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### Abstract:

Landslide is a movement of mass of rock, earth or debris down a slope. Tiruvannamalai is a town located in the Tiruvannamalai district of Tamil Nadu, India. The town is situated at the foot of the Annamalayar Hills the part of the Eastern Ghats Mountain range. On December 1, 2024, landslide occurred in Tiruvannamalai due to heavy rainfall caused by Cyclone Fengal. According to sources the landslide occurred at around 4.30 pm on Sunday due to continuous downpour caused by cyclone fengal. IMD realised weather condition during 30<sup>th</sup> November 2024 to 1<sup>st</sup> December 2024 heavy to very heavy rainfall (115 mm to 204 mm) at many places in Tamil Nadu and Kerla states. Tiruvannamalai receives 144 mm rainfall in 24 hours. Unfortunately, this landslide resulted in the loss of seven lives, all from the same family, when a large rock crashed into their house. The trapped members were identified as Rajkumar and his wife Meena, their two children and three children of Meena's brother. The landslide was triggered by continuous rainfall, which caused unstable conditions in the area. National Disaster Response Force (NDRF) has involved in Rescue operations in the Tiruvannamalai landslide, in which seven people were trapped and seven body recovered by the NDRF from the landslide spot. This paper basis on the secondary data which collected from News Paper and metrology department. Landslide hazard zonation methodology has been used for landslide investigation and landslide risk management and attempt to find out the reason behind the landslide.

**Keywords:** Landslide, Cyclone Fengal, NDRF, Landslide Hazard Zonation, Remote Sensing, GIS.

### Introduction:

A landslide is a natural disaster. Landslide disasters happen all over the world and in India. Landslides are caused by many factors including earthquakes, volcanoes, mining, excavation, construction of houses, roads, deforestation and rainfall. Landslide incidents have occurred in many states of India including Assam, West Bengal, Uttarakhand, Maharashtra, Kerala, and Tamil Nadu etc. Since 1948 till now, many people have lost their lives due to landslides. In 2013, 5700 people lost their lives in the state of Uttarakhand while 151 people lost their lives in the village of Malin district Pune in Maharashtra and 07 people killed in Tiruvannamalai in Tamil Nadu state [1].

### Review of Literature:

Understanding the causes of Uttarakhand disaster June 2013 Scientific Reviewed by Aravind S Nair and S.K.Singh, Various caused of disaster of Uttarakhand such as metrological causes, geological causes, flash floods, glacier, lakes and anthropogenies are observed, The Tropical Rainfall Measuring Mission (TRMM) data shows heavy rainfall in the area of Uttarakhand about 500 mm recorded in the week of 11th June 2013 is major cause of disaster. Landslides were also a cause for the disaster. The term 'landslide' includes all varieties of mass movements of hill slopes and can be defined as the downward and outward movement of slope forming materials composed of rocks, soils, artificial fills or combination of all these materials along surfaces of separation by falling, sliding and flowing, either slowly or quickly from one place to another. Although the landslides are primarily associated with mountainous terrains, these can also occur in areas where an activity such as surface excavations for highways, buildings and open pit mines takes place. Many factors contribute to slides, including geology, gravity, weather, groundwater, wave action and human actions. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. Flash floods are described as rapid and sudden flooding of low-lying areas The main causes of flash floods can be heavy rain associated with thunderstorms, cloud bursts, hurricane, severe tropical storms or melt water from ice or snow. As a result of global warming, melting of glaciers has increased and this has led to the formation of the glacial lakes. The mountains

weakened by landslides holding the lakes are a frightening prospect. It has been reported that there are nearly 8,000 glacial lakes in the Hindukush Himalaya area and excessive snowfall or rainfall or storms can cause these lakes to overflow, giving rise to flash floods in the region [2].

The research has been conducted on Landslide hazard assessment: recent trends and techniques By Sudhakar D Pardeshi and other authors, (2013) Landslide hazard zonation is an important step in landslide investigation and landslide risk management. Term 'zonation as the process of division of land surface into areas and ranking of these areas according to the degree of actual or potential hazard from landslides or other mass movement. Rainfall threshold has been used for landslide predication and landslide prone zone areas. Application of Remote Sensing and Geographical Information System is of huge importance for effective landslide hazard assessment. High resolution satellite data combined with powerful GIS techniques have improved the level of accuracy of LHZ maps in recent times [3].

The case study has been conducted by the S.M. Sarvade on Malin landslide which occurred on 30 July 2014, A massive landslide wiped out the village of Malin located at 110 km from Pune city, in the Western Ghats, Mound of mud and debris that came down from a nearby hillock, swallowed up almost the entire tribal village of around 50 families, Final death toll was 153 when the rescue operation was stopped and around 100 people were missing. Deforestation and Levelling of Land on the Hill for Cultivation is the major cause of landslide. I observed through Google Earth image stream appeared on the slope of hill towards Malin village hence landslide occurred. [4]

The study of landslides hazard with help of remote sensing and GIS map conducted by Praveen Kumar Rai, Remote sensing images provide many useful lands use information to combine in a GIS environment with other spatial factors influencing the occurrence of landslide. The landslide inventory is a fundamental prerequisite for landslide hazard analysis based on GIS. The satellite imageries of LANDSA, T ETM+, IRS P6, ASTER etc. along with Survey of India (SOI) topographical sheets form the basis for deriving baseline information on various parameters like slope, aspect, relative relief, drainage density, geology/lithology and land use/land cover [5].

A study has been conducted by Kannan M on Landslide is a common natural hazard that usually occurs in mountainous areas. Rapid urban development and high traffic intensity movements have been hampered to a great extent by phenomenon of landslides [6].

Seven feared dead in landslide after rain in Tamil Nadu, A family of seven including five children were feared to be trapped in a landslide in Tiruvannamalai. The family resided close to Annamalayar hills in Tiruvannamalai. According to the Police sources, the landslide occurred at 4.30 pm on Sunday due to continuous downpour caused by cyclone fengal. The family of were Identified as Rajkumar and his wife Meena their two children and three children of Meena's brother. The family was residing on the 11<sup>th</sup> street in Voc Nagar in Tiruvannamalai [7].

#### **Location of the study area:**

The present research work is focused on the in Tiruvannamalai town it is located in Tamil Nadu state. The town is situated at the foot of the Annamalayar Hills, which are part of the Eastern Ghats Mountain range. Tiruvannamalai city located north latitude between 11°55' and 13°15' N and East longitude Between: 78°20' and 79°50' E is situated at the foot of a 700-meter heights hill. the slope of the hill is steep and the rainwater flows down through small streams, a small stream was seen flowing down the slope at VocNagar street 11 here the landslide occurred.

**Objectives:** The present study has been undertaken with the following specific objectives.

To study on landslide in Tiruvannamalai, and understanding causes of landslide in the study region.

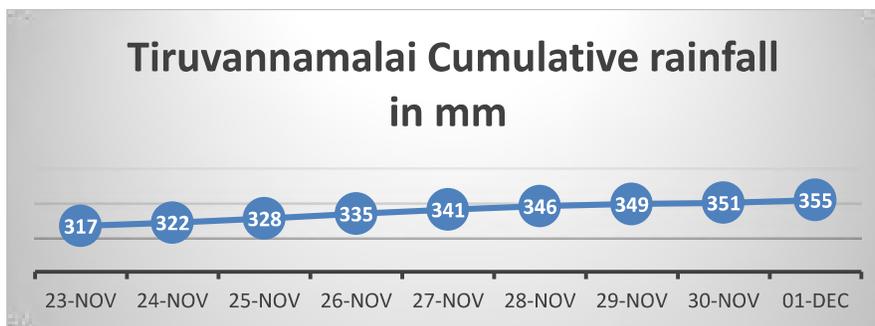
**Data and Research Methodology:** The present study is basis on the secondary data, which is obtained from Newspaper and google earth image and metrology department. Landslide hazard zonation methodology has been used for landslide investigation and risk management. Maps and graphs are used to show the landslide location and other analysis.

#### **Results and Discussion:**

Tiruvannamalai is a town located in the Tiruvannamalai district of Tamil Nadu, India. The town is situated at the foot of the Annamalayar Hills, which are part of the Eastern Ghats Mountain range. On December 1, 2024, landslide occurred in Tiruvannamalai due to heavy rainfall caused by

Cyclone Fengal. According to sources the landslide occurred at around 4.30 pm on Sunday due to continuous downpour caused by cyclone fengal. IMD realised weather condition during 30<sup>th</sup> November 2024 to 1<sup>st</sup> December 2024 heavy to very heavy rainfall (115 mm to 204 mm) at many places in Tamil Nadu and Kerla states. Tiruvannamalai receives 144 mm rainfall in 24 hours. Extreme heavy rainfall occurred at many places over Villupuram district on 01<sup>st</sup> & 02nd Dec; and at isolated places over Tiruvannamalai district on 01st & 02nd Dec; over Cuddalore, Kanchipuram districts & Puducherry on 01st Dec; over Krishnagiri, Dharmapuri, Kallakurichi & Salem districts on 02nd Dec 2024. Isolated heavy to very heavy rainfall [8].

Tamil Nadu was receiving rains due to the returning monsoon, along with the formation of fengal cyclone over the Bay of Bengal on 27 November 2024. Further, this cyclone entered the state of Tamil Nadu in the North-west direction, so on 29-30 November 2024, there was heavy rain in the northern part of Tamil Nadu, Tiruvannamalai place is located north west part of Tamil Nadu here soil of this place appears to be laterite soil which is a soft its usually vulnerability to landslide. A stream was seen flowing from the hill where the Landslide occurred and the house was built on the path of the same stream. Due to continuous rain, the soil on the hill became wet and caused landslides, in which mud, silt, stones, were washed away. Meanwhile, a large stone hit the house Seven members of the same family were buried under the mud and died.



**Source: 1.1 IMD, Regional Metrological Centre Chennai. 05.12. 2024**

Above graph shows the cumulative rainfall of Tiruvannamalai Town, graphs show the cumulative rainfall from 23 November to 01 December 2024, from 23 November rainfall gradually increased till 29 November but from 30 November rainfall rapidly increased due to fengal cyclone, 120 mm rainfall recorded in 24 hours.

### Conclusion:

Tiruvannamalai is a town located in the Tiruvannamalai district of Tamil Nadu, India. The town is situated at the foot of the Annamalayar Hills the part of the Eastern Ghats Mountain range. On December 1, 2024, landslide occurred in Tiruvannamalai due to heavy rainfall caused by Cyclone Fengal. According to sources the landslide occurred at around 4.30 pm on Sunday due to continuous downpour caused by cyclone fengal. IMD realised weather condition during 30<sup>th</sup> November 2024 to 1<sup>st</sup> December 2024 heavy to very heavy rainfall (115 mm to 204 mm) at many places in Tamil Nadu and Kerla states. Tiruvannamalai receives 144 mm rainfall in 24 hours. Unfortunately, this landslide resulted in the loss of seven lives, all from the same family, when a large rock crashed into their house. The trapped members were identified as Rajkumar and his wife Meena, their two children and three children of Meena's brother. The landslide was triggered by continuous rainfall, which caused unstable conditions in the area. National Disaster Response Force (NDRF) has involved in Rescue operations in the Tiruvannamalai landslide, in which seven people were trapped and seven body recovered by the NDRF from the landslide spot. Tiruvannamalai place is located north west part of Tamil Nadu here soil of this place appears to be laterite soil which is a soft its usually vulnerability to landslide. A stream was seen flowing from the hill where the Landslide occurred and the house was built on the path of the same stream. Due to continuous rain, the soil on the hill became wet and caused landslides, in which mud, silt, stones, were washed away.



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## **References:**

1. Sahdev Dr. Bharat Lal Sahu<sup>2</sup> Dr. Shobhana Ramteke<sup>3</sup> (2024), Landslides disaster in India, mitigation and their impacts Disaster poor areas in India. Landslides disaster in India, Sustainability, Agri, Food and Environmental Research, vol. 12, special issue. 2024, <http://dx.doi.org/> pp. 1
2. Aravind S Nair<sup>1</sup> and S.K. Singh<sup>2</sup> (2013), Understanding the Causes of Uttarakhand Disaster of June 2013: A Scientific Review. DRVC 2024. pp.1
3. Sudhakar D Pardeshi<sup>1</sup> Sumant E Autade<sup>2</sup> and Suchitra S Pardeshi<sup>3</sup> (2013), Landslide hazard assessment: recent trends and techniques, Springer Plus Journal pp.2
4. S. M. Sarvade<sup>1</sup> M. M. Sarvade<sup>2</sup> P. S. Khadatre<sup>3</sup> and M. R. Kolekar<sup>4</sup> (2014) 30/7 Malin Landslide: A Case Study, Proceedings of National Conference” GEPSID” held on October 11-12, 2014, Ludhiana, pp.2.
5. Praveen Kumar Rai<sup>1</sup> Kshitij Mohan<sup>2</sup> and V.K. Kumra<sup>2</sup> (2014), Landslide Hazard and Its Mapping Using Remote Sensing And GIS, Journal of Scientific Research Vol. 58, pp.2.
6. Kannan Maruthu (2023), Review of Landslide Research Article, International Research Journal of Innovations in Engineering and Technology (IRJIET) ISSN 2581-3048 Volume 7, Issue 8, pp.2
7. The Times of India 2<sup>nd</sup> Dec.2024 09.55.
8. IMD, Regional Metrological Centre Chennai. 05.12. 2024.