



Developmental Strategies to Laterite Mining Areas - A Geographical Approach

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Abstract

Laterite is a typical rock formation found commonly in the tropical monsoon regions as a capping over the hillocks. It is best developed in the Western Ghats and its foothills. Laterite has the peculiar property of being soft when newly quarried, but being hard and compact on exposure to the air. Also, loose fragments and pebbles of rock tend to re-cement themselves into solid masses as compact as the original rock. On account of this property it is usually cut in the form of bricks for building purposes. In earlier days people failed to recognize the economic potentials of laterite. They cut up laterite bricks for their immediate domestic purposes only. Later the field was mechanized and intensive mining of bricks and its transportation and marketing brought tremendous changes in the physical as well as socio-economic set up of the region. Irikkur block panchayath in Kannur district is now well known for its good quality laterite bricks. Here the ruthless mining of lateritic hills brought drastic changes in the local environment of midland hillocks and socio-cultural profile of the region. Present study perceives the problem from a geographical standpoint and attempts to suggest planning measures for the sustainable development of the mining regions.

Key words : *Laterite; Mining; Midland hillocks, Sustainable development.*

Mining activity exerts a long lasting impact on landscape, eco-system and socio-cultural-economic considerations. Impact of mining on land environment gets reflected in land-use pattern of the respective area because the more the land gets exposed to erosion by losing its green cover and regolith. Physical setting of the land system is getting disturbed due to mining and related activities (excavation, overburden dumping etc.). Its water resources get damaged, soil get contaminated, part or total of flora and fauna gets lost, air and water get polluted and the more damages go on proceeding in accelerated rates and the cumulative effects push the land towards degradation. When we are promoting the economic gains of laterite mining, its adverse effect on local environment cannot be overlooked. Laterite mining scenario of the midland hillocks of the study area calls for due attention to restoration/reclamation of land after mining in order to utilize the land for useful purpose.

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Mining is one of the oldest professions of the world and it grew with the evolution of man and civilization. Environmental impacts of mining are important to the society in and around the mining complexes not only because of the direct impacts but also the indirect impacts. It being the fact, all the activities the human beings do are for the benefit of the society, the mining activities should also yield benefits to the society, which so far has not been taking place. Laterite is a typical rock formation found commonly in the tropical monsoon regions as a capping over the hillocks. It is best developed in the Western Ghats and its foothills. It is the characteristic feature of midland hillocks of north Malabar region of Kerala especially Kannur and Kasaragod Districts.

Laterite is a typical rock material of monsoon region. Laterite occurs principally as a cap over the summits of Basaltic hills and plateaus and is the characteristic feature of tropical monsoon regions (Wadia 1975). Its geological nature was described only later by Francis Hamilton Buchanan, a medical officer of East India Company (Buchanan 1801). Laterites are residual sedimentary rocks, reddish or brownish coloured, comparatively soft rocks, containing high degree of porosity and are carrying vermiform structures (Fermor, 1911 and Maclaren, 1906). Laterite has the peculiar property of being soft when newly quarried, but being hard and compact on exposure to the air. Also, loose fragments and pebbles of rock tend to re-cement themselves into solid masses as compact as the original rock. On account of this property it is usually cut in the form of bricks for building purposes. Irikkur block panchayath in Kannur district is now well known for its laterite bricks. Here the ruthless mining of lateritic hills brought drastic changes in the local environment as well in the society. In the areas of extensive laterite formations, its mining has emerged as a major economic activity of the local people. Present investigation is an attempt to analyse the effects of laterite mining on the midland hillocks of Kannur district in Kerala and tries to suggest planning strategies from a geographical perspective.

Profile of study area :

Irikkur block is typically the midland portion of Kannur district. The block extends from 11° 55' N to 12° 05' N latitudes and from 75° 20' E to 75° 45' E longitudes. It extends over a total area of 433 sq. km. The eastern hilly tract gradually merges to the foothills of Western Ghats. Some parts of the block, mainly the areas adjoining to the Kattampally Lake, are flat and lie almost at sea level. The block has a general slope from northeast to southwest (Fig.1). Valapatanam River, one of the major west flowing rivers of the State flows through the central part of the block. The study area is endowed with a well developed drainage network. Study area has a humid climate with an oppressive hot season from March to the end of May. The average annual rainfall is 3900 mm and more than 75% of it occurs during

study area. The highly undulating eastern and southeastern parts of the Block have undergone laterization and in a number of places hard mesa like lateritic landforms have been developed (Narayanaswamy and Srikumar Chattopadyay 1996). Lateritic capping over the erosional surface has played a significant role on the denudational processes of the study area. There are two lateritic sheets which extend upto a length of nearly 180 km. and a width of around 30 km. One of them extends through Arabithattu, Manipara, Kalliatuparamba, Velliamparamba, Kulinja, Chedicheri, Malappattam, Kamplari, Chepparamba and Nediya. The other sheet extends through Chuzhali, Kurumathur, Kanjirangad and Elamperampara regions of Thaliparamba block and thereafter it spreads to Pyvalike and Bayar regions of Kasaragod district.

The block has a general slope from northeast to southwest. The northern panchayaths are comparatively elevated regions. In these panchayaths laterite formations are not extensive. Isolated patches of laterites are found in these areas but they are not utilized as bricks as they are not of good quality from constructional point of view. In most of the areas laterization process is in a transitional stage and

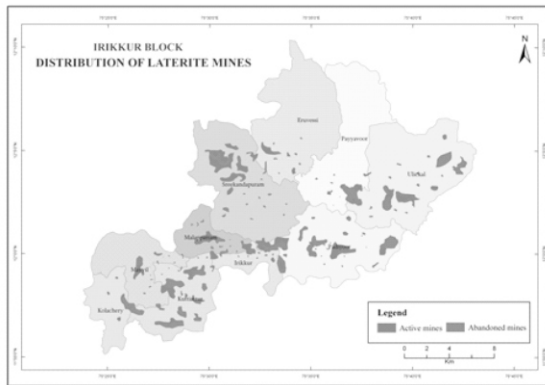
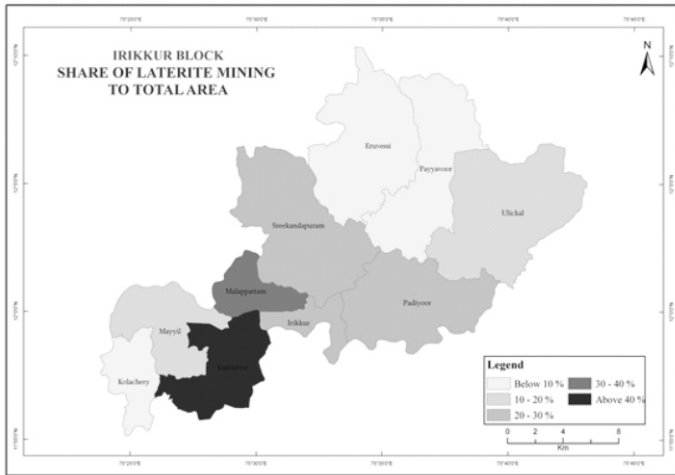


Table.1 : Irikkur block Distribution of laterite mines

Sl No	Panchayath	Area of Panchayath in sq. km.	Total mined area in sq. km.	Total mined area in %	Area of active mines in sq. km.	Area of active mines in %	Total no. of active mines
1	Sreekanthapuram	66	15.8	23.9	8.9	13.5	110
2	Payyavoor	49	0.7	1.4	0.3	0.6	6
3	Eruvessi	67	1.9	2.8	0.8	1.2	7
4	Mayyil	33	3.5	10.6	2.6	7.9	30
5	Kuttiattur	35	16.4	46.9	5.7	16.3	66
6	Malappattam	19	6.8	35.8	4.2	22.1	30
7	Irikkur	11	2.9	26.4	0.7	6.4	19
8	Padiyoor	54	12.9	23.9	4.1	7.6	41
9	Ulickal	78	11.3	14.5	3.4	4.4	35
10	Kolachery	21	0.5	2.4	0	0.0	0
	Total	433	72.7	16.8	30.7	7.1	344

Compiled by the investigator

Out of the total block area of 433 sq. km., mining is carried out in about one sixth of the area (72.7 sq. km.) However there exist wide variations in the total mining area in different panchayaths (Fig.2). 16.8% of the total area of the block was under laterite mining. Kuttiattur panchayath has nearly half its area (46.9%) under mining. It is followed by Malappattam panchayath with 35.8% of its area under mining. Irikkur (26.4%), Sreekandapuram (23.9%) and Padiyoor (23.9%) panchayaths also have a higher share of area under mining, compared to the block average (Table. 1 and Fig.3)



Study reveals that along with the intensification of mining its effects on the local environment also increased manifold. Mining left irreversible effects and scars on the local environment. The socio-cultural and economic profile of the region also affected considerably. Thus the various impacts of mining are also viewed and analysed as the part of the present investigation. A questionnaire survey was conducted among the peoples residing around the mining areas. Among the panchayaths, four panchayaths namely Kuttiattur, Sreekandapuram, Padiyoor and Ulickal are brought under study as they are having comparatively larger share of total mining area. The sample size is fixed on the basis of total mined area. In total 283 samples are taken randomly. Peoples residing at various distances from mines are interviewed. Investigator carried out detailed field study in the study area. The locational aspects in the questionnaire are noted down on the grounds of field experience. For example, the elevation of the region is marked with the help of GPS. The nature of slope, terrain, soil, overburden, etc., are marked on the grounds of the output of discussion between the researcher and the respondent. The details of depth of water table are noted through observing the wells. The seasonal fluctuations in water level are enquired with the members of the household. The possible effects of mining are enquired through the questionnaire. The opinion of

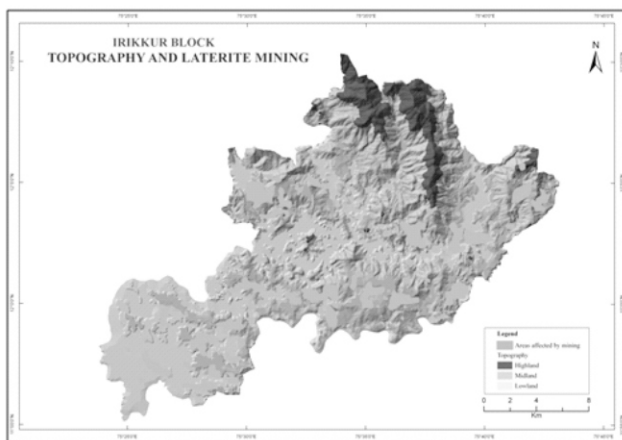
people regarding the effects on physical environment, nature of pollution, soil erosion, silt accumulation, surface run off, vegetal cover, water table, etc., are also included in the questionnaire. The results of field study can be summarised as follows.

Most of the mines are located over the midland region composed predominantly of lateritic mesa (Fig.4). Mining affected the socio-cultural and economic profile of the region considerably. In general mining positively affected the local economy.

Ruthless mining adversely affected the physical set up of the locality. Mining aggravated degradation of midland hillocks. People along the slopes are in fear of landslides. Mining intensified soil erosion. It led to accumulation of debris in low lying plains and paddy fields. Soil profile of the hill tops has been disturbed vigorously. Veneer of greenery has been surrendered for mining.

Pollution is inevitable mining result. Mining aggravated noise and air pollution in and around the mines.

Laterite mining affected the hydrological elements of the locality also. Mining pits reduced surface runoff. Storage of water in the deep pits positively



Overburden removal is normally done by using excavators, which results in generation of large volume of waste (soil, debris and other material). This is useless for the industry and is normally sold out for cheap prices. The people of the neighbouring regions purchase this soil and debris for filling up of low lying areas. It bears multifaceted impact on ecology as well as economy. However, in most of the cases it has been observed that the damage due to mining activity has been reflected on decrease in green cover or water resource or both.

The world mining community continually debates on the issues of pollution and land degradation along with its economic gains. Considering the mining

scenario, economic gains and environmental degradation are to be treated as two sides of a coin. It is found that economic gains are for short duration and environmental implications are long lasting. Mining can never be a sustainable activity. Even then the active involvement of administrators and local communities can fetch a more appreciable result in future. Several guidelines have emerged as best practices for mining environments in recent years. Study area also can take notice of these practices and set up its own appropriate practice rules for the sustainable development of the region.

It can be suggested that the mining of laterite bricks should be permitted only in a particular direction so that adjacent abandoned pits can be restored (leveled) to useful land in a planned manner. It is necessary to level the mines as much as possible. Mining areas are to be rehabilitated to its original landscape, followed by providing adequate vegetal cover. These provisions are to be insisted upon while contractor's leasing.

Attempts can be made towards the reconstruction of disrupted topography caused by ruthless mining. Most natural landscapes are composed of drainage basins which in turn consist of hill slopes and stream channels in an orderly arrangement for effectively conveying water and sediment. These get disturbed during mining. Care is to be taken to minimize erosion and runoff. The importance of topographic reconstruction cannot be neglected because the resulting landforms are the foundation upon which other reclamation practices are executed and eventual land uses take place.

Efforts should be taken for the reconstruction of disrupted soil profile also. It is to be noted that the replacement of removed topsoil as such is quite impossible. In most cases, top soils have the necessary physical, chemical and biological properties to sustain plant development, although the use of substitute geologic materials is often inevitable. To a certain extent revegetation on reclaimed soil can be the possible alternative. Therefore as far as practicable the top soil should be stored at a suitable place with proper precautionary measures so that it could be utilized during reclamation process. Stacked topsoil should be surrounded by proper embankments to prevent erosion. It can be stabilized further by planting grasses and bushes.

It is already noted that revegetation is a principal strategy for the revival of degraded lands with desirable secondary water quality and aesthetic benefits. Revegetation goals are from simple erosion control to the full restoration of complex native communities. It will improve the nutrient and organic matter content in soil. Plantation of mixed species of economic importance should be done after 2-3 years of growing grasses. Additional organic matter can be added to the

veneer so as to promote future soil development and vegetal growth. Afforestation and protection of existing plantations are necessary in the study area. Social forestry would do well in this area, as the region is well suited for trees of all categories. While selecting suitable species for plantation in mine area, the following considerations have to be taken into account:

Planting pollutant tolerant species.

Fast growing plants with thick vegetation foliage

Indigenous/exotic plants species with easy adaptability to the locality.

Socio economic requirement of the people of the surrounding area.

Geological and geotechnical investigations along the midland hillocks are to be continued. Safety and stability factors of hill slopes are to be studied. Disturbances on the geological setting of the strata should be analysed properly. Laboratory testing of soils and materials to investigate the parameters of soil degradation is essential for sustainable restoration. The toxicity of the soil, stability of waste dumps, volume of soil erosion, etc are to be investigated. Meteorological and climatological investigations should be carried out in order to collect standard data (temperature, amount of rainfall, humidity and wind patterns etc.) and to assess their influence on atmospheric and water pollution. It is found that open cast mining of lateritic mesas affected the spatio-temporal fluctuations in water table. Hydrological conditions of lateritic regions which include the quantity, quality, movement and storage of water above and below the surface are also to be studied scientifically.

Development of planning strategy of disturbed lateritic hills should start from the mapping of mines and environs. In order to delineate the areas of direct and indirect environmental degradation detailed field survey is required. Advantages of spatial technology can be effectively used in data acquisition and planning. High resolution-Satellite data is available now and land use land cover transitions can be analysed properly. GPS surveys will be instrumental in geographical investigations of laterite mines. Geographical Information system (GIS) can be effectively applied for implementing restoration strategies.

Some pits in consolidated lateritic beds at lower elevations could be turned into the storage tanks that would hold back the water of monsoon rains to be used in dry season. This could help in ground water recharging. Trees could be planted successfully on the edges of these tanks. Some pits can be used as landfills for non-hazardous municipal or industrial wastes or mining overburden. Thereby the area could be leveled and given a soil veneer. Such land can be used for plantation, recreation, or construction.

Future mining should be subjected to environmental screening based on the preparation of EIA and analysis of significant environmental issues involved which are not done as at present. The mining industry, the government and the local people must work together to care for future generations. There is also a need for better planning of reclamation/restoration system to bring back protocols employed, which are specific for region, site and land use. Drilling should be prohibited especially in inhabited areas. In scenic spots mining shall not be allowed. Due weightage should be given to the type of productivity and quality of soil before the land is leased out for mining. Mining can be permitted in such hillocks where agricultural productivity has been proved very low or areas with little vegetal cover. In densely populated areas manual mining can be recommended subject to certain environmental safeguards. Even in the case of manual mining, sprinkling of water over the laterites will bring down the quantum of suspended particulate matters in the air that will reduce air and noise pollution considerably.

The authorities are found to be helpless in checking the demolition of midland hillocks because there is no effective law to check the razing of hills owned by private parties. They are also having no complete data of degradation. Environmental organizations and NGOs should seriously take up the issue by creating awareness on the ecological role of the laterite hills. Proper orientation and support should be given to the local people too. The present regulatory system of controlling laterite mining is ineffective and evasive. Panchayat institutions should take the responsibility of local environment. The district planning officer under the district planning committee should be the "regional planner" backed up by appropriate legal powers and supported by a set of trained personnels to assist him in various environmental matters including EIA.

Conclusion

The interrelationship between the exploitation and degradation of natural environment and regional development is particularly relevant in the present context. Sustainable development is the only alternative to conserve nature and natural resources to enable the forthcoming generations to live here safely and successfully. The over-extraction of all natural resources including laterites should be discussed with this approach in mind. The qualities of laterite bricks are widely appreciated and their demand increases day by day. The Laterites as an in situ material forming land have been formed over thousands of years through exceedingly slow geological and geomorphological process in the region (Thomas Varghese et al 1993). Mining, however, degrades them at an alarming rapidity, making these areas appear like blights on the surface. A well thought out plan should be implemented to conserve the rest. It is not practical and ideal to stop mining abruptly. We have to set some limits, both vertical as well as horizontal, to mining

areas. There are many examples in the study area itself where the mined out areas look much better and are more productive than the pre mining status. Truly speaking, mining can be planned and executed with the end result being a well developed and used land area.

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