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EXTRACTION OF CONSTRUCTION MATERIAL IN ARAVALLI REGION OF HARYANA AND DELHI: ITS SPATIAL PATTERN, ECOLOGICAL HAZARDS AND ECONOMIC IMPACTS

Doctoral Dissertation Abstract (2019)

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The mining industry meant for extraction of construction material is expanding very fast in India since independence. The growth of construction activity, in Delhi and surrounding National Capital Region in Haryana, has generated huge demand for concrete and sand. As a result, Aravalli region in Haryana and Delhi has experienced large-scale legal as well as illegal mining of construction material, without caring the provisions made through several central legislations for conservation of environment and mineral resources. Illegal quarrying is a common practice, although Supreme Court has banned mining of construction material in the surrounding areas of Delhi since May, 2009. Lack of sufficient information regarding the negative effects of extraction activities has led to environmental degradation in these areas. Therefore, the present study is aimed at exploring the distribution and concentration pattern of extraction sites of construction material and their impacts on the ecology and environment of the surrounding areas.

Objectives of the Study

Major objectives of the present study are:

- to map the mines of construction material in Aravalli region of Haryana and Delhi;
- to examine the ecological hazards induced due to mining of construction material and
- to assess the perception of local people with regard to change in socio-economic conditions; impact on agriculture and on ecological conditions and human health.

Database and Methodology

The study is based on primary as well as secondary sources of data. In the present study, remote sensing data have been used. The United States Geological Survey satellite data of LANDSAT 5 TM and 7 ETM^{+} sensor with a spatial resolution of 30 m have been used to locate and determine the area under extraction of construction material in the study area. LANDSAT images covering the Aravalli

region of Haryana and Delhi have been assembled and analyzed to determine environmental change over two decades in terms of land use/land cover, biomass and moisture content. Moreover, about 12000 high resolution Digital Globe Image tiles, for the study area, from Google Earth have been used. Ancillary data, like Survey of India topographic maps, have been procured to prepare the base and relief map of the study area.

For in depth study about the construction material mines and their impacts on ecological conditions and the living environment of the people, four separate sites have been delineated for four types of extraction activities i.e. stone mining, slate mining, stone crusher and sand extraction. The site of Sirohi and Khori-Jamalpur mines in Faridabad district have been selected for the study of stone mining; Kund in Rewari district has been selected for slate mining and Khanak in Bhiwani district has been selected for stone crushers. For the sand extraction, Dohan river and its surrounding areas near Narnaul town in Mahendergarh district have been chosen. A circle of 10 km radius has been drawn around each site for analyzing the ecological/environmental impacts in the surrounding area of mines. Furthermore, a buffer of one km has been delineated along the mining sites to analyze the impact of mining in the close proximity or vicinity of mines. Comparison between these two areas brings out the impact of material extraction on ecological conditions.

The environmental health index, an indication about extent of extraction of construction material and other developmental activities has been developed for different sites. For this purpose, different band ratios namely Normalized Difference Vegetation Index, Normalized Difference Moisture Index, Normalized Difference Bare Land Index and Normalized Difference Water Index have been calculated. In order to have more comprehensive idea about the degradation caused by the extraction of construction material over the years, ratio of composite values, for the year 1989 and 2009 has been generated. Based on possible negative impacts on various derived layers, a rating has been given to assess positive and negative changes in the ecology of mines. Groundwater level observations have been used to prepare water table depth maps in Arc/Info 9.3 using Geo-statistical Analyst extension. To depict the spatial pattern of groundwater depth, isopleth technique has been used for mapping.

Major Findings

Delhi has been dependent on the Aravalli ridges, located in its vicinity, for obtaining construction material since long. But large-scale destruction of fragile ecosystems and physical environment of Aravallis began during early 20th Century. During post-liberalization period, private capital investment in the construction sector further accelerated the demand of construction material. It led to widespread environmental devastation in terms of puncturing the aquifers, deforestation and defacing the natural landscapes. Environmental devastation attracted the attention of Supreme Court of India during 1990s. But despite this, the illegal mining of construction material and violation of mining rules and regulations for ecological safeguards continued in the banned territory in Haryana. The Apex Court in May 2009 suspended all the mining operations and put a blanket ban in the region.

However, the extraction of construction material became quite widespread

phenomenon in the Aravalli region during post-liberalization period. Stone mines have spread in Faridabad, Gurugram, Nuh, Rewari, Mahendergarh and Bhiwani districts. Since 1990s, the Aravalli region experienced mushroom growth of stone crushers in the vicinity of most of the stone extraction sites. These have been located in clusters of hundreds of units in Faridabad, Gurugram, Nuh and Bhiwani districts. Slate mining in Haryana is found in Rewari and Mahendergarh districts and it is mostly concentrated around Kund town. The channels of Dohan and Sahibi rivers in Mahendergarh and Rewari districts and of Yamuna river in Faridabad and Palwal districts have numerous sites for sand extraction.

Area under active slate mines increased by two and half times during the two decades. The area covered by stone crushers clusters also increased by 3 times over the two decades. Stone crushers emit tons of dust and caused air and soil pollution in an extensive area. However, Government's revenue earnings from these mining activities have increased many folds over the decade. Mining of construction material is responsible for several negative socio-economic impacts and health and environmental hazards, particularly, when the quarrying activities are being carried out haphazardly and not as per the prescribed norms and regulations.

Degradation of land, soil, water and air is the major environmental problem associated with mines in the study area. Mining of construction material has made the land susceptible to erosion and loss of vegetal cover. The clearing of vegetation in mining areas has posed serious threats to rivulets and other surface water bodies. Noise and air pollution have been observed as major health problems around stone crusher sites.

The perception of the people is also in conformity with the scientific findings of the present study. It has been observed, by the respondents, that mining of construction material and crushing operations have significant negative impact on the human health in its surrounding areas. Some of them also perceive mining of construction material as a threat to their economy and livelihoods. Despite this realization, the people in the mining area, at large, are in favour of continuation of mining operations as they are more interested in the economic benefits being accrued from these mines.

At some places, the mines have been found to be very close to the settlements and other infrastructures such as railway lines, state highways, major roads and canals. This causes danger to the infrastructure and is a blatant violation of mining norms. Most of the stone and slate mines have been carried out at the depth of over 50 m below the surface. Similarly, the sand is being extracted from the river bed beyond the depth of 3.0 m, the prescribed depth in the regulation. This results in drastically reshaping of the sub-surface drainage patterns. Hence, depths of quarrying, especially deep quarries up to the groundwater levels, need to be regulated immediately.

The workers are living in the close proximity of the mines and stone crushers. They inhale the dust, day and night, which causes serious health hazards. Hence, residences for workers should be constructed at least 500 m away from their workplaces. Mining of construction material is not only a hazard to the environment, but it is also being seen as a toll on public health. Hence, government should take initiative to promote research and development for the construction of infrastructure from the reusable materials.

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