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EARTHQUAKE: CAUSES AND MANAGEMENT IN INDIA

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ABSTRACT:

Earthquakes are one of the major natural disasters as they are the most unexpected and the most devastating among other natural disasters. Every year it causes great loss of life and property worldwide. India has seen the most exceedingly terrible tremors somewhat recently. The turn of the century saw one of the most shocking Bhuj quake in 2001. Earthquakes are thus a major cause of concern in India's disaster profile as it has resulted in significant losses. In order to reduce the damage caused by these incidents, the disaster management committee has put in place some safety measures. However, the recent earthquake occurrences have brought forth the question of earthquake preparedness in India again. This paper is an attempt to highlight the causes of earthquakes in India, the damage it results in and various programs and policies designed to manage them. It also discusses the gaps in earthquake preparedness and steps that can be taken to mitigate the risk of earthquakes better. This will protect us from suffering significant losses and will help us to cope better with this hazard.

KEY-WORDS: *Tectonic Plates, Earthquake, Zoning, NDMA, Earthquake Management*

INTRODUCTION:

India's increasing population and extensive unscientific constructions rapidly growing all over, including huge factory buildings, multistoried luxury apartments, gigantic malls, supermarkets as well as warehouses and masonry buildings keep - India at high risk of earthquakes. During past couple of decades, India has experienced about 10 major earthquakes that resulted in over 20,000 deaths. According to the current seismic zone map of the country, over 60 per cent of India's land area is under threat of moderate to severe seismic hazard. As a matter of fact, entire Himalayan belt is prone to disastrous earthquakes of magnitude more than 8. Scientists have repeatedly warned us of the high chances of very severe earthquakes in the Himalayan region, through multiple publications, which could adversely affect the lives of several million people in India.

There was a time when regions of India away from the Himalayas and other inter-plate boundaries were considered relatively safer and were at less risk of damage from earthquakes. In the past, however, even these areas have experienced devastating earthquakes, albeit significantly lower than the Himalayan earthquakes. Recent research suggests that in light of the seismic risk of these regions, many areas classified as low risk may be placed at a higher level of seismic risk, or vice versa. The North-Eastern part of the country frequently experiences moderate to large earthquakes. On an average, the region experiences an earthquake with a magnitude greater than 6.0 every year. The

Andaman and Nicobar Islands are also located on the inter-plate border and are often subject to severe earthquakes.

The increase in the risk of earthquakes is due to the acceleration of development activities driven by urbanization, economic development and global trade in the Indian economy. As a result, the loss of human life is not the only determinant of how destructive the earthquake was, significant economic losses leading to the collapse of a local or regional economy after an earthquake can have long-term negative effects across the country and are thus a major factor to consider in earthquake risk assessment.

EARTHQUAKES AND ITS TYPES

The Earth's crust is made of tectonic plates. These plates keep moving slowly. Sometimes, they get stuck at their boundaries due to friction and when the pressure for movement overcomes the friction, energy is released in the form of waves or vibrations that travel through the earth's crust and shakes the earth. So, the shaking of the surface of the earth due to a sudden, rapid release of energy in the form of vibrations is called an earthquake. Seismic waves (also known as S waves) are created by this rapid release of energy that travel in all directions. The seismic activities in an area determine the type and intensity of the earthquake. An earthquake can range from minor tremors to large building shanking shock. Minor quakes brought about by little vibrations happen at regular intervals however extraordinary seismic tremors happen on account of blaming (ordinary, converse and strike-slip) cause an incredible number of interruption.

The area or point underneath the outer layer of the earth where the quake begins is called hypocenter and the area straight over the hypocenter on the outer layer of the earth is known as the focal point. Below are few types of earthquakes:

1. Tectonic Earthquakes: Generated due to sliding of the rocks along the fault plane. This is the most commonly occurring type of earthquake.
2. Volcanic Earthquake: Occur due to volcanic activities and displacement caused because of those. These are confined to areas of active volcanoes.
3. Collapse Earthquake: These occur in the areas of intense mining. Roofs of underground mines collapse that cause tremors.
4. Explosion Earthquakes: Ground shaking caused by huge explosions like a nuclear explosion and chemical explosion
5. Reservoir induced Earthquakes: These occur in the areas of huge reservoirs like dams.

EARTHQUAKES IN INDIA

India has had its share in some of the devastating earthquakes. More than 60% of the Indian land is prone to moderate to very high-intensity earthquakes.

Some of the great earthquakes in India are listed below:

1. Cutch Earthquake (1819) which was 8.3 magnitude
2. Assam Earthquake (1897)
3. Bihar-Nepal Earthquake (1934) of 8.4 magnitude
4. Koyna Earthquake (1967) of 6.5 magnitude
5. Uttarkashi (1991) of 6.6 magnitude
6. Killari (1993) of 6.4 magnitude
7. Bhuj (2001) of 7.7 magnitude
8. Jammu Kashmir (2005)
9. Andaman and Nicobar Islands (2009 and 2010) of 7.5 magnitude

EARTHQUAKE MANAGEMENT IN INDIA

Earthquake management in India, goes through different stages. Some of the important areas of earthquake management in India are:

1. Awareness among various stakeholders

2. Structural mitigation measures
3. Appropriate town planning, monitoring and enforcement of earthquake-resistant building codes.
4. Proper earthquake response planning
5. System of decentralized response
6. Trained manpower to deal with the disaster

Bureau of Indian Standards [IS 1893 (Part I):2002], has divided Indian land into four seismic zones. Zone-II, III, IV and V. Zone II is the least seismically active region and thus least prone to damage due to earthquake while Zone V is the most active region with maximum chances of damage.

Zone V: Entire northeast India, Himachal Pradesh, Uttaranchal, parts of Jammu and Kashmir, part of North Bihar, Rann of Kutch in Gujarat and Andaman & Nicobar Islands.

Zone IV: Rajasthan, parts of Jammu and Kashmir, Delhi, parts of Gujarat, Sikkim, small portions of Maharashtra near the west coast, Bihar, northern parts of Uttar Pradesh, West Bengal and Himachal Pradesh.

Zone III: Tamil Nadu, remaining parts of Uttar Pradesh, West Bengal, Gujarat, parts of Punjab, Rajasthan, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Goa, Lakshadweep islands, Kerala, Orissa, Andhra Pradesh, Maharashtra and Karnataka.

Zone II covers other remaining parts of the country.

Government of India set up a High-Powered Committee in 1999 and a National Committee after the Gujarat earthquake, to make recommendations on mitigation mechanisms and effective preparedness. The 10th 5-year plan document included a detailed chapter on Disaster Management. The 12th Finance Commission was commissioned to review the financial arrangements for Disaster preparedness and Management. In December 2005, the Disaster Management Act was formulated and enacted.

THE DISASTER MANAGEMENT ACT ENVISIONED THE CREATION OF:

1. National Disaster Management Authority (NDMA), headed by the Prime Minister. It was to implement activities of Disaster Management in India.
2. State Disaster Management Authorities (SDMAs), headed by individual Chief Ministers to do likewise at the state level.
3. Some Important measures to prevent and mitigate earthquake loss in India are:
4. Building Materials & Technology Promotion Council (BMTPC): It undertakes projects to generate awareness among the people and various government agencies and for retrofitting of life-line structures.
5. National Earthquake Risk Mitigation Project (NERMP): Its aim was strengthening of the non-structural and structural dimensions of earthquake mitigation efforts, reducing the vulnerability in the high-risk districts. Necessary risk mitigation measures were put in place in the areas of high seismic activities under this project. NDMA, who was given the responsibility of this project prepared a Detailed Project Report (DPR) on same.
6. Initiatives by Ministry of Panchayati Raj: It provides funds under Backward Regions Grant Fund (BRGF) for meeting critical gaps in infrastructure and other developmental requirements. The ministry has financed several district plans for construction of panchayat buildings, Angawadi centers, classrooms, roads, bridges, school buildings, culverts, etc.
7. and restructuring of State Institutes for Rural Development (SIRD) buildings, panchayat training centers, block resource centers, etc. under the BRGF.
8. The National Center for Seismology: It comes under the Ministry of Earth Sciences. It submits earthquake surveillance and hazard reports to various government agencies. It includes three divisions: Earthquake Monitoring & Services, Geophysical Observation System and Earthquake Hazard & Risk Assessment.
9. National Retrofit Program: The National retrofitting Program was launched under the Home Ministry in 2014 following the guidelines on 'seismic retrofitting' laid by NDMA, along with experts

from requisite ministries and various IITs. The RBI had asked the banks to not provide loans to any building construction which does not follow the guidelines laid for the earthquake resistant structures. The public authority sent off two Mobile applications: 'India Quake' - Developed by the National place for seismology, this portable application disperses ongoing tremor data. 'Sagar Vani' - This versatile application disperses sea related alarms and data promptly, for the most part planned to serve beach front networks for their security.

10. National Building Code (NBC): It is a comprehensive building code and a national instrument that provides guidelines for regulating the building construction activities throughout the country. It was first distributed in 1970 at the case of the Planning Commission and was additionally changed in 1983. From that point there were three significant changes gave, two out of 1987 and the third in 1997. The changed form of NBC was then brought out as National Building Code of India 2005 (NBC 2005). The salient features are meeting the challenges posed by natural calamities and incorporating the contemporary applicable international best practices.

The National Disaster Response Force (NDRF) endeavors to be the specialist on call at legacy locales, which are defenseless against catastrophes like quakes, floods, tornadoes, and tidal wave across India. The NDMA guidelines of 2007 on earthquake preparedness are very important part of earthquake management in India. There are 6 pillars of earthquake management per these guidelines:

1. Earthquake resistant construction of new structures.
2. Retrofitting of existing structures and selective seismic strengthening
3. Regulation and enforcement.
4. Awareness and preparedness.
5. Capacity development.
6. Emergency response.

CONCLUSION

Earthquake is one such disaster that cannot be predicted. Even today, when we have such developed technology, it is impossible to predict next quake. In 2005, India made great progress in in dealing with earthquakes by making legal and institutional mechanism, that is the Disaster Management Act-2005 and National Disaster Management Authority under the chairmanship of Prime Minister. Thereby Indian government shifted its focus from an approach that was relief oriented to something that depends on prevention and preparedness. However, since we are so prone to this disaster, we must take more steps to prevent the damage it results in.

Below are few practices which India as a community can imbibe and learn from other communities around the world as currently, we fall short of such measures.

1. Indian government should invest more funds in research and development so that we don't fall behind in technology development like remote sensing and GIS that will help us monitor and may be predict earthquakes in future.
2. NGOs and other social associations can play major role in spreading the awareness about Dos and Don'ts during an earthquake. They can also help in relief measures after the incidence of earthquake.
3. Mock drills should be performed at local community levels to monitor and improve the level of preparedness in case an earthquake happens, especially in areas more prone to seismic activity.
4. There should exist more formulated and better quality control around earthquake resistant construction.
5. At individual level we should ensure that we are spreading earthquake safety awareness in our local communities.

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