International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 10 | October - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

Study of Landslide Provinces of India and Landslide All-India Rank of District Wise of Maharashtra

Supriya Suhas Kanade[1], Sanap Mahesh Balasaheb[2]

[1]MET's Institute of Technology (Polytechnic)
Nashik
[2]MET's Institute of Engineering, Nashik.

Abstract - Landslide is the natural hazards. In India, North West Himalaya landslide provinces Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, etc. and North Easte Himalaya landslide provinces Assam, Nagaland, Manipura, Mizoram, etc. Western ghat landslide provinces Maharashtra, Kerala, Karnataka, etc. state occurring landslides and the number of landslides occurring in monsoon 2014 and 2017 to 2022 field based, the stock database is to be had in a web GIS platform in the Bhuvan portal. The landslide stock database shows the hotspot region. In Maharashtra district Thane, Pune, Raygarh, Sindhudurg, etc. frequently occurring of land sliding. All-India rank of districts wise for their exposure to landslides of Maharashtra districts Thane, Pune, Raygarh, Sindhudurg, Nashik, Ratnagiri, Ahmednagar, Kolhapur, Satara, Mumbai Suburban, Mumbai by Landslides mapped using high-resolution satellite data in Maharashtra, which occurred between 2014 to 2021 shows the hotspot region.

***Key Words*:** GIS, Hotspot, Satellite, Rank

1.Introduction

Landslides is one of the major natural hazards, causing major problems in mountainous areas besides killing hundreds of people every year, as property damage, disruption of travel and blockage of communication in some areas, e.g., Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Assam, Meghalaya, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Haryana, are particularly affected by earthquakes due to development activities that deliberately meet the ever-increasing human demand that is very pronounced for the purpose of the solution.

India is one of the four most seismically vulnerable countries, with an estimated 100,000 earthquakes per 100 km per year. Approximately 12.6% of the land area is under landslide, excluding snow-covered area. Of this, 0.18 million square kilometer provinces area meters falls in the north-eastern Himalayas, including the Darjeeling and Sikkim Himalayas; In the North West Himalayas 0.14 million sq. m. km. 0.09 million km^2 in Western Ghats and Konkan Hills and 0.01 million km^2 in Eastern Ghats Landslides in India it occurs mostly during the rainy season. The Himalayas and the Western Ghats easy human concentration because of the mountainous terrain and heavy rainfall.

2. Methodology

2.1 Study area:

Maharashtra is the western peninsular vicinity of India occupying an large portion of the Deccan plateau. It is boundary of the Arabian sea to the west, the Indian states of Karnataka and Goa to the south, Telangana to the southeast and Chhattisgarh to the east, Gujrat and Madhya Pradesh to the north, and the Indian union territory of Dadar Nagar haveli Daman Diu to the northwest. Maharashtra is the 2nd populous state in India and the 3rd most populous country subdivision globally.

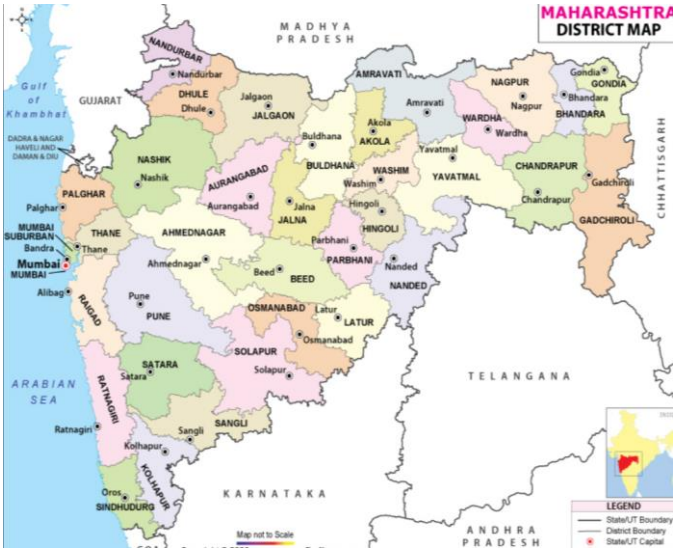

Fig -1: Administrative Map of Maharashtra

2.2 Method:

The following method was used to achieve the objective of present research: -

Step I Primary data was collected by exhaustive literature survey of the topic of investigation. Published literature, reports were collected from various libraries, institutes and government departments etc. Besides this relevant

literature will also be collected from reference books, bulletins, reviews etc.

Step II The information of land slide pattern were collected by National Remote Sensing Centre, ISRO, Bhuvan and National Database for disaster management (NDEM).

Step III Analysis of a results landslide of Maharashtra, high resolution satellite data and Image analysis of CARTOSAT.

3. Result and Discussion:

3.1 Landslide in India:

The database covers landslide-susceptible regions of India in the Himalayas and Western Ghats. Satellite statistics of excessive to very excessive-decision nature consisting of IRS-1D PAN LISS-III, Resourcesat-1, 2 and 2A LISS-IV Mx, Cartosat-1 and 2S, Aerial pix have been used within the mapping of landslides. Change detection using visual (manual) and virtual (automated) strategies were used to prepare the landslide stock database. Some mapped landslides were established in the field using mobile App and from the information record. The database mainly carries 3 varieties of inventories – seasonal, event-based totally and direction-clever for the 2000- 2017 duration. Seasonal inventory includes pan-India landslide database corresponding to the 2014 and 2017 rainy season in India. The database is to be had in a web GIS platform in the Bhuvan portal. The landslide stock database shows the hotspot region.

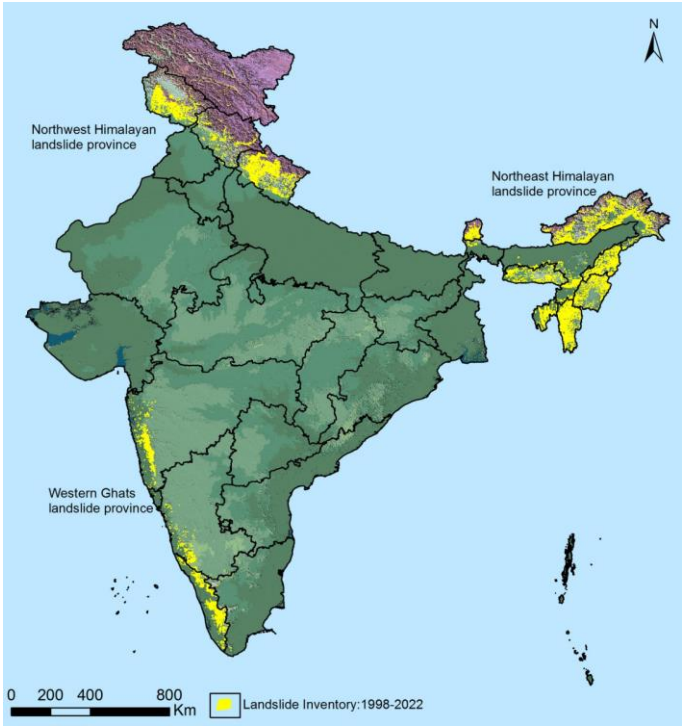

Fig -2: Landslide of India.

In fig. 2, shows the landslide inventory between 1998 to 2022 of India Northwest Himalayan provinces, Northeast Himalayan provinces and western ghat landslide provinces.

Landslide data base of India monsoon season 2014 Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Assam, Meghalaya, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Haryana is 6826, 23, 922, 1593, 73, 24, 2904, 54, 379, 1205, 56, 1243, 2127, 97, 2, 82, 9, 79 respectively and total landslide in monsoon 2014 all over India is 17,698.

Landslide data base of India monsoon season 2017 Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Assam, Meghalaya, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Haryana is 19, 172, 455, 79, 82, 4709, 2071, 4559, 2254, 8014, 793, 512, 1, 19, 45, 8, 100 respectively and total landslide in monsoon 2017 all over India is 23,895.

Total landslide data base of India state wise Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Assam, Meghalaya, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Haryana is 7280, 23, 1561, 11219, 1569, 172, 7689, 2132, 5494, 12385, 8070, 2569, 2639, 5112, 3, 1094, 6039, 690, 100 respectively and total landslide all over India is 80,933.

Event based per year in Jammu and Kashmir is 1 / 2015, Himachal Pradesh is 1/ 2017, 51/2013 and 2/2021, Uttarakhand is 32/2003, 307/2010, 473 / 2012, 6610 / 2013, 1 / 2017, 329/2021 and 1/2022, Sikkim is 1408 / 2011, 8 / 2012 and 1/ 2016, West Bengal is 66 / 2011, Arunachal Pradesh is 75 / 2016 and 1/2021, Nagaland is 7/2017, Manipur is 556/2017 and 1/2022, Mizoram is 8926/2017, Assam is 533/2017 and 5091/2022, Maharashtra is 5012/2021, Karnataka is 993/2018, Kerala is 5191/2018, 756/2019, 09/2020 and 29/2021, Tamil Nadu is 603/2018 and total event based per year landslide is 37,074.

Table -1: Landslides database of India

Sl. No.	State/UTs	Monsoon season 2014	Monsoon season 2017	Event-based / year	Field based /year	Total
1	**Jammu and Kashmir**	6826	19	1 / 2015	434 / 2011	**7280**
2	**Ladakh**	23		-	-	**23**
3	**Himachal Pradesh**	922	172	1/ 2017 51/2013 2/2021	413 / 1998	**1561**
4	**Uttarakhand**	1593	455	32/2003 307/2010 473 / 2012 6610 / 2013 1 / 2017 329/2021 1/2022	1419 /1998	**11219**
5	**Sikkim**	73	79	1408 / 2011 8 / 2012 1/ 2016	-	**1569**
6	**West Bengal**	24	82	66 / 2011	-	**172**
7	**Arunachal Pradesh**	2904	4709	75 / 2016 1/2021	-	**7689**
8	**Nagaland**	54	2071	7/2017	-	**2132**
9	**Manipur**	379	4559	556/2017 1/2022	-	**5494**
10	**Mizoram**	1205	2254	8926/2017	-	**12385**
11	**Tripura**	56	8014	-	-	**8070**
12	**Assam**	1243	793	533/2017 5091/2022	-	**2569**
13	**Meghalaya**	2127	512	-	-	**2639**
14	**Maharashtra**	97	3	5012/2021	-	**5112**
15	**Goa**	2	1	-	-	**3**
16	**Karnataka**	82	19	993/2018	-	**1094**
17	**Kerala**	9	45	5191/2018 756/2019 09/2020 29/2021	-	**6039**
18	**Tamil Nadu**	79	8	603/2018	-	**690**
19	**Haryana**	-	100	-	-	**100**
Total		**17,698**	**23,895**	**37,074**		**80,933**

3.2 Landslide all-India rank of district wise of Maharashtra:

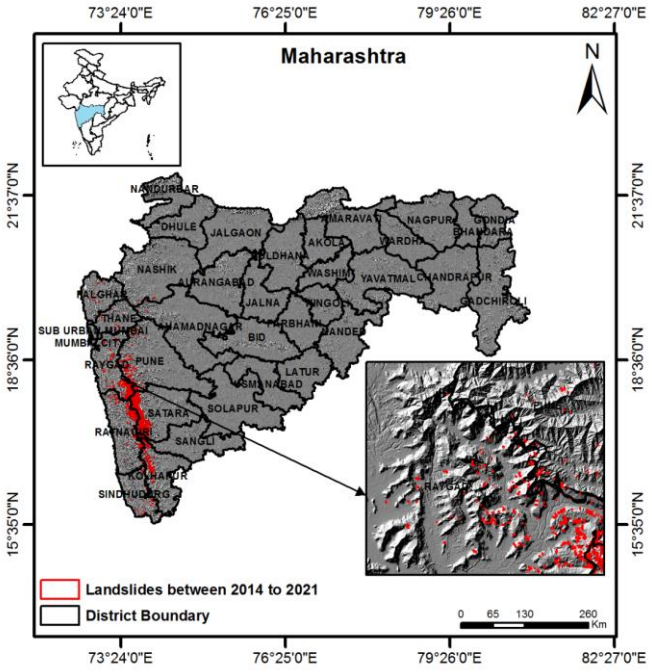

Fig -3: Landslides mapped using high-resolution satellite data in Maharashtra, which occurred between 2014 to 2021.

Table 2. Table shows the all-India rank of districts wise for their exposure to landslides Maharashtra.

District Rank	District
80	Thane
107	Pune
109	Raygad
114	Sindhudurg
128	Nashik
129	Ratnagiri
131	Ahmednagar
133	Kolhapur
134	Satara
139	Mumbai Suburban
140	Mumbai

3. Conclusion:

Landslide occurring in India frequently Uttarakhand, Mizoram, Jammu and Kashmir, Tripura, Arunachal Pradesh, Kerala, Maharashtra, Meghalaya, Assam, Sikkim, Himachal Pradesh, Karnataka is 11219, 12385, 7280, 8070, 7689, 6039, 5122, 2639, 2569, 1569, 1561, 1094 respectively in this state or union territories more than one-thousand-time landslide occurs in this area is the hotspot of land sliding.

Maharashtra District's is in the top 150 all-India rank of districts wise landslides. District all-India rank Thane, Pune, Raygad, Sindhudurg, Nashik, Ratnagiri, Ahmednagar, Kolhapur, Satara, Mumbai Suburban, Mumbai is the District Rank 80, 107, 109, 114, 128, 129, 131, 133, 134, 139, 140 respectively.

REFERENCES

1. D. M. Cruden. A Simple Definition of a Landslide. Bulletin of the International Association of Engineering Geology, Volume 43, 1991, 27-29.
2. D. J. Varnes. Slope movement types and processes, In: R.L. Schuster and R.J. Krizek, Landslides— Analysis and control. National Research Council, Special Report 176, 1978, 11–33
3. D. J. Varnes. Landslide Types and Processes, Landslides and Engineering Practice. National Research Council, Special Report 58, 1958, 20-47.
4. Fabio Vittorio De Blasio. Introduction to the Physics of Landslides, Lecture Notes on the Dynamics of Mass Wasting, Springer Dordrecht Heidelberg London New York. 2011.
5. National Remote Sensing Centre (NRSC) portal: https://www.nrsc.gov.in/
6. Bhuvan portal: https://bhuvan.nrsc.gov.in/home/index.php
7. National Database for Disaster Management (NDEM): https://ndem.nrsc.gov.in