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**Study of Landslide impact on Landuse in Chooralmala village in Wayanad District Kerala 2024 using Remote Sensing & GIS**

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## Table of Contents

S No	Content	Page No
1	INTRODUCTION	4
2	Scope of the Study	5
3	Location of the project	5
4	Tools and References	5
5	Limitations	5
6	Methodology	8
6.1	Procurement of Satellite Imagery	8
6.2	Preprocessing of data	
7	LanduseLandcover Details	8
8	Impacted Area its Background	9
9	The Incident	9
10	About the Terrain	10
11	DEM	10
12	Slope of the study area	11
13	Conclusion	11
14	References	11
	<b>TABLES</b>	
1	Satellite data procurement	3
	<b>FIGURES</b>	
1	Location map of the project area	6
2	Satellite Image of the study area	6
3	Yellow marked area of the flooded region	6
4	3D DEM of the study area	7
5	Slope Map	7
6	Contour Map	7
7	LandUse Land Cover Map	8
8	Lanslide effected pictures	8
9	Drone Image of Churmala Image	8

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# Study of Landslide impact on Landuse in Chooralmala village in Wayanad District Kerala 2024 using Remote Sensing & GIS

**Project Location:** Punjirimattom, Mundakkai, Chooralmala, and Vellarimala villages in Meppadi Panchayat, Vythiri taluk in Wayanad, Kerala.

The knowledge of Satellite data information is important for many planning and management activities as it is considered an essential element for modeling and understanding the earth system.

The term land use relates to the human activity or economic function associated with a specific piece of land, while the term land cover relates to the type of feature present on the surface of the earth (Lillesand and Kiefer, 2000).

Land cover maps are presently being developed from local to national to global scales. The use of panchromatic and medium scale aerial photographs to map land use has been an accepted practice since the 1940s. More recently, small scale aerial photographs and satellite images have been utilized for land use and land cover mapping. The satellite remote sensing technology has found its acceptance worldwide for rapid resource assessment and monitoring, particularly in the developing world. National Aeronautical and Space Administration (NASA) of USA has made most significant contributions with satellite based remote sensing techniques. Since 1972, after the Landsat-1 was launched, remote sensing technology and its application has undergone a tremendous change in terms of sensing development, aerial flights with improved sensors, satellite design development and operations including data reception, processing, interpretation, and utilization of satellite images.

All these advancements have widened the applicability of remotely sensed data in various areas, like forest cover, vegetation type mapping, and their changes on a regional scale. If satellite data is judiciously used along with the sufficient ground data, it is possible to carry out detailed forest inventories, monitoring of land use, vegetation cover and human activity at various scales.

GESPL has endeavored to study the landslide impact areas by using Satellite images to mark temporal changes for specified study area with Meppadi Panchayat of Vaithiri Taluk of Wayanad, Kerala in India before the disaster on 30<sup>th</sup> July 2024.

Geosys Enterprise Solutions Private Limited An ESRI Partner network Bronze is an Indian company providing world-class Enterprise Geographic Information System (GIS) solutions thereby helping businesses, governments and private organizations to make timely, informed and mission-critical decisions by leveraging the power of geography.

Geosys has carried out temporal change detection studies by procurement, processing and mapping of the satellite

## *Land Use Land Cover*

### *1. Introduction*

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## 2. Scope of The Study area

The objective of the present study is to study the landslide impact areas of Wayanad the origin point of the Iruvanjippuzha area the debris logged areas of Choormala village pre and post math impact and the landuse before the disaster.

### Scope of the Project Includes:

- The work involves provide High resolution satellite images in certain portions of Meppadi Taluk and preparing the landuse analysis report.
- Procurement of satellite images of the study area before 30<sup>th</sup> July 2024.
- DEM, Contourmap & Slope map
- Preparation of Landuse Landcover map and reporting

## 3. Location of the Project

Punjirimattom, Mundakkai, Choormala, and Vellarimala villages in Meppadi Panchayat, Vythiri taluk in Wayanad, Kerala,

North-West Corner: 11° 33' 13.56"N (Latitude), 76°7'7.5"E (Longitude)

South-East Corner: 11° 26' 50"N (Latitude), 76°11'43"E (Longitude)

Location Map shown in Fig. 1

## 4. Tools and Resources

To meet the project requirements, GESPL has acquired the following satellite data.

**Table 1: Satellite data procured**

SI. No	Year	Satellite	Spatial Resolution	Date of Pass
1	2024	Resourcesat LISS-4	5.8m	29-Apr-2024
2	2024	Sentinel 2A	10m	15-May-2024
3	2024	RISAT EOS4	18m	31-July-2024

The limitations of Remote Sensing, Image Processing, Geographical Information Systems, cartography and GPS are applicable in this study.

*Location Map*

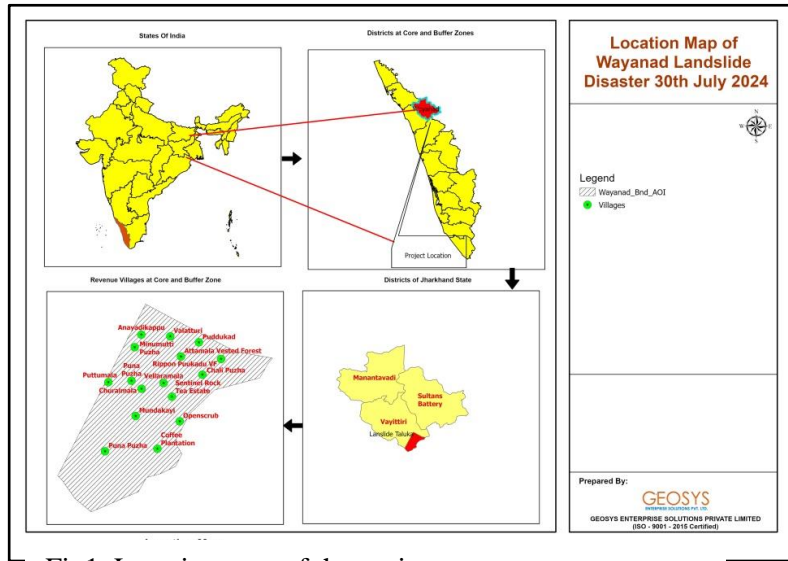


Fig1. Location map of the project area

*Satellite Image of the Study area*

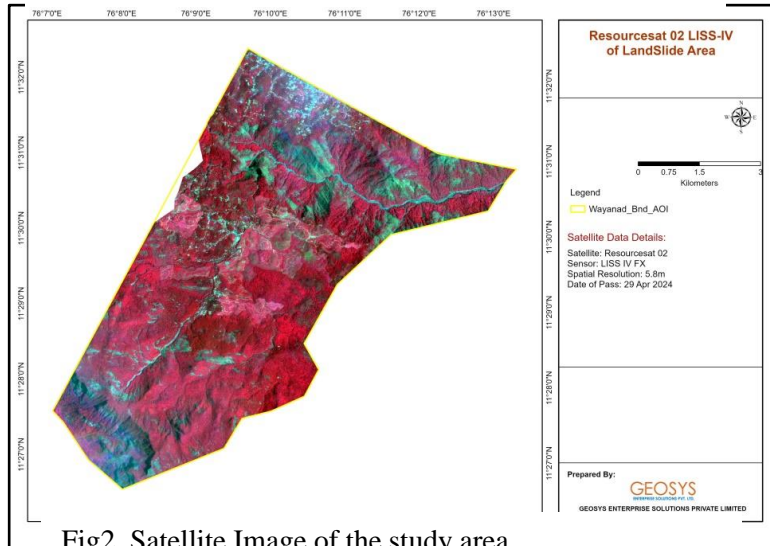


Fig2. Satellite Image of the study area

*Yellow marked area of the flooded region*

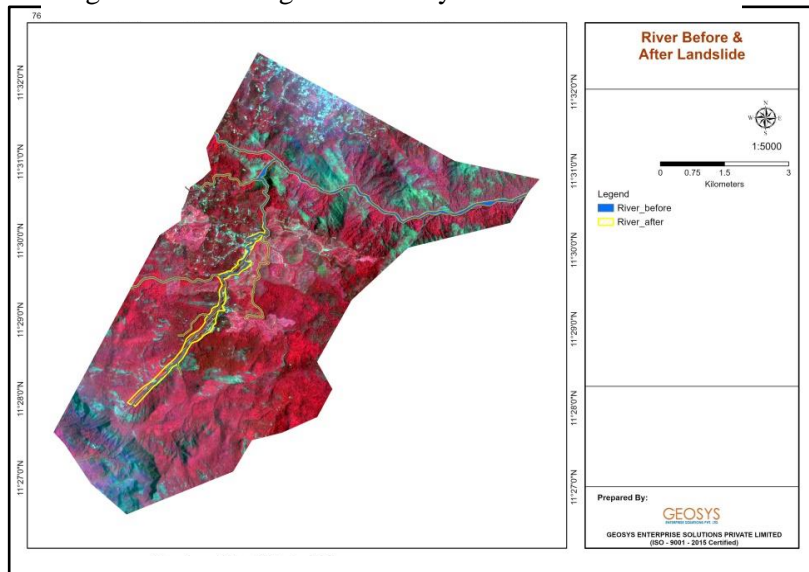


Fig3. Yellow marked area of the flooded region

**3D DEM of the study area**

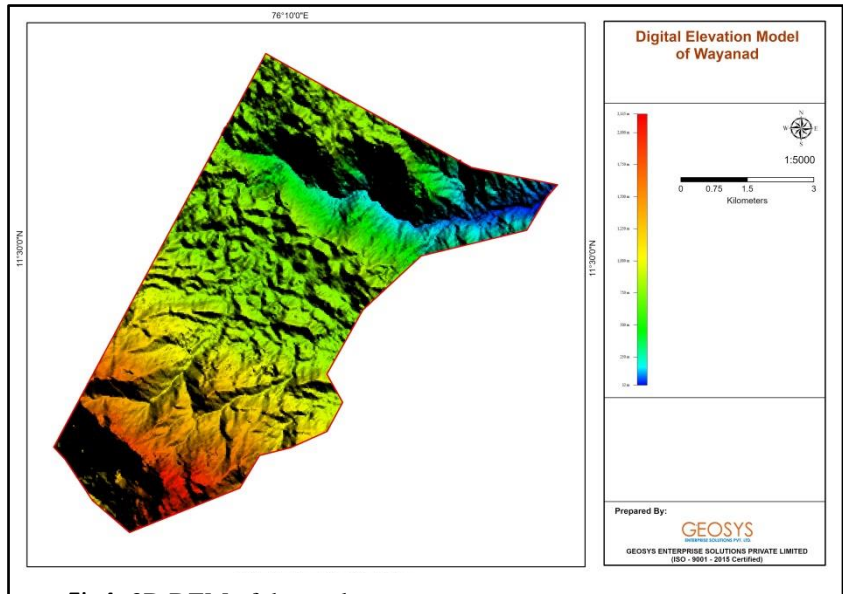


Fig4. 3D DEM of the study area

**Slope Map**

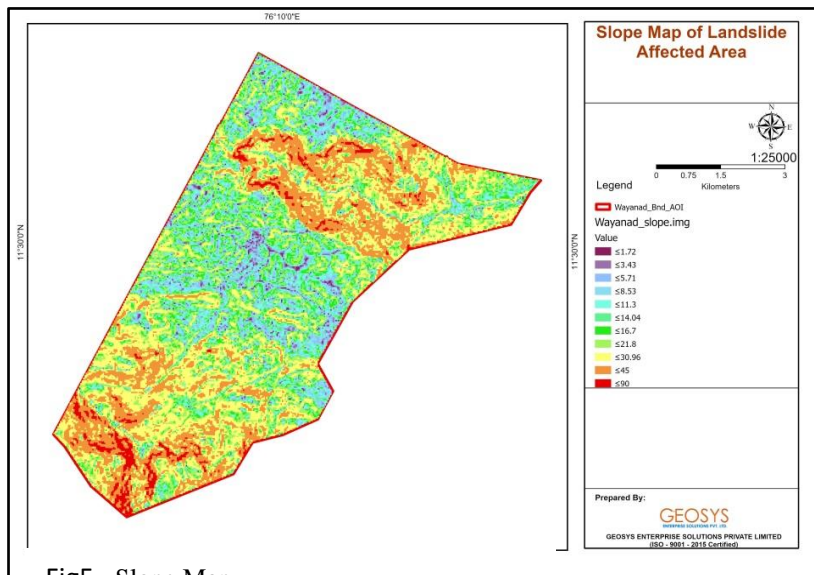


Fig5. Slope Map

**Contour Map**

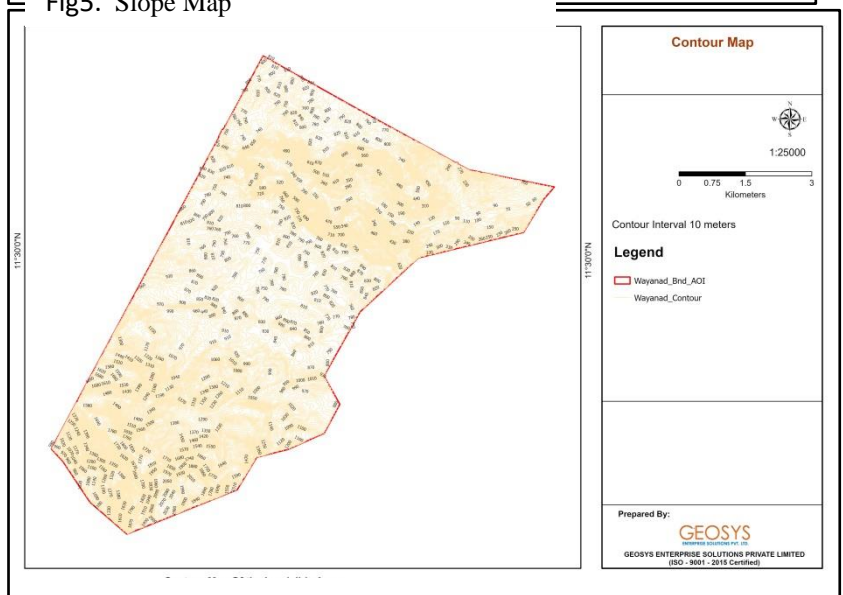


Fig6. Contour Map

**Landuse Land Cover Map**

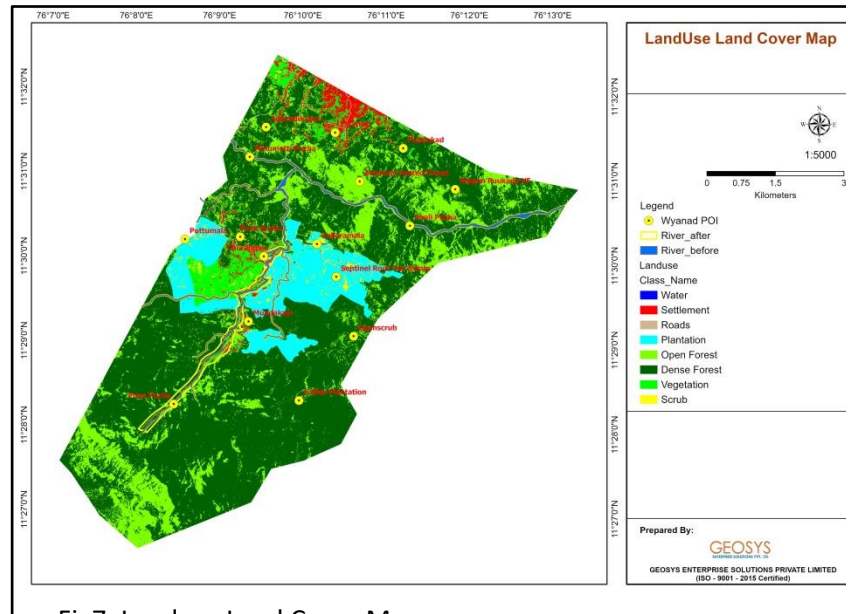


Fig7. Landuse Land Cover Map

**6. Methodology**

**6.1 Procurement of Satellite Imagery**

The Satellite data covering the study area as given in Table.1

**6.2 Preprocessing of data**

The Digital Image Processing has been performed using ESRI ArcGIS ProV1.3 software. Mapping of the structures and digitization has been done by using Deep Learning Tools in ArcGIS Pro .

Spatial data of the High resolution satellite data has been geometrically corrected. To carry out the geo- referencing, ground control points (GCPs) were identified on the maps and raw satellite data. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data. Alternate GCPs were also generated to attain the Root Mean Square (RMS) error less than 0.5 pixels and then both the images were co-registered.

**7. Landuse Land Cover Details**

The satellite imagery of the study area around as captured by satellite. Eight Landuse Categories were classified Water Bodies including Rivers, Dense and Open Forest, Plantations Private and Tea Plantations, Settlements, Roads, Land with/without scrub are shown in Fig2.

The yellow demarcation shows the flood inundation along the actual river course. (Fig3)



**8. Impacted Area its Background**

Wayanad District in Kerala is located on the hilly terrain covering Western Ghats mountain range has been listed as the landslide prone areas by the Landslide atlas of India published by NRSC.

The fateful villages Punjirimattom, Mundakkai, Chooralmala, and Vellarimala are beautiful landscape located on hilly terrain and vast agricultural land, known for tea and Coffee plantations has borders with Nilambur forests and the Chaliyar River. Most of these villagers work as plantation workers and also engage in cattle rearing.

The Iruvanjippuzha and chaliyar rivers originate in the Western Ghats and flow Westward to Arabian Sea.

The impact of Landslide was caused by sudden torrential rains over the region and landslide from the origin point of Iruvanjippuzha flooded the villages downstream with mud and debris submerging the villages overnight.

**9. The Incident**

The landslides, which occurred on 30<sup>th</sup> July 2024, led to at least 420 fatalities, 397 injuries, and more than 118 people still missing. The Indian Army, the National Disaster Response Force (NDRF), and local emergency response teams have launched a large-scale search and rescue mission to locate those feared trapped in the disaster.



Fig8. Landslide effected pictures

**Drone Image of Chooralmala Village**



Fig9. Drone Image of Chooralmala

**10. About the Terrain**

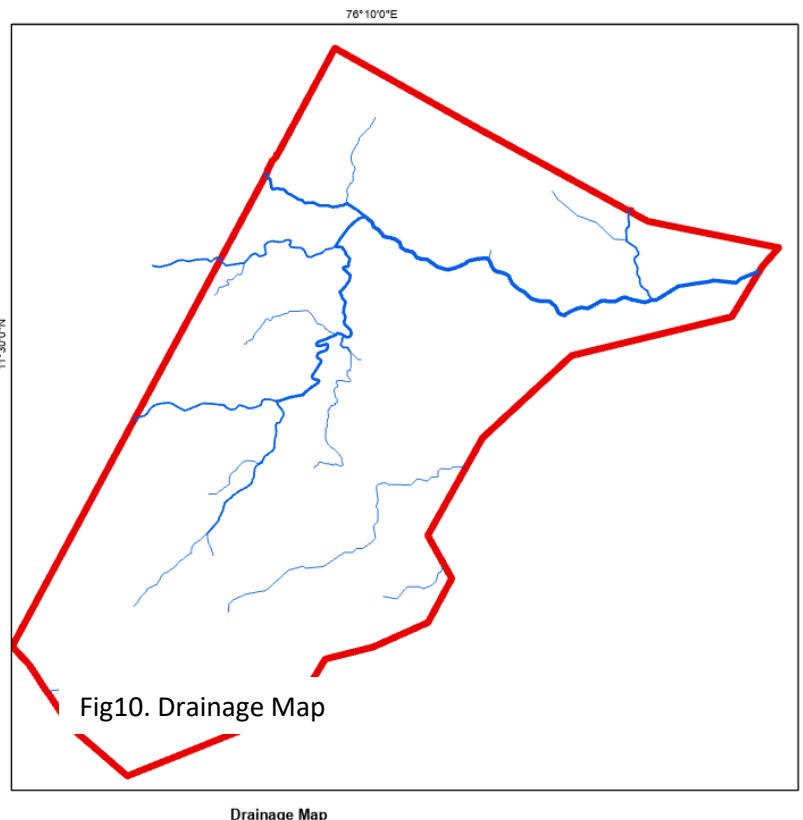
Survey of India Toposheets C43E2\_58A2, C43E3\_58A3 has been used for the topography studies. In topography map of the landslide area contours, drainage pattern, Roads, settlements, water bodies and forest boundaries has been shown.

The Landslide area is mostly hilly undulating area, the elevation values range between -40m to 2130m.(Fig6)

The area is covered with reserved forests namely Attamala Vested Forest and Rippon Puukadu VF, Vellarimalla Vested Forest and Puna Puzha, Minumutti Puzha River and Chali Puzha are passing through the study area.

The Study area is covered with 1- 4th order streams.

**Drainage Map**



**11. DEM**

Digital Elevation Model (DEM) fig 4 of the study area is Prepared using CARTOSAT DEM of NRSC.

Churalmala, Mundakayi , Puttumala, Vellaramala, Valatturi Dudduked, Anavedikannu, are the major

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*Slope of the study area*

A slope map (fig.5) is a two-dimensional representation of the steepness of a surface, or its gradient. It's used to show the change in elevation of a region, and can help identify potential hazards, plan construction projects, and more.

Slope maps use color gradients, shading, or numbers to indicate the slope of the terrain. Flat areas are usually marked in gray, with darker colors used to indicate increasing slope. Slope maps can be categorized into areas of different slope, such as:

Red color indicates Very steep Slope

*Conclusion*

Despite the flood and rain alert issued by the state and IMD a major loss of lives and damage was caused due to the landslide and people were washed away with the flood water. Pieces of body parts were found along the river Iruvanjippuzha and chaliyar. Many became homeless and orphans. Though we couldn't escape the nature fury, Remote Sensing and GIS techniques can predict the flood inundation and highly vulnerable areas.

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