as they fear accidents, hence creating social problems.
5. The plantation is very low, the farmers also added that due to the layering of dust over fields the productivity of soil has decreased gradually.
6. The natural vegetation was however high, but that was particularly seasonal vegetation also because we visited the place during pre-monsoons.
7. We didn't observe any stray or wild animals, although most of the area is mountainous and typical seasonal forest. Also, not many birds were visible, given the fact that monsoons had arrived.

The people of Ghatashamsabad told us that all the stones which the dumpers carry come from Bena (the village in Haryana). According to him, the Aravalli mountains were lush green with lots of wild animals and birds in the forest. Also, it used to be divided into two parts with Villages like Nuh in Mewat having heavy water and bad soil which makes it unfit for agriculture, and other parts like Ghatashamsabad, Basai, and Nasirwas having water fit for drinking and agriculture purposes. He told us that with the onset of mining activities in Mewat the lush green forest has turned into barren lands with a loss of vegetation and biodiversity, leading to severe ecological disturbances in this region. On our way to Ghatashamsabad, we saw defaced mountains with large pits and dug surfaces. In the green patches, we could see red large patches of soil because of the removal of rocks from the mountains. This land degradation renders various wild animals and birds homeless. We could hardly see any wild animals or birds in this region. The soil samples from Ghatashamsabad were collected and it was found that the soil is within optimum value with a PH of 6.4 and but the humidity of the soil is also very less which makes it a little bit difficult to grow crops. The villagers told us that the quality of the soil has degraded over the years, making it difficult for them to grow and yield enough crops to run their lives smoothly. Moisture content and PH of soil play a vital role in the germination of seeds and the growth of a crop. Though there were no traces

of any heavy metal found in the soil tested yet the organic matter of the soil is found to be affected due to the addition of inorganic matters brought in by silts from the dumpers carrying loads of stones. This silt forms a coating on the soil and affects the soil life system, its salinity, and crop productivity.

The waste dumps of the mined rocks (consisting of sediments and small pieces of rocks) could be seen littered on the roadside which causes the reduction of moisture levels in the soil as well as in the air. There are no waste management techniques employed by mining companies for environmental health. The waste dumps also add to air, soil, and water pollution. The growth of crops mainly depends upon the monsoons. There is a shortage of water supply as well. The maximum and minimum temperature in the village was found to be 3-4 degrees higher than the temperature in Delhi. The temperature rise could be because of the loss of forest land, air pollution, and the absence of any streams or lakes in this region. Also, gas emissions from vehicular movement and dust from the silts lead to a rise in temperature. Another problem is the change in landscape and deforestation which leads to increased solar radiation exposure in the deforested land. Green plants help in absorbing CO₂ and other harmful gases and release oxygen into the air. These also help to reduce the temperature in that area. Therefore it seems to follow the vicious cycle given below.



Surface and groundwater of the Ghatashamsabad

The water samples were collected from the wells of Ghatashamsabad and an adjoining village Basai. It is interesting to see the pumping motor placed inside the well. This shows the reduction of the groundwater table inside the well. The reason for the reduced groundwater level might be the absence of any stream in this region and the use of water on mining sites for washing purposes. The water pumped at the mining site leads to a reduction of water levels in the surrounding regions. Also, deforestation leads to various problems plants have the property to bind the soil, keep the temperature of the surroundings low which helps in the precipitation of clouds (causing rain), and finally, helps the rainwater to seep into the ground through the soil. This process helps to keep the water level to be optimum inside the ground. But if this cycle breaks down by deforestation then soil erosion takes place and all the rainwater flows down into drains and the ground water level does not rise. Also, the rainfall in the region without trees reduces therefore scanty rainfall also decreases the water level inside the ground.

The water sample collected shows the PH to be 7.5 and the dissolved oxygen is also found to be within permissible limits. The water collected does not contain any heavy metal impurity in this village. The salinity and hardness are also within an optimum limit. The reason for the lack of contamination in water might be that since the material mined is sandstone, it generates dust particles composed only of "silica" which is not soluble and being heavy settles down at the bottom of water reservoirs like ponds, wells, and mines and does not affect the portability. Also, the sample

collected was from the pumped water where impurities might flow away. Secondly, these villages are located a few km away from the mining site. There were no streams in and around the villages. So we can conclude that surface water is contaminated within permissible limits and the groundwater level changes to a lower level due to mining activities. Also, there is a shortage of water due to scanty rainfall, high temperature, and a lack of rain harvesting techniques.

We could spot small pits and ponds filled with rainwater. These are also home to mosquitoes and microbes which cause various diseases like Malaria, cholera, gastroenteritis, etc. This is confirmed by the health data we reported above.

Conclusion

In nutshell, the factors responsible for ecological disturbance in Ghatashamshabad are given in Table 3 [1-10].

Pollution	Sources
Air	Dumpers, machines, mined minerals
Soil	Deforestation, rise in temperature, low humidity, contamination
Lack of biodiversity	Land degradation, contaminated soil, lack of adequate water supply, high temperature
Land degradation	Mining activity, removal of soil and rocks
Noise and seismic activity	Blasting of rocks, vibrations displace tectonic plates

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