ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

ANALYSES OF THE IMPACT OF SEISMICITY ON THE ENVIRONMENT IN AND AROUND PATAN TEHSIL OF SATARA DISTRICT, MAHARASHTRA

Mr. Sandeep SampatTadakhe
Research Student,
Asst. Professor, Balasaheb Desai College
Patan, Dist. Satara.

Dr. C. U. Mane
Research Guide,
Associate Professor,
Head of Dept. Geography
Balasaheb Desai College, Patan, Dist. Satara.

Abstract

Frequent Earthquake can negatively affect the environment in number of ways. The initial shock can create the primary effects of earthquakes that trigger ground shaking, ground rupture, initiation of slope failures, ground dislocation, landslides, tsunamis, and liquefaction, displacing soil and leaving the area vulnerable to erosion. Historically the only earth tremors in the Konya region prior to the construction of Konya dam occurred in 1962. There were frequent reports of earthquakes, the epicenter of the earthquake was located in 10x30 square kilometer area in and around Patan Tehsil or near the vicinity of the Koyna Dam, and Chandoli Dam Reservoir. Most of the primary data regarding impact of earthquakes is being collected through field work. E.g. Field visits, Surveying and Interviews to villagers and secondary data collected through the Seismological Dept. Koyna dam. The Chi-Square test is used to check the dependency (or association) between two categorical variables.There is association between earthquake risk zone and Impact on environment or both factors are dependent. As the distance increases from the earthquake epicenter the impact on environment lowered.

Key Words: *Frequent,Liquefaction, Displacement, Epicenter*

INTRODUCTION:

Seismic activity located in and around Patan Tehsil region in the State of Maharashtra, India has persisted for more than 50 years following the impoundments of Koyna Reservoir in 1961 and Chandoli Reservoir in 1985. Earthquake can negatively affect the environment in number of ways. The initial shock can create the primary effects of earthquakes that trigger ground shaking, ground rupture, initiation of slope failures, ground dislocation, landslides, tsunamis, and liquefaction, displacing soil and leaving the area vulnerable to erosion. Quakes

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

can also stir up dust, pollen, spores, and other material and disburse it into the air. Fires are probably the single most important secondary effect of earthquakes. The severity of the Earthquake or area effected depends upon the earthquake magnitude, intensity and distance from the epicenter.Patan Tehsil and surrounding region is the forming part of the Western Ghats in the south-western part of the Deccan volcanic province, has become a region of producing continuous seismicity. The current recorded data about the seismicity of this region is the spans of over fifty years, during which more than 100,000 earthquakes have been recorded. The record of seismicity prior to 1962 was extremely limited.

The Koyna Dam site in western Maharashtra has been seismically active since the dam was built in 1962 and in filled with water in 1963.

OBJECTIVES:

The present study is based on the following objectives:

- To study the geographical setup of the study area.
- To assess the effects of earthquake on Environment of the study area.

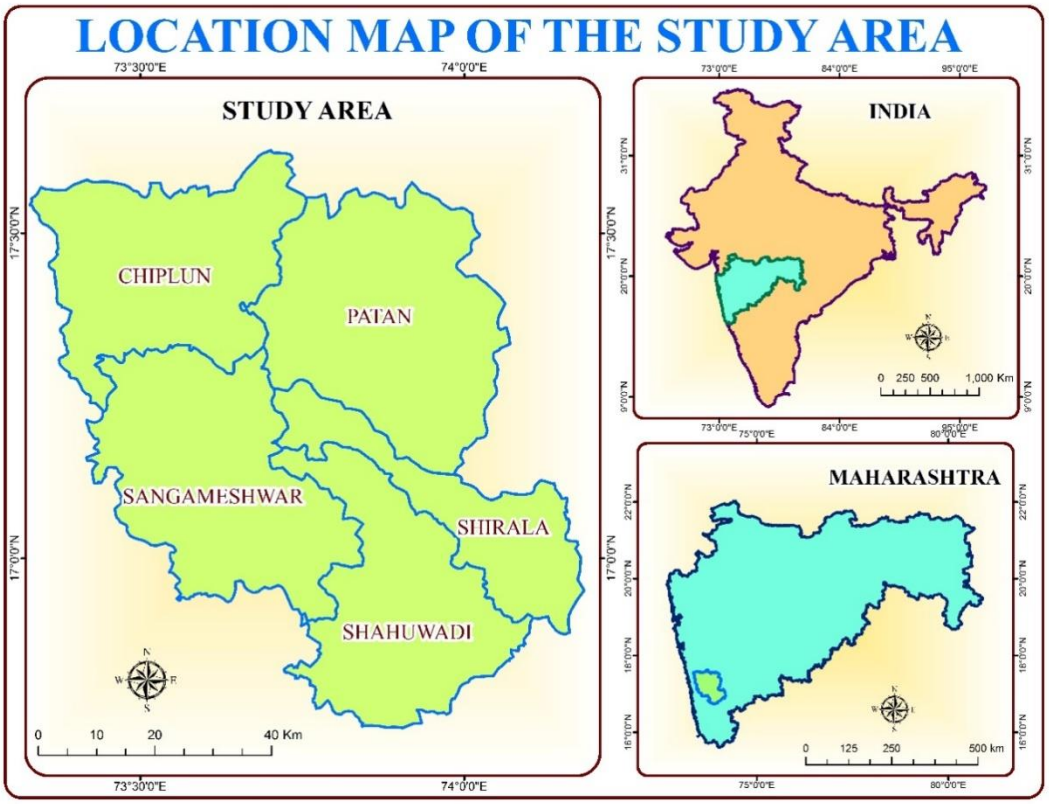
HYPOTHESES: Earthquakes are responsible for the degradation of environment of the area.

STUDY AREA:

The area of investigation covers parts of Satara, Sangli, Kolhapur and Ratnagiri districts in the state of Maharashtra. The study region is seismically active region from these five tehsils. The latitudinal and longitudinal extent of The study area is stretched between 16°43‘46‖ North Latitude to 17°53‘33” North Latitude and 73°19‘01‖ East Longitude to 74°13’10” East Longitude Respectively. Total geographical area of study area is 6416.684862 sq. km. in Maharashtra. Patan Tehsil and surrounding region is the forming part of the Western Ghats in the south-western part of the Deccan volcanic province, has become a region of producing continuous seismicity.

Figure No. 1. Location Map of Study area.

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020



In the study area there where agriculture, horticulture and forest are the dominant land - use. Two major reserved forest (the Koyna – Mahabaleshwar Range and the Chandoli National Park – a tiger reserve) occur along the steep west - facing Western Ghats Escarpment that runs north – south. The famous Koyna Dam which is India's largest hydroelectric project is also nearby. Koyna regions Average high temperature 28.8°C (83.8 °F) Average low temperature 13.7 °C (56.7 °F). Mean temperature range is 24°C (75°F). Rainfall in this region averages 3000–4000 mm (120–160 inches). About 200 inches of rainfall in 345 sq miles watershed above.

DATABASE & METHODOLOGY:

Most of the primary data regarding earthquakes is being collected through field work. E.g. Field visits, Surveying and Interviews with local and officials. The secondary data is be collected through Seismological Dept. Koyana dam, Koyananagar, PatanTahsil and related reference books, magazines, published unpublished Articles, journals, and published Govt. Report, District Census hand book, Newspapers, Other media reports and relegated websites.

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

The collected information is analyzed with The Chi-Square test. It is used to check the dependency (or association) between two categorical variables.

Where, Oi and Ei are observed and expected frequency respectively. 2 follows chi-square distribution with (r-1) (c-1) degree of freedoms, where r and c are number of rows and columns respectively. We reject the null hypothesis H_0 at α% level of significance if p-value less than equal to. The p-value is a smallest level of significance at which we reject H_0.

The map tables are used for presenting and their interpretation which is supporting for getting proper inferences.

DISCUSSION AND RESULT:

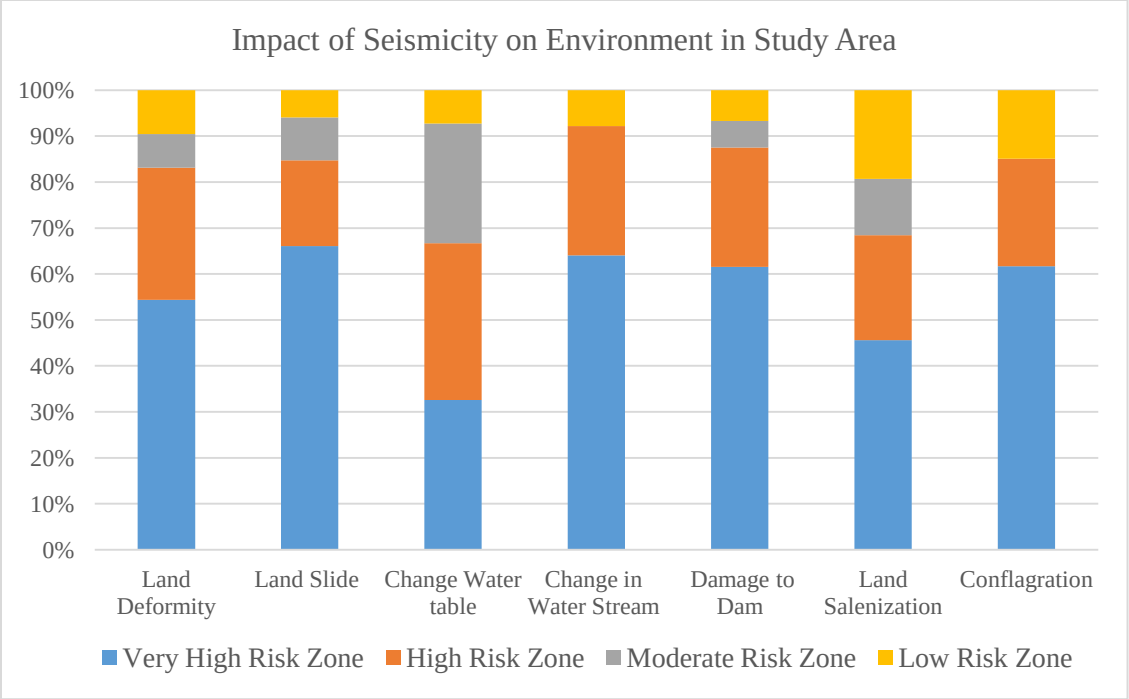
There are five tehsils of four districts lies in study area. There are total 945 number of villages in study area. Out of the total number of villages Patan tehsil has 343 villages and one town. Shirala tehsil has 95 villages, Chiplun Tehsil has165 villages and two towns. Sangmeshwer Tehsil has 198 and one town and Shahuwadi tehsil consist 135 villages and one town. According to the distance from the earthquake epicenters the study area divided in to four earthquake risk zone those areVery High Risk Zone, High Risk Zone, Moderate Risk Zone, Low Risk Zone.

Major Environmental Impacts of Earthquake in Study Area.

Frequent seismicity also effected on environment of study area. When queried about the impacts of seismic shocks on the environment in the study area, respondents revealed diverse impacts as shown in Figure no.5.2. The major earthquake impacts observed are deformation of land by development of fissures or cracks in the ground, rock fall or land slide, change in level, taste or colour of underground water table, change in water streams, conflagration, salinization of land and damage or break of dams.

Figure No. 2. Impact of Seismicity on Environment in Study Area

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020



Rock fall and Landslides: While inquiring respondents about their experienced about earthquake impact on environment. 48.2 percent said yes they experienced land deformation out of these 54.3 percent respondents are from Very High Risk Zone, 28.8 percent respondents are from High Risk Zone, 7.3 percent respondents are from Moderate Risk Zone and 9.6 percent respondents are from Low Risk Zone experienced. From all respondents 26 percent undergo the experienced rock fall and landslides nearby in their area. Out of these 66.1 percent respondents are from very high risk zone, 18.6 percent respondents are from high risk zone, 9.3 percent respondents are from moderate risk zone and 5.9 percent respondents are from low risk zone experienced rock fall and landslides nearby in their area.

Change in Water Table: While investigating about change in level, taste or colour of underground water table 30.4 percent from all respondents come across with this change. Most of them feel change in water table. 32.6 percent respondents are from very high risk zone, 34.1 percent respondents are from high risk zone, 26.1 percent respondents are from moderate risk zone and 7.2 percent respondents are from low risk zone experienced change in level and taste of underground water.

Change in Water Stream: However asking about Change in Water Stream nearby the region. From all respondents 14.1 percent said yes and 85.9 percent said no. out of those who

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

experienced Change or disappearing Water Stream 64.1 percent respondents are from very high risk zone, 28.1 percent respondents are from high risk zone, no one experienced from moderate risk zone and 7.8 percent respondents are from low risk zone.

Land Salinization:While questioning about land salinization 12.6 percent respondent are agreed, out of them 45.7 percent respondents are from very high risk zone, 22.9 percent respondents are from high risk zone, 12.3 percent experienced from moderate risk zone and 19.3 percent respondents are from low risk zone experienced land Salinization in their nearby areas.

Conflagration: Although inquiring about Conflagration, 14.9 percent respondent from all agreed out of which 61.7 percent respondents are from very high risk zone, 23.4 percent respondents are from high risk zone, and 14.9 percent respondents are from low risk zone experienced Conflagrations in area at the time of 1967 great earthquake.

Damage or Bursting of Dam: While questioning about damage or bursting of dam due to earthquake more than 95 percent respondents answered that 1967 great earthquake is responsible for crack in Koyna dam and 23% answered earthquake is responsible for damage or seepage of water from thesmall dams in surroundingregion. Out of them 61.5 percent respondents are from very high risk zone, 25.9 percent respondents are from high risk zone, 5.8 percent experienced from moderate risk zone and 6.8 percent respondents are from low risk zone. Even if distantly accidental dam burst happens, triggered by the above reasons, individually or cumulatively, there will be cascade effect of dam bursts in the river basin with huge downstream flooding causing massive destruction to life and property.

While compering earthquake risk zone and Impact on environment,Here Chi-Square Test Value is 10.984, where P value = 0.012. P-value<0.05 and it indicate that reject null hypothesis H_0 at 5% level of significance. That is, there is association between risk zone and Impact on environment or both factors are dependent.

Considering all the respondents most of the environmental effects due to earthquake occurred in very high risk zone consisting epicenteral part of study area. Than in high risk zone some villages experienced degradation of environment. i.e. Villages in Koynanagar, Morgiri, Dhebewadi division of Patan Tehsil, Bopoli division of Chiplun Tehsil, Devrukh

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

division of Sangmeshwer Tehsil, and Malkapur Division of Shahuwadi Tehsil.Minimum effects on environment experienced in moderate and low risk zone.

CONCLUSION:

The environmental effects are observed according to earthquake magnitude and intensity or distance from the epicenter. Most of the environmental effects due to earthquake occurred in very high risk zone consisting epicenteral part of study area. Than in high risk zone some villages experienced degradation of environment. i.e. Villages in Koynanagar, Morgiri, Dhebewadi division of Patan Tehsil, Bopoli division of Chiplun Tehsil, Devrukh division of Sangmeshwer Tehsil, and Malkapur Division of Shahuwadi Tehsil. The major earthquake impacts observed are deformation of land by development of fissures or cracks in the ground, rock fall or land slide, change in level, taste or colour of underground water table, change in water streams, conflagration, salinization of land and damage or break of dams. There is association between risk zone and Impact on environment or both factors are dependent. As the distance increases from the earthquake epicenter the impact on environment lowered.Earthquake effects on environment are observed, with geologically characteristic, frequently Geomorphological, and sometime both Geologically Geomorphological characteristic effects are recorded.

REFERENCES:

1. Gazetteer of India: Gazetteer of Ratnagiri district, Director, Government Printing, Stationary and Publications, Maharashtra State, Bombay-4, p. 4.
2. Geological Survey of India, (1976): Geology of theSatara District, Maharashtra, 125th Anniversary Celebration, 1976 p. 2.
3. Gunnell, Y. and Radhakrishnan, B.P., (1967): The Western Ghats of the Indian Peninsula: In Proceedings of the Seminar on Geomorphological Studies in India, Sagar, and in Memoir Geological Society of India 47 (1):133-144. 2001.
4. Shanavas P.H., Sumesh A.K., and Haris P.M., (2016): Western Ghats from Ecology to Economics, Educreation Publishing, R2 94, sector-6, Dwaraka, New Delhi-110075.

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

5. Sarma, S. V. S., B. Prasanta, K. Patro, T. Harinarayana, K. Veeraswamy, R. S. Sastry, and M. V. C. Sarma (2004), amagnetotelluric (MT) study across the Koyna seismic zone, western India: Evidence for block structure, Phys. Earth Planet. Inter., 142, 23–26.
6. Talwani, P. (1997a), Seismotectonics of the Koyna-Warna Area, India, Pure Appl. Geophys., 150, 511–550.
7. https://en.wikipedia.org/WesternGhats

