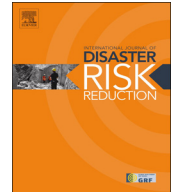


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# A paradigm quantitative approach for a regional risk assessment and management in a few landslide prone hamlets along the windward slope of Western Ghats, India

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## ABSTRACT

Landslide occurrences in Western Ghats are not rare but rather a brooding omnipresent reality with all its fury. The devastation caused by this cataclysmic phenomenon is unwittingly greater than one could imagine as the density of population in the state of Kerala is  $\sim 800$  per  $\text{km}^2$ . This study aims at providing a quantitative estimation of elements at risk to landslides in a stretch of landslide susceptible zones, demarcated using a heuristic approach and spreading over a few hamlets in parts of Western Ghats. The vulnerability results reveal that: 1,321,056 nos. of human population, 2656 cattle, livestock and poultry, and INR 2650 crore ( $\sim$ US\$ 143 billion) worth of property are at risk. Management practices, on a regional scale, along transport corridors and major settlement areas are proposed. As this part of the world experiences a tropical climate, monsoon is the sole triggering mechanism of landslides. Hence an early warning system with reference to rainfall and a series of surface drainage network will help in minimizing the effects of the landslides.

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## 1. Introduction

*“When will there be an end to the horrifying scenes and harrowing incidents of earth materials in shambles accumulating over corpses and carcass, trees and houses uprooted?”*

This big question flashes on every mind after witnessing a landslide.

Then, everyone ponders over the ways how this can be thwarted. Sajinkumar [1].

Vulnerability is a fundamental component in the evaluation of landslide risk [2]. ‘Contradicting’ definitions with ‘similar’ sense were given for vulnerability: Alexander [3] defined landslide vulnerability as the ability of an element to withstand mass movements and for Varnes [2] landslide vulnerability is the degree of loss to a given element or a set of elements at risk resulting from the occurrence of a landslide of a given magnitude in an area of given types or sizes. Vulnerability, in the present context, may be defined as the level of potential damage, or degree of loss, of a given element subjected to a landslide of a given intensity [4]. Vulnerability assessment involves the understanding of the interaction between a landslide and the affected elements. Hazard maps that are not accompanied by vulnerability analysis are not meaningful for effective decision-making [5]. Landslide risk is commonly defined as a function of landslide hazard,

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elements at risk having certain damage potentials and given vulnerabilities of each element at risk to a landslide with a defined magnitude. Elements at risk comprise the population, properties, economic activities, and public services [3]. Although vulnerability estimation is an important part while assessing landslide risks, a literature review demonstrates the lack of vulnerability studies in landslide risk research [6] in both the social and natural science approaches. A unified methodology for classifying and assessing quantitatively the vulnerability of elements at risk to the types and magnitudes of specific landslides does not exist [7].

## 2. Statement of the problem

Hilly regions, in any part of the world, is a rush spot for tourism, hydroelectric projects and agriculture [8]. Hence drastic changes in land use occur in hilly regions, which are already hot spots for different natural hazards, landslides being the most omnipresent. The Western Ghats, the bold westerly escarpment of India [9], bears the testimony of frequent landslides, especially during the monsoon season, and they cause widespread damage to life and property. About 8% (1400 km<sup>2</sup>) of area in the Western Ghats of Kerala is classified as a critical zone for mass

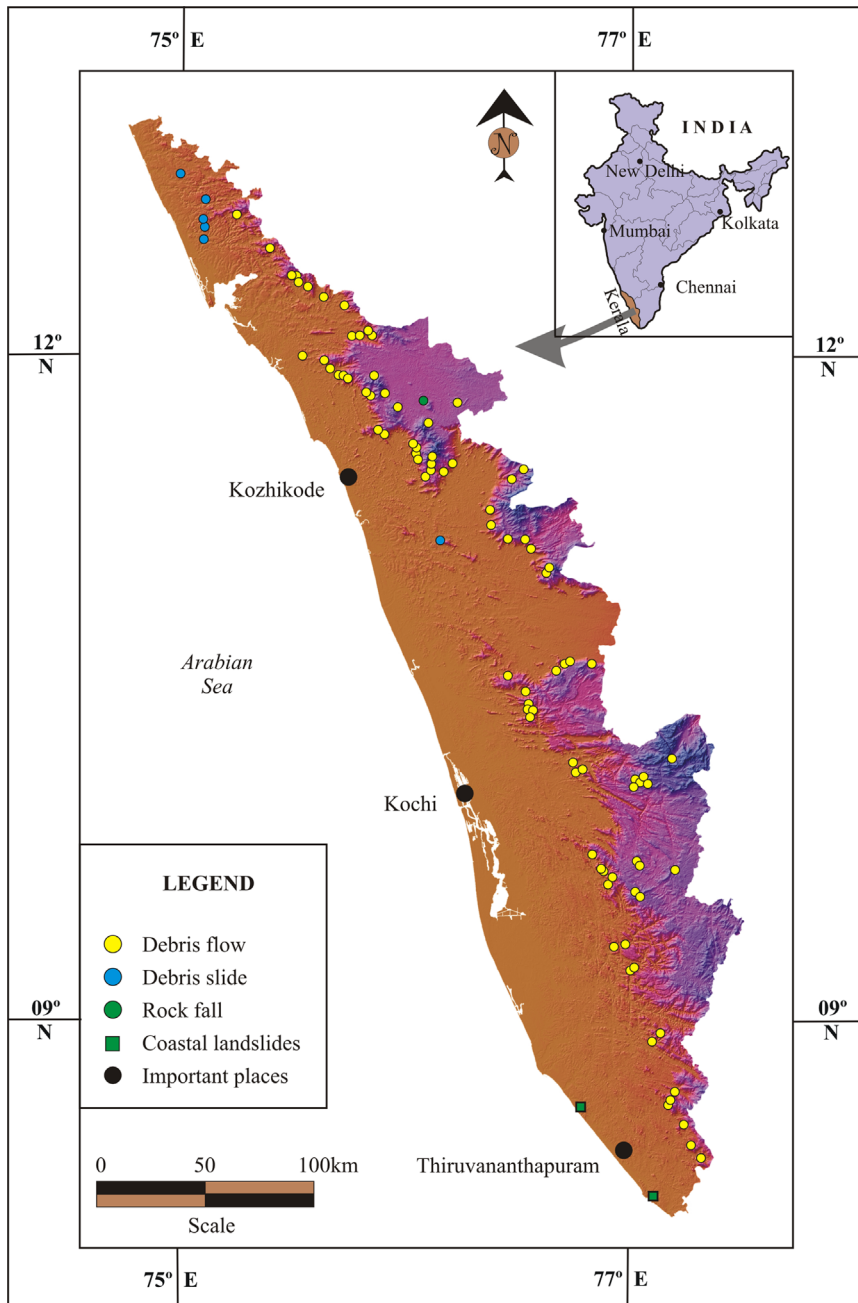


Fig. 1. Major landslides overlaid on SRTM data for the entire Kerala state.

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