IMPACTS OF MARGALLA HILLS CRUSHING PLANTS ON THE ENVIRONMENT

By

Dr. Kamran Muzaffar Khan[1]

SYNOPSIS

The study focuses on the detection of changes and effects of Mining and crushing Margalla hills on its environment. For this purpose, the Margalla hills range are selected where the aerial photograph of 1953, 1986 and 1999 are available. This area lies near Taxila by-pass at a distance of 5 km from University of Engineering and Technology, Taxila and 30 km from Islamabad. It mainly comprises of sandstone and shale, which is very suitable for construction of building and bridges and has been the main supplier of limestone for the construction. That is why the beautiful Margalla hills are being eaten away causing large scale environmental degradation and air pollution. To stop destruction we need to propose certain other sites suitable for the mining to fulfill limestone needs. Visual and digital image interpretation of the available images together with Geographical Information System (GIS) techniques is helpful in this respect.

1. Introduction

The study area lies at the border of Islamabad (the Capital of Pakistan) and Rawalpindi Districts. Geographically, it stretches from 330, 42/ to 330, 44/ north latitude and 720, 46/ to 720, 52/ east longitude (Figure 1).

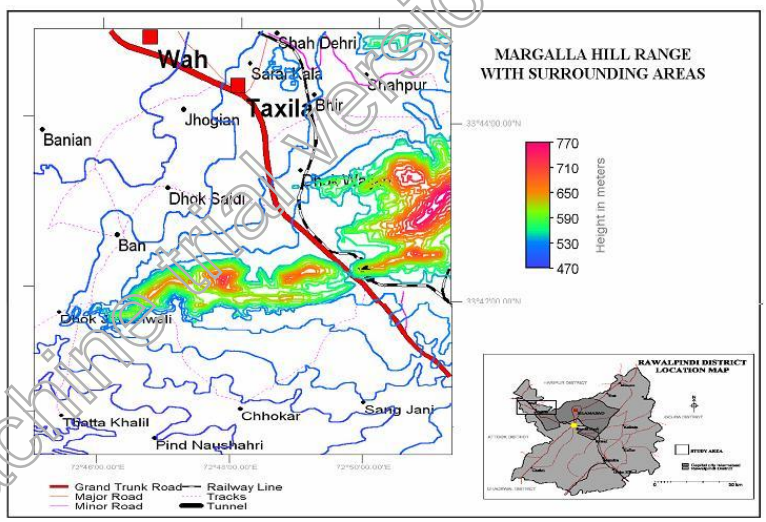


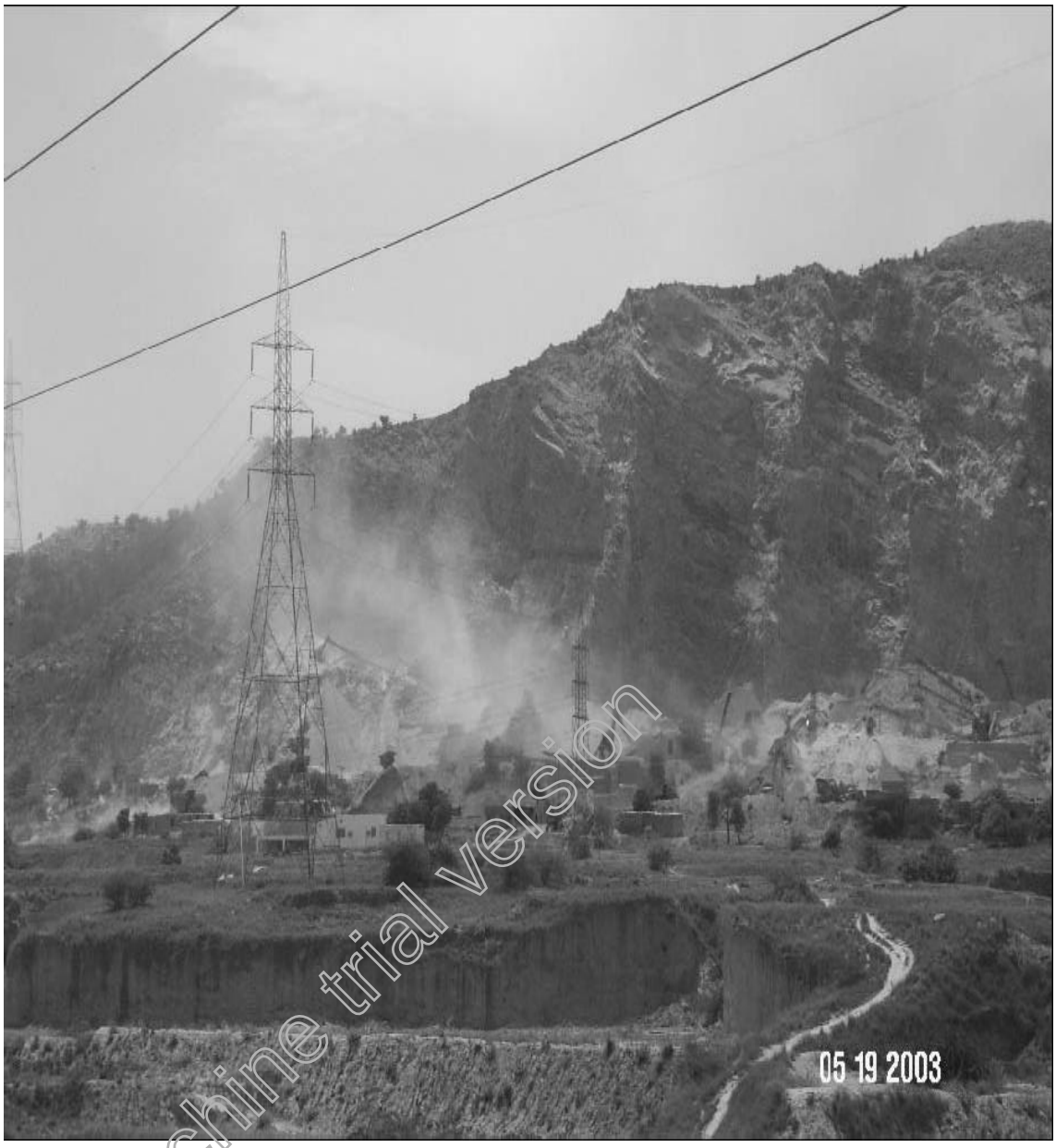
Figure 1: Location Map of Margalla Hill Range

Margalla hill range starts from this point and further runs north-west direction which ultimately joins the Murree mountain series. Islamabad, the Capital City; is located in the southern foothills of Margalla hill range. This area lies at a distance of about 30 km from Islamabad. From the last 30-35 years, when the Capital city came into being, after that time, the Margalla hills remained the main supplier of limestone for the construction of buildings, roads and bridges to the Islamabad and surrounding areas. Geologically, the rocks in the area range in age from Jurassic to Paleocene and are of sedimentary origin. It mainly comprises of sandstone and shale, which is very suitable for the construction of buildings and bridges. That is the reason that the beautiful and green Margalla hills are being eaten away by limestone mining and crushing activities (Figure 2), which in addition to the destruction of the natural landscape, is causing large scale environmental degradation and air pollution.

pdfMachine trial version

---

1. Associate Professor Civil Engineering Department University of Engineering and Technology Taxila.kamran.muzaffar@uettaxila.edu.pk.



pdfMachine trial version

Figure 2: Current view of Margalla Hills

The site is exposed on the main Grand Trunk Road, which connects Islamabad with rest of the Punjab and North West Frontier Provinces of Pakistan.

The total area of Margalla crusher is being divided into different block zones named as khawaja block, Ahmed block, Syed block etc. There are total 60,000 to 70,000 thousand workers employed on site belonging to different remote areas. Total numbers of machineries working on site are nearly about 300-350. For breaking Margalla stones the blasting is carried out by using kartoos. According to the site man's statement, the total number of drill men are about 12,000. Total number of plant workers are 8,000. One day blasting expenditures are nearly about Rs. 25,000. The whole of the site is computerized being monitored in Wah cantt. Material crushed from here is transported into different parts of country especially in Muzzaffrabad, Lahore, Karachi, Multan etc. Blasting continues since 1975.

2. Geology of the Margalla Hill

The rocks in the area range in age from Jurassic to Paleocene and are of sedimentary origin. The limestone deposits of the Samana Suk and lockhart limestone formation from the main source of aggregate material around Islamabad and are being quarried extensively. (Figure 3).

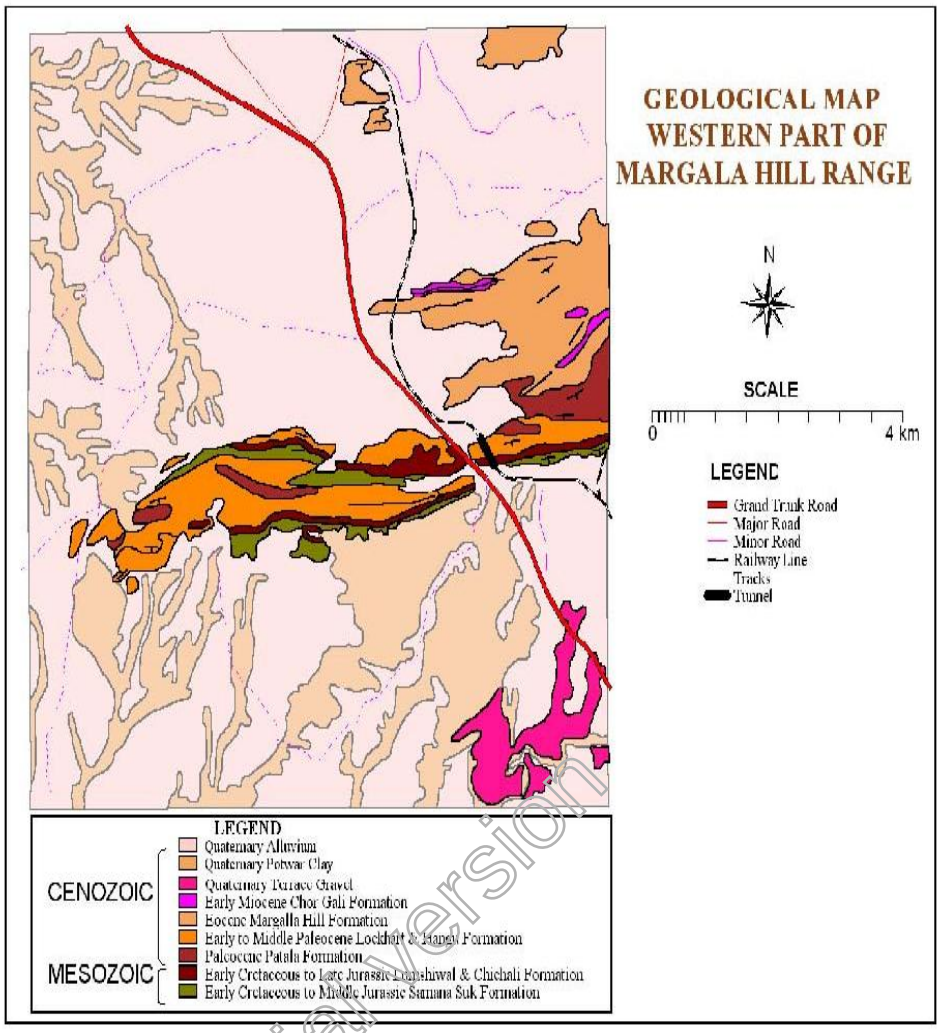


Figure 3: Geological Map of Margalla Hill Range & Surrounding Areas

The various lithological units are described as under:

a) Hangu Formation: It consists of laterite, lateritic claystone and sandstone with minor siltstone. Sandstone is reddish brown, weathers dark rusty brown, fine to coarse grained, pisolitic and ferruginous.

b) Lockhart Formation: It is well-developed formation in the area. It consists of predominantly marine limestone and subordinate marl and shale. Limestone is pale gray to dark gray, medium grained, thick bedded, in part nodular, hard, bituminous, and fossiliferous. Marl is grayish black amid fossiliferous. The shale is olive, gray to greenish gray and has weakly developed cleavage. Thickness ranges from 70 to 280 m. Limestone has an average Los Angles Abrasion Test Value of 22.79 percent loss for 500 revolutions. The average apparent specific gravity of the crushed rock is 2.69 and average absorption is 0.625.

c) Chichali Formation: It comprises sandstone and shale. Sandstone is grayish green to dark yellowish green, glauconitic, massive hard. Shale is greenish black, thin bedded and fissile.

d) Lumshiwal Formation: Small lenticular bodies of this formation are exposed in the range. The formation comprising greenish gray, medium grained, glauconitic sandstone and yellowish gray limestone is exposed in the range. The limestone is thin to medium bedded, argillaceous and at certain places it becomes shelly.

pdfMachine trial version

e) Samana Suk Formation: It is exposed on the southern side in the form of lenticular body. It is composed of thin to medium bedded limestone with subordinate calcareous sandstone. The limestone and dolomite belong to marine environment and deposited on a continental shelf. Limestone of Samana Suk Formation indicates different amounts of energy in the various carbonate depositional environments. The limestone is brownish gray to yellowish gray. It is oolitic biomicritic, and intrasparitic. Exposed thickness ranges from 200 to 250 m. Its contact with overlying Lumshiwal Formation is unconformable. The base is not exposed.

3. Flora and Fauna

The vegetation of the southern slopes is short and stunted, comprising deciduous and evergreen trees with diverse shrub growth. In the north stand pines, Eucalyptus, Peepal trees, Paper Mulberry and groves of oak. The Margalla Hills are home to various species of wildlife, including monkeys, exotic birds and carnivores such as the rare and presently endangered Margalla leopard. Commonly found animals in the Margalla include Rhesus monkeys, jackals (often heard cackling at night near the hills), wild boars, porcupines, mongoose and the pangolin or scaly anteater. The wild boar in particular can be seen at some of the least expected places in the city. While they generally stay close to the hills, occasionally (particularly in winter when the hills are cold) they can be seen quite far from the Margalla. Often the boars will have small hideouts in the green belts in and around the city. The increasing practice of throwing litter near the hills also attracts both monkeys and wild boar to come and forage through the rubbish. The wild boars can be quite large, very solidly built and usually travel in large groups.

4. Climate

Climate is sub humid to subtropical continental, receiving rainfall from both monsoon and western disturbances. The maximum rainfall occurs during the monsoon season From July to September. The average rainfall is about 1,044 millimeters per year, with more than 50% occurring in monsoon season. The mean maximum temperature ranges from 25.6°C to 39.4°C (78.1°F to 103°F) in June and the mean minimum temperature ranges from 3.2°C to 16.7°C (37.8°F to 62°F) in January. Temperatures in the project area vary from -1.1°C to 46.1 °C (30° F to 115° F).

5. Noise and Dust

The main aspects of these activities are generation of noise and dust. There are emissions during crushing material movement and transfer vibratory screening operation conveyors and crushers both generate mechanical sound as well as large amounts of dust. Water used for cooling purposes will also carry large loads of suspended solids.

6. Data Analysis

6.1 Methodology Adopted For Preparing Maps

6.1.1 Creation of Digital Elevation Model (DEM)

For this study, Integrated Land & Water Information System (ILWIS) 3.2 version was used. Infact ILWIS is a powerful tool not only for the analysis of GIS data but it is also a useful tool for the image processing and enhancement. A detail of contours with interval of 15m were drawn from the top sheet number 43C/14 in GIS and for this purpose, on screen digitization were used. When the contour were finalized after checking the redundancy and segment mode of the map, then these contour were interpolated by using the “Contour Interpolation” command in ILWIS. As a result DEM was produced this was further enhanced to get more attractive picture of the DEM (Figure 4, and 5). The aerial photos will be georeferenced first by taking tie point on selected places with the help of Global Positioning System (GPS), which will be used to collect the said data in the field. After getting data, the aerial photos will be georeferenced with the study area. Then the contour map will be superimposed one by one on these aerial photos to get the GIS statistical data. As a result separate maps will be prepared in which the rate of encroachment will be shown in the form of DEM for three different years. Side by side statistical

pdfMachine trial version

data will be generated which will lead us to conclude that if a specified rate continues, in how many years the Margalla hill range will be completely wiped-out.

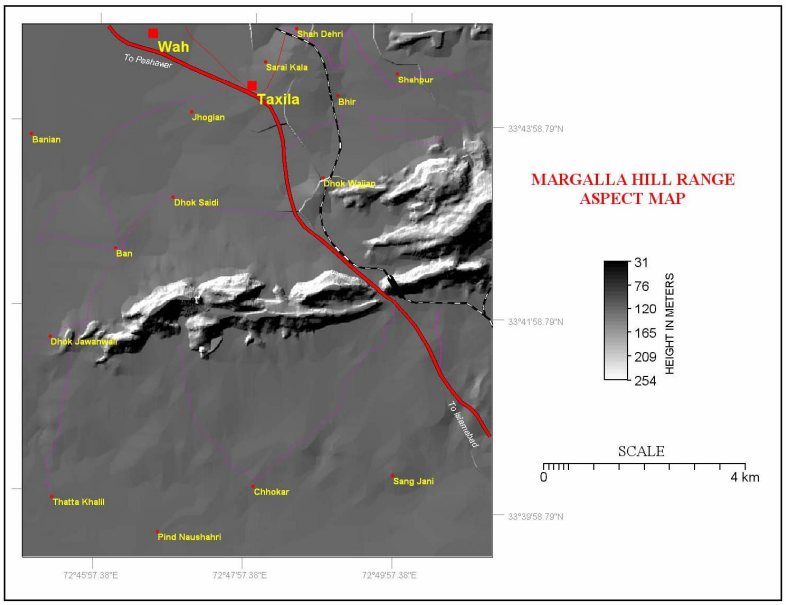
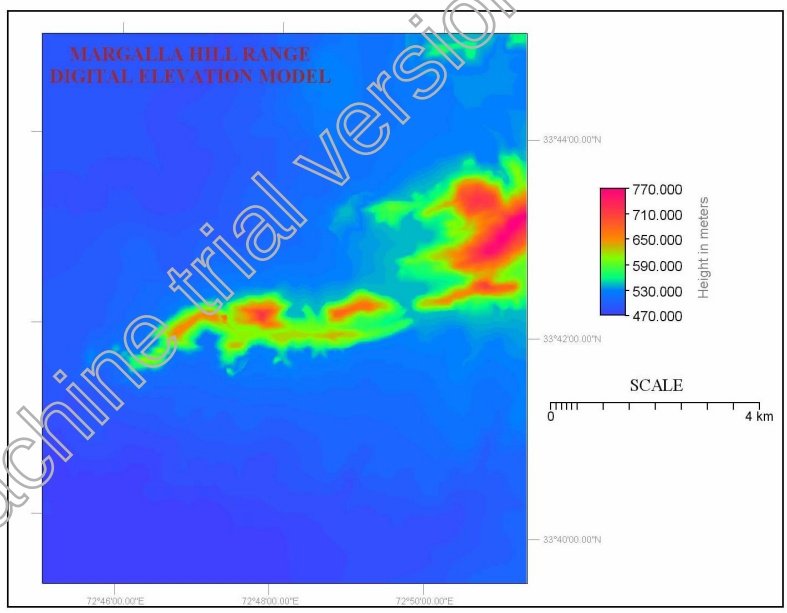


Figure 4: Aspect map derived from the enhancement of DEM (Digital Elevation Model)



pdfMachine trial version

Figure 5: Digital Elevation Model derived after interpolating the contour on interval of 15m

6.2 Positive Aspects

- It plays an important role in the economy of Taxila and as well as the country.
- Crushing in Margalla hills is a source of earning for people.
- Additionally, it's a main way in providing the construction material

6.3 Negative Aspects

- Crushing is producing fatal pollution, having bad impact on the health of the people. The noise of blasting is irritating to the people of surrounding areas. Noise has a negative effect on hearing.

- The available aerial photographs show the situation before mining, during the mid of mining and now the latest situation. Figures 6-8 show the gradual depletion of the Margalla hill range. Aerial Photograph of 1953 shows the situation before the start of the mining activities, where the beautiful Margalla hill is standing majestically. While during 1986 and 1999, the beautiful Margalla are being eaten away by the mining activities.

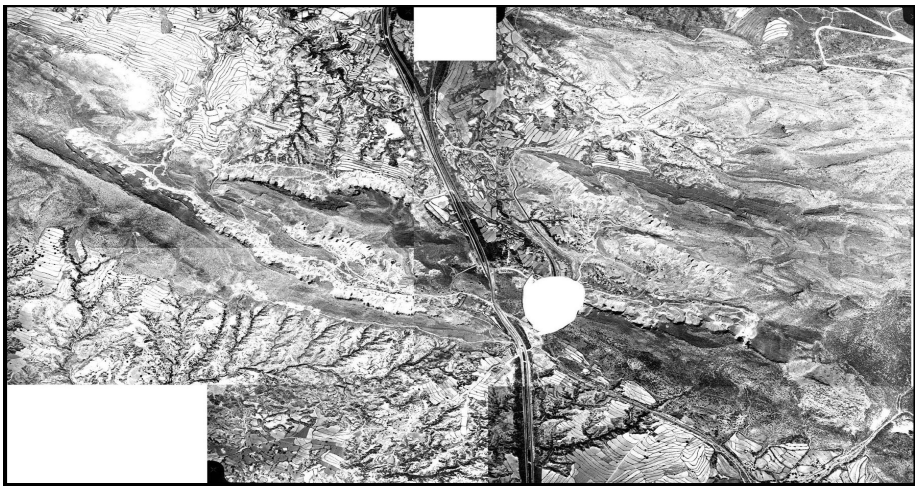


Figure 6 : Landsat Image (1953)

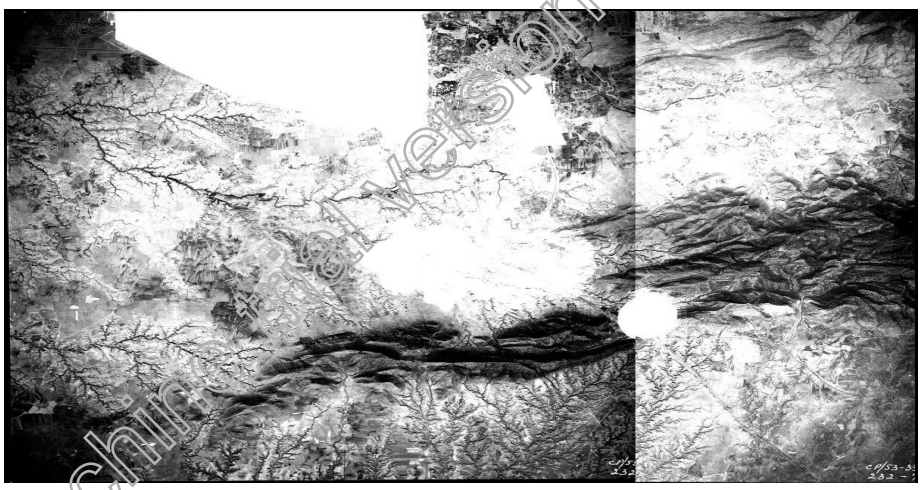


Figure 7: Landsat Image (1986)

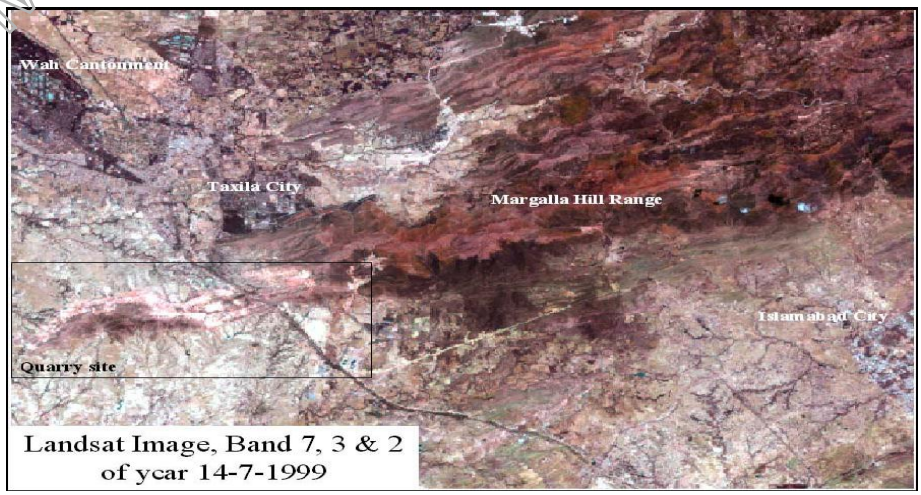


Figure 8 : Landsat Image (1999)

pdfMachine by Broadgun Software

- With the reduction of hill area, the area for the animals habitant in these hills is also being reduced. This reduction is also affecting the weather of the surroundings. It will also affect the amount and direction of wind blows.

- The use of Remote Sensing techniques are very useful tools for quick assessment and monitor such kind of changes, especially the use of these techniques in Geographical Information System (GIS) enable us to interpret and visualize the changes that have taken place from time to time. Visual and digital image interpretation of the available images together in GIS environment will lead us to conclude and recommend certain concrete steps to stop mining activities and propose certain other sites suitable for the mining.

- Therefore an attempt has been made to monitor these changes in putting the aerial photos in GIS environment and to derive some concrete conclusion.

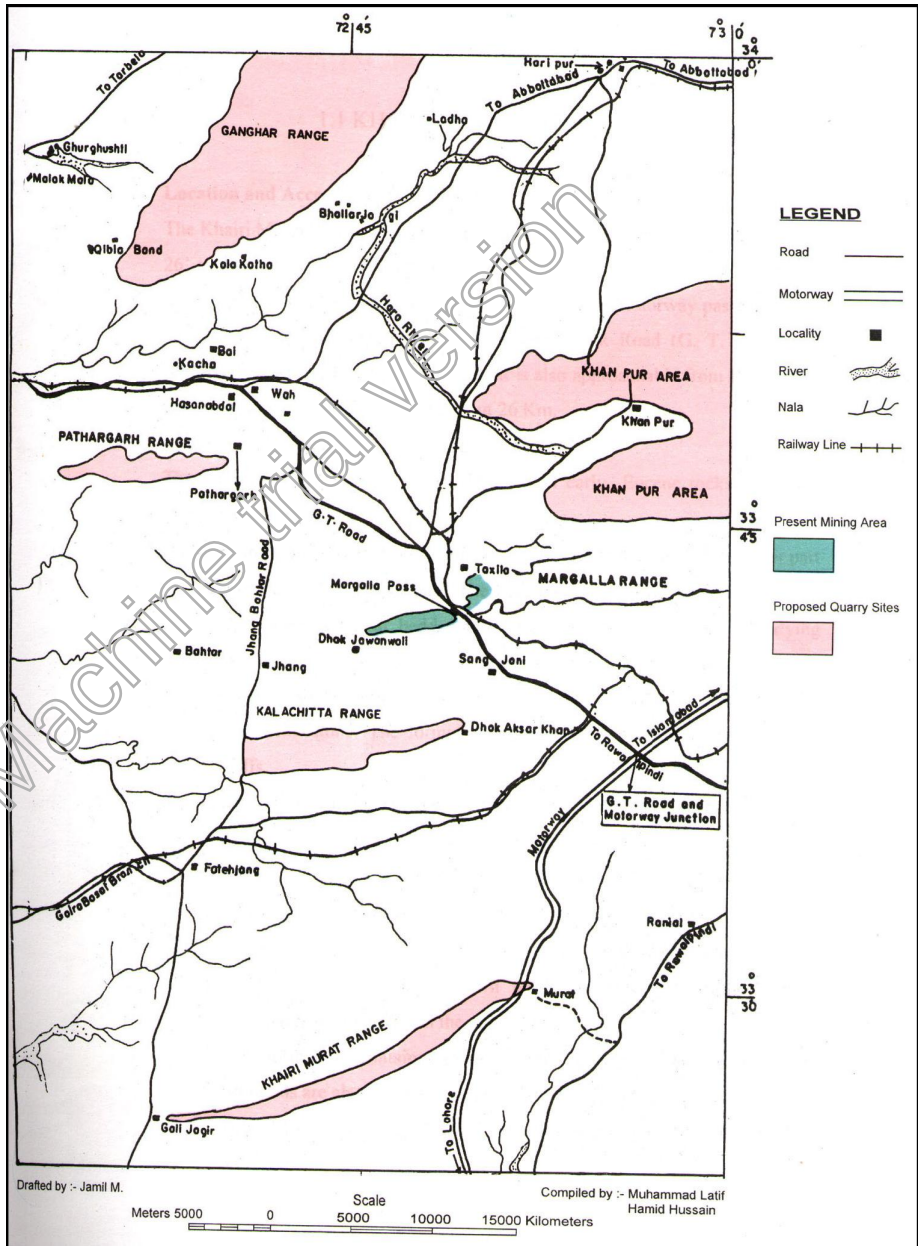


Figure 9 : Alternate Limestone quarry sites around Islamabad

pdfMachine trial version

7. Conclusions

Based on the interpretation of the aerial photographs and studying other relevant data, it can be concluded that if the present quarrying is allowed to continue, very soon the western side of the Margalla hills will cease to exist, along with species inhabiting the site. Furthermore, due to continuous quarrying, the environmental problems will become further aggravated as well as expose the people to fatal diseases.

8. Recommendations

To reduce quarrying from the Margalla hill range, some alternate quarrying sites have been proposed for future mining and to preserve the beautiful Margalla hills from further damage. Therefore five new proposed sites have been recommended. These sites are Khairi Murat, Kala Chitta, Pathargarh, Khanpur and Ganghar Ranges, which can be used for future exploitation for limestone aggregate in place of present Margalla hill range mining site. The reserves of limestone of all the five localities are enough to meet the present and future needs of construction material as compared to the present mining site, which will soon be depleted. The quality of limestone is more or less same in all these new localities as that of the Margalla Hills quarries. All the above localities are easily approachable especially the Khairi Murat Range where the Islamabad — Lahore Motorway passes through its North Eastern side. Main power supply line is also passing through all the recommended localities. These sites are easily approachable through main road and situated at a reasonable distance from Islamabad and Rawalpindi districts.

9. References

Falak Nawaz, 2003. The Effect of Mining on Geomorphology, National Centre of Excellence in Geology, University of Peshawar, Pakistan.

Akhtar, M., Bajwa, M. S., & Kausar, A. B., 1983. Geology of Fatehjang area, Attock and Rawalpindi Districts, Punjab. Pakistan. GSP 1. R. No. 171.

Gauhar, S. H., 1966. Cement Resources of Pakistan, GSP Pre-Publication. Issue No.39.

Hussain, A., and Lawrance, R. D., 1987. Landslide near Nicholson Monument, Margalla Range, lslamabad, Pakistan, GSP I.R., No. 282.

Latif, M., and Hussain, H., 2002. Limestone Quarry Sites around Islamabad and Kohat. GSP 1. R. No. 721. Sheikh, I. M., Pasha, M. K., Williams, V.S., and Khan, K. S. A., 1993. Environmental Geology of the lslamabad - Rawalpindi area, Pakistan. Project Report (I R), PK. 109, 3A.

Mujahid Hussain Naqvi, 2009. Incharge of Crushing at Khuaja Block, Margalla hills.

www.wikipedia.com

pdfMachine trial version