

LANDSLIDE MAPPING OF CAUVERY RIVER BASIN BY USING GEOSPATIAL TECHNIQUES

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Article Info	ABSTRACT
Article History: Received: 15th Dec 2025 Accepted: 19th Dec 2025 Published: 20th Dec 2025 Keywords: Landslide, Cauvery basin, weighted overlay	In many region of on the earth a temporary instability of superficial mass of soil and also rocks has always been an actual natural problem. These superficial masses may leave their original positions abruptly or extremely slowly and start either a downgrade movements or vertically downward sinking thus giving rise to baffling situations in mountain region or hilly regions. These movements of the ground may entail loss to property as well as life. Landslide may be ignored if they occur in uninhabited places and of no human interest areas but, if they occur in places of importance such as highways, railway lines, valleys, reservoirs, human inhabited areas and agricultural lands, obviously such instances lead to blocking of traffic, collapse of buildings, harm to fertile land and human life loss, so on apart from heavy loss of human life and economic properties. In order mitigate and manage the landslide disaster, need to drawn a detailed plan using available technologies and sources of GIS.

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How to Cite: Kurhade, S. B., Koli, S. D., & Attar, M. S. (2025). Landslide mapping of Cauvery River Basin by using geospatial techniques. IIP: International Multidisciplinary Research Journal (IIPIMRJ), 2(IV), pp. 1102–1106

1 Introduction:

Remote Sensing and GIS can be a very useful tool to complement conventional methods involved in landslide mitigation and also landslide management in hilly areas. Remotely sensed images or satellite images can be widely used to detect locations of landslide apart from using for creation of various thematic layers of triggering factors of landslide in study area. Geographic Information System (GIS) can be useful tool in modeling the phenomena besides used it for preparation of thematic layers; these all layers and models we can made with the help of GIS software's like Arcmap.

2 Objective Of The Study:

The primary aim of this research paper is to delineate the landslide hazard areas for Cauvery basin using weighted overlay method.

3 Study Area:

The Kaveri, also spelled Cauvery in English, is a large Indian river. The origin of the river is traditionally placed at Talakaveri, Kodagu in the Western Ghats in Karnataka, flows generally south and east through Karnataka and Tamil Nadu and across the southern Deccan plateau through the southeastern lowlands, emptying into the Bay of Bengal through two principal mouths. It runs across three of the southern Indian states i.e. Karnataka, Tamil Nadu, Kerala and a Union Territory of Puducherry. The Cauvery river basin is lies between the latitudes $11^{\circ} 29' 35''$ N & $10^{\circ} 57' 24''$ N and the longitudes $77^{\circ} 42' 40''$ E and $78^{\circ} 14' 17''$ E.

4 Physical, Human And Demographic Characteristics:

4.1 Geology: Cauvery basin forms a part of the South India, in west to east direction. In terms of rock types there are metamorphic and also igneous rocks predominate throughout the basin which marks major events of volcanism, plutonism, metamorphism and sedimentation. Charnockites, high grade schists, migmatites, also green stone belts and consolidated gneisses of Archean age are the most commonly found rocks in the Cauvery Basin. Southern part of the basin is characterized with laterised and ferruginous sandstone. Certain coastal areas also have conglomeratic sandstone, coralline limestone and shale. Around 38,000 sq km of the area in the basin is covered by hard rock and around 11,000 sq km by sedimentary comprising mainly the delta portion.

4.2 Geomorphology: The whole of the watershed forms an Erosion landform especially from origin of the Cauvery river basin to Thiruchirappalli city in East of river capture region. Moderate to gentle sloping land interspersed with isolated plains and pediments characterize the western part of the watershed. The southern part of river basin mainly consists of flood plains and alluvial fills also.

4.3 Soil: Soil types vary all across the basin but the red soils are the predominant category of soils followed by black soils here. The highland areas which fall in Karnataka have laterite soils, reddish brown in color. Highlands of Kerala also have red loam soils along with some areas of black soils which are fertile. The soils in Tamil Nadu on the other hand are deep soils with increasing depth towards the coast. These soils have high clay content, low draining capacity, poor nitrate, poor phosphorus and also high potassium. The principal soil types found in the basin are red soils, black soils, laterite, alluvial soils, forest soils. Red soils occupy large areas in the river basin.

4.4 Rainfall: Precipitation varies considerably across the whole Cauvery river basin.

While, the western side of the catchments mainly experiences the south-west monsoon from June to September month; north-east monsoon from October to December month falls on the eastern side of catchment. The rainfall during the rest of the period is insignificant here.

4.5 Temperature: There is a considerable variation in the mean daily maximum and minimum temperatures across the Cauvery river basin. The mean daily maximum temperature ranges from 19.5 to 33.70 C, whereas the mean daily minimum varies from 9.1 to 25.20 C.

4.6 Natural vegetation: Out of the total area of the Cauvery river basin, the area under forest is just 19.53%. Roughly 18% of total basin area in Karnataka and 19% in Tamil Nadu are covered with forest. In Kerala part of the basin, the forest cover is much higher but considering that area forms a small part of total river basin; this comes out to be negligible. Forests have been and are under great stress because of the ever increasing demand for the forest products which can be a serious threat to the ecosystem in the Cauvery river basin. Sediment observations are also made at 11 of these stations.

4.7 Land Use Land Cover: In Cauvery basin land use in the basin can be divided into four categories: arable land, non arable land, forest land and land for habitation. More than 50% of the land area in the basin is arable, which implies that it can be cultivated. About 21.6% of the land is non arable. Total forest cover in the basin comes out to be 19.53%. Among the inhabited areas of the Cauvery river basin, rural and urban areas form two distinct kinds of habitations.

4.8 Agriculture activity: More than 60% of the total population in the basin lives in rural areas and their major occupation is only agriculture. The land under cultivation in the Cauvery river basin is 48%.; 24% of the cultivable area has some means of irrigation or other. The crops grown in the area vary from region to region, major crops are paddy, sugarcane, ragi, jowar etc; some other crops such as coffee, pepper, banana, betel vine, gingili, onion, cotton, black gram are also grown here.

4.9 Rural population: In TamilNadu part of the Cauvery basin, around 73.7% of the population lives in rural areas. In Karnataka part of the Cauvery basin, rural population comprises 60.47% whereas in Kerala part of the Cauvery basin, the population is completely rural. Total number of villages in the entire basin is around 17356.

4.10 Urban population: 31.2% of the total population lived in urban areas in the basin, which has further increased in the last two decades. The urban centers population density of Bangalore is the highest. The demographic shift towards urban areas is expected to increase the demand for water in future.

5 Materials And Methods:

The first stage in all the landslide vulnerability assessment studies of collection of existing information and data for the investigation study area (here is the Cauvery river basin). The vulnerability problem is mostly solved through the strategic plans and by adapting multi criteria analysis it can be achieved by identifying the criteria closely related to the landslide problem. The Satellite imagery data can be managed and analyzed

with the use of geographical information system.

Data Used:

Slope and Slope Aspect prepared using ASTER DEM.

NDVI is created by using SPOT vegetation data.

Soil map created by using data from NBSS.

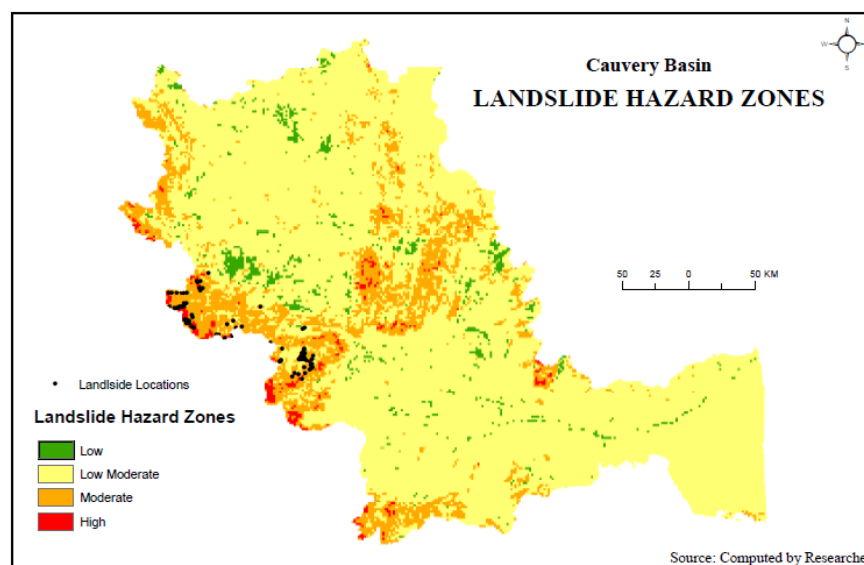
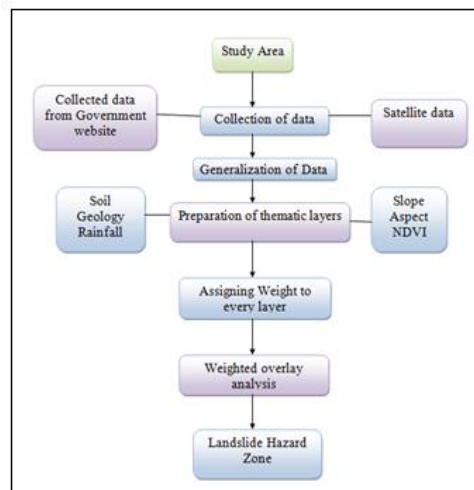
Geology map is created here by using the data from Geological Survey of India.

Rainfall layer is prepared using data from IMD.

6 Methodology:

Weighted Overlay Analysis: The calculated information values again took in to the Arc GIS software where all the values are integrated with their map layers using join operation here. After that all the layers were added to weighted overlay analysis tool extension in Arc GIS software and where used to randomly assign the weighted overlay analysis tool contains range of values here. The values are again classified in four classes as shown in table given below.

Flow Chart of Methodology:



7 CONCLUSION:

The present research work is an attempt towards application of GIS for landslide mapping in study area. Different thematic layers have been used in this study such as NDVI, Slope, Slope Aspect, Rainfall, Soil, and Geology. The numerical Weights of the categories of the factors have been determined using subject knowledge.

Four landslide susceptible zones were arrived based on landslide susceptibility and was heights in the slope range. The weighted and ranked themes were overlaid in GIS software Arcmap. The study area, Cauvery Basin was classified into four hazard zones. Here classified as the zone I (Low), zone II (Low Moderate), zone III (Moderate), zone IV (High). Where is zone I is low hazard while zone VI is High vulnerable zone. In this present study 5 % of area falls under zone VI, near 15 % of area falls under zone III. Near 70 % of area falls under zone II, near 10% of area falls under zone I. If we compare pre occurred landslide locations over landslide vulnerability zone map, we found that most of the landslide locations falls under zone VI.

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