Landslide hazard zonation mapping using frequency ratio and relative effect models in Katteri macro watershed Nilgiris district, Tamilnadu

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Abstract

Present analysis is endeavored in Kattery macro watershed, Nilgiris District, Tamil Nadu, Republic of India wherever a serious landslide happened. totally different thematic maps relating landslide hazard studies were established from the toposheets and Remote Sensing satellite symbolisms utilizing Geographical system (GIS). Landslide hazard zonation map of Kattery macro watershed was ready by distribution correct weights and ranks for numerous themes. The north eastern and south-western part of Kattery macro watershed is additional susceptible to landslides and also the south-eastern part is a smaller amount vulnerable.

Keywords: Type Landslide hazard zonation- mapping-Katteri macro watershed-Remote and GIS-weights and ranks;

1. Introduction:

Landslide is a vital natural hazard the earth is encountering now. It happens as results of each evolution further as natural factors. It causes severe impacts on the atmosphere as well as mankind. the most causation factors of landslides are rainfall, tectonic movements and human interventions.

Landslides are a frequent development within the Nilgiri district of Tamil Nadu, India. It is particularly more common in and around Kateri watershed. The unexampled rains caused quite 100 landslides among a region of 250 km\textsuperscript{2} in 1978 and in 1979. This incidence of landslide was on a far larger scale and nearly 200 landslides were recorded within the Nilgiris district. In recent past, major landslide events moving natural slopes were recorded in 1978, 1979, 1987, 1993, 1996, 2006, and 2009. These events resulted in varied casualties and loss to properties in the Nilgiri hills.

In 1993, a detritus slide at Marapallam killed quite fifty people, and destroyed eighteen homes and one mosque. In 2009, downfall triggered more than three hundred landslides in the Nilgiri area, that affected each cut and natural slopes and resulted in eighty casualties and an calculable loss of US$ 6.5 million. The 2009 downfall triggered a significant landslide in achanakal hamlet of ketti village inflicting loss of life and property. Significant rains in November, 1979 brought in giant scale landslides within the Cooonoor sector. The devastation because of landslides is even additional severe in the recent past. During this context, remote sensing and GIS techniques play a vital role in the landslide vulnerability assessment. tho' several studies were administrated to grasp the rainfall, groundwater level, geology, geomorphology, land use and land cowl changes in several elements of Nilgiri districts, only landslide zonation mapping. Application of Geotextiles and morphometric studies were administrated in Kateri watershed. No website specific study to demarcate landslide prone locations at small watershed level was done. This study deals with landslide susceptibleness assessment, slope stability and experimental analysis of landslide incidence and landslide disaster management and mitigation. This study is that they would like of the hour to save lots of life and property [1-17].
The relative impact model relies on the ascertained index relationships between distribution of landslides and every landslides connected factor. The most advantage of logarithmic perform is in domain determination for output information that provides civil rights for and and minus domains of calculated relative effect values. Naveen dominion et al. (2011) ready landslide hazard zonation map exploitation the relative effect technique for South eastern a part of Nilgiris, Tamilnadu, India. Ghafoori et al. (2006) have done landslide hazard zonation using the relative effect method in Bormahan drainage basin in Binaloud mountains region, NE Iran [1-17].

2. Material and Method

The Nilgiris is settled at an associate degree elevation of 900 to 2636 meters higher than MSL. Its angular distance and longitudinal dimensions being one hundred thirty kilometer (Latitude: 11°10.00N - 11°42.00N) by 185 kilometer (Longitude: 76°14.00E to 77°02.00E). The Nilgiris is delimited on North by Karnataka State on the West by Coimbatore District, Erode District, South by Coimbatore District and because the East by Kerala State Shown in Figure 1b and 2 and therefore the satellite read of the study space is additionally shown in Figure 2. In Nilgiris District the topography is rolling and steep. concerning 60% of the tillable land falls underneath the slopes ranging from sixteen to 35%. The flow chart (Figure 1a) explains the methodology process.
3. Data sets for the analysis

The data is that the fuel for GIS analysis. The datasets used for this study has been derived from remote sensing satellites and field data. The thematic maps such as geology, soil and landuse are derived from satellite remote sensing data. The analysis concerned field data that was collected on downfall details, starting from one 1995 to 2005 and also the different data is the occurrence of historical landslides for the past three decades (1976-2005). Most of the spacial data were noninheritable by deciphering satellite mental imagery and geography maps. Table 1 shows summary of computer file and their salient points for landslide hazard zonation.

| S.NO | Description       | Agency                        | Summary of data Collection Techniques               | Shape          | Scale      |
|------|-------------------|-------------------------------|-----------------------------------------------------|----------------|------------|
| 1    | Geology           | Remote Sensing and Satellite GSI interpretation and GSI Maps | ImageryPolygon                                    | Polygon 1:50,000 |            |
| 2    | Soil              | Soil Survey reports, Satellite Atlas and Remote interpretation with reference to soil survey report | ImageryPolygon                                    | Polygon 1:50,000 |            |
| 3    | Landuse           | SOI Toposheets and remote sensing | ImagieryPolygon and Topographic maps | Polygon 1:50,000 |            |
| 4    | Slope (Derived)   | DEM                           | Made from aDEM                                      | Raster         | 1:50,000   |
| 5    | Aspect (Derived)  | DEM                           | Made from a DEM, no extra data collection required  |                | 1:50,000   |

4. Preparation of landslide susceptibility mapping

4.1 Integration OF GIS Analysis

The themes are appointed rank and weights consistent with its condition to landslide existence. All maps have been integrated and overlaid to make final landslide inclined map of ketti small watershed. condition index springs from composite weight of all the factors, that is that the total of the merchandise of rank and weight of every overlaid theme[1-17].

4.2 Assessment

Valuation of the landslide status map has been valid as compared with field investigations of locations of previous major landslides inside the study space. For validation of the ready map, the past landslides incidence knowledge from GSI (pub no:57, 1982) was taken. there's smart correlation between areas outlined as extremely prone and moderately susceptible zones and also the proverbial landslides. The study area comes beneath highly landslide susceptible zone.

4.3 Present land use

Katteri watershed contains a vicinity of 2919 hect during which most of the land are annual, perennial crops and inhabitations. during this the ketti microwatershed comprises an area of 328.23 hectares (Figure 3).

4.4 Drainage pattern

Most of the drains be due north east to south west direction within the study space (Figure 4). The drainage patterns ascertained during this region are largely dentritic. Most of the study area is drained with dentritic and sub-dentritic drainage patterns. the drainage pattern is found to be terribly course (Figure 4).
The assessment of quantitative prevalence associated landslides distribution of laborious rock parcel of land could also be virtually not possible while not an understanding of the lithology, stratigraphy and structural characteristics of varied earth science units. The study space is comprised of archean metamorphic
rocks that mainly include charnockites. More or less the whole study area is occupied with the charnockite rock.
 attiny low patch of the study area is occupied by dolerite dykes, which show linear structure. Charnockite forms the
majority of the rock units within the Nilgiri district. This hypersthenes-bearing bluish grey rock forms the basement in high grade metamorphic terrain[1-17].

5. Geomorphology

Geomorphology that deals with the scientific study of landforms provides a sound basis for evaluating
associate degree integration the natural resources reminiscent of soil, vegetation; surface and groundwater, and
land use. Landforms contribute to soil development, vegetative growth surface and water circulation and agricultural
practices. The hills rise dead from the encompassing plains to an elevation of 1370m MSL and it's encircled by the
Coimbatore plains within the southeast, Bhavani plains in the northeast, Moyar natural depression in the north and
Gudalur highland in the northwest. The distinguished peaks are Ooty hills, Dodabetta, Kodaibetta, Bhavani Betta
and Devabetta. Dodabetta is that the highest peak in South India (GSI 2000). Two kinds differing types differing
kinds of landforms are notified within the Nilgiri highland. One type contains high peaks and rocky escarpments and
is marked by radial emptying patterns. These landforms are termed as Doddabetta landforms. The opposite landforms
embrace the plateau with mild topography with thick soil development and indirect streams, that are regionally
termed as Ootacamund landforms. within the gift study, IRS Resource Sabbatum satellite knowledge was wont to
study numerous landforms in the study space. The vital landforms known within the study area embrace moderately
compound plateau, in crammed valleys, and Ootacamund surface and high dissected deflection slope[1-17].

6. Slope

Slope is a crucial parameter in any landslide vulnerability zonation mapping. Shuttle radiolocation
topographical Mission (SRTM) satellite information has been used for the preparation of slope map. victimisation
the Arc-view 3D analyst, the slope has been classified into numerous categories. It shows that slope varies from
0-5% to over 61-170% within the study space (Figure 5) [1-17].

Figure 5 Slope map of the study area
6.1 Soil

The soils of the study area are mainly lateritic in origin with shallow to deep soil. The soils are porous however the infiltration isn't so high on cope up with the high intensities of precipitation that occur sometimes. The foremost portion of the study area is occupied by the sandy clay and partially with sandy clay soil and loamy sand (Figure 6).

7. Landslide susceptibility assessment

Landslide could be a frequently occurring activity within the Nilgiri district of Tamil Nadu state, Bharat thanks to high intensity of rainfall. Landslides occur each in remote, unpeopled yet as in the populated areas. Most of the landslides occur in the places wherever deforestation, plantation, urbanization and shifting cultivation take place. In such places, more rain water might infiltrate into numerous soil layers and cause landslides. As web site specific study involving landslides, Landslide condition assessment (LSA) was in hot water Ketti micro-water shed, victimization remote sensing and GIS techniques. Numerous thematic maps supported the info and field study with GIS application the subsequent maps of Ketti small watershed were ready. 1.Watershed map,2.Present Land use map,3.Drainage map,4.Slope map,5.Soil Map,6.Elevation & Contour Map Pertaining to the current work was prepared from Survey of Bharat geography maps and satellite imageries (Figure 7). The prepared maps were even within the field throughout field investigations. Finally all the thematic maps were integrated victimization GIS applications to organize landslide condition map of ketti micro watershed [1-17].
8. Conclusion

Landslide hazard zonation mapping was tried in and around Kattery macrowatershed, Ooty Hills, Tamil Nadu, India victimization remote sensing and GIS techniques. at first varied thematic maps pertaining to the present work was ready for Survey of India geography maps and satellite imageries. The prepared maps were verified within the field throughout field visit. Finally, all the thematic maps were integrated using GIS and landslide hazard zonation map was prepared. Landslide hazard zonation map illustrates that north-eastern and southwestern part of the study area is a lot of vulnerable for landslides. The landslide hazard zonation map contains 5 classes of vulnerability like terribly low, low, moderate, high and really high.

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