IDENTIFICATION OF EROSION PRONE FOREST AREA - A REMOTE SENSING AND GIS APPROACH

S. Jayakumar[1], JUNG BIN LEE, Lkhagva Enkhbaatar[3], and Joon Heo[4]
[1]jayakumar@yonsei.ac.kr, [2]ortolan@yonsei.ac.kr, [3]enkhbaatar@yonsei.ac.kr
[4]jheo@yonsei.ac.kr
School of Civil and Environmental Engineering,
Yonsei Univ., 134 Shinchon-Dong, Seodaemun-Gu, Seoul 120-749, Korea

Abstract

Erosion and landslide cause serious damage to forest areas. As a consequence, partial or complete destruction of vegetation occurs, which leads to many cascading problems. In this study, an attempt has been made to identify the forest areas, which are under different risk categories of erosion and landslide, in part of Eastern Ghats of Tamil Nadu. Relevantthematic maps were generated from satellite data, topographical maps, primary and secondary data and weights to each map were assigned appropriately. Weighted overlay analysis was carried out to identify the erosionprone forest areas. The result of erosion and landslide prone model reveals that 4712 ha (17%) of forest area is under high risk category and 15879 ha (58.65%) isunder medium risk category. The results of spatial modeling would be very much useful to the forest officials and conservationist to plan for effective conservation.

Key words: Eastern Ghats, remote sensing, forest fire, erosion, spatial modeling

Introduction

Landslide and erosion cause considerable damage in forest areas during rainy season. Some times landslide disrupts human life severely. Kolli hill, one among the hills of Eastern Ghats of Tamil Nadu has a total forest area of 272.00 sq. km., having varied forest types with varying density classes constitute this habitat (Jayakumar *et al.*, 2002). Extensive damage caused by erosion and landslide jeopardize regeneration and result in over all degradation (Jha *et al.*, 2000 and Ciesla, 1989). Erosion and landslide in the forest regions are triggered by deforestation, steepness of slope, vegetal cover, and intensity of precipitation and physical property of soil. Conservation of existing forest cover mainly depends on precise planning and implementation (Martin *et al.* 1998 and Tiwari *et al.* 1996).If the forest areas, which are likely to be affected by erosion and landslide could be identified beforehand, then suitable conservation policies couldbe taken up. With these backgrounds this study was taken up to

a. Identify erosion prone forest areas by spatial modeling

Weighted overlay analysis was performed with appropriate thematic layers with weightages. According to the results of erosion and landslide risk model, the forest area has been categorizedinto three classes viz., low, medium and high. The low risk category occupies 538.28 ha, which is 1.98% of the total forest area, the medium risk category occupies 15879.34 ha, which is 58.65% of the total forest area and the high risk category occupies 4712.02 ha, which is 17.40% of the total forest area. Among the three risk categories, priority should be given to the area that belongs to high risk. Area under this category occurs in the north eastern and western sides of the hill. Slope of this region is high, topsoil is less, vegetation cover is also poor and intensity of rainfall is high. All these factors together influence these areas. Necessary preventive measures such as construction of contour bunds and re-vegetation should be taken up to prevent landslide and erosion.

References

Beaubren, J., (1986). Visual interpretation of vegetation through digitally enhanced Landsat – MSS images. *Remote Sensing Reviews*, **2,** 111 – 143.

Census of India, (1991). District Census Hand Book, Salem, Govt. of India.

Chuvieco, E. and Martin, M.P., (1992). Global fire mapping and fire danger estimation using AVHRR images, Photogrammetric Engineering and Remote Sensing, 60, 563 – 570.

Ciesla, W.M., (1989). Aerial photographs for assessment of forest decline – A multinational overview. *Journal of Forestry,* **87,** 37 – 44.

Dobhal, G.L., (1987). *Development of Hill areas.* Concept Publishing company, New Delhi.

Greenberg, J.P., Zimmerman, P.R., Heidt, L. and Pollock, W.J., (1984). Hydrocarbon monoxide emission from biomass burning in Brazil, Jr. Geophysics Res., 89.

Harikrishnan, M., (1977). Working plan for the Salem forest division, Government of Tamil Nadu, India.

Jayakumar, S., Arockiasamy, D.I. and John Britto, S., (2002). Conserving forests in the Eastern ghats of through remote sensing and GIS – A case study in Kolli hills. Current Science, 82, 1259 – 1267.

Jayakumar, S., Arockiasamy, D.I. and John britto, S., (2000).Estimates of Current States of Forest Types in Kolli hill using Remote Sensing. *Journal of Indian Society of Remote Sensing,* **28,** 141 – 151.

Jensen, J.R., (1986). *Introductory digital image processing – A remote sensing perspective,* Prentice Hall, New York, USA.

Jha, C.S., Dutt, C.B.S. and Bawa, K.S., (2000). Deforestation and land use changes in Western Ghats, India. *Current Science,* **79,** 231 – 237.

Kushwaha, S.P.S., Rocky, P., Leima, S. and Roy, P.S., (2000).Plantation type differentiation from fused IRS data – An analysis. *Proceeding of the Spatial Technologies for Natural Hazards Management. Indian Institute of Technology, Kanpur, 21 – 22 November, 2000,* pp. 233- 238.

Mani, G.,(1976). Report of the Investigation for Bauxite in Kolli Malai, Salem District, Tamil Nadu – Progress report for the field season 1975 – 76, Geological Survey of India, Tamil Nadu circle, Madras.

Martin, M.E., Newman, S.D., Aber, J.D. and Congalton, R.G., (1998). Determining forest species composition using high spectral resolution remote sensing data. *Remote Sensing of Environment,* **65,** 249 – 254.

NRSA, (1998).Biodiversity Characterization at landscape level Using Remote Sensing and GIS. *Field Manual,*National Remote Sensing Agency, Hyderabad.

Tiwari, A.K., Kudrat, M. and Manchanda, M.L., (1996). Remote sensing and GIS: Indispensable tools for regional ecological studies, *Tropical Ecology,* **37,** 79 – 92.