Leveraging IT in Disaster Management

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ABSTRACT

At the global level, there has been considerable concern over natural disasters. In fact, the human toll and economic losses have mounted. Over the past years, the Government of India has brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process.Disaster management occupies an important place in any country's policy framework as it is the poor and the under-privileged who are worst affected on account of calamities/disasters. The steps being taken by the Governments emanate from the approach based on the information technology. Present Paper focuses on the e-government disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development. E-Governance and some NGO's are involved in the different countries state and provide the various prevention information form the disaster. Two case studies are used one for china disaster and second for Japan earthquake disaster and finding is influenced from planning , preparedness, technology, mitigation and recovery ,by this the government prevent the disaster.

***Keywords*:** E-Government, Disaster Management, Information Technology, GIS

1. Introduction

India and other developing country such like Indonesia,Thailand,Srilanka,Vietnam and, Malaysia which comes under the category of developing country, are still in process of evolving a robust system which could mitigate the devastations caused by disaster be it natural or man made. Indonesia was seriously affected by the earthquake and tsunami created by the 2004 Indian Ocean earthquake on 26 December 2004,swamping the northern and western coastal areas of Sumatra, and the smaller outlying islands off Sumatra. Nearly all the casualties and damage took place within the province of Aceh. According to the country's National Disaster Relief Coordination Agency, 126,915 people are dead and 37,063 are missing. Similarly Thailand government reported 4,812 confirmed deaths, 8,457injuries and 4,499 missing after the country was hit by a tsunami caused by the 2004 Indian Ocean earthquake on December 26, 2004.(Indonesia Disaster Management plan ,January,2005) The Thailand authorities estimate that at least 8,000 are likely to have died. The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface/degree of vulnerability. (Thailand disaster Management Plan 6th February 2005)The main facets of disaster is Unpredictability, Unfamiliarity, Speed, Rgency, Certainty, Hreat, This influences the mental, socio-economic, political and cultural state of the affected area. Generally, disaster has the following effects in the concerned areas-(a)It completely disrupts

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the normal day to day life,(b)It negatively influences the emergency systems,(c)Normal needs and processes like food, shelter, health, etc. are affected and deteriorate depending on the intensity and severity of the disaster(d)A serious disruption of the functioning of society, Causing widespread human, material or environmental losses which exceed the ability of the affected society to cope using its own resources (Assam Disaster management plan). Generally, disasters are of two types – Natural and Manmade. Based on the devastation, these are further classified into major/minor natural disaster and major/minor manmade disasters. Some of the disasters are listed below,

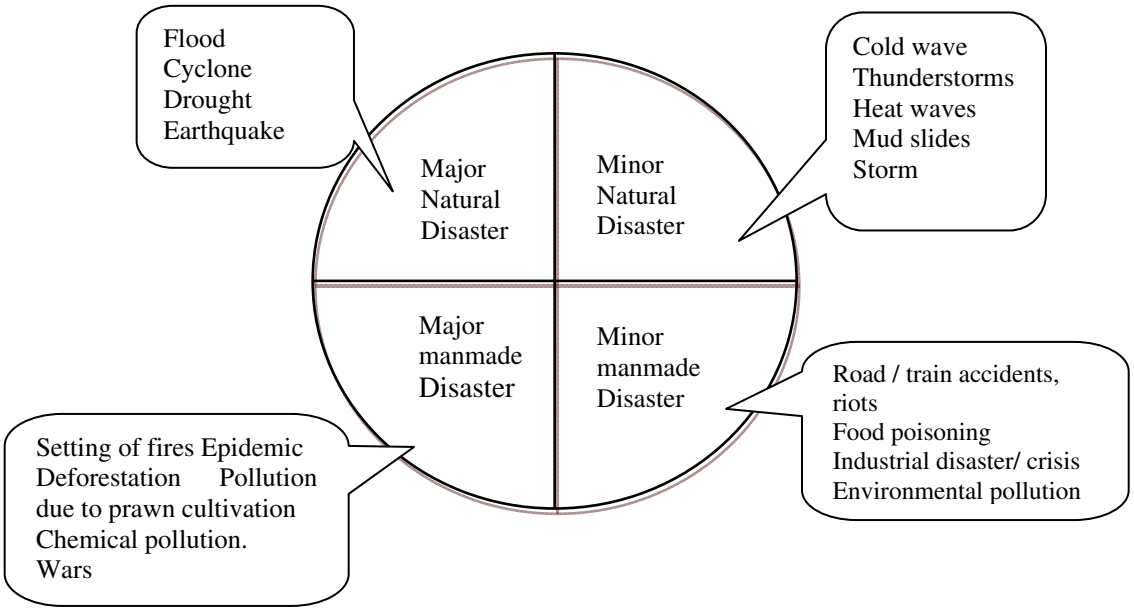

Figure 1: Types of Disaster (Sources: NDMI)

2. Effects of Major Disasters

Disasters throughout history have had significant impact on the numbers, health status and life style of populations we can categories the Disaster effect in three categories.

The Immediate Effects: - These types of disaster are generally uncertain, unpredictable and create the huge loss of society. The nature related problem and man made created problem. In this disaster are include blast effects, heat effects, electromagnetic rays effects and radiation effects. India, Pakistan, Srilanka are always survive in this types of problem and try to resolve it (http:gugratdisater.rog).

The Short Term Effects:- The short term effect of the disaster is generally short lived as devastation is caused owing to callous approach of human being towards nature which retaliates and reciprocates in form of natural calamities like flood ,earthquake and drought .The deliberate in insincere attitude of human society for the nature is root cause of the man-made disaster .Increasing rate of deforestation is now resulting (Source)in frequent occurrence of flood, quake and drought Devastation like contaminated water supply, pour sanitation, unhygienic food, wastes and dead bodies. Radioactive contamination of water and food and area are major concerns as it creates a lot of other problems for the survivors and the rescue teams.

Long Term Effects: These are the immeasurable. Some well known effects include radiation injuries due to radiation fallout, suppression of body immunity, chronic infection and other associated illnesses are the unwanted disaster. They knock with pre information (HPC Report Annexure12: Glossary of Terms pp101).

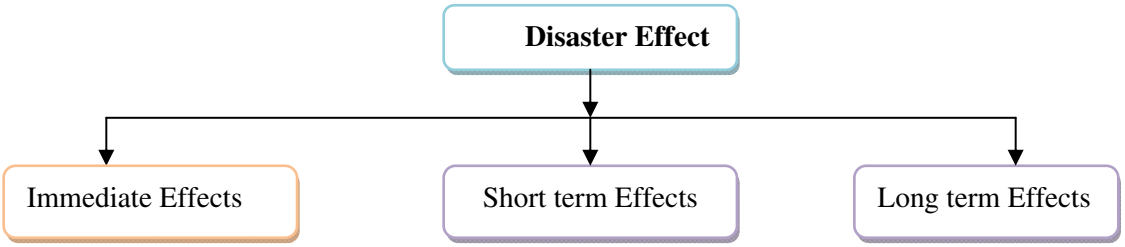

Figure 2: Disaster Management Plan

3. Caselets on Disaster Management

3.1 Japan Earthquake

The Niigata_ken-Chuestsu earthquake occurred in October 2004. It was the first major earthquake ever witnessed by the country in its history replete with incidents of quakes. The seismic intensity of the quake was registered 7 on the Rictor scale. In addition to that fukuoka-Kenseiho-Oki earthquake occurred in march 2005 in northern Kyushu a maximum seismic intensity of 6 was registered on a scale. The inputs collected from various sites of earthquakes like *Ocean Trench* occurred during the past 30 years indicate that quake could strike throughout the country as there are approximately 2000 active earthquake faults in Japan and in its costal areas.

3.2 China Natural Disaster

China is one of the countries suffering from the most severe natural hazards all over the world. Although some great progress have been gained in natural hazard mitigation, the natural disasters bring big economic loss, in average, natural disasters lead to a direct economic loss of 3~6 percentage of total GDP and death of thousand people every year. China's complex climate and varied geological conditions result in a multitude of natural hazards. Floods, droughts, earthquakes, blizzards and typhoons are the natural disaster. On average, approximately 200 million people are affected and several thousand people are killed in disasters every year. There are various laws directly or indirectly related to disaster management, and several ministries share responsibility for disaster mitigation, early warning, and response. UNDP has been assisting the government of China in emergency relief and rehabilitation since the early 1990's.

Japan and China are both are the one of the biggest economies in the world and contribute a great economy in world but both are the biggest victims of different types of disaster. On an average China faces three to six percentage economy loss every year. China and Japan also has suffered from volcanic eruption and earthquake and its economy takes beating owing to disaster. Besides, Japan faced the man made disaster when its cities -Hiroshima and Nagasaki were impounded by US in 1945. Japan also face the earthquake and Landslide problem Japan government established the disaster management institution and involve the many minister and non –government employees and create the awareness in society.

As per the analysis of the case study natural disaster is managed by the information technology and we can save the human and society. Disaster cannot be completely by government and non-government institution.

However but by creating awareness and developing a suitable warning system, disaster preparedness and management of disasters through application of information technology, we could minimize the havoc wreaked by disaster. The changing scenarios have opened up a large number of scientific and technological resources and skills to reduce disaster risk. Some IT tools are below

4. GIS & Remote Sensing: A use full tool

GIS provides a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types for both scientific management and policy oriented information. The specific GIS application in the field of Risk Assessment are:- Hazard Mapping to show earthquake, landslides, floods or fire hazards. These map could be created for cities, districts or even for the entire country and tropical cyclone (Sinha, et al. 1999). Remote sensing makes observation of any object from a distance and without coming into actual contact. Remote sensing can gather data much faster than ground based observation, can cover large area at one time to give a synoptic view. Remote sensing comprises Aerial Remote Sensing which is the process of recording information, such as photographs and images from sensor on aircrafts and Satellite Remote Sensing which consists of several satellite remote sensing system which can be used to integrate natural hazard assessments into development planning studies. GIS and Remote Sensing in various disasters are as follows:-

Earthquake: GIS and Remote Sensing can be used for preparing seismic hazards maps in order to assess the Exact nature of risks.

Floods: Satellite data can be effectively used for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning and post-flood survey of rivers configuration and Protection works.

Drought: It is one of the best use of GIS and Remote Sensing we can used GIS and Remote Sensing in drought relief management such as early warnings of drought conditions will help to plan out the strategies to organize relief work. Satellite data may be used to target potential ground water sites for taking up well-digging programmes. Satellite data provides valuable tools for evaluating areas subject to desertification. photographs and digital data can be used for the purpose of locating, assessing and monitoring (UNDP Sub-Regional Seminar on Drought Mitigation 28-29th August, 2001 –Tehran)

Landslides: Landslide zonation map comprise a map demarcating the stretches or area of varying degree of anticipated slope stability or instability. The map has an inbuilt element of forecasting and is hence of probabilistic nature. Depending upon the methodology adopted and the comprehensiveness of the input data used, a landslide hazard zonation map able to provide help concerning location,-extent of the slop area likely to be affected, and rate of mass movement of the slope mass

Search & Rescue: GIS can be used in carrying out search and rescue operations in a more effective manner by identifying areas that are disasters prone and zoning them accordingly to risk magnitudes (Mandal, 1999).

Internet: In the scenario of communication, the internet provides a useful platform for disaster mitigation communications. Creation of a well defined web site is a very cost-effective means of making an intra-national and international presence felt. It provides a new and potentially revolutionary option for the rapid, automatic, and global dissemination of disaster information. A number of individuals and groups, including several national meteorological services, are experimenting with the Internet for real-time dissemination of weather observation, forecasts, satellite and other data. In the most critical phase of natural disasters

electronic communication have provided the most effective and in some instances perhaps the only means Of communication with the outside world.(Gupta,2005)

Warning & Forecasting System: An advance system of forecasting, monitoring and issuing early warnings plays the most significant role in determining whether a natural hazard will assume disastrous proportions or not.

5. Disaster Prevention Mechanism

Proposed model is based on the finding of the learning and show the how to country prepare the prevention plan and use the information technology for mitigation and for the recovery.

Figure 3: Disaster Prevention Mechanism

Planning: Planning is the essential and the pre condition of the disaster preparedness without planning government can not take any initiative .planning is a first step process of the government and government use the information technology for prevention.

Preparedness: Preparedness is the second step of the government plans **e**very government is always prepair for the disaster prevention and recovery and announce the natural disaster zone and how you prepair for the disaster.

Technology: Technology is the third step of the disaster management plan government is reduce the disaster damage by the information technology and reduce the country economy loss. Japan and China are both country sue the information Technology and reduce the GDP ratio. It is the best example of the information technology in disaster prevention.

Mitigation: Mitigation is the fourth step of the disaster management plan it describe how we reduce the risk and how to manage the abnormal life and increase the living standard after the disaster.

Recovery: Recovery is the fifth step of the disaster prevention plan, government is start the central to state level disaster recovery with the help of the local administration and NGO's

6. Indian Government's role in Disaster Management

Indian government has passed a bill on the disaster management in 2005 and developed a disaster management plan for country. The National Disaster Management of India, work through the e-governance and local level management E-governance plays a vital role in disaster management in Indian. India has strong in information technology and handle the related situation for example government is all time pre-announce about the Tsunami and other problem. Some key feature are also provided by the National Disaster Management of India. The government body has suggested the some tips about the how to aware people about the earthquake and cyclone and other natural disaster. NDMI has provided the pre-preparation information of disaster and suggested the measures to be adopted for keeping the society safe against the tentacles of the disasters. It is playing major role in disaster management with the help of information technology and time to time alert society , some valuable tools are described below.

National Remote Sensing Agency (NRSA): Satellite data are used very effectively for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning and past flood survey of river configuration and protection works.

Seismological Observations: Seismological observations in the country are made through national network of 36 seismic stations operated by the IMD, which is the nodal agency. These stations have regularly collected data over long periods of time and analyses it & forecast.(NDMI)

Indian Metrological Department: IMD provides cyclone warnings from the Area Cyclone Warning Centers It has developed the necessary infrastructure to originate and disseminate the cyclone warnings at appropriate levels. It has made operational a satellite based communication system called Cyclone Warning Dissemination System for direct dissemination of cyclone warnings to the cyclone prone coastal areas. IMD runs operationally a Limited-area Analysis and Forecast System based on an Optimal Interpretation analysis and a limited area Primitive Equation model, to provide numerical guidance. (Mandal, 1999)

Warning System for Drought: The National Agricultural Drought Assessment and Management System has been developed by the Department of Space for the Department of Agriculture and Cooperation, and primarily based on monitoring of vegetation status through National Oceanic and Atmospheric Administration Advanced Very High Resolution data. The drought assessment is based on a comparative evaluation of satellite observed green vegetation cover (both area and greenness) of a district in any specific time period, with that of any similar period in previous years. (UNDP Sub-Regional Seminar on Drought Mitigation 28-29th August, 2001 –Tehran)

7. Disaster Management Cycle

Administrative Structure of Disaster Management in India

The Department of Agriculture and Cooperation (DAC) in the Ministry of Agriculture, Government of India, is the nodal department for all matters concerning natural disasters relief at the Centre. The National Contingency Action Plan (CAP) facilitates launching of relief and rescue operations without delay. There are various committees at the national level for disaster management such as Cabinet Committee for effective implementation of relief measures in the wake of natural calamity; National Crisis Management

Committee at the national level headed by the Cabinet Secretary who is in charge of various types of disasters and supporting ministries as members; Crisis Management Group reviews various measures required for dealing with a natural disaster, and coordinates activities of the Central ministries and the State Governments pertaining to disaster preparedness and relief and obtains information from nodal officers on measures relating to the above. Figure 4 shows the Interaction Pattern in the Government.

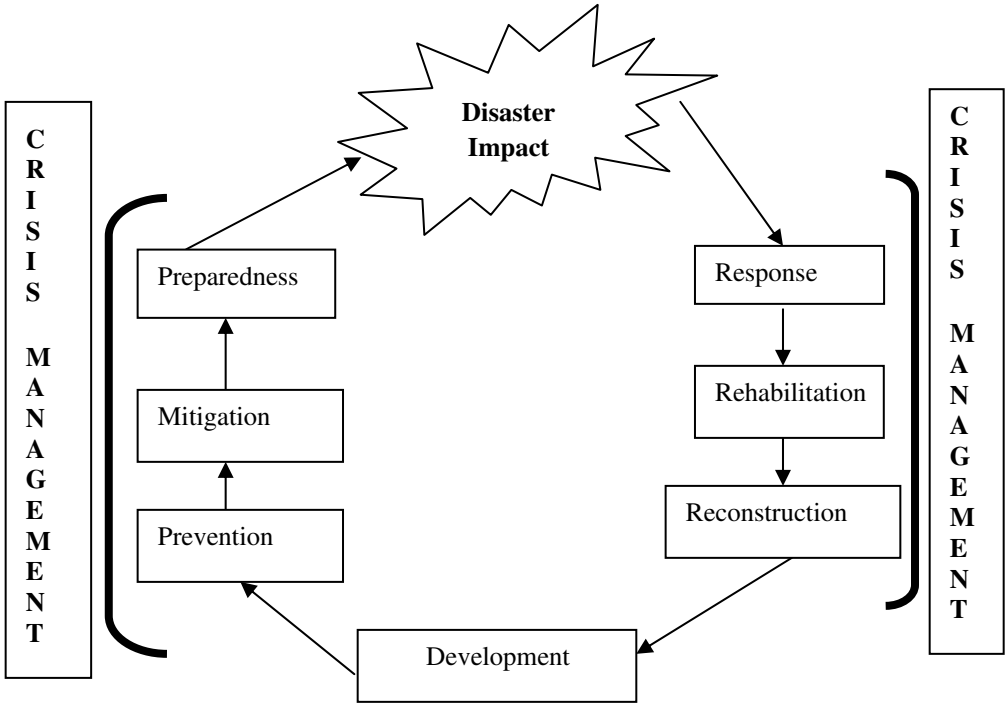

Figure 3: Overview of the Disaster Risk Management Programme [2002-2007]
(Source:- Profile of Karimganj District, Assam, India)

The State Governments are autonomous in organizing relief operations in the event of natural disaster and a long-term preparedness / rehabilitation measures. The State Governments efforts are supplemented by Central Government. There is a State Crisis Management Group (SCMC) under the Chairmanship of Chief Secretary/Relief Commissioner to take into consideration the infrastructure and guidance received, from time to time, from Government of India and formulate action plans for dealing with different natural disasters. There is a State Level Control Room set up whenever a disaster situation develops.

States are further divided into districts, each headed by the District Collector (also known as the District Magistrate or Deputy Commissioner), who is the focal point at the district level for directing, supervising and monitoring relief measures for disaster and for preparation of district level plans. The Collector exercises coordinating and supervisory powers over functionaries of all the departments at the District level. The relief measures are reviewed by the District Relief Committee consisting of official and no-official members, including local legislators and members of parliament. In the wake of Natural disasters, a Control Room is set up in the District for day-to-day monitoring of the rescue and relief operations on a continuing basis. The Collector/Deputy Commissioner maintains close liaison with the Central Government authorities in the districts, namely, Army, Air Force an Navy, Ministry of Water Resources, etc., who supplement the effort of the District Administration in the rescue and relief operation. They also co-

ordinates all voluntary efforts by mobilising the non-government organizations capable of working in such situations.

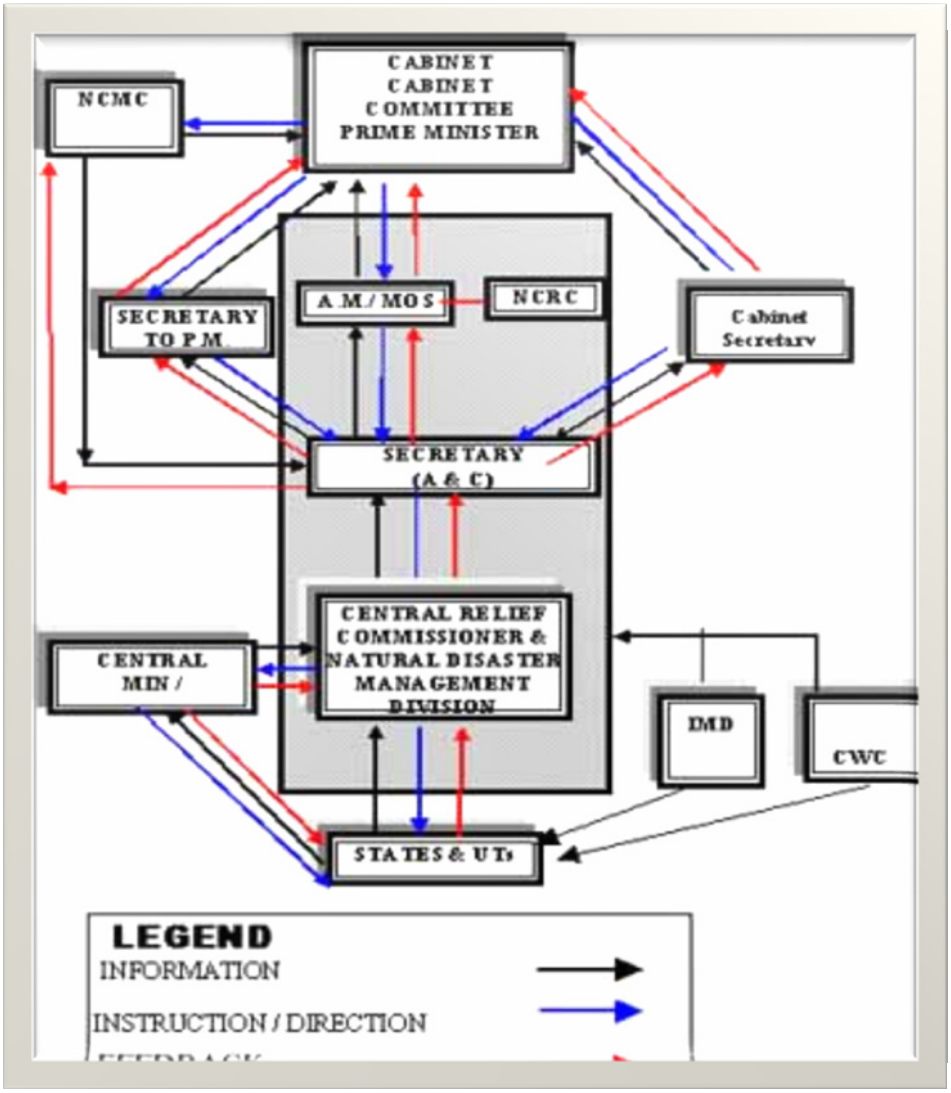

Figure 4: Natural Hazards - The Interaction Pattern in the Government

The armed forces of the country have played a vital role during disaster emergencies providing prompt relief to the victims even in the most inaccessible and remote areas of the country. The organisational strength of the armed forces with their disciplined and systematized approach, and with their skills in technical and human resource management make them indispensable for such emergency situations. India having a federal structure the integrated disaster management mechanism exists within the government framework

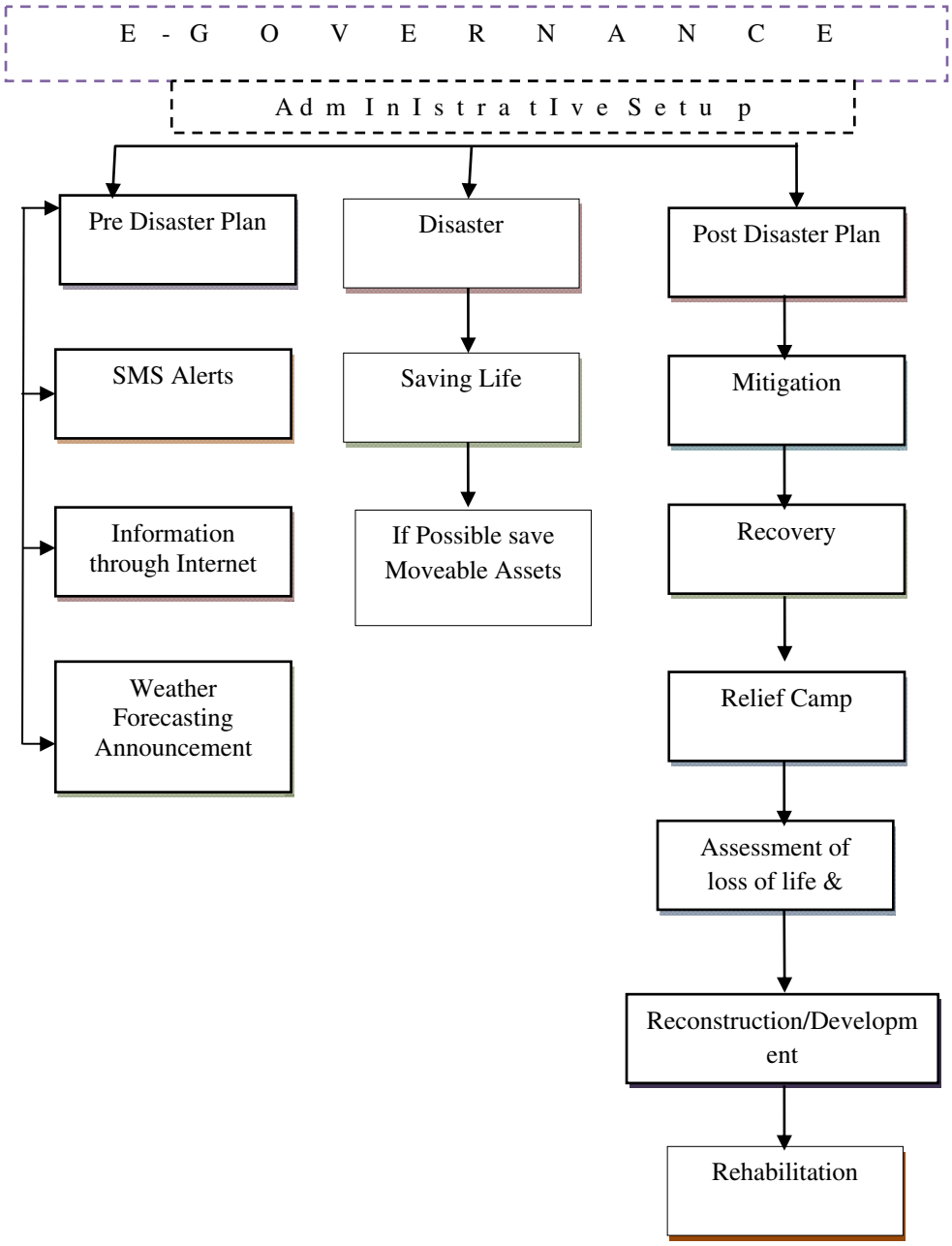

Figure 5: Conceptual Model for Disaster Management

8. Proposed Conceptual Model for Disaster Management

Proposed model work with the help of E-Governance aims at reducing the impact disaster in every aspect. Government play the important role in disaster management and provide the information through the

information technology and aware to society to pre disaster management and after disaster management and how to save the human life.

The proposed disaster management plan under the e-governance mechanism which includes administrative cell looking after all post-disaster initiatives and provide the guide line to state level management and local level management. It works like a bridge between the state level and the national level mechanism. Government can divide the disaster management plan in three level and each level of the mechanism has well structured functional cells. The first level is pre disaster plan, in this plan government evolves premonition system to issue warning and guidelines about the disaster. It involves various techniques like SMS, weather forecasting and information through Internet. The second step revolves around epicenter of disasters. In this step government make attempt to save precious life, minimize casualties and loss of moving assets as possible. In third step is include the mitigation, recovery, Relief Camp, assessment of life and property, Reconstruction and development and rehabilitation. In disaster time main objective is to save the life and provide the food to every and each person. Planning, preparedness, recovery, reconstruction and redevelopment and rehabilitation is important challenges. Government in bid to overcome the impact of disaster, fulfill the needs with the help of local level administration and some non profit making organizations.

9. Concluding Remarks

It is necessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate investments in information technology. Awareness and training in Information technology in a much greater measure is required to develop human resources, particularly in the developing countries, which are chronically suffering from natural disasters. The disasters usually occur in the well-defined areas, even though the community does not know the coping mechanism for the disaster. The disaster mitigation programmes must be extensively taken up covering various aspects at international level and national level to minimize the disaster damages. There should be a greater emphasis on development of new technologies in disaster mitigation. The disaster preparedness and awareness are effective ways of mitigating the impact of future disasters. The proliferation of the information technology and its related tools in the country has enabled the government to evolve IT based disaster management mechanism to tackle disaster in its pre and post phases. With the help of e-governance it could respond to a call made during the disaster promptly and effectively.

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