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Study on Social, Economic and Environmental Effect of Earthquake

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Abstract:

India's is at high risk due to population overshoot and unscientific constructions of buildings is mushrooming all over India. Floods, cyclone, earthquakes and landslides are the frequent phenomenon. India has suffered major earthquakes that have resulted in over 20,000 casualities. One of the most overwhelming natural disaster is earthquake which is caused by sudden shaking of the earth surface. This paper present review on the socio-economic and environmental effect of earthquake in order to learn from this event and understand what are the relevant steps required to improve the condition after earthquake.

Keywords: *Earthquake, Social Effect, Economical Effect, Environmental Effect*

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Introduction

India is one of the world's most disaster prone area. Wind storms, earthquake, and floods are few of the very common disasters that usually occur in India. Around 57% of the land is prone to earthquake. Major earthquake occurred in Kangara (1905), Bihar-Nepal (1934), Latur (1993), Bhuj (2001), and Sumatra (2004) (Patil, 2012). According to the National Disaster Management Authority, emergency kit for earthquake management must include Battery Operated Torch, Extra Batteries, Battery Operated Radio, First Aid Kit and Manual, Emergency Food (Dry Items) and Water (Packed And Sealed), Candles And Matches in a Waterproof Container, Knife, Chlorine Tablets or Powdered Water Purifiers, Can Opener, Essential Medicines, Cash, Aadhar Card and Ration Card, Thick Ropes And Cords, And Sturdy Shoes (https://ndma.gov.in)

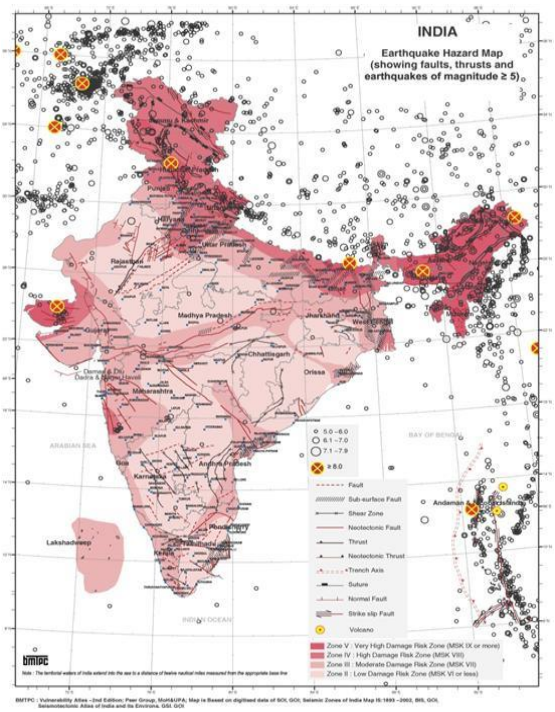

Figure 1: Earthquake Hazard Map (Source: https://ndma.gov.in)

Earthquake is one of the most overwhelming natural disaster caused by sudden movement of the ground. Different changes in the environment is observed due to earthquake, which is classified as Primary and Secondary Effects commonly known as earthquake environmental effects (EEE). These primary and secondary effects is further classified into subsidence, surface faulting and displaced rocks, tsunami, ground cracks, liquefactions, landslides respectively (Choudhury *et al.* 2016).

During earthquake, sudden movement beneath the earth crust which causes concentric shock waves to travel outward from that center point to the periphery. Focus is a point where the earthquake originates and the point just above the focus is known as Epicenter.Following are the three different types of waves are produced which have their own characteristics and move through certain layers within the earth.

1. **P-Waves** – P-Waves also known as Primary Waves. P waves are similar to sound waves. In this the surface of the earth tends to move back and forth which produces small displacements of the ground.

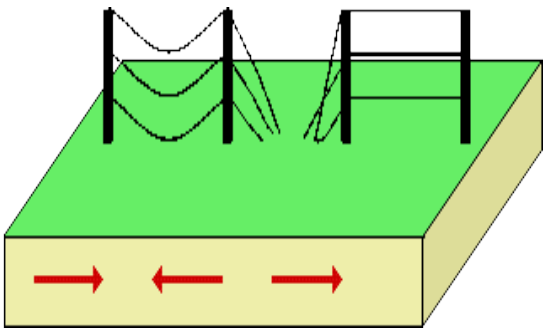

Figure 2: Example of P-Waves

2. **S-Waves** – S-Waves or Secondary Waves traverse quite slowly when compared to P-Waves. These waves spread in all directions from originating from center. Speed of S-waves depends on the density of rock material.

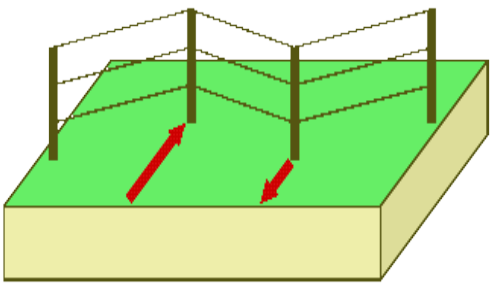

Figure 3: Example of S-Waves

3. **L-Waves** – L-Waves also known as Surface Waves have low frequency transverse vibrations having long wavelength. L-Waves are created at the point just above the focus and travel towards the periphery. This type of waves are mainly responsible for the intense casualities (www.geography-site.co.uk).

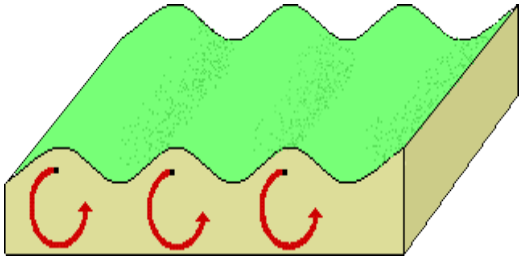

Figure 4: Example of S-Waves

Richter scale is an instrument used to measure and calculate the intensity of earthquakes. Richter scale was named after and developed by Charles F. Richter. For calculating the magnitude of the earthquake, Richter scale uses the info provided by seismograph. On Richter scale if earthquake occur above 7, it is known as devastating effect where as if it is occurring below 3 then it can't be felt. And if it is between 3 and 6 then it is known as mild type (https://www.conserve-energy-future.com).

Earthquake Prediction

Earthquake cannot be predicted neither by USGS nor by any other scientists as it cannot define the basic three elements that is the date and time, location, and magnitude. Still there are few people who says that they can predict earthquakes but their statement are false on the basis of following reason:

- Do not based on scientific evidence
- Do not define all 3 of the elements.
- Predictions are always general.

If luckily earthquake happens as per their prediction they claim it as their success even though 1-3 of prediction is different, therefore it can conclusively said that earthquake ca never be possible (https://www.usgs.gov).

Effects of Earthquake

Natural disasters either mild or moderate will adversely effects the socio-economic and environmental impacts in developed or undeveloped regions due to lack of preventive action and resources. Earthquakes can happen anytime as it cannot be predicted. It can caused by numerous reason whose effects can be clearly seen and observed socially, economically and environmentally, which is shown in table 1:

Table 1: Effects of Earthquake (Source: http://www.bbc.co.uk)

	Social Impacts	Economic Impacts	Environmental Impacts
Short-term Effects	• Loss of human life. • Destruction of homes. • Disturbed transportation system • Disturbed communication links. • Contaminated Water supplies.	• Shops and other infrastructure gets destroyed. • Looting • Disturbed transport and communication	• Destruction of landscape. • Gas pipe explosions may cause destruction. • Landslides may occur. • Floods may cause *Tsunamis*.
Long-term Effetcs	• Spread diseases. • People are accommodated in refugee camps.	• High cost of maintenance. • Loss of income	• Loss of habitat, flora and fauna.

Causes of Earthquake

Explosive volcanic eruptions

Tectonic activity (most common type of earthquake)

Earthquake are caused by numerous reasons, in which few of the causes are mentioned below.

- Tectonic Movement
- Volcanic Activity
- Dislocation of the Earth's Crust
- Adjustment in inner Rock Beds
- Pressure of Gases in the interior
- Landslides and Avalanches
- Denudation of the Landmasses and depositions of materials
- Faulting and folding in the rock beds (https://www.importantindia.com).

Review of Literature

Jain (1988), studied that India has a very high frequency of earthquakes i.e. magnitude greater than 8.0 during 1897 to 1950. For example, Cutch Earthquake of 1819, Assam Earthquake of 1897, Bihar - Nepal Earthquake of 1934, Koyna Earthquake of 1967, Bihar - Nepal Earthquake of 1988 etc. The country must focus on daily issues of poverty, shelter, law and order, health etc. effected

after earthquake otherwise the effects will be unimaginable.

Gupta (2001), focused on the Gujarat earthquake 2001 and learned that earthquake can't be predicted therefore, there is need of safe construction in the earthquake prone areas. With the help of proper awareness program make people aware about the recovery and reconstruction program for appropriate steps for disaster reduction, prevention, and mitigation.

Patil (2012), studied about Disaster profile and Management of India and recommended that by creating awareness and providing proper training we can help in disaster preparation and response. There is also need to change in perception of people. Proper coordination between different departments and stakeholders must be done for more effective disaster management system.

Doocy, *et al.* (2013), reviewed the impact of earthquake on human from 1980-2009 with an aim to discuss the impact of earthquakes on human in terms of injury, mortality and displacement and, to the extent possible, identify risk factors related with these results. Conclusively they said that different strategies must be used to mitigate the impact of future earthquakes and improvements to the built environment.

Mata-Lima, *et al.* (2013), addresses the socioeconomic and environmental impacts of natural calamities with an objective to know key variables in the reduction and prevention of the impacts of natural disasters such as earthquake.

Mohan and Kumar (2013), discussed about the earthquakes and dams in India which make 57% of land susceptible to earthquakes.

Martha, *et al.* (2015), studied about the landslides in Sikkim triggered by the Mw 6.9 earthquake on 18 September 2011 by using Post-disaster very high resolution (VHR) satellite. The earthquake-affected area was out-of-reach, VHR data from these satellites helped in getting the quick and synoptic assessment of the damage of an area of 4105 km2 in Sikkim.

Dey (2015), presented a case study of Nepal earthquake and its impact on humans to examine the causes, nature, consequences, extent, and causes of the earthquake. Concluded that earthquake was more severe due to geology of earth and design of buildings.

Jain (2016), from the different source of information it was clear that the construction of building is also one of the major issue. Therefore, there is need for creating an environment for safe construction. Few work has been done in the country to improve this construction process are competence-based licensing for engineers; enforcement of building codes by the municipal authorities; development and propagation of building typologies that are inherently earthquake-resistant.

Shakya (2016), studied the impact of earthquake on Nepalese economy and women in Nepal on secondary information available on internet. A discussion was done on the historical background of the earthquake and follows to identify the impact of earthquake on people and properties. Further focused prerequisite of resources for reconstruction and recovering of the lost sectors.

Sinha and Kumar (2017), studied three major earthquakes of India i.e. Sikkim Earthquake; Gujarat Earthquake; and Maharashtra Earthquake and found that the damage primarily due to poor design and construction practices and lack of quality control which ultimately result in very high economic loss.

Conclusion

After going through the available research, it can be said that earthquake can't be predicted therefore, the government must create proper awareness program make people aware about the recovery and reconstruction program. Earthquake affects the socio-economic and environmental condition of the earthquake prone areas. It not only effect the human lives but also affect the mental growth of the populations. Therefore, every state government must take the precautionary measure to mitigate the impact of earthquakes and improvements to the social and economic status of the earthquake prone area.

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