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14

Natural Disaster and Protective Models for Prevention of Disaster

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Introduction:

Change is the law of nature. It is a continuous process that takes place in various elements, whether big or small, matter or non-matter and affects our natural and socio-cultural environment. This process is prevalent everywhere, but its results, intensity and scale vary. This change can come at a slow pace, as in landforms and organism. This change can also come at a fast pace, as in volcanoes, explosions, tsunamis, earthquakes and storms etc. similarly, this effect can be limited to a small area, as in storms, hailstorms and tornadoes or it can be so widespread, as in global warming and depletion of the ozone layer. From the natural point of view all changes that occur are value neutral, but from the human point of view these changes are value laden. It is because the change that occurs in season is considered as an expected change whereas some changes are unexpected and bad like earthquakes, flood and war.

In geographical literature, disasters are considered to be the result of natural forces and humans are considered to be their innocent and helpless victims. But natural forces are not the only cause of disasters. The origin of disasters is also related to human activities. Some human activities are directly responsible for these disasters. Bhopal gas tragedy, Chernobyl nuclear disaster, war, release of gases into the atmosphere and greenhouse gases, environmental pollution related to noise, air, water and soil etc. are examples of disasters. Some human activities also indirectly promote disasters. Landslides and floods due to deforestation, construction work and fragile land and unscientific land use are some expels due to which disasters are indirectly affected.

The frequency and destructive consequences of natural disasters have increased significantly in recent times due to human intervention in natural processes. The severity of disasters depends on our preparedness. The measure of impact depends on the choices we make in responding to the challenge. Choices are strongly related to our vulnerability to disasters. For example, a well-constructed house is more likely to withstand nature's fury, while poorly constructed houses are highly vulnerable to disasters. This is called vulnerability. Well-constructed houses are less vulnerable to disasters, while poorly constructed houses are highly vulnerable. Therefore, a disaster is a crisis about which human beings have no foresight or foreknowledge. Devastating conditions caused by these disasters are spread over a wide area and cause huge loss of lives and finances. That is why disaster is defined as a serious disruption of the functioning of a society which results in human, material or environmental losses beyond the capacity of the affected society to cope using its resources.

Purpose of the Study:

This research study is an attempt to reveal some protective models for prevention of natural disasters. Therefore, the purpose of this study is to understand which models can be used to avoid natural disasters and how can we take preventive steps through them.

Methodology:

This research study followed content analysis method for the analysis of objective. Therefore, secondary data is the primary source of this study which includes research articles, environmental reports, news, books, and some published articles in newspapers.

Concept of Disaster:

According to the Disaster Management act 2005, disaster means destruction, accident or negligence caused by man-made or natural causes in an area. These causes lead to losses related to loss of human life and natural damage. In an area where man-made or natural accidents are of such nature or magnitude, that the capacity to prevent them by the resources there is limited. The international Red Cross Society and Red Christen have given a more comprehensive definition of disaster. According to the International Red Cross Society, 'disaster is a sudden event that seriously damages the functioning of society and community and causes social, economic, and environmental damage. These events occur beyond the capacity of society and community to use resources. Disaster occurs whenever a disaster affects vulnerable people.

According to the definition of UNO, 'a disaster is an even that causes sudden, massive loss of human life and other damage.' WHO on the other hand defines disaster as, 'a crisis that befalls humanity, about which humans have no prior knowledge or fore-knowledge. The devastating conditions caused by these disasters are widespread and affect a large number of people simultaneously, causing significant financial and life losses that are not easily repaired.

Natural Disaster:

Nature is considered to be the source of liberation of resources. Many different types of event occur in the cycle of nature. Due to these events, there are huge changes in the surface water cover and the atmosphere. This has a devastating impact on human life changes, this is called natural disaster. Natural disasters are classified into two types: surface disaster and meteorological disaster. Natural disasters are those disasters which are caused by nature and are beyond human control. But it is also true that uncontrolled human activities increase the impact of natural disasters rapidly. For example, improper use of hill slopes, over cultivation, deforestation, road construction on slopes has intensified the impact of natural disaster landslides. There are many types of natural disasters like floods, cyclones, earthquakes and volcanic eruptions.

When environmental imbalance and internal disturbance of the earth appear in their dreadful form, then it is called a natural disaster. Flood, drought, earthquake, volcano, and storm etc. are examples of natural disaster. When a natural disaster occurs, there is a lot of loss of life and property. Transportation and communication services come to a halt, houses collapse along with humans, animals, birds and other living creatures are also affected.

Natural disaster can be defined as some rapid, instantaneous or profound impact of the natural environment upon the socio-economic system. Having reference to Turner, Alexander in his book mentions natural disaster as, "an event, concentrated in time and space, which threatens a society or relatively self-sufficient sub-division of a society with majority unwanted consequences as a result of the collapse of precautions which had hitherto been culturally accepted as adequate." (David Alexander, 1993, 3-4)

Classification of Natural Disaster:

People all over the world experience and face various types of disasters and endure them. Now people are aware of it and are working to reduce the damage caused by it. Various steps are being taken at various levels to reduce its impact. Natural disasters also identified and classified to deal with them efficiently.

Sr. No.	Classification	Examples
1.	Atmospheric	Blizzard, lightning storm, thunder storm, heat wave, tornado, tropical cyclone, drought, hailstorm, frost, cold wave, snow storm, monsoon, smog cyclone etc.
2.	Geological	Earthquakes, volcanoes, landslides, soil erosion, ice avalanches, subsidence, debris, flows,
3.	Aquatic:	Floods, tides, ocean currents, storms, hurricanes, tsunamis,
4.	Biological	Plant animal colonization in the form of insects, grays, fungi, bacteria, viruses, dengue, chicken gunia, bird flu,

If a disaster occurs frequently in a particular region, the extent and the intensity of the hazards created by that disaster can be analyzed. By analyzing the consequences and losses caused by such recurring situations, disaster prone areas are declared for that disaster. These disaster prone areas are likewise: a. Earthquake prone area b. Storm prone area c. Tsunami prone area, d. Drought prone area, e. Forest prone area, and f. Snow storm prone area.

Generally, natural disasters have an impact on physical infrastructure and agricultural productivity. They can also cause loss of property and life. Many factors are involved in the devastating impact on a country. Such as the severity of the disaster, the geographical location of the affected area and efforts made to mitigate the immediate ill effects of the disaster. Failure to mitigate the short-term economic impact of a disaster can lead to long-term economic devastation of the country. The primary effects of a natural disaster are seen in the form of collapsed buildings and their debris. While introducing the impact of natural disaster, Alexander further also states the example US drought in 2012, when America was stricken by drought as rain disappear almost for 25 days, resulting drying up of maize, wheat, corn and soybean crops and with the death of thousands of cattle. Emergency was declared in Midwestern states of America. The *tohoku* earthquake that trigged tsunami in 2011 at Japan seacoast affected the nuclear plants of the country.

Protective Models in India:

India's geographical, climatic, geomorphological and socio-economic conditions are different from other nations. India has to face many natural disasters like drought, flood, cyclone, landslide, earthquake, forest fire etc. India is one of the ten most disaster prone countries in the world. The country faces disasters due to many factors, both natural and human induced. The Himalayan region is prone to disasters such as earthquakes and landslides. Due to geo-tectonic and adjacent alluvial plains of the Himalayan region, it is vulnerable to earthquakes, landslides, water erosion etc.. According to the report of National Policy on Disaster Management, 58.6 percent of the land mass is prone to earthquakes of moderate to very high intensity and over 40 million hectares is prone to flood and river erosion, while almost 5,700 km seacoast is prone to cyclone and tsunami.

Model 1. Predictive Analysis in Disaster Prevention:

Predictive analysis in disaster prevention refers to the use of data statistical algorithms, and machine learning techniques to identify the likelihood of future disaster event. This approach involves analyzing historical data, current conditions, and various environmental factors to forecast potential natural disasters and their impacts. By leveraging advanced computational methods, predictive analytics enable disaster management professionals to anticipate and prepare for a wide range of catastrophic events, from hurricanes and earthquakes to floods and wildfires.

Predictive analytics in disaster management offer many significant benefits. Firstly, it significantly enhances the ability to forecast disasters with greater accuracy and lead time. This improved prediction capability allows authorities to issue warning earlier, giving communities more time to prepare and evacuate if necessary. Secondly, it enables more efficient resource allocation. By understanding the likely scale and location of a disaster, emergency responders can strategically position personnel, equipment, and supplies in advance. This proactive can dramatically reduce response time and improve the effectiveness relief efforts.

Model 2. Support Vector Machine:

Support Vector Machines in machine learning are a supervised system that is usd to solve classification and regression problems. Support Vector Machines are considered important by many people from this perspective because they produce remarkable accuracy with low computational power. Since they are mainly used in classification problems, they also used in context of natural disasters. The investigation of Liu, J. et al. 2021 has revealed the accurate and excellent accuracy counted by Support Vector Machine in the flooding area of South East and South Asia. Therefore, Supportive Vector Machine is another model that predicates and counts the highest flood susceptibility level. Thus in flood management, this mechanism is useful for providing information in both belt and road region of the country.

Model 3. Emergency Management Cycle:

This model functions to communicate the communities and the environment regarding risks and managing risks. This management of emergency functions through prevention, preparedness, response and recovery levels. Therefore, disaster management and its individuals have to know their role and responsibilities through this model. So far the Prevention cycle of emergency management model is concern; it enforces the organization to take action in advance, especially during the case

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of mitigation. Construction of sea wall around the seacoast is the example of this model. This pre and preventing step protects infrastructure and human life from wave tides. This step of cycle believes on the principle of all time ready to face the disaster. In case of preparedness, the organization and authorities are prepared to have preparative measures in facing the disaster. It also educates the people by sharing information associated to natural disaster. Response cycle of management engage itself in saving lives of people animal and other things.

Thus, the cyclical nature of this model highlights on managing emergencies happen all the time and not just during the specific season like monsoon or other.

Model 4. Regression:

This model is simpler as compared to Supportive Vector Machine and Predictive Analysis. It is handily in situation where the predicted outcome is more straightforward. In disaster forecasting, the aggression models like Logistic Regression, Poly-nominal Regression, and Linear Regression are commonly employed. To understand the severity of drought, a regression model collects historical data from that geographic area, predicts the overall weather conditions, temperature, and estimates the soil moisture level. From the perspective of predicting natural disasters, regression model works to the extent that they are able to clearly understand the data in terms of individual variables and the outcome they predict.

Multiple regression models work together in a storm-prone situation, taking into account the overall measurements of wind speed, atmospheric pressure, and coastal topography, to provide a forecast of the impact, allowing people and stakeholders to take preventive steps.

Conclusion:

Thus, with a view to successfully and effectively dealing with natural disasters, various organizations have created many preventive models through disaster management. In the modern era, the use Artificial Intelligence algorithms will also be worthwhile in this field and provide accurate predictions of coming disaster. Although humans have developed technology to successfully cope with the changing natural disasters, nature also has brought forth its own forms due the increasing needs of human and disorganized interaction of human with nature. Even though humans have taken preventive steps, they often fail in this regard. What necessary is to satisfy own needs and respect the nature.

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