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A CONCEPTUAL REVIEW OF RISK ASSESSMENT AND ELEMENTS AT RISK

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ABSTRACT

The understanding of disasters has progressed from a purely techno- centric perspective to a social and ecological perspective to unraveling the phenomena associated with disasters. An event whether a product of natural phenomena or human activities, turns out to be a catastrophic disaster, if the community or society fails to adequately cope up with it. By systemic understanding, hazard simply acts as a 'catalyst' in that it brings forth underlying tensions that are always present as potential pressure (Watts, 1983). For the sake of conceptual clarity, it is desirable to clear the semantic confusion between three interrelated terms, viz. hazard, risk, and vulnerability, which are used often in disaster literature. Disaster is the actual occurrence of the apprehended catastrophe. Hence, disaster is "any occurrence that causes damage, ecological disruption, loss of human life, deterioration of health and health services, on a scale sufficient to warrant an extraordinary response from outside the affected community or area." World Health Organisation (WHO). A hazard technically is not a disaster unless the 'trigger' (natural or man- made) sets it off. A hazard may or may not lead to an event, or the event in itself may or may not cause damage. Such probabilities are determined by the vulnerability of 'elements' at risk. Vulnerability is the extent to which an 'element' (animate/inanimate) is harmed in the event of a disaster; in other words, is susceptible to a given hazard. 'Elements' are identified as life and property likely to suffer damage in the event of a disaster. In this paper an attempt has been made to gain conceptual understanding of the Risk and how it has progressed over time. This paper also discusses various elements at risk and the significance to understand these elements.

KEY WORDS: Risk, Infrastructure, Vulnerability. Etc.

INTRODUCTION

Risk means an apprehension or a threat of something untoward happening. In the words of James Neill, the concept of "risk" usually refers to the probability of loss of a 'valued resource'. The word risk is one of the most notable examples of a word with multiple usages in that a risk may refer to a chance or a probability ("risk of exposure"), a consequence or impact ("the risk from smoking"), or a perilous situation ("a hazardous waste plant creates a risk"). Interpretations of the word "risk" have evolved linguistically on the basis of involuntary or voluntary events. For example, "danger" is often used to describe an involuntary event, whereas "peril" may be used to describe a voluntary event.

The term risk has come to be applied more specifically, in that the nature of 'risk' differs with the type of activity under consideration. For example, investment in mutual funds (MFs) is a 'risky' venture. If stock prices fall by 10%, market risk says that MFs are likely to see erosion in their net asset value (NAV-rupee value of a single MF unit, calculated on the value of the underlying assets of the fund less its liabilities, divided by the number of units outstanding, disclosed at the end of each trading day). Risk in the specific context of insurance business implies taking wise investment decisions with correct reading of the market situation to offset probable losses with gains. Usage of the word "risk" in the context of health and environmental risks integrates two ideas; firstly that the situation being discussed has the potential for detrimental consequences; and secondly that there is some improbability associated with the circumstances. There is uncertainty whether a hazardous event will occur; when or where it will occur; who or what will be affected; and the magnitude of the consequences. "Risk", in this sense, includes both the possibility and the character of the detrimental event. A statement of risk based solely on one aspect of risk, such as the probability of occurrence, has been referred to as a single dimensional risk. Financial or insurance risks are primarily single dimensional risks, as are statements on health risks that are restricted to the chance of occurrence (Hamilton and Viscusi, 1999). In the specific context of disaster management, risk implies application of specialist knowledge on the part of professionals to forewarn of disasters accurately and anticipate the risks involved in citing, land use management and project planning decisions in hazard prone areas so as to prevent/reduce impact of impending disaster(s). Thus in disaster terminology, Risk is defined as "the likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be a frequency or a probability. Often it is expressed in mathematical terms as:

Risk = f (frequency or probability, consequence)

Frequency is usually expressed as events per year and probability is a number between 0 and 1. Consequence is usually measured in terms of either money or fatalities. If we constrain ourselves to consider consequence in terms of a single fatality then risk becomes a function of frequency or probability since consequence is a constant (Skelton, 1997).

Understanding risk involves the governance function of risk management. Risk management means reducing the threats posed by known hazards, whilst simultaneously accepting unmanageable risks, and maximising any related benefits. Thus, understanding and managing risks can easily achieve risk mitigation. The process involves analysing the risk(s), estimating potential effects, positive against negative and determining its implications for planning.

Risk management is essentially a function of governance involving policy planning, setting up an organisational framework involving government agencies, private corporate sector and the non-government community action groups, professional associations and outside experts. It is defined as the "systematic application of management policies, procedures and practices" to assess the requirements of risk reduction, through identifying risk and taking stock of constraints, factoring the same in policy, monitoring risk with a view to updating risk assessments periodically developing thus institutionalising a culture of prevention (Guzman, 2005).

OBJECTIVES OF THE STUDY

There are a number of significant advantages to be gained by understanding the concept of risk and the elements at risk. Taking cognizance of local risk, present study is aimed to achieve following objectives:

- To understand the concept of Risk and its historical progression,
- To gain general appreciation of the elements at Risk.

METHODOLOGY

This paper is discriptiove in nature. Available secondary data and the literature from various sources have been used to develop this paper.

HISTORICAL PROGRESSION OF 'RISK'

The concept of risk flourished since Blaise Pascal's theory of Probability when risk came to be associated with "probability, uncertainty, occurrence or recurrence of events, the consequences of these events and the human choices involved therein. It has since been applied in game, science,

engineering, and business, among other areas of socio economic activity. The related concept of 'uncertainty' evolved further when, in 1703, Gottfried Von Leibniz argued that things are not entirely predictable but actually quite uncertain and the uncertainty has to be enquired into for better understanding of natural processes (Guzman, 2005). Today the study of risk is formalised as an academic arena with great practical relevance, denoted by the label, 'Risk Management.'

In the context of risk, a pertinent idea is that of locus of control. Locus of control refers to the origin of causation, that is, whether an event lies outside or within one's control. A person's locus of control belief is also referred to as "attribution". Attribution refers to how people perceive events, that is, whether with a fatalistic attitude or with a belief in human causation. Locus of control determines the cultural or attitudinal vulnerability of a community. As per Guzamann, understanding of risks is what distinguishes the modern civilisation from the ancient Greek, when natural events were considered visitations of Gods, attributed almost completely to fate. Also, the understanding of hazard, vulnerability, disaster et al, was diffused as the terms were interchangeably applied to refer to all kinds of disastrous situations.

Modern civilisation has since inquired into natural phenomena 'rationally' and relied on collective societal action to meet the challenges. The result has been better control over life and growing confidence in human ability to unravel mysterious phenomena. Reducing the risk of disease has been a phenomenal achievement in the last century and a half. The coin however, has a flip side. Development has brought about new challenges and new risks in that the automobile has cost many lives; energy supplies and industries have introduced new hazards and so on. The scenario as it obtains at present is that risks have been ever present, only the nature of some seems to have changed in that technological risks and those arising from human conflict such as war and terrorism seem to have replaced some of the common ones, like disease. "Risk' is now defined, as the possibility that an expected outcome is not achieved or replaced by another or that an unforeseen event occurs." This is a broad view of risk that includes both uncertainty due to future events and the consequences of limited knowledge, information and experience.

ELEMENTS AT RISK

Elements at risk are the property, resources, people and infrastructure likely to be affected adversely during disasters, referring to all animate and inanimate objects likely to suffer harm in the event of a disaster. Besides these tangible elements, intangible elements also need to be accounted for, such as

the mental health of sufferers, the impact on the environment, cultural impact of migrations, etc. Though elements at risk to different types of disasters are the same, certain specific elements may be at risk from certain types of hazards may be identified. Certain tangible and intangible elements have been identified with regard to different hazards as principal vulnerable elements by Seeds India. These are as under:

	Tangible	**Intangible**
Floods	Everything located in flood plain and tsunami areas. Crops, livestock, machinery, equipment, infrastructure, weak building etc.	Social cohesion. Community structure, cohesion, cultural artifacts, etc.
Earthquakes	Weak buildings and occupants machinery and their equipment, infrastructure, livestock, contents of weak buildings, etc.	Social cohesion, community structures, cohesion, cultural artifacts, etc.
Landslides	Anything located on at the base of steep slopes or cliff tops, roads and infrastructure, buildings on shallow foundations, etc.	Social cohesion. Community structure, cohesion, cultural artifacts, etc.
Strong Winds	Lightweight buildings and roofs. Fences, trees, signs, boat fishing and coastal industries. Crops and Livestock , etc.	Social cohesion. Community structure, cohesion, cultural artifacts, etc.
Technological Disasters	Lives and health of those involved on or near the vicinity. Building, equipment, infrastructure, crops and livestock, etc.	Destruction of the environment, cultural losses, possible population disruption, etc.

The role of science and technology in disaster mitigation is currently being emphasised in accordance with the All Hazards Approach to disaster management. This approach implies that a level of technical and administrative preparedness can develop expertise to tackle all kinds of natural and man-made disasters, including terrorism. Hence all knowledge should be assimilated in a 'clearing house agency' or networked through a focal point and more funds committed to scientific research to ensure comprehensive preparedness to handle any kind of emergency that might present itself. The focus is on science and technology, the intent being to take full advantage of available scientific knowledge and administrative expertise, bring it under one umbrella, translate technology to application whenever /wherever possible and take a long term perspective to disaster management

(SDR, 2003). From an all hazards perspective, certain major categories of 'elements at risk' from all types of human made and natural disasters can be identified as follows:

INFRASTRUCTURE

Infrastructure includes communication infrastructure, viz. electrical poles, connecting wires, roads, bridges, etc., buildings, including housing infrastructure, small businesses, industrial houses and critical facilities like hospitals, and important government offices. The latter are termed critical facilities because damage to these facilities puts the situation beyond control and even escalates the disaster, for example, if electrical wiring is disrupted during a catastrophe, many more people are likely to die of electrocutions, or if drainage pipes break down or essential services like hospitals are affected, disaster situation would be harder to control. Damage to critical facilities also leads to technological disasters due to failure of the basic infrastructure of the system or the release of potentially harmful substances like release of oil, radioactive materials or hazardous chemicals into the air, water and/or land. Such incidents may happen accidentally or may be intentional acts of sabotage. For effective disaster recovery, such facilities have to be made as perfectly disaster resistant as possible and services therein as efficient and accountable as could be possible. Hence technology has to focus on earthquake proofing and flood proofing of critical facilities on a priority basis. For example, America is affected frequently by oil spills, building fires, large wild fires in states of Colorado, Arizona and Oregon, besides Hurricanes and Tornadoes, with the fresh threat now of Terrorism. Disasters have disrupted almost every sector of the American society, including industry, agriculture and forestry, transportation, schools, hospitals, insurance, recreation, tourism, telecommunications, water, power and military installations. Conservative estimates indicate that over $20 million may have been lost in the year 2002 alone. Budgeting for disasters is also difficult since disaster costs fluctuate annually and money cannot always be diverted to disaster management efforts from regular development tasks (Sub-committee on Disaster Management, Interim report, 2003, America).

PEOPLE

Growth in cities has been capital- intensive. Population pressure, commercial considerations, and inadequate legislation to prevent improper land use in hazard prone areas has led to a compound hazard situation where many factors have interacted to put populations at risk from natural and man-made hazards. In such a situation, development itself has become a cause of vulnerability of

people. More buildings are likely to suffer damage, which would mean more loss of life and property from natural hazards. Even otherwise, people are vulnerable to climate change induced health risks consequent on general environmental degradation and global warming due to unchecked emission of greenhouse gases, deforestation and loss of flora and fauna. Air pollution has led to increased incidents of respiratory diseases and typical forms of cancer, particularly, lung and skin cancer apart from reported incidents of dengue fever, brain fever, cholera, malaria, diarrhea, malaria and food poisoning. Loss of livelihood and disruption of normal life are some of the other hazards faced long after disaster impact has subsided. In the man- made hazards category, of particular note, are technological and chemical hazards, which lead to mortality in large magnitudes, as was evident during the Bhopal Gas Tragedy. In poor countries that are particularly vulnerable to natural hazards like floods, earthquakes and cyclones, interest articulation has been found to be ineffective as 'passive publics' have been unable to voice their concerns effectively, which has meant inadequate interest articulation for policy. Passive attitude is directly related to lack of awareness of disaster issues among people, presence of other pressing concerns like poverty and unemployment that call for attention and lack of institutionalisation of the interest articulation in the form of lobby and pressure groups in traditional societies. Particularly vulnerable are the poor and marginalised sections of society who are forced to inhabit hazard prone areas and also lack resilience in the face of disasters.

ENVIRONMENT

Schools and businesses had to be shut down in Malaysia, because of severe air pollution and breathing problems caused by forest fires in the Indonesian Sumatra islands. The fires help clear land for cultivation in Indonesia. A brown haze has been created over the Indian Ocean, which has enveloped, besides Malaysia, Singapore, Australia and Thailand. Scientists fear it can travel half way round the globe in a week. The World Health Organisation says sir pollution in major South East Asian countries and Chinese cities is among the worst in the world, killing about 500,000 people each year while the global failure is an estimated 800,000 deaths. There endorses the imminence of international cooperation such as that envisaged in the Kyoto protocol. On a regional basis, Indonesia needs legislative protective measures and Malaysia needs to examine if its palm oil plantations in Indonesia are contributing to the haze factor (TOI, 28th August 2005).

Air and water pollution have been acute in India due to uncontrolled industrialisation, inadequate

legislation to control industrial activity, and unwillingness on the part of concerned 'stakeholders' (industrialists, politicians and administrators who are often partners or controllers of such businesses) to abide by such legislations. The reason is obvious. If policy makers themselves are the involved interests, public interest often becomes a camouflage for private interest. In public administration literature, the difference between public and private interest is particularly stressed. In such cases, the theoretical distinction diffuses; solution gets rather difficult, much to the disquiet of public administration specialists.

SIGNIFICANCE OF UNDERSTANDING ELEMENTS

As explained in the International Decade for Natural Disaster Risk Reduction (IDNDR) and ESCAP regional meeting, "all the elements that contribute to risk must be carefully identified and the order of their importance established. The elements can also be evaluated with respect to their potential to cause damage to existing development. Once the major hazards are identified, the risk analyses will aim to determine their magnitude and frequency. Disaster risk management involves the assessment of hazard and vulnerability." As explained in the draft of the ESCAP meeting, Hazard Assessment is concerned with defining the properties of the hazard and its direct effect. For example, tropical cyclones pose three threats, namely, wind, flood and storm surge. The intensity of a tropical cyclone is measured by its wind characteristics, which are described by velocity and direction. Evaluation of the hazard associated with cyclones therefore involves the measurement of wind direction, velocity and frequency at a number of meteorological stations. Similarly, the assessment of the flood hazard involves the identification of:

- Flood behaviour;
- Topography, and
- Population at risk.

Such information can be combined and depicted on a map, which gives a visual description of the areas at risk, the elements at risk, nature of risk and the steps required to meet the contingencies involved. For hazard evaluation of storm surge, it is necessary to determine the frequency of intense winds, the topography of the continental shelf and adjacent coastline and the normal tidal behaviour. In evaluating the relationship of hazards to the elements at risk, it is important that the analysis is applied to the entire disaster episode, "encompassing onset, response, and aftermath and recovery phases." Different sets of 'elements at risk' will emerge in the different phases of the disaster episode.

For example, the threat to life and limb of the disaster prone residents is an issue during the response phase, while the rapid return of the water supply, sewerage and communication systems to serviceability is an issue during the recovery phase.

CONCLUSION

Disaster management is an imminent administrative task for reduction of disasters through prevention, preparedness, mitigation and response. There has been a paradigmatic shift of emphasis in the last decade from disaster relief and rehabilitation to prevention and mitigation strategies. Shift of emphasis from disaster response to risk reduction has opened up areas of exploratory research in the subject of disaster management. Disasters play havoc with the lives of people and amount to excessive loss to humanity and infrastructure. Due to disasters, the normal life is thrown out of gear and the existing patterns of regulatory and development administration suffers heavily. The economic, social and psychological dimensions of the wrath of disasters adversely affect the environment around. There are elements at risk with regard to each disaster. Thus, the local communities are required to be prepared to face the aftermath of the disasters effectively. The first step in this direction is to undertake vulnerability analysis, which brings to light the 'elements at risk' such as the population, buildings and infrastructure. The most vulnerable members of the community are the expectant and lactating women, single women, children, and old, disabled, handicapped, sick and ailing people. Their special needs have to be kept in view in vulnerability analysis. Likewise, the physical vulnerability of elements has to be recognised by the community for the purpose of initiating specific measures to reduce the extent of losses in their regions. It is imperative to take formal and non-formal measures to equip the community to identify the potential threats in order to cope with the intensity of future disasters. Precise quantification of risk, however, is difficult. At best, a gross estimation of risk is possible, taking, for example, number of deaths and the number of people exposed to a hazard. Such crude estimates give only a limited idea of the likely damage from a hazard for different peoples at different places or even the probability of its occurrence.

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