ABSTRACT

As the population rapidly increases in developing countries, the need for housing and infrastructural development reaches new heights, there is an increasing demand for bricks and tiles. In Kerala, almost all the districts, except Idukki, the tile/clay mining activities is carried out in large scale. In order to meet out the demand of the state the surface occurrence of clay is mined extensively, but the mining process is most unscientific. The paddy fields of the state, which play a vital role in the eco-balance of the area, are virtually destroyed leading to an irreversible ecological imbalance. Thrissur district, situated in the central part of Kerala is leading in its production of clay bricks and tiles for construction. In order to understand the impacts of mining over natural resources, Thirisur district is selected as the study area. The district covers an area of 3,032 sq. km and has an average annual rainfall of 3370 mm.

The main objectives of the study area are, To study land use/land cover pattern, geomorphology, soil characters and hydrology of the study area using remotely sensed data, GIS and GPS; To identify the mining affected areas and assess the impact over landforms and hydrological systems; Integrated all the parameters using GIS techniques and suggest remedial measures for curtailing further degradation and reclaiming the degraded zones. The methodology includes evaluation of environmental impacts of the natural resources such as landform, land use, hydrology and soil by using Cartosat-1 PAN data (2010), LISS-IV data (2005), SOI toposheet (1966) coupled with field work and secondary data in GIS platform. The ancillary data such as mining site inventory, demography and socio-economic survey details of tile industries are prepared. Then, integrated analysis was done using GIS environment and evaluation of impact of clay mining was made for environment hazard management and finally suitable clay mining areas are also suggested.
Total of 124 clay mining locations are present in 39 Panchayaths, 1 Municipality and 1 Corporation. The highly affected taluks include Thalapally, Thrissur and Mukundapuram. In analysis part, cropping pattern, land use/land cover change, impacts in hydrology, status of clay mining and virgin location, site suitability and recommended depth are derived through GIS analysis. The paddy land data shows a decreasing trend from 2004-05 to 2007-08 and a fluctuating trend till 2012. The land use/land cover maps were prepared during 1966, 1973, 1990 and 2010 and change analysis is carried out from 1966-1973, 1973-1990 and 1990-2010. The changing pattern analysis shows that increase in population density and settlements there by the increase in demand for the construction materials including clay and other natural resources are the factors influencing the land use change in the district. The paddy production in the district is found decreased. Built Up, Agriculture plantation, abandoned and waterlogged clay mining area are showing increasing trend. Conversion of paddy to other crops and settlement, change in forest plantation to agriculture plantation, land filling along with other land use/land cover changes is found in the district.

The clay mining impacts identified in the natural drainage system are drainage choking, waterlogged clay mining pits and stream course change. Status of clay mining and virgin area is prepared from land use map (2010), land mining area from geomorphology (2010), and secondary data. Suitable area for clay mining was derived through overlay analysis and the parameters selected for the study are status of clay mining, virgin location, comparatively deeper groundwater level, tile/brick industry location, soil (type, texture, depth, quality) and proper transportation facility. Among the study area, an area of 4.36 sq. km in 20 locations is suggested for suitable sites for sustainable clay mining and recommended depth is between 1 and 3 m.

Indiscriminate clay mining, unscientific planning and developments, insufficient guidelines and lack of awareness of environmental and socio-
economic issues are the major challenges in clay mining and tile/brick industries in Thrissur district. Tile/brick industries are facing scarcity of clay due to the restriction of mining from the paddy fields. The recommendations suggested for the management of mining affected area as well as conservation of clay resource in the study area are, clay/sand mining will drastically affect the existing land use and the mined areas will be difficult to rehabilitate. So land use norms are to be strictly followed to avoid unscientific land use and land fills; conservation of the paddy field through food security schemes to avoid ecological imbalance of the study area; vegetables and seasonal crops can be practiced in refilled clay mining pits where paddy is not cost effective; utilization of waterlogged clay mining pits for pisciculture, floriculture and recreational purpose; the existing waterlogged clay mining pits should be kept unpolluted to avoid contamination in adjacent wells; use of reservoir silt as an alternative to tile/brick clay; utilization of fly ash bricks produced from thermal power plants as an alternative to clay bricks in an experiment basis; and formulation of environment management plan for managing the already degraded zones.