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Understanding The Geo-Hazards-Simplified

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Abstract-

When the hazard occurs it may then be called an event, accident, emergency, incident, or disaster. The study and monitoring of geo-hazards helps us to better prepare ourselves and respond to these geological events when they do occur. Geo-hazards can be small features that have an impact only on their local area such as a small landslide that partially blocks a road or track through to large earthquakes that affect entire cities. They can also be very large events that have a widespread impact such as large tsunami.

The paper describes, as Geo-hazards are geological and environmental conditions and involve long-term or short-term geological processes. Geo-hazards can be relatively small features, but they can also attain huge dimensions (e.g., submarine or surface landslide) and affect local and regional socio-economy to a large extent (e.g., tsunamis). The processes that have formed the earth continually act on or beneath its surface. The movement of plates in the earth's crust and local concentrations of heat are a continuing source of hazards to people and their structures. The results of the extensive research on geologic hazards that has been conducted to date have been translated into a form accessible to non-scientists, and small-scale maps displaying historic, actual, and potential hazard levels are available. The geologic hazard assessment techniques, most of which are well beyond the technical, temporal, and budgetary constraints of integrated development planning studies, it presents and discusses existing information which can and should be used during the Preliminary understanding. This information is sufficient to show, whether a hazard constitutes a significant problem in development area and, day to day life.

Keywords-Geo-hazards**,** development and planning, huge dimensions, potential hazards

I. Introduction

India is vulnerable, in varying degrees, to a large number of disasters. More than 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12%) of its land is prone to floods and river erosion; close to 5,700 kms, out of the 7,516 kms long coastline is prone to cyclones and tsunamis; 68% of its cultivable area is vulnerable to droughts; and, its hilly areas are at risk from landslides and avalanches. Moreover, India is also vulnerable to Chemical, Biological, Radiological and Nuclear (CBRN) emergencies and other man-made disasters. Disaster risks in India are further compounded by increasing vulnerabilities related to changing demographics and socio-economic conditions, unplanned urbanization, development within high-risk zones, environmental degradation, climate change, geological hazards, epidemics and pandemics. Clearly, all these contribute to a situation where disasters seriously threaten India's economy, its population and sustainable development

I. Of the 7,516 km long coastline, close to 5,700 km is prone to cyclones and tsunamis.
II. 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity.
III. Over 40 million hectares (12 per cent of land) is prone to floods and river erosion

II. Classification of Major Geo- Hazards

Geo-hazards have the potential to significantly impact the cost of construction, operation and maintenance of infrastructure. A simplified classification of the major hazard-related geologic phenomena and the hazards they cause is presented in the table below.

Geologic Event	Geo-Hazards Caused
Earthquake	**A. Ground shaking**
	B. Surface faulting
	C. Landslides and liquefaction
	1. Rock avalanches
	2. Rapid soil flows
	3. Rock falls
	D. Tsunamis
Volcanic Eruption	**A. Tephra falls and ballistic projectiles**
	B. Pyroclastic phenomena
	C. Lahars (mud flows) and floods
	D. Lava flows and domes
	E. Poisonous gases

With the present state of technology, most geologic events cannot be prevented or even predicted with any precision. Landslides are an exception: they can often be prevented. Areas prone to such events can be identified as earthquake fault zones, active volcanoes, and coastal areas susceptible to tsunamis. However, not all earthquake faults have been identified. Estimates of an occurrence of a given hazardous event are probabilistic, based on consideration of the magnitude of an event and its occurrence in time and space. Other measures-duration, areal extent, speed of onset, geographic dispersion, frequency-can be anticipated with even less precision.

Nevertheless, appropriate mitigation measures can enormously reduce the damage caused by geologic hazards. The City of Los Angeles, California, for example, instituted a system of grading regulations that has resulted in a 90 percent reduction of landslide-related damage to structures that were built after it went into effect (Hays, 1981). High density of population and infrastructure increases the risk, making hazard mitigation even more important.

Geologic events are distinctive for their extremely rapid onset. Unlike a flood or hurricane, whose impact at a site can be forecast hours or days in advance, earthquakes give virtually no warning. Volcanoes often show signs of a general increase in activity but give little or no warning of the actual eruption. (In a few areas where known hazards exist, e.g., Nevado del Ruiz, Mt. St. Helens and the San Andreas Fault, instrumentation has been installed which can give an indication of impending activity.) Tsunamis travel great distances over the open ocean; one triggered off the coast of Peru might hit the coast of Japan 18 hours later, giving reasonable warning time, but the same tsunami would hit the coast of Peru with almost no warning at all.

In addition to speed of onset, geologic hazards also tend to have impacts covering large areas. Earthquakes can cause damage over millions of square kilometres, and tsunamis travel the entire ocean and cause major damage thousands of kilometres from their point of origin. For these reasons, non-structural mitigation measures, such as land-use zoning or the development of monitoring systems, tend to be particularly effective.

Sudden phenomena include:

- Earthquakes - Liquefaction (soils), Tsunamis.
- Volcanic Eruptions - Lava Flows, Ash Fall, Lahars.
- Landslides - Rock Falls or Slides, Debris Flows, Mud Flows.
- Floods - Inundation, Erosion.
- Snow Avalanches.
- hydrothermal eruptions.
- Sand Blasting (Windblown)

avalanches (snow, rock, or air & snow) and its runout. earthquakes and earthquake-triggered phenomena such as tsunamis. forest fires (espec. in Mediterranean areas) leading to deforestation.

A geo-hazard is a geological state that may lead to widespread damage or risk. ... Geohazards can be relatively small features, but they can also attain huge dimensions (e.g., submarine or surface landslide) and affect local and regional socio-economy to a large extent (e.g., tsunamis).

The nature which makes the life possible on Earth also have enough power to transform the world drastically. The unprecedented movement of Earth causes many of deadliest natural disasters like Earthquakes, Tsunamis, Volcanic eruptions and landslides. Followings are seven most dangerous natural disasters on Earth. Followings are seven most dangerous natural disasters on Earth.

III. Earthquakes

Earthquakes are one of the most dangerous disasters ever faced by the human. Earth's surface holds number of plates called tectonic. Such plates have rough edges and they always keep moving and slide over each other.

As the tectonic plate surface have faults the gets stuck while sliding and remaining parts keeps moving. Whenever the force of these plates overcomes the friction the energy gets released in the form of seismic waves and shakes the outer world. Ere are thousands of earthquakes happens across the world every day. But most of them are too small to be detect and some have the power to destroy everything.

- Seismometers is the instrument used to measure the seismic waves produced by earthquakes. The intensity or magnitude earthquakes are measured by ritcher scales, magnitude 3 or lower earthquakes are very weak in nature, magnitude 7 or higher have power to destroy the entire city.
- Scientists can't predict the Earthquakes, when it comes or where it hits.

Top most earthquake prone cities in the world

1. Kathmandu, Nepal.
2. Istanbul, Turkey.
3. Delhi, India.

4. Quito, Ecuador.
5. Manila. Philippines.
6. Islamabad, Pakistan.
7. San Salvador, Salvador.
8. Mexico City, Mexico.
9. Izmir, Turkey.
10. Jakarta, Indonesia.

IV. Hurricanes

Hurricanes are powerful rapidly rotating storm system mainly hit over tropical seas. Hurricanes are also called as typhoon, cyclone collectively known as tropical cyclones. Hurricanes will spread across 600 miles rotate inward and upward at 70 to 200 miles per hour speed.

Hurricanes are formed where ocean water with temperate above 80-degree F and wind blows in same direction that of upward force. The evaporation from sea water also increases the force of hurricane. But no such hurricanes hit lands with same power as it gained from source, have enough power to generate heavy rain, high waves and strong winds. Top most hurricane prone cities in the world.

i. Tampa, Florida United States.
ii. Naples, Florida, United States.
iii. Jacksonville, United States.
iv. Honolulu, Hawaii.
v. Houston, Texas, United States.
vi. Savannah, Georgia, United States.
vii. Mobile, Alabama, United States.
viii. Charleston, South Carolina.
ix. keywest, United State.
x. providence, United States.

V. Tsunamis

Tsunamis or tidal waves formed due to the Earthquakes, volcanic eruption or other form of disturbance in oceans. Tsunami tides have heights of hundreds of meters and large wavelength.

Such tidal waves will travel thousands of miles and mainly hits coastal areas. Tsunamis have greater speed at deep water in ocean. The speed decreases as it approaches coastal areas but have greater height. The retrieval of waves is the main indication of Tsunamis. Top most Tsunami prone countries in the world.

i. Albania
ii. Chile.
iii. China.
iv. East Timor.
v. Japan.
vi. India.
vii. Indonesia.
viii. Maldives.
ix. Mexico.
x. Sri Lanka.

VI. Lightning

Lightning is natural formation of electricity and flows through air like a flash. Due to the collision between ice gained cloud formation of charges will take place at beneath of clouds, once charge concentrate at any point on earth a sudden flow of electricity will pass. It can be mountains, trees, animals or humans. Lightning have temperature up to 54000 degree Fahrenheit, approximately six times hotter than surface of Sun.

There are 100 lightning strikes in every second on Earth that have enough power to destroy everything within no time. The presence of dark clouds in the sky is the indication of lightning, thunders also sounds this disaster. Lightning mainly hits in the areas where instability of environment, variation of temperate or pressure occurs.

VII. Tornadoes

Tornadoes are strong, violently rotating air storm initiate from clouds to surface of earth. Some violent tornadoes achieve wind speed up to 300 miles per hour. Tornadoes are normally found in condensation funnel shape, also holds several shape depending on pressure of air. The thunder storms, mixing up of cold, moist air with hot air makes instability and violent tornadoes will form.

Tornadoes have enough power to destroy the entire city and uproot trees. Such violent storm can be found within all continents except Antarctica. Tornado alley (region that covers North Texas, Oklahoma, Kansas and Nebraska) is the most tornado-prone area in the world.

Top most tornado prone areas in the world

i. Oklahoma, United States.
ii. Indianapolis, Indiana, United States.
iii. New Orleans, United States.
iv. Atlanta, United States.
v. Florida, United States.

VIII. Volcanoes

Volcanoes are actually an opening from the inner part of Earth to the surface. Volcanic eruption emerges ashes, hot lava and poisonous gases. The convergence and divergence of tectonic plates under Earth which causes the formation of volcanoes. Mainly volcanoes are found in mid-Atlantic and pacific ridge.

A volcanic eruption happens when the pressure on magma chamber inside Earth increase and push magma to surface through volcanic vents. Volcanic eruptions will destroy the surrounding areas, aircrafts, also heaten up the atmosphere. Volcanic tremor, small earthquake near volcano, ejection of steam and gases are the indication of volcanic eruptions. Most active volcanoes of world are-

i. Erta ale, Ethiopia.
ii. Mt. Merapi, Indonesia.
iii. Mt. Yasur, Vanuatu.
iv. Volcan de Colima, Mexico.
v. Mt. Erebus Antarctica.
vi. Mt. Cleveland, Alaska.
vii. Kilauea, Hawaii.
viii. Sakurajima, Japan.
ix. Mt. Stromboli, Italy.
x. Pacaya, Guatemala.

IX. Landslides

Landslides is a geological activity in which falling of rocks and soil occur down a slope of land. Heavy rains, small earthquakes, volcano eruptions and of course the gravitational force are the driving forces of landslide. The human activities like mining, construction and quarrying also cause land sliding. The movement of soil away from the actual foundation, sudden decrease in ground water level and cracking of ground are indication of landslides. Main landslide prone areas are-

i. laces at slopes.
ii. Hill side places.
iii. Places where landslides exit in older times.
iv. Islands.

X. Recommendation

Mitigation measures for risks associated with geo-hazards can broadly be classified in six categories:

i. Create an enabling legal and regulatory framework for geo-hazards management. The responsibility and duties of national, provincial and municipal entities need to be clarified with regards to geo-hazards, with matching funding mandates. Furthermore, hazard information should feed into the land use planning process. Codes and guidelines must be introduced and mandated to aid and regulate the planning and engineering professions. 1
ii. Carry out hazard and risk mapping exercises, and use GIS systems to determine the nature and extent of hazards and their likelihood of occurrence. A level of risk that can be tolerated must then be defined to enable easier decision making. Modern geo-referenced database systems (GIS systems) for data management, visualization, risk evaluation and planning are a powerful instrument in the decision making process.
iii. Where deemed appropriate, install monitoring and warning systems. Monitoring and warning systems are a cheap option in the hazard mitigation process. These can range from sensors and geophones to detect rock movements or landslide movements, to installing rain gauge stations, or the regular taking of water levels to monitor flooding risks and events. They can be installed when hazards are identified or developed after construction. They can mitigate the loss of human lives but have no value in physically preventing damage to the road structure.
iv. Funding mechanisms must be established to deal with emergency situations. For more efficient geo-hazards recovery and restoration efforts, agencies in charge of road maintenance and construction in geo-hazard prone zones should be provided line items in their budgets.
v. Incorporate geo-hazards management in the asset management process from pre-project to project phase through implementation and finally to maintenance: During the feasibility studies, preliminary engineering designs, and detailed engineering designs, geo-technical issues (where relevant) should be thoroughly investigated.
vi. community preparedness and awareness building, with transfer of knowledge and communication with authorities and society.

XI. Reference

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