DISASTERS AND THEIR EFFICIENT MITIGATION USING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) - A MINI REVIEW WITH A SPECIAL REFERNCE TO INDIAN CONTEXT.

[1] **Kattamuri Ramakrishna , ** [2]**P.V.V.Prasad Rao, ** [1]**S. Mohini Rani**

[1] Research scholar , [2] Professor.

[1&2] Department of Environmental sciences, Andhra University, Visakhapatnam, India.

Abstract :

Natural disasters which are increasing in frequency and enormity in the 21st century are to be managed effectively and efficiently in order to reduce their impacts on humans, this review paper emphasizes the applications of information and communication technology to be used effectively in disaster management strategies.

Keywords: Disasters, ICT, Crowd sourcing, Mobile applications .

I. Introduction:

The varied climatic patterns across the landmasses and unique geography of India had made it prone several natural disasters. The Disaster management act of India 2005 defines a disaster in a broad spectrum as "catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area"(Ref 1). And according to National disaster management policy of India about 58.6 per cent of the country's landmass is prone to earthquakes of moderate to very high intensity, about 5,700 km is prone to cyclones and tsunamis, about 40 million hectares (12 per cent of the land) is prone to floods and river erosion, of the 7,516 km long coastline, , and 68 per cent of the cultivable area is vulnerable to drought (Ref2). It is estimated that in India about 0.02% of the total deaths were due to the natural Disasters i.e. about 1979 people in India died as a consequence of natural disasters (Ref 3). It is also to be noted that disasters not only cause loss to mankind but also catastrophically damage the economy and assets of any nation. In the year 2017, globally about 18.78 million people

were displaced due to the disasters, and for the same year in India about 1.35 million people were displaced (ref 4). As mentioned earlier disasters create havoc on the economy as well and it is evident from the fact that the economic losses due to the disasters globally was 0.24% of the global GDP in the year 1990 , where as in the year 2017 it was 0.43% (ref 5). This statistic clearly indicates that the intensity and frequency of disasters have increased over the time and these all can be attributed to climate change and other major climatic phenomenons.

Hence for a nation to progress and protect its citizens from the impacts of disasters there must be an efficient Disaster mitigation plan. As natural disasters are very hard to prevent, the policy's framed to towards disaster mitigation must be aimed at minimizing the impacts of disaster to the most possible extent. In India the National disaster management act was framed in the year 2005 and national policy on Disaster management was formulated in 2009 and a National Disaster management plan was made in the year 2016 (ref 6) which provides framework and direction to the government agencies for all phases of disaster management cycle.

The efficient disaster management plan involves four phases, they are- mitigation, preparedness, response, and recovery. The mitigation phase is the pre-disaster phase where in efforts are taken in order to eliminate disaster. The preparedness phase involves framing an efficient plan in order to tackle an upcoming disaster. The response phase is post disaster scenario wherein it involves immediate actions taken by the authorities when a disaster strikes, and finally the recovery phase involves restoration of the affected area to its original state.

ROLE OF ICT IN DISASTER MITIGATION:

To effectively mitigate or prevent a disaster augmentation of human resources and funding is of prime importance, another more important facet of mitigation and managing a Disaster is the utilization of technology. The priority 1 of Sendai framework has also envisaged promoting investments and innovation technology development in long run and develops solution driven risk management strategies (ref 7). And also technology is considered to be the answer to the plethora of challenges that arise during the time of a disaster (ref 8, 9). Thus the role of Information and communication technology (ICT) in preventing disasters is unparalleled in this technology driven 21st century. Internet which has reached nook and corner of the globe can potentially serve as a resource in warning about the occurrence of a disaster. It is estimated that globally there are about 3.8 billion smartphone users in the world that is almost 50 % of the world's population and this number is expected to rise very quickly (ref 10). These smart phones with proper technology installed in them can serve as potential disaster mitigation resources. Although there has been a rapid

progress in technology related to disaster monitoring, forecasting and mitigation, the knowledge generation and dissemination through these technologies remains to be repressed mainly due limited mobility and coverage. Now we shall discuss about some of the Efficient and available ICT's that will help us the mankind to efficiently manage and mitigate the catastrophic effects of a Disaster:

INTERNET AND SOCIAL MEDIA:

It is estimated that globally there are about 4.57 billion people are having access to internet as of 2020(ref 11), which is 595 of the global population this vast resource of network can certainly serve as medium to educate , inform and create awareness to the people during the pre as well as the post disaster phase. Social media also can also serve as a crunch resource during the time of a disaster in several ways in managing the disaster. During the devastating hurricane sandy in 2102, it was estimated that about 8 lakh photos were taken along with their locations by the internet users (ref12). With more than 3 billion social media users (ref13) and many available social media platforms the transformation of knowledge and information can easily be made during the times of a disaster. India a developing country with its 29.5 % of population (ref 14) having access to internet can effectively utilize the services of internet during the times of a disaster.

GEOGRAPHICAL INFORMATION SYSTEMS:

Geographical information system is an information technology system (IS) combining hardware software and telecommunication network used to create , collect and distribute data pertaining to the geographical locations (ref 15). The GIS can be used efficiently as it enable the users produce and store high quality maps of any scale. There are several GIS technology currently available in the global market such as the ArcGIS , QGIS Open Layers, Google Maps API etc. GIS with a wide range of services to offer such as - Hazard Mapping, Vulnerability Assessment, Risk Assessment, Data Management, and Organizational Development can play a key role in managing and mitigating disasters such as floods, landslides, forest fires, earth quakes etc. For example a hazard zonation map can be prepared using GIS. GIS can be potentially used in earthquake related studies such as Hazard zonation, tectonics and damage assessment. India, with its diverse terrain, landscapes and eco-systems and with a geographical area of 32, 87,240 km2

(ref 16) with 58.6% of its landmass prone to various types of disaster is already using GIS effectively so as to manage the damaging effects of the disasters.

SMART PHONES AND MOBILE APPLICATIONS RELATING TO DISASTER MANAGEMENT:

Mobile phone or cellular phones which are accessible to most us have gained considerable importance in the field of disaster management and have great potential to usher the affected communities in provide useful information during the times of disaster and also aid in the relief and rehabilitation activities(ref 17). The important fact where the mobile phones play a crucial role in disaster management is that about 90% of the world's population has coverage to mobile signals (ref 18). These interconnection of networks with advancing technology can provide the real time scenario whilst the time of the disaster or pre-disaster to the authorities. And moreover mobile phones are of great importance in a developing nation like India as majority of the people are have access to internet through their mobile phones rather than using computer (ref 19). There are have been millions of applications specifically designed for mobile phone operating system which enable the users perform specific tasks and functions. Although there have been plethora of mobile applications very few of them are oriented towards disaster management. Well designed and structured applications for disaster management have huge potential to provide real time scenario to the authorities and management. The consideration of mobile applications can be considered in the primordial stage of disaster management because of the fact that mobile users spend their 82 % of time on mobile apps and 18% of their time on internet browsing (ref20),so well designed apps if properly marketed can penetrate through the communities which are frequently prone to disaster.

The term 'crowdsourcing' has gained a considerable importance in the field of ICT. There have been many definitions put forward to define crowdsourcing but basic theme is that it is the process of collecting information from the general public. In the field of disaster management crowdsourcing virtually enables the public to provide content for consumption through online transmissions like mobile phones (ref 21). Globally there have been several crowd sourcing applications developed which have gained considerable repute in the field of Disaster management, among them SAHANA FOSS, petabecana.id, Netquake, Ushahidi, Crisistracker etc.

India a country with vast geographical terrain and with strong National Disaster management Plan adopted in the year 2016 in accordance with the Sendai Framework for Disaster risk reduction (SFDRR) is effectively functioning towards mitigate the increasing frequency of Disasters. The national disaster management authority(NDMA) was created in the year 2006, and is considered as an enforcing body for the implementation disaster management plans, similarly the national disaster response force (NDRF) was created under the aegis of Disaster management act of India 2005, and the purpose of NDRF is to provide the services of well trained and well equipped personnel to the public during the times of a disaster. Although there has been a robust management strategies deployed to efficiently tackle a disaster, one major obstacle in disaster management in India is the lack of data availability as identified by the Ministry of Home Affairs, Government of India (ref 22). As mentioned earlier the numbers of smartphone users in India have increased to almost two fold from 2014 with 22 crore smartphone users to 40 crore in the year 2017 (ref 23). This broad base of smartphone users can serve as data providers via 'crowd sourcing apps' and evidently 'My gov' an initiative of the government of India is on one the world's biggest Crowd sourcing platform(ref 24). Thus crowdsourcing disaster management apps have huge potential to flourish in the Indian online market.

 However during a recent research carried out in 2018(ref 25) on the mobile apps in India ,only about 33 apps were found to be relating to disaster   management and the average number of download for all these apps combined together was found out to be 1119 .This statistic is considered to be dismal figure when compared to the enormity of a country with a population size of 1.35 billion. It is clearly evident that the disaster management aps have rarely penetrated into the communities. The most prominent fact of a crowd sourcing app is that its success primarily depends on the active participation of users (ref 26). And another hindrance to the success of these crowdsourcing apps and also other web technologies are Network congestion and data interoperability. If these constraints are addressed then the role of ICT in disaster management and mitigation is further enhanced to a great extent (ref 27).

CONCLUSION:

Disasters which have become frequent in the 21st century are ought to be handed effectively in order to minimize the human and financial losses. Technology which has been evolving rapidly is already playing an indispensible role in the management and mitigation of disasters. The disaster management which involves-Mitigation, Preparedness, Response, and Recovery in its every stage need data of the real time scenario which can be can be efficiently collected through these crowdsourcing apps and other web based technologies. The role of social media if used effectively can also be of great use in the Disaster management strategies as evident from some of the recent experiences. India with a

geographical are of 32, 87,240 km2, with its 58.6% of its area prone to disasters needs an efficient disaster management system. Information and communication technology which has revolutionized in knowledge and data dissemination can play a huge role chalking out effective disaster management plan and also can aid potentially in relief and rehabilitation activities. India, which is a signatory to the Sendai Framework for Disaster Risk Reduction is can employ ICT to the fullest potential in management of disasters and achieve 7 goals set under the SFDDR.

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