Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 212 (2018) 707–714

Procedia Engineering

www.elsevier.com/locate/procedia

7th International Conference on Building Resilience; Using scientific knowledge to inform policy and practice in disaster risk reduction, ICBR2017, 27 – 29 November 2017, Bangkok, Thailand

A Model for Enhancing the Role of Information and Communication Technologies for Improving the Resilience of Rural Communities to Disasters

M.F.M Firdhous[a]*, P.M Karuratane[a]

[a]*Faculty of Information Technology, University of Mratuwa, Moratuwa 10400, Sri Lanka*

Abstract

Rural communities are generally considered to be more disadvantaged than their urban counterparts in many aspects. In times of disasters too, rural population would be more vulnerable and have less opportunity to bounce back after disasters. Disasters may occur at any place, any time irrespective of the nature and the status of countries. Many lives have been lost and many more have lost their livelihoods due to disasters. It would be possible to minimize the human as well as economic losses through proper disaster management initiatives. ICT has undergone rapid advancements during the recent years and penetrated into almost every aspect of human life. ICT is an enabling technology that is capable of bridging the gap between societies. Hence ICT can be leveraged to enhance the disaster resilience of the rural communities. This paper presents an integrated model for leveraging ICT for enhancing the disaster resilience of rural communities.

Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience.

*Keywords:*Disaster management; disaster resilience; disaster management phases; ICT; integrated model; rural and urban population.

1. Introduction

A disaster is an unexpected event that disrupts the normal functioning of a community generally resulting in widespread loss of lives and livelihoods, damage to properties and other material and heavy environmental impacts

Corresponding author. Tel.: +94-11-265-0301; fax: +94-11-265-0922.
E-mail address: firdhous@uom.lk

1877-7058
Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience
10.1016/j.proeng.2018.01.091

[1]. Disasters are commonly categorized into two groups as natural disasters and man-made (technological) disasters. Natural disasters are the adverse events following certain natural processes of the Earth. Natural disasters include floods, hurricanes, cyclones, tornadoes, storms, droughts, volcanic eruptions, earthquakes, tsunamis, wildfires, ice storms, and other geologic processes [2]. On the other hand, man-made disasters result from human actions including intentional ones as well as the ones that happen due to negligence [3]. Pollution, terrorist attacks, industrial accidents such as oil spills, chemical leaks and explosions along with human induced wildfires are some examples of man-made disasters. Natural disasters were initially thought to happen as a result of natural processes or supernatural power's responses to human wickedness or immoral behavior [4–6]. But in recent times, many researchers argue that humans must hold responsibility for the outcomes of many natural phenomena including disasters [3]. A disaster irrespective of its nature may occur at any place irrespective of the developed, developing, small, large, island or landlocked status of countries as well as at any time day or night [7]. According to the United Nations World Water Assessment Programme (WWAP), hundreds of thousands of lives have been lost and millions have lost their livelihoods due to disasters [8]. Many disasters normally occur suddenly and unexpectedly with relatively little or no time to adjust or prepare [9]. Also there are some types of disasters that develop slowly over a period of time followed by a long recovery time.

Rural communities in many countries are less advantaged compared to their urban counterparts [10]. Rural communities suffer from many shortcomings including limited access to resources, high levels of poverty and unemployment, inadequate or less developed infrastructures and lack of access to public services. The situation is more aggravated as the majority of the rural population live in less developed countries of Asia, Africa and Latin America [11]. With respect to the preparedness and resilience to disasters too, the rural population is considered to be more vulnerable than their urban counterparts [12–15].

In this paper, the authors develop an integrated model for exploiting the developments of ICT for enhancing the disaster risk resilience and management with special emphasis to rural communities. It is proposed to investigate how ICT can be successfully used prior to the disasters in detecting them, and alerting and warning the identified victims to be, during the disasters in saving the lives and properties of affected people and after the occurrence of the disasters in bringing lives of the affected people back to normalcy. The proposed integrated model would include all the above aspects.

2. Effect of Disasters on Rural Communities

Disasters can be categorized into two groups as the ones that happen suddenly with little or no prior notice and the ones that start slowly and develops cumulatively over a period of times. Natural and manmade disasters like floods, earth quakes, tsunami and terrorist attacks fall under the first category of sudden events. On the other hand, droughts, famine, environmental degradation, pest infestation and desertification fall under the second category of disasters that start slowly and develop over a period time [16]. Irrespective of type, disasters may occur any part of the world including both developing and developed countries. According to the United Nations Development Programme (UNDP), 75% of the world's population live in an area that has been affected by disasters at least once during the last 20 year period of the last century [17]. Further, the same study states that developing countries are more vulnerable to disasters compared to the developed countries. It has been statistically shown that though only 11 percent of the people exposed to disasters live in least developed countries, they account for more than 53 percent of the disaster related deaths. Deaths are only one aspect of losses resulting from by disasters and constitute relatively a small portion of all the losses ensuing a disaster including human, economic, social and environmental losses. Thus, it can be safely concluded that the developing countries suffer more from disasters than the more advanced countries. One of the main reasons attributed to this discriminative results is the rapid, unplanned and uncontrolled growth megacities especially in the developing world. This kind unplanned growth of population within limited geographic areas stretch the limits of the available infrastructure and other resources beyond their capacities. Thus, create new problems as well as increase the negative effects of the existing problems.

Disasters have been identified to have adverse impacts on both natural and built environments resulting in damages that far exceed the capacity of the local community to absorb it and recover on their own without external help [18]. The effects of disasters have been quantified based on the damages caused in terms lives lost, material and livelihood losses and the cost of environmental losses [19]. On the other hand, vulnerability to disasters has been prescribed as