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RESEARCH ARTICLE

ONE DECADE OF RAINFALL PRECIPITATION VARIATION WITH LANDSLIDES IN UDHAGAMANDALAM – METTUPALAYAM HIGHWAY, TAMILNADU

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A B S T R A C T

The paper presents correlation between the rainfalls Precipitation variation with existing landslides was carried out. The Precipitation data were collected from IWS (Institution of Water Studies) and reconstructed for annual and season wise for the period from 2003 to 2012. The data were interpreted through graphical methods. The interpreted rainfall data were shows that higher amount of rainfall variance was noticed in Northeast & Southwest Monsoon season. It clearly reveals that higher rainfalls and higher number of landslides were noticed in the year of 2009 and lower rainfall and lower number of landslides were noticed in the year of 2003. Most of the landslides were occurring in the heavy rainfall season that rainfall is the leading triggering factor for landslides.

INTRODUCTION

Rainfall is an important triggering mechanism in landslide occurrences. It induces shallow landslides, mostly soil slip and debris flows, initiated by a transient loss of shear strength resulting from the increase in pore-water pressure, caused by intense rainfall on loose surface soil underlying finer less permeable bedrock (Wilson and Wieczorek, 1995). In the literature, two approaches have been proposed to evaluate the dependence of landslide occurrence on rainfall events. The first approach is based on the definition of empirical intensity-duration thresholds for landslide activation (Corominas, 2000; Aleotti, 2004; Berti and Simoni 2005; Wieczorek and Glade, 2005; Guzzetti et al., 2008). Rainfall is certainly one of the most frequent causes of landslides occurrences. Intense storms with high intensity, long duration rainfall have great potential to trigger rapidly moving landslides (Anderson and Sitar 1995; Iverson, 2000). Landslide natural hazards is need to study intensively, because the death loss is around 1 lakh and numbers upto 2007 and the number is also 983 (Pankaj, 2009). This shows the importance to study the landslides. Many workers have attempted to assess the landslides through Rainfall Vs Landslides in Nilgirs and Kodai regions (Gurugnanam, 2013 and Gurugnanam 2008).

Study area

The study area is prepared from Survey of India (SOI) Toposheets at a scale of 1: 50000. Mettupalayam – Udhagamandalam road sector length of 47 kilometers and the road was buffered to 10 km on either side. The area encompasses a total of 982 square kilometers and bounded between 76° 43' 30'' and 76°54' E longitudes and 11° 19' 30'' and 11° 30' N latitudes. The elevation ranges between 280 m and 2620 m above MSL (Fig.1).

METHODOLOGY

The base map prepared from Survey of India (SOI) Toposheets 58A/11 &15 at a scale of 1: 50000. The daily rainfall data were collected from Institution of Water Studies, Govt. of Tamil Nadu for the one decade (2002 – 2013) and the data were assessed. The reconstructed data were interpolation into graphical methods by rain gauge stations wise. The existing landslides and rainfall data were correlated.

RESULT & DISCUSSION

The 29 rain gauge stations were recorded for the overall annual rainfall precipitation in the study area (Table .1). They are namely stations

Ten years (2003 – 2012) data were collected from Institution of Water Studies and were assessed (Graph.1). It was found that the average Southwest monsoon rainfall is 454.62 mm and average Northeast monsoon rainfall is 633.69 mm. In the pre-monsoon and post-monsoon season, the average rainfall was noticed as 202.4 mm and 35.13 mm respectively. Average annual rainfall of 1313 mm was observed in the years 2003-2012 rainfall interpretation.

Post-monsoon season rainfall variation graph shows that high rainfall were noticed in five locations, peak of the graph line indicated the highest rainfall and near to bottom of the line is indicated low rainfall (Graph.2).. Runnymedu is the highest rainfall location and Kallatti is the lowest rainfall location. The meager amount of rainfall receives in the post-monsoon season.

Pre-monsoon rainfall variation graph reveals that most of the rain gauge stations are received in more than 100 mm except two locations Kallatti and Karamadai. Kethi location is the highest rainfall station were noticed.

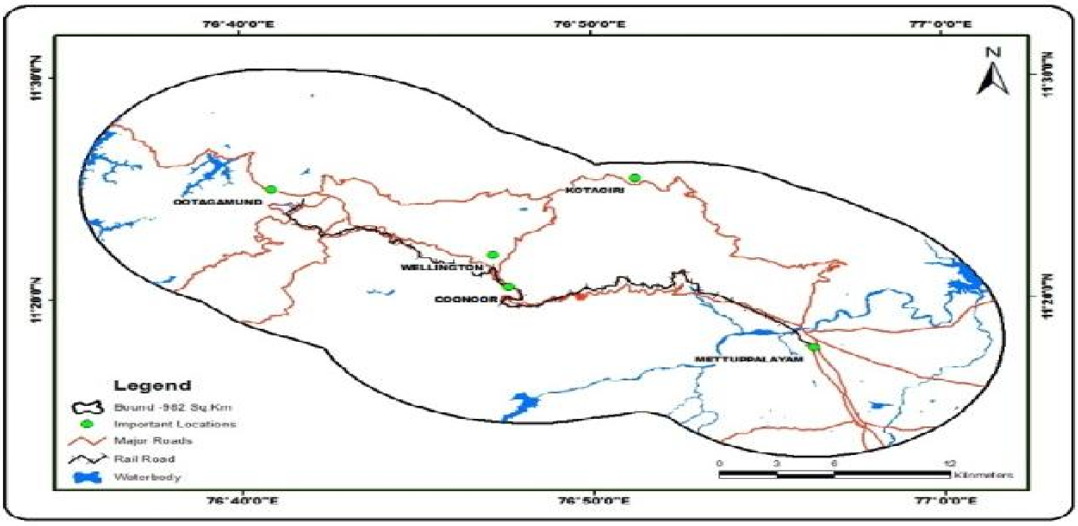
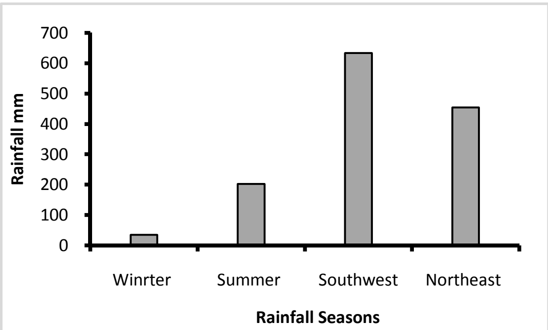


Fig.1 study aea

Table 1 Rain Gauge Stations

1	Adarly
2	Avalanche
3	Coonoor
4	Coonoor_Rly
5	Devala
6	Ellamanna
7	Emarald
8	Glenmargan
9	Governersola
10	Gudalore
11	Gurrency
12	Hillgroove
13	Kallatti
14	Kethi
15	Kinnakorai
16	Kodanadu
17	Kothagiri
18	Kundah
19	Kunshola
20	Naduvattam
21	Ooty
22	Ooty_Scr
23	Runnymedu
24	Upperbhavani
25	Valvewoodes
26	Mettupalayam
27	Karamadai
28	Annur
29	PN Palayam

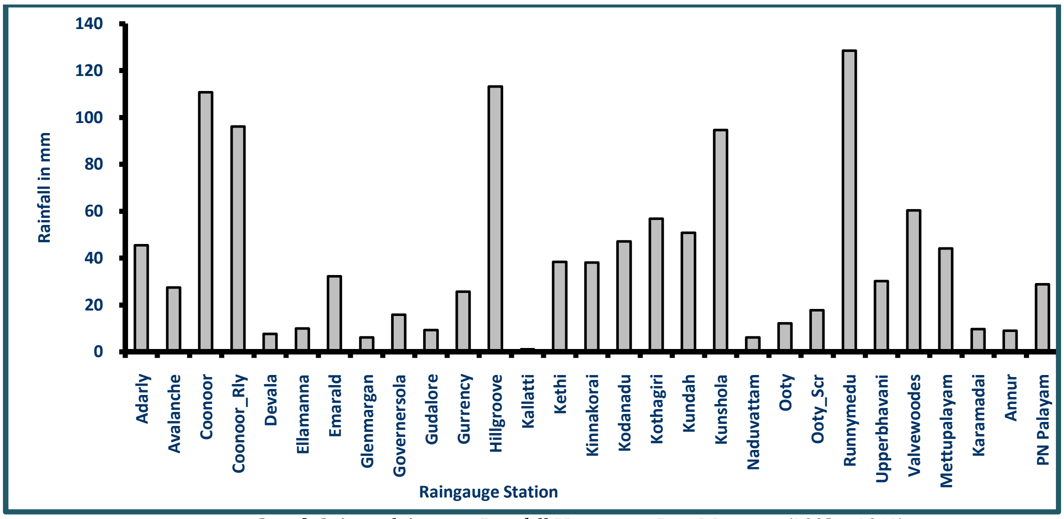


Graph 1 Average Annual Season wise Rainfall Variation (2003 – 2012)

rain gauge stations and lowest rainfall was noticed in Karamadi, Adarly and Annur.

Northeast monsoon season rainfall variation (Graph. 5) shows that the highest rainfall stations are Coonoor and Coonoor Railway Station and Runnymedu. The lowest rainfall stations were noticed Karamadai, Kallatti and Annur. Large amount of rainfall was received in this season. Frequencies of landslides occur in northeast monsoon season during 2003 to 2013.

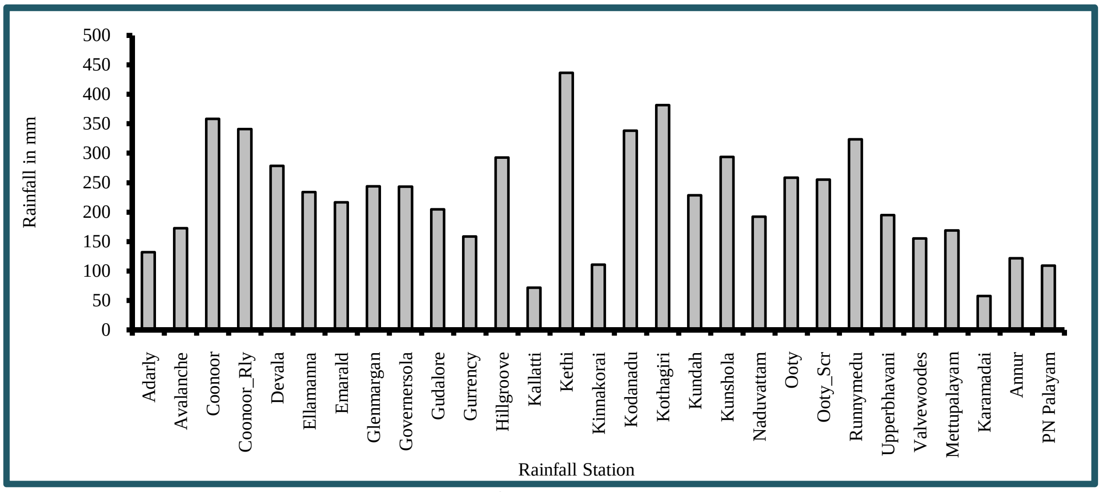
Annual average rainfall variation (Graph. 6) reveals that Twenty nine rain gauge stations present in and around the study area.



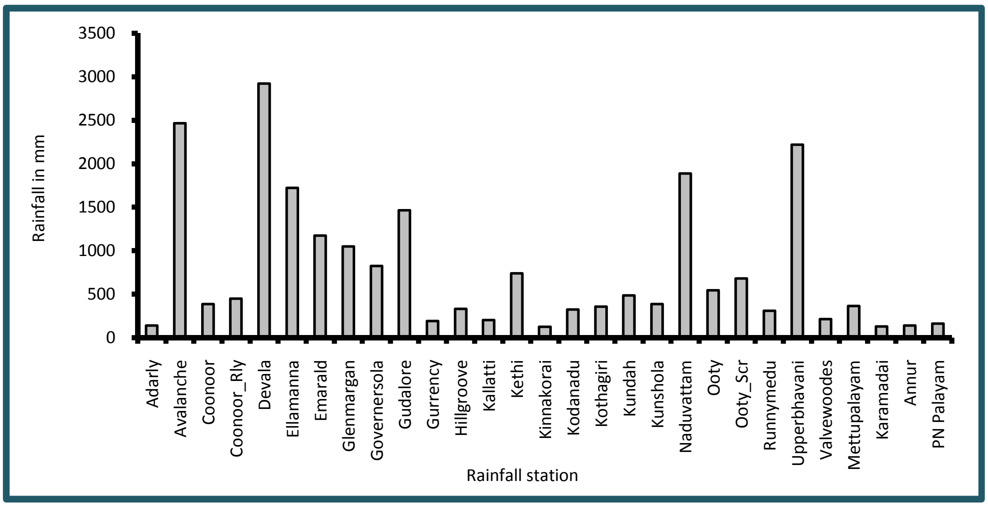
Graph 2 Annual Average Rainfall Variation – Post Monsoon (2003 – 2012)

The highest rainfall were noticed in southwest monsoon season. Graph. 4 shows that the highest rainfall was noticed in Devala, Avalanche, Gudalore, Naduvattam and Upper bhavani

Six rain gauge stations were recorded in high rainfall locations out of twenty nine rain gauge stations like Avalanche, Devala, Ellamanna, Kethi, Naduvattam and Upper Bhavani.



Graph 3 Annual Average Rainfall Variation – Pre Monsoon (2003 – 2012)



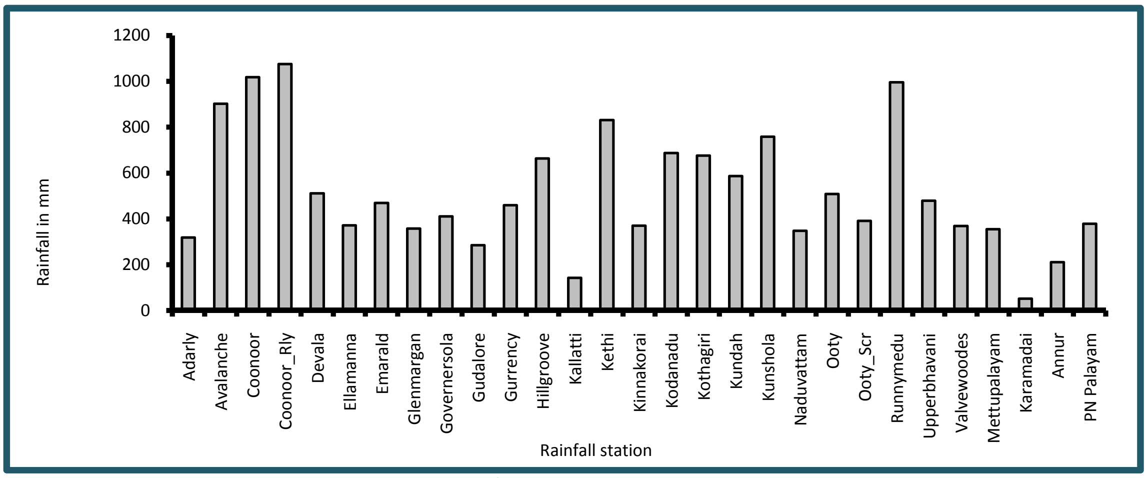
Graph 4 Annual Average Rainfall Variation – Southwest Monsoon (2003 – 2012)

Fourteen rain gauge stations, namely Coonoor, Coonoor (RS), Emarald, Glenmargan, Governersola, Gudalore, Hillgroove, Kodanadu, Kothagiri, Kundah, Kunshola, Ooty, Ooty (SCR) and Runnymedu received a moderate rainfall, as the rest of the nine stations, namely Adarly, Gurrency, Kallatti, Kinnakorai, Valvewoodes, Mettupalayam, Karamadai, Annur and PN. Palayam recorded in low rainfall.

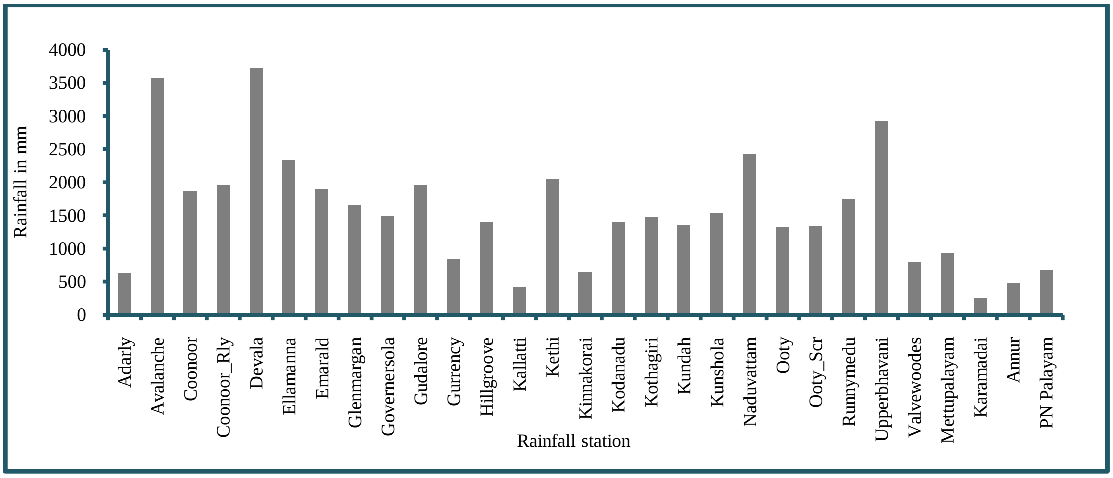
The annual average rainfall data and existing Landslides data were converted into percentage for graphical interpolation (Graph. 7). These data correlation shows that, the higher rainfall and higher number of landslides were noticed in the year of 2009 and the lower rainfall and lower number of landslides were noticed in the year of 2003. It clearly reveals that study rainfall is the predominant factor for the landslides.

CONCLUSION

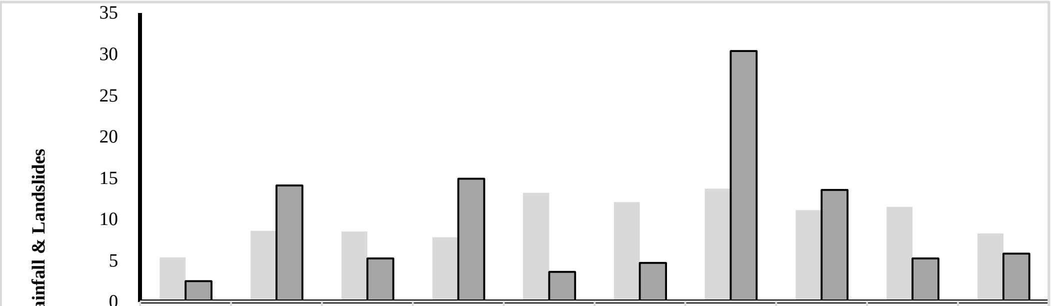
The present study shows that rainfall variation in season wise were done through graphical methods.



Graph 5 Annual Average Rainfall Variation –Northeast Monsoon (2003 – 2012)



Graph 6 Annual Average Rainfall Variation (2003 – 2012)



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Rainfall	5	9	8	8	13	12	14	11	11	8
Landslides	2	14	5	15	4	5	30	14	5	6

Graph 7 Annual Average Rainfall Vs Landslides correlation (2003 – 2012)

The study area receiving a higher amount of rainfall was noticed in Southwest Monsoon and Northeast Monsoon. Graphical interpolation was done with rainfall gives better understanding of the rainfall variations. It clearly reveals that high amount of landslides occur in the six rain gauge stations, moderate rainfall were noticed in Fourteen rain gauge stations and rest of the rain gauge stations were recorded in low rainfall. The rainfall data and existing landslide locations were correlated. It clearly reveals that most of the landslides were occurring in the heavy rainfall season that rainfall is the leading triggering factor for landslides.

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