EXPLORATORY REVIEW OF DISASTER RISK ASSESSMENT MODELS FOR PROMOTING EFFECTIVE DISASTER RISK REDUCTION IN PAKISTAN

QURATUL AIN ANWAR

Thesis Submitted to Ghazali Shafie Graduate School of Government in fulfillment of the requirements for the Degree of Masters
Universiti Utara Malaysia
2018

EXPLORATORY REVIEW OF DISASTER RISK ASSESSMENT MODELS FOR PROMOTING EFFECTIVE DISASTER RISK REDUCTION IN PAKISTAN

QURATUL AIN ANWAR

Thesis Submitted to Ghazali Shafie Graduate School of Government in fulfillment of the requirements for the Degree of Masters
Universiti Utara Malaysia
2018

Kolej Undang-Undang, Kerajaan dan Pengajian Antarabangsa
(College of Law, Government and International Studies)
Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

QURAT-UL- AIN ANWAR

calon untuk Ijazah **MASTER**
(candidate for the degree of)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

EXPLORATORY REVIEW OF DISASTER RISK MANAGEMENT ASSESSMENT MODELS PROMOTING EFFECTIVE DISASTER RISK MANAGEMENT IN PAKISTAN

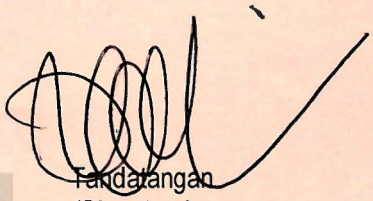
seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada **25 NOVEMBER 2018**
That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on: ***November 25, 2018***

Pengerusi Viva *(Chairman for Viva)*	: **ASSOC. PROF. DR. MAZLAN ISMAIL**	Tandatangan *(Signature)*	
Pemeriksa Luar *(External Examiner)*	: **DR. KHAMARRUL AZHARI RAZAK**	Tandatangan *(Signature)*	
Pemeriksa Dalam *(Internal Examiner)*	: **DR. WAN NADZRI OSMAN**	Tandatangan *(Signature)*	

Tarikh **25 NOVEMBER 2018**
Date

Nama Pelajar *(Name of Student)*	:	**QURAT-UL- AIN ANWAR**
Tajuk Tesis *(Title of the Thesis)*	:	**EXPLORATORY REVIEW OF DISASTER RISK MANAGEMENT ASSESSMENT MODELS PROMOTING EFFECTIVE DISASTER RISK MANAGEMENT IN PAKISTAN**
Program Pengajian *(Programme of Study)*	:	**MASTER**
Penyelia Pertama (First Supervisor)	:	**ASSOC. PROF. TPR. DR. DANI SALLEH**



Tandatangan
(Signature)

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a Masters degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for the copying of this dissertation in any manner, in whole or in part, for the scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Ghazali Shafie Graduate School. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from this thesis.

Requests for permission to copy or to make other use of materials in this project thesis, in whole or in part should be addressed to:

Dean of Ghazali Shafie Graduate School

UUM College of International Studies and Government

Universiti Utara Malaysia

06010 UUM Sintok

Malaysia

ABSTRAK

Tumpuan kebangsaan dan antarabangsa telah diarahkan pada pengurangan risiko akibat kesan besar bencana dan selepasnya yang memerlukan perbelanjaan sumber untuk membaiki kerosakan yang disebabkan oleh bencana ini. Evolusi risiko yang berterusan telah meningkatkan keperluan untuk penilaian risiko bencana yang berkesan untuk memberikan maklumat pada perancangan pengurusan risiko bencana dan proses intervensi pengurangan risiko bencana. Pendekatan ke atas penilaian risiko bencana yang dianjurkan dan sistematik akan membantu dalam penyelenggaraan kredibiliti itu mempromosikan kualiti proses dan hasilnya.Model khusus yang direka untuk tugas bertindak sebagai alat penting untuk pendekatan metodologi terhadap penilaian risiko bencana. Oleh kerana tidak mempunyai model yang sesuai untuk penilaian risiko bencana, kerajaan tempatan Pakistan telah mempertimbangkan keperluan untuk kajian ini dan oleh itu telah menyatakan perlunya model penilaian risiko bencana bersepadu dan holistik. Dalam proses membangunkan model penilaian risiko bencana yang berkesan, penyelidikan ini diterajui untuk mewujudkan hubungan awal antara penilaian risiko bencana dan pengurangan risiko bencana untuk menentukan faktor utama dalam pengurangan risiko bencana yang berkesan. Analisis awal yang terlibat dalam merumuskan hipotesis teori penilaian risiko bencana telah mengkaji faktor utama yang memaklumkan proses penilaian risiko bencana. Perdebatan ini terus membandingkan dan mengkaji tiga model penilaian risiko bencana Model Penilaian Kapasiti Kerentanan Masyarakat (CVCA), Model Pengurangan Risiko Berasaskan Komuniti dan Model Penilaian Risiko Bencana Afrika Selatan menganalisis ciri-ciri utama, infrastruktur dan implikasi model-model. Perbandingan kajian tiga model yang disorot memberikan wawasan yang diperlukan untuk membangunkan model penilaian risiko bencana untuk pemerintah tempatan di Perbandaran Pakistan. Pembangunan akhir penilaian risiko bencana untuk kerajaan tempatan di Pakistan dikreditkan kepada penyelidikan dan penemuan yang menjadi garis panduan subjektif.

Kata kunci: Penilaian risiko bencana, Pengurusan risiko bencana, Pengurangan risiko bencana, Perkembangan keselamatan, Penyertaan masyarakat.

ABSTRACT

The national and international focus has been directed towards risk reduction due to the immense impact of a disaster and the aftermath that requires the expenditure of resources for repairs of the damages caused by these disasters. The continued evolution of risks has increased the need for effective disaster risk assessment in order to provide information to disaster risk management planning and disaster risk reduction intervention process. An approach towards disaster risk assessment that is organized and systematic will aid in the maintenance of the credibility, therefore, promoting quality of the process and its results. Specific models designed for the task acts as an essential tool for the methodological approach towards disaster risk assessment. Due to lacking a proper model for disaster risk assessment, the local government of Pakistan has taken under consideration the need for this study and therefore has expressed the need for an integrated and holistic disaster risk assessment model. In the process of developing an effective disaster risk assessment model, the research was led in direction of establishing a preliminary link between disaster risk assessment and disaster risk reduction in order to determine the key factors in effective disaster risk reduction. The preliminary analysis involved in formulating a theoretical hypothesis of disaster risk assessment examined the key factors informing the disaster risk assessment process. This debate continued to compare and review three disaster risk assessment models the Community-wide Vulnerability Capacity Assessment (CVCA) Model, the Community-Based Risk Reduction Model and the South African Disaster Risk Assessment Model analyzing key characteristics, infrastructure and implications of the models. The reviewing comparison of the three highlighted models provided the necessary insight needed for developing disaster risk assessment model for the local government in Pakistan Municipalities. The final development of disaster risk assessment for the local government in Pakistan was credited to these researchers and findings that were the subjective guidelines.

Keywords: Disaster risk assessment, Disaster risk management, Disaster risk reduction, progression of safety, Community participation.

ACKNOWLEDGMENT

With the name of Allah Almighty, the most beneficent, the most merciful, and the Creator of mankind, who has given us the knowledge to understand the right and wrong, to explore the hidden mysteries of the world? First of all, I would like to thank Allah Almighty who gave me strength and courage to complete this task successfully. Then, I would like to pay special gratitude to my respected supervisor. I am highly indebted to my main supervisor, Associate Professor Dr. Dani Salleh for providing valuable guidance, encouragement, and support. I have learned a lot from him which would guide me through the rest of my life. He has been a source of inspiration and motivation during my period of study.

I also take this opportunity to thank my parents, spouse, and kids who supported me during the time of difficulty and encouraged me to face the challenges as Opportunities to excel in life. Challenges are not hurdles but opportunities to explore new knowledge. So, I am very thankful to my family for much-needed support. I am also quite thankful to my Brother for his endless support and encouragement.

Last but not the least; I would like to offer my special thanks to all of my teachers, and my university, Universiti Utara Malaysia, for providing me a supportive and healthy environment to fulfill my task.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AJ&K	Azad Jammu and Kashmir
CCI	Chamber of Commerce and Industry
CWS	Church World Service
DCO	District Coordination Officer
DDMA	District Disaster Management Authority
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EDO	Executive District Officer
EOC	Emergency Operations Centre
ERC	Emergency Relief Cell
ERRA	Earthquake Reconstruction and Rehabilitation Authority
	ederally Administrated Tribal Areas
NGOs	Non-governmental Organizations
PCSIR	Pakistan Council for Scientific and Industrial Research
PDMA	Provincial Disaster Management Authority
PDMC	Provincial Disaster Management Commission
SDF	Sangi Development Foundation
HRV	Hazard Risk Vulnerability
NDMA	National Disaster Management Agency
HDMC	National Disaster Management Commission

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A natural disaster is the occurrence of an extreme hazardous geophysical, atmospheric or hydrological event (e.g., earthquake, landslide, tsunami, windstorm, flood or drought) that impacts on communities causing damage, disruption and casualties, and leaving the affected communities unable to function normally without outside assistance (Benson *et al*, 2007). Among the numerous natural disasters, the earthquake is the one that could cause the worst damage. An earthquake as a phenomenon that occurs unexpectedly for very small time duration but in result requires long-term recovery and planning and leaves a message that alarms to be prepared for its next unpredictable visit and noticeable vulnerability. This class of hazards characterized by low probability of occurrence and high consequences, presents a difficult public policy problem; how to sustain public interest and involvement; how to attract adequate government resources for mitigation programs. Thus, under a stable condition, the majorities of the authorities at state, provincial and national level have the main emphasis on the aftermath of disaster response which includes rehabilitation of the sufferers, relief, and rescue at present their disaster management policies.

Earthquakes are a special kind of hazards in that most human losses are due to collapse of human-made structures like buildings, dams, structures, and so on.

Therefore, in principle, with appropriate resources for research, development, training, monitored by necessary investments in hazard reduction, earthquakes are a hazard that is within our control to respond to. The risk can be minimized with appropriate planning, design, and measures for example where not to build and how to build so that collapse of structures will not occur. Invariably, "Prevention" is adopted to replace "Response".

1.2 Earthquake Disaster Risk Management in Pakistan

An earthquake with the intensity of 7.6 was measured in October 2005 that took place in Northern Pakistan, in the Himalayas bottom, an epicenter of 95km approximately to Islamabad north East. There is an assessment of the death toll of excessive 1,300 in Indian-administered Kashmir and 81,000 in Pakistan. Moreover, an estimation of 70,000 injured in Pakistan and in Indian-administered Kashmir, it was just 6,000. There were displacements of 3.3 million people rendering them homeless. Assessment too many remote settlements with a high population are not likely to be possible due to road and bridge damage (ERRA, 2006). With the initial earthquake, there was a record of 1000 aftermath effects. There was an intensification of massive landslides with over 1km wide landslide and 1m deep collapsing into Muzaffarabad. Meanwhile, the loss of life and the damage magnitude was disproportionate to the earthquake mass, making it the foremost hazard. The hazard has been far worse than the expectation due to the building vulnerability. The destruction affects both private homes and institutional buildings due to the vulnerability of the earthquake (Rossetto, 2009). The earthquake collapsed and damaged houses not less than 60,000, with 6,298 for educational institutions and 782 health facilities in the Pakistan and Khyber Pakhtoon Khan (K.P.K.). The total

housing units of eighty-four percent collapsed in PAK and thirty-six percent in the K.P.K, while 90% of the houses collapsed in rural areas (Parker, 2010). Moreover, the most widespread damage was suffered by the private housing sector; this includes education, livestock sectors, and transportation (Bothara, 2008).

Table 1. 1
Ten Strongest Earthquakes of South Asia since 1900

	Date	Mw	Latitude	Longitude	Location
1	26 December 2004	9.1	3.29	95.98	Sumatra –Andaman arc
2	15 August 1950	8.6	96.76	96.76	Chayu –Upper Assam
3	15 January 1934	8.1	87.09	87.09	Nepal – Bihar border
4	27 November 1945	8	63.48	63.48	Makran Coast, Pakistan
5	30 May 1935	7.8	66.4	66.4	Quetta, Balochistan
6	4 April 1905	7.8	76	76	Kangra, Himachal Pradesh
7	26 June 1941	7.7	92.5	92.5	Middle Andaman Island
8	26 January 2001	7.7	70.31	70.31	Bhuj, Gujarat
9	8 October 2005	7.6	73.53	73.53	Kashmir – Kohistan
10	29 February 1944	7.4	75.3	75.3	Near the Maldive Islands

Source: ASC, (2008)

Table 1. 2
Ten Most Fatal Earthquakes of South Asia

Year	Location	Magnitude	Death in South Asia
2004	Sumatra	9.1	55,000+
2005	Kashmir	7.6	75,900
2001	Bhuj	7.7	13,845
1935	Quetta	7.3	35,000
1905	Kangra	7.8	28,000
1934	Nepal – Bihar	8.1	10,653
1993	Latur	6.4	10,000
1974	Northern Pakistan	6.2	5,300
1998	Afghanistan	6.6	4,000

Source: ASC, (2008)

Pakistan in 2006 constituted a National Disaster Management Commission that comprises disaster management authorities from federal and provincial to the district

level. President of Pakistan promulgated the National Disaster Management ordinance on December 23, 2006: National Disaster Management Commission was set up by similar disaster management authorities that will be established at municipal, district and provincial levels.

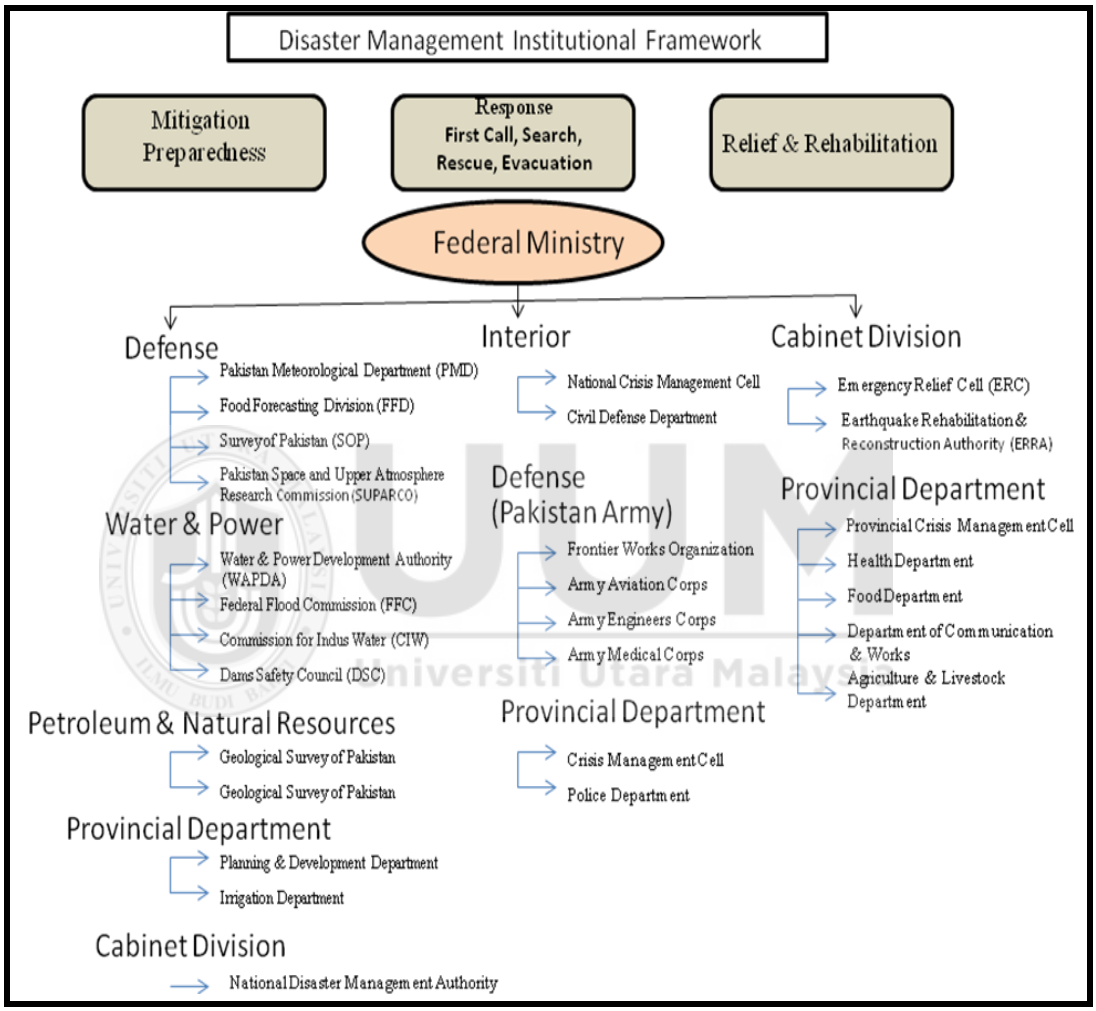


Figure 1. 1: Institutional Framework Disaster Management In Pakistan (NDMA, 2015)

1.2.1 Crisis Management Cell

The Pakistan Flood Commission is a dedicated body dealing with research and development in crisis management cell but mostly they deal with flood hazard of the river but there is no single institution in Pakistan specific for supervising an activity such as hazard of the earthquake. The Pakistan Army always conduct rescue and

evacuation, they provide short-term shelters, medical and food services but all these are not enough in terms of relief and rehabilitation.

1.2.2 Establishment of National Disaster Management Authority (NDMA)

The 2005 earthquake was a point of a turnoff in Pakistan in the management structure of disaster risk with the extension of natural hazard in the history of Pakistan annually, the impacts of the disaster laid an additional burden on the budget of the country. By considering the system of the economy, there is understanding of the significance of Disaster Risk Reduction (DRR) and the National Disaster Management Commission (NDMC) was founded in 2006 to reduce the response to the disaster.

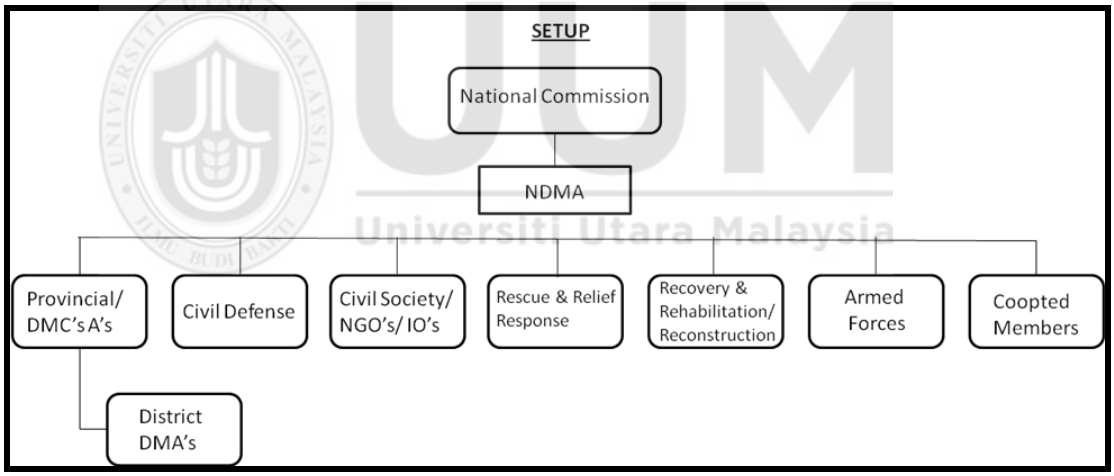


Figure 1. 2: The setup of National Disaster Management Authority (NDMA) at Provincial, District and Municipal levels in Pakistan

1.2.3 The Roles of National Disaster Management Authority

NDMA was assigned to carry out policies, strategies, and plans to reduce risks of disaster. Ultimately, in 2007, the National Disaster Risk Management Framework (NDRMF) was developed and offered strategies to all stakeholders and national disaster risk reduction policy (NDRRP) were founded in 2013. In contrast, there is still a criterion for sustainable ecological and socio-economic development to

appropriately integrate DRR into strategies and plans to make resilience out of the country to a different kind of disaster to prove that there is a need for development and improvement in terms of institutional, social and economic capacity at the local and national levels.

1.2.3 Problem Statement

The disaster has been identified as one of the factors that negatively impact not only on the environment but also the individual living within that environment (Wassenhove, Van L.N, 2006) it can also be caused by unforeseen circumstances beyond human control. A dexterous phenomenon that causes massive magnitude negative impacts on individuals and surroundings or in other words an emergency situation that results in the widespread destruction which far exceeds our capability.

Disasters can occur at various levels which can be detrimental to human life. It can be influenced by human activities or as a result of natural occurrences (Wassenhove, Van L.N, 2006). Disasters can hit without expectation or prior notice to any place and can cause destructions in any form, as they contain a high risk of vulnerability which results in a disturbing individuals life. The policy objective of anticipating and reducing risk is called disaster risk reduction (DRR). Although often used interchangeably with DRR, disaster risk management (DRM) can be thought of as the implementation of DRR, since it describes the actions that aim to achieve the objective of reducing risk. Disaster risk is an indicator of poor development, so reducing disaster risk requires integrating DRR policy and DRM practice into sustainable development goals. Pakistan's approach to disaster management has improved much since the initial challenges faced following the 2005 earthquake. The threats posed by natural

catastrophes are intensifying. As a consequence, the volume of effort in the field of disaster management has been accelerating, mainly in Disaster Risk Reduction (DRR). DRR concentrates on pre-disaster actions.

Table 1. 3
Categories of Disaster Management

Pre-disaster	**Disaster**	**Post-disaster**
Mitigations & Preparedness	**Response**	**Recovery**
Assessment Risk factors Vulnerability Planning Infrastructure Policymaking Capacity building resources Training/education	Relief operations: First phase Medics, food, shelter Second phase Housing Food supply chain building Logistics stages: Mobilization and procurement Long haul The last mile	Infrastructure rebuilding Re-establishing communities Measure the effects of: Infrastructure Planning Response short and long-term Lessons leamed. Debris cleaning feedback to planning and response

Source: Earthquake hazards in Haiti; An analysis of response and preparedness strategies for the design of a New Mitigation Approach (Alteus, 2017).

Due to the rapid increase in the community, a high cost is being utilized on huge consideration to support communities to accomplish applicable towards disaster risk reduction strategies. Currently, communities across the globe are becoming conscious of the need to be adequately informed and enlightened about intending issues on disaster management. This is due to the nature of occurrence of the disaster which cannot be predicted by any particular community. Thus by growing intensity of occurring of disasters and its impacts, internationally disaster develops various plans in order to reduce disaster impacts in disaster occurrence. As a way of intensifying and amplifying disaster management techniques, various strategies were introduced by the international disaster reduction community to avert and manage unforeseen

disaster circumstances. The international initiatives in this esteem could be outlined to the international span back, thereby being informed by intensifying the amplification and impact of disasters. The community of international disaster reduction introduced many strategies as a way to counter and manage to develop and estimate the circumstances of the disaster. In this method, those initiatives can be outlined back to the international span.

Presently, the Act of Disaster Management of Pakistan 2002, examines the risk of disaster assessment and therefore identified it as the most serious and first according to the Pakistan NDMF, towards the reduction of risk as stated in Section 20, 33 and 47 of the Act (Pereira, 2010). Moreover, the identification of assessment of disaster risk emphasizes the outcomes of vulnerability risk and hazard had a strong relation. This can be illustrated simply by (Risk=Hazard x Vulnerability). which depicts that more high occurrences of hazards and more population vulnerable, the more the results increase in the probability of risk. (Blaikie, 1994). More so, the consequences and amplification of risk assessment is the best to approach towards actual risk reduction yet, currently there is the absence of it in Pakistan there is no model that could ensure the disaster risk assessment either at(regional or district level).

The execution of a plan that goals to avoid the disaster or minimize its effects comes under the definition of mitigation. Pre-mitigation activities are community's training to respond and recovery after occurrences of disaster. Mitigation is a process that involves the management of disasters either at the early stage or its avoidance. It is primarily aimed at reducing the adverse effect of disasters on community and the individual. The response can also be measured as the availability of resources and

alternatives directed by policies to retain human lives, property and social and administrative structure of the community. It tends to minimize the occurrence of the hazardous effect of disasters. It goals to reduce the hazards occur in the result of the disaster.

At last, recovery comprises the activities continued till a long time after occurrence so it has been clear that natural disaster cannot be omitted but its impacts on individuals can be reduced by taking prior action against its vulnerability and loss. This focuses on the need to indulge in cost-effective techniques and solutions to minimize loss and sufferings in the result of the disaster. This research was inspired by deep concern for numerous individuals who have been victims of disasters that have resulted in the loss of both human life and property which could be as a result of either technological or man-made modeling approach.

The purpose of this research is to have a deep knowledge of disaster which aids decision making policy planners and disaster management team specifically in the development of mitigating policies, response, and rehabilitation in Pakistan, by application of analyzing of qualitative data by using hazard risk vulnerability (HRV) analysis modeling approach. Hazard can be defined as the intensity of damaging physical event, phenomenon and/or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Each hazard is characterized by its location, intensity, frequency, and probability. However, vulnerability is a set of conditions and processes resulting from physical, social, economic, and environmental factors, which increase the susceptibility of a community to the impact of hazards. Positive factors that increase

the ability of people and the society they live in to cope effectively with hazards and can reduce their susceptibility are often designated as capacities. Whereas the risk can be defined as the probability of harmful consequences or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Risks are always created or exist within social systems, therefore it is important to consider the social contexts in which risks occur and that people, therefore, do not necessarily share the same perceptions of risk and their underlying causes (UNISDR, 2006).

Currently, there is the high desire of communities to recognize the possibility of occurrence of hazards in order to control the probability of its occurrence to assess susceptibilities to research and to improve new systematic approach, towards a disaster management process.

However, communities have not approached a workable and practical HRV analysis. For successful access to disaster management, community participation is important, along with the active collaboration of local government involvement. Thus, there is a desire of new paradigm although a community has an approach to HRV effectiveness to an analysis, essentially to make sure that an effective HRV analysis is useful only when its results and calculations are based on factual data used for executing plan used for disaster management. This research is based on the determination to develop an overall efficient HRV analysis model that can be executed by a community that can efficiently relieve the significant destruction of a disaster. In addition, if a community has access to an HRV analysis of high effectiveness, it is paramount to

recognize that the latter is different from the total process and that any approach that is successful to the management of disaster must be incorporated into the planning of the community. Therefore, the community has no point in having access to an in-depth of HRV analysis if there is no action on the result discovered.

The primary objective of this study is to create and examine a community based and an integrated model for analysis of HRV having the capacity to reduce the negative impact of disaster successfully. The next session describes how this goal is reached in terms of the methods used and the specific research questions addressed. Hence it has been clearly identified that the impact of natural disasters in the context of human and economic losses has increased in recent years, and overall society has become more vulnerable to natural disasters. More so, this research from past to choose cost and time being a temporary solution against disaster instead, of being prepared for that before it occurs which is also an integral part of disaster management (Arya, 2000). Thus, it is better to prepare to prevent and mitigate disaster rather than to wait for a disaster to go for long-term benefits, in view of extending of the root cause of dilemma and different conditions, the most important issues are identified, along with many solutions and the main aspects for policy intervention. Moreover, distributing these concepts into practical strategies would create combinations of priorities and solutions, resources and time frames to be carried out without a full examination of the instances. Changes or adjustments are proposed in a way in which settlements of humans are grown, managed and shaped to secure interaction of harmony between human systems and nature, in order that natural disaster vulnerability would minimize.

This approach subsequently will help to develop recommendations on building typology and use of materials and techniques that minimize the loss of failure and focuses to the problems and their solutions at the level of surviving sufferers and helpers as a social and technical program.

1.4 Research Questions

The research is design to archive the following objectives:

i. What is disaster risk assessment with in the local government context in Pakistan?
ii. What is the relationship between disaster risk assessment and disaster risk reduction?
iii. How can the existing models be adopted according to the context of Pakistan?

1.5 Research Objectives

In order to achieve research objectives, this research will tend to achieve some basic information about disasters and risk policy management that covers mitigation, preparedness, response, and recovery. Taking into consideration a case of the earthquake in Pakistan for the purpose to achieve and evaluate HRV model justification, explanation, and policy-making an evaluation.

i. To explore and propose disaster risk assessment policy recommendations with in Local Government in Pakistan.
ii. To examine and evaluate a link and relationship between disaster risk assessment and disaster risk reduction.

iii. To explore and evaluate disaster risk assessment models promoting effective disaster risk reduction and to adopt and contextualize an appropriate disaster risk assessment model for local government in Pakistan.

1.6 The significance of the Study

The municipality and local government of Pakistan faced a great challenge in the development of a national disaster risk management comprehensive framework in the year 2007. Thus, there is a need to proposed a suitable and appropriate model for achieving actual risk assessment towards the application of disaster risk reduction policies. Although National Disaster and Risk Management Fund (NDRMF) achieved a framework in 2007 which ensures policies for stakeholders later in 2013 it merges with National Disaster and Risk Management Policy (NDRRP) with the framework of disaster prevention and risk reduction policy. Thus this research will be helpful for the municipality and will serve as an informative tool that proposed a suitable model for acceleration and to introduce disaster risk assessment along with disaster risk reduction policies.

The task confronting local, state and district government in Pakistan is the application and observation of the conditions of the NDRMF that was developed in 2007, which provides strategies to every stakeholder and to the NDRRP in 2013 which was also established in accordance with prevention of disaster and risk reduction of disaster. Thus, this research serves as a tool for local government proposing a suitable and appropriate model for the rapid disaster risk assessment towards the application of policies in disaster risk reduction. Moreover, the significance of the study is the practice of the disaster enhancement in risk

assessment through an integrated and coordinated method comprising a various team of relevant stakeholders. The consequence of such development is the improved conceptualization and information of the activities in disaster risk assessment of more active and informed participation process by all stakeholders.

The core of a vulnerability-driven as such, with community-based from bottom to the top system, is justifiably uttered the merits of the conceptual partnership in the assessment of disaster risk. Additional significance of the research is that apart from the contribution to the theories on disaster risk assessment and reduction, the body structure of the model created a stimulated application, thereby over-appropriate the contextualization across the subdivisions of the government involved in the practices of disaster risk. Having determined the main contribution of this study, it is important to examine the methodology of the research employed to achieve the various results of the research.

The research will start with the review of pertinent theories and concepts of developing strategies and development control currently has been in use in Muzaffarabad Pakistan with reference to the impact of Earthquake on housing units, institutional level and local infrastructure at private and public sectors. This approach will give a wider scope of the concept pertaining to reduce the effect of the earthquake and to minimize the loss destruction due to use of in proper planning and construction techniques and inadequate use of the material.

1.7 Thesis Organization

The thesis consists of six chapters. Chapter one states the theoretical background of the study in generality with reference to the earthquake management in world scenario and later in context of South Asia and then specifically in case of Pakistan earthquake Oct 2005, research problem, research questions and objectives, then followed by the purpose of the study, methodology adopted for the research and significance of the study.

Chapter two reveals previous research literature that connect with the management of earthquake and it's after effects and vulnerability on built environment cause due to damages of non-engineering building types.

It further explain definitions of disaster management and process of disaster management and also explain that without access to an adequate HRV analysis it is difficult to minimize the effects and vulnerability to disaster during and after math furthermore it also explains the difference between natural disaster and technological disaster and how earthquake a natural disaster transforms into technological disaster due to non-engineered building constructions. The theoretical framework and research model were presented at the end of the chapter.

Chapter three considers the research methodological presentation employed to actualize the objectives of the research. The chapter also explains design method of the research used to conduct research.

Chapter four is based on the analysis of data, analyzing the disaster risk management reduction process in Pakistan.

Chapter five represents the exploratory review of three disaster risk assessment models and promoting effective disaster risk reduction strategy.

Chapter six is the theoretical, methodological and practical implementation of the findings were foregrounded. Lastly, recommendation and suggestion for future research were offered.

CHAPTER TWO

DISASTER MANAGEMENT

2.1 Introduction

This chapter reviews the literature related to the study. The first section discusses the disaster management process and the next section examines the definition of disaster management and also discuss the difference between natural disaster and the technological disaster, furthermore it also discuss the framework that how natural disaster transforms into technological disasters due to collapse of building structures that fall due to earthquake because of the absence of engineering input in them.

2.2 Definition of Disaster

Disasters are a major problem worldwide and a serious threat to sustainable development. Their impacts are diverse: as well as loss of life, injury and disease and the destruction of property and other assets, disasters can also cause social and economic disruption, loss of infrastructure and other services and damage to the environment (Twigg, 2015). As per the Oxford dictionary a disaster is “a sudden accident or a natural catastrophe that causes great damage or loss of life” (Oxford Dictionary, 2018)

2.3 Definition of Disaster Management

A reference to Myers (1997) in which it is stated that the mitigation, preparedness, response, and recovery are not separate endeavors and they should not be pursued by separate professionals. They are a long-term process and must be linked. In this regards, this dissertation proposed a compatible definition to explain disaster risk management process as, "*A process that targets to achieve similar objectives and standards in focus to the community in contact with a probability of occurrence of disasters".* However, Quaranteli's emphasis that disaster management is successful when the process is prioritized rather than written plans. By referencing this statement the followed definition adopts the approach that managing a disaster requires a set of individuals who must cooperate and build common interest. Due to limited resources and time, every aspect and approach will be prioritized and hence may overwhelm some aspects over the other. The process should be overall helpful for the members participating in the whole endeavor to find common grounds that are listed by Mileti (1999) this should aid in getting the process completed through prioritized manner.

According to the defining of disaster, it is expedient to reflect this tenure within the framework of four classes:

i. Lexicology,
ii. Origin/cause,
iii. Characteristics, and
iv. Capacity to respond

2.3.1 The Process of Disaster Management

A disaster is an outcome from the hazard coalition, vulnerability and inadequate or volume to minimize the probable potential of risk. A disaster occurs when a hazard reacts to the vulnerable population and leads to damage, death, and destruction. Any hazard whether, flood, earthquake or cyclone which generate occurrence along with higher vulnerability will increase the loss of life and property due to disaster occurrence. For instance, an earthquake in an unpopulated area cannot be seen as a disaster irrespective of the intensity of the forces impacted. An earthquake is said to be devastating only when it disturbs people, routines, and their properties. Therefore, disaster happens when vulnerability and hazard take place simultaneously. More so, the increases the capacity of the individual, will decreases the impact of the hazard. Thus, there is a need to understand the three main components namely; hazard, capacity, and vulnerability with suitable examples to have a basic knowledge of disaster management (Khan, 2008).

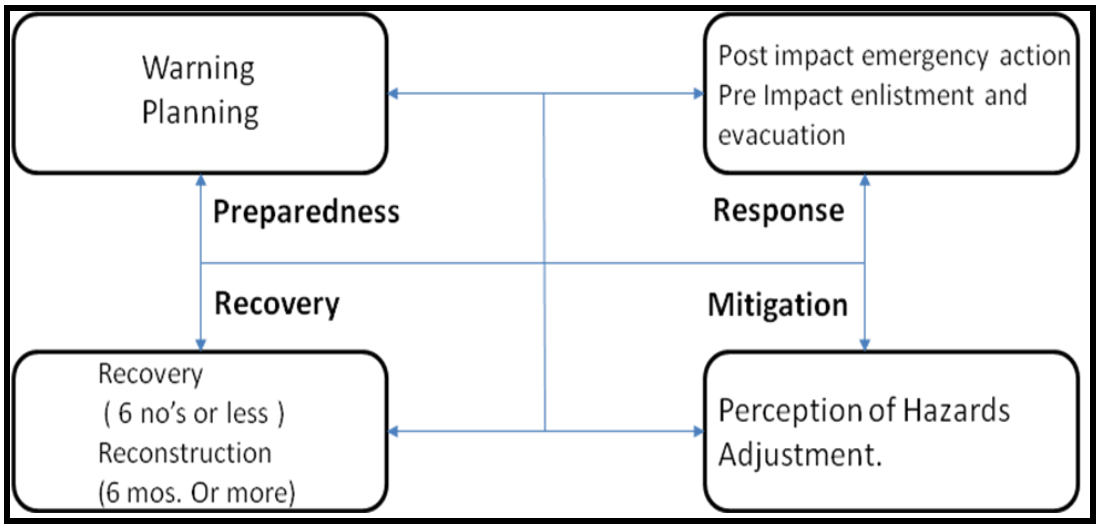


Figure 2. 1: Framework of Disaster Management
Source: *Drabek (1986)*

The series of these methods propose a straight approach to managing the disaster ensuring efficiency, rather than other highly complicated counter proposals that may not be applicable (Quarantelli, 1981). According to Drabek, it is emphasized to test the planning and developing techniques for enhancing the plan. On the other side Quarantelli, believe the most efficient way to go according to my opinion is based on six areas that can effectively tackle disaster management

i. Hazard Risk and vulnerability (HRV) analysis,
ii. Mitigation
iii. Response (including alert and warning, impact, immediate after incidence, and rescue)
iv. Recovery and Reconstruction
v. Awareness and training
vi. Exercising or testing of emergency plans.

HRV analysis is part of disaster managing process in which every step is interconnected to one another in a manner of the loop. The activity in any one step will affect next to it and continuity in circular one another rather than linear. As shown in figure 2.2.

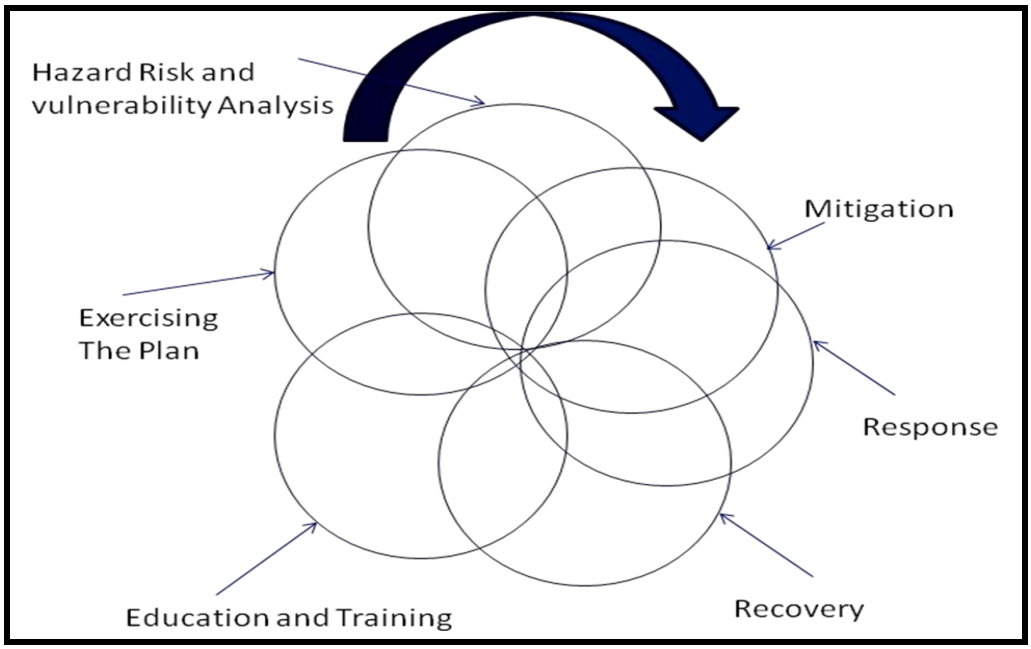


Figure 2. 2: The Process of Disaster Management
Source: Drabek (1986)

2.3.2 Disaster Management Cycle

It consists of three-part execution that includes all the divisions that are essential for a successful disaster response whether it is before the impact of the event or after the occurrence of the event, these three parts are necessary for successfully recovering, retaining or preventing from the disaster of the event.

2.3.3 Disaster management cycle in Pakistan

Pakistan as a whole has suffered an abundance of natural disasters and technological disasters, however, it has required progressing in mitigation of these catastrophes. It is observable that little or no cooperation from government level is received when a disaster does strike, there is only a minimal faction of government concern shown only when the disaster strikes leaving the option of preventing or preparing for the disaster behind. Problems that are present in Pakistan are following.

i. Lack of communication and understanding between government institutes and civil

ii. Society.

iii. No divisions present for organized execution.

iv. Lack of proper resourced response from government levels.

v. No awareness or research systems.

vi. Lack of equipment and labor.

vii. High corruption level of government officials and politicians.

These problems are derived from research findings by the response rate from the government when a disaster strikes, for reference earthquake in Margalla Towers Islamabad and Balakot or Azad Kashmir can be taken, in some of these areas, no response from the government was observed for approximately five days. (Poonsuph, 2006; World Disasters Report, 2003)

Policies currently in Pakistan for Disaster Response are following.

i. The main focus in Pakistan after any disastrous occurrence is on rescue and relief of the people. The government also pays a considerable amount of money over these rescues and rehabilitation.

ii. The management policies are more focused on saving the prime areas with political, economic and strategic importance rather than the areas with poor conditions.

iii. There is a considerable amount of knowledge to the management bodies about disasters and how to identify them.

iv. However, no long-term preparations are ever made to avoid these disasters from occurring or trying to minimize the losses.

v. Another flaw in these management bodies is that they act on their own and do not consult with other sectors or discuss their strategies with other management bodies.

vi. Therefore, efficient and most effective management cannot be achieved due to the lack of proper central authority and no coordination among the organizations.

vii. When the focus is on state-level disasters, the only concern of these organizations is to save the structural system which results in the neglect of local people, their protection and the livelihood of these people.

viii. Henceforth, it is safe to say that the departments of disaster and relief have always been under-resourced with little or no importance given to the administrative sector.

Furthermore, no amount of money has ever been steadfastly given for the sole purpose of disaster planning and the only two departments that are in-charge of these managements i.e. emergency Relief Cell and Federal Flood Commission are deeply lacking the required training. Also, the employees don't show loyalty to their works due to the unsure environment regarding their jobs.

An increase in the number of disasters has been noted in the past couple of years. It has been seen in the reports from (1994-1998) that the number of the average disasters was 428 which climbed up to 707 in between (1999-2003). This shows an increase of 60 percent. Furthermore, Pakistan's continued suffering of lack of management can be judged by the fact that in the years ranging from 1999-2003 a number of 6,037 people were killed and 898,631 were injured. Moreover, the

earthquake of 2005 resulted in the deaths of more than 80 thousand people with 3.5 million were those who lost their houses at that time. The disaster management in Pakistan basically revolves around flood disasters and their rescue and relief problem. The main focus in Pakistan after any disastrous occurrence is on rescue and relief of the people. The government also pays a considerable amount of money over these rescues and rehabilitation.

The management policies are more focused on saving the prime areas with political, economic and strategic importance rather than the areas with poor conditions. There is a considerable amount of knowledge to the management bodies about disasters and how to identify them. However, no long-term preparations are ever made to avoid these disasters from occurring or trying to minimize the losses. Another flaw in these management bodies is that they act on their own and do not consult with other sectors or discuss their strategies with other management bodies.

Therefore, an efficient and most effective management cannot be achieved due to the lack of proper central authority and no coordination among the organizations. When the focus is on state-level disasters, the only concern of these organizations is to save the structural system which results in the neglect of local people, their protection and the livelihood of these people. As far as the flooding, with its frequent incidents, is concerned it can be seen that the government has taken proper measures to control these occurrences.

2.4 Risk

Risk can be defined in various ways according to the application and situational context. Commonly, people refer to risk as future harm that is affected by certain sources or action taken in their everyday life. In a more formal and academic sense, the risk is defined as a measure of probability and severity of adverse effects (Lowrance, 1976). Risk has also been defined as "the extent to which there is uncertainty about whether potentially significant and/or disappointing outcomes of decisions will be realized" (Sitkin&Poblo, 1992). Meanwhile, according to Zsidisin (2003), risk can be categorized into three dimensions which are outcome uncertainty, outcome expectation, and outcome potential. In general, three aspects are identified as important when analyzing the risk: the action or the sources causing the risk, the outcomes from the risk, and the impact measurement in order to adverse or mitigate outcomes. So, risk can be concluded to be related to the probability of future outcomes caused by certain actions or sources and the measurement of impact from these outcomes. Ballard (1992) proposed a formula for the quantification of risk which can be written as:

Risk = Frequency x Consequences.

According to Rowe (1977), risk involves two major components (a) the existence of a possible unwanted consequence or loss and (b) uncertainty on the occurrence of that consequence which can be expressed in the form of a probability of occurrence. These components are equal to the two components mentioned above by Lowrance (1976). In addition, the risk is defined here as the potential for realization of unwanted, negative consequences of an event. The causative event may be a single event, a combination of events or a continuing process and the consequence may

affect individuals, groups of people, society, and its institutions or they may affect physical and biological systems. Theoretically, risk does not occur under conditions of certainty. If a catastrophic event is known with certainty, then benefit and cost may be traded prior to the event to reduce the impact to an acceptable level.

According to Penning-Rowsell and Handmer's (1990) definition of risk, geomorphologists mostly merge the possibility and the consequences of an occurrence. The hazard is commonly well-defined as the probability of a variation of a given magnitude occurring within an identified time span in a given context; the connected risk is the resultant loss or damage of natural life, property, and resources (Varnes et al, 1984). For example, it may be incredible to minimize the possibility of an event, particularly in the situation of natural hazards (e.g., an earthquake), while there may be a multitude of activities, especially social activities, that can be taken to reduce the aftermath of an event (e.g. getting safe building codes, elaborate neighborhood response policies, etc.).

On the other side, when considering technological hazards (e.g., a hazardous material spill), there might be some activities that can minimize the probability of the disaster occurring and other activities that can minimize its negative impact. The point is, steps taken to minimize the likelihood of a hazardous event do not certainly have an impact on its outcome. For example, improving safety precautions at a chemical plant may minimize the likelihood of the event occurs, but it will do a bit to minimize the community impact of an emission of poisonous gases.

However, in some circumstances there may definitely be a relation between the probability of an event and its outcomes (e.g., amplified safety practices may lead to a quicker response to the leakage of poisonous gases. In other words, stated that the objective of an HRV analysis is to serve in the prioritization of mitigation plans, and given that the risk assessment is presented as a way of examining risks so that they may be better avoided, reduced, or otherwise managed (Wilson and Crouch 1987).

It would seem, assuming that time and resources are not unlimited, that risk assessment involves the ability to rank the probability of a disaster occurring along a range from high risk to low risk. According to the key definition of the verb Risk in the Oxford English Dictionary, is to expose to the chance of injury or loss.

Firstly, it is essential that there be a possible loss of some extent (we will use the loss as a general expression to include injury). Secondly, it is necessary that there must be a chance of loss. A definite loss is not a risk. Thirdly, the nation to expose which means that the decision maker authorities can take actions that result in increased (or decrease) the amount or chance of loss. Therefore to risk in fact the availability of a choice. (MacCrimmon and Wehrung 1986). As stated by Mac Crimmon and Wehrung, the accessibility of choices is directly associated to the adoption and execution of mitigation strategies who execute these mitigation policies and how they are decided upon focus us to Penning-Rowsell and Handmer's third definition of risk, which comprises the distribution of authority within society. However, increased pressure to implement mitigation strategies by formerly marginalized and poor citizen may minimize the effect of a disaster but not the probability of its existence (consider, for example, an earthquake).

2.4.1 A Definition of Risk

So, it has been clear that there is no definition of risk has been accepted. Therefore, for the purposes of this research thesis, Risk has been defined as the likelihood, based on existing data and research, of a disaster take place in a particular area. The impact on the community may differ, depending upon the scale or magnitude of the disaster, but the probability of every disaster has to be calculated individually from its consequences. The consequences of hazards are considered under the vulnerability and impact phases of HRV analysis.

2.4.2 Risk Management

Risk management is not capable to benefit all at once. Moreover, all individuals do not agree on a common share of benefits, therefore, contentious issues may not be capable to resolve or reduce to similar personal performance (National Research Council 1989). Risk management is the ultimate period of HRV analysis, and it must be successful in providing data to surviving and likely hazards, risks, impact, and vulnerabilities so that individuals are capable of decision making with respect to mitigate policies. In fact, there is no settlement as to either risk assessment and risk management should be measured as one process or should a part.

It has been observed by Lave (1986) and Paoli (1995), that risk assessment is one of a series of steps that take place within the risk management part of HRV analysis. This is the adopted approach for this research that while defining disaster risk management process two main queries must need to focus. (l) Does the implementation of mitigation strategies include in it? and (II) What should target to ensure that it is meaningful vies-a-vies disaster management?.

There is no relationship between the risk management community and development strategies should be a part. With respect to transferring risk assessment to the domain of the scientist and risk management to the domain of the policy maker.

Rowe (1991) says, while it is Potential to effect such parting in some circumstances, general adherence to such regulation can lead to the covering of serious policy matters. However, In this research, it would argue that they should be separated. Acknowledge what risks and vulnerabilities exist is significant, as is being capable to rank them according to which are most expected to occur and, having occurred, to have the greatest negative significances. However, having this information is far different than being able to do something with that information.

The discussion regarding which mitigation dealings to implement in order to deal with risks and vulnerabilities integrates such issues as the accessibility of resources, political acceptance, public pressure, availability of tools and practices for dealing with the circumstances, and so on. Risk management and the development of mitigating strategies, respectively, involve different experts suggestions (e.g., seismologists versus engineers, hydrologists versus building inspectors, etc.) and are built on different sets of information. Thus, this research suggests that the risk management process should prioritize the areas scheduled for mitigate strategies and make approvals concerning which issues should be undertaken; meanwhile, it would also argue that Risk management process should not be included under the implementation of mitigation strategies.

Although the risk management step is acute with concern to distributing resources for mitigation and with concern to the development of a disaster response strategy, few models have explained it (and the essential steps it incorporates) in a practical, easy-to-carry-out method. The comfort with which researchers and specialists gloss over risk management seems curious.

Godschalk (1991) declares that risk and vulnerability mapping is simply a technique for locating areas with different degrees of likelihood and vulnerability. He this exemplifies this with the use of a hurricane flood zone map, which highlights the areas of possible flooding and potential evacuation. Further, he states that the worth of the buildings and structures could be calculated and that the dollar price could provide people with a vulnerability analysis.

Although recognizing that, throughout the United States, such maps have been completed for anything other than floods, he concludes: In the meantime, the local emergency manager must use various local, state, and federal resources to compile risk and vulnerability maps. And when the maps are not available? Godschalk is inexplicit. He lists, as the first two of three steps in his mitigate process:

To identify all confined hazards: their characteristics, locations, likelihoods of existence and potential impact on individuals, property and the environment; also identifying suitable actions to reduce the impact on structural and non-structural damage.

Evaluating the likely risks of disaster occurrence and the vulnerability of individuals, property and the environment to damage or destruction. The investigation is based on records of structures and inhabitants at risk, estimates of economic loss, training of risk perception, and strategies of mitigation costs and benefits.

Here he recommends, what it is that a mitigating process should address, but on the other side, he did not describe how it should be conducted. It would claim that the risk management phase must contain not only the risk assessment phase, as previously defined but also the vulnerability assessment phase (as is suggested by Godschalk). However, Paoli (1995) includes a risk assessment phase (e.g., value/cost analysis) and a risk control phase (i.e., that which classifies practical risk control options and evaluates them for effectiveness, remaining risk, and stakeholder acceptability), but he neglects the concept of vulnerability.

Additionally, he fails to acknowledge that the incidences and magnitudes of risk scenarios are basically unknown and that insecurity is very high. And, even still there are approaches for looking at the distribution of welfares and costs, due to the complexity of disasters they are simply not suitable in this context. Often what is of direct advantage to one sector of the population (e.g., providing jobs in a hazardous waste disposal site) is not of benefit to another (e.g., providing the increased potential of a dangerous hazardous material spill).

2.4.3 Steps of Risk Management

Lave (1986) recommends that risk management is composed of nine steps (see figure 2.3). He includes references to vulnerability aspects under the first column (Facts and

Data), but he did not indicate that how analyses are to be done and how judgments are to be ended. For example, he says that the elements of the problem must be pulled together in a decision analysis. But, How they are to be acknowledged and how they are to be pulled together and, definitely, how the decision investigation is to be structured is not explain in any practical detail. It is also stimulating that there are no lines clearly making any connections between the several elements. Moreover, Lave makes no explanations of who is supposed to be settling the risk management process. However, Lava's list of criteria for defining whether or not a risk has been properly managed appears to be a good one. The first criterion is the degree to which the risk has been compact to a level of acceptability, the second criterion is proficiency, the third criterion is justice and the fourth criterion is organizational simplicity.

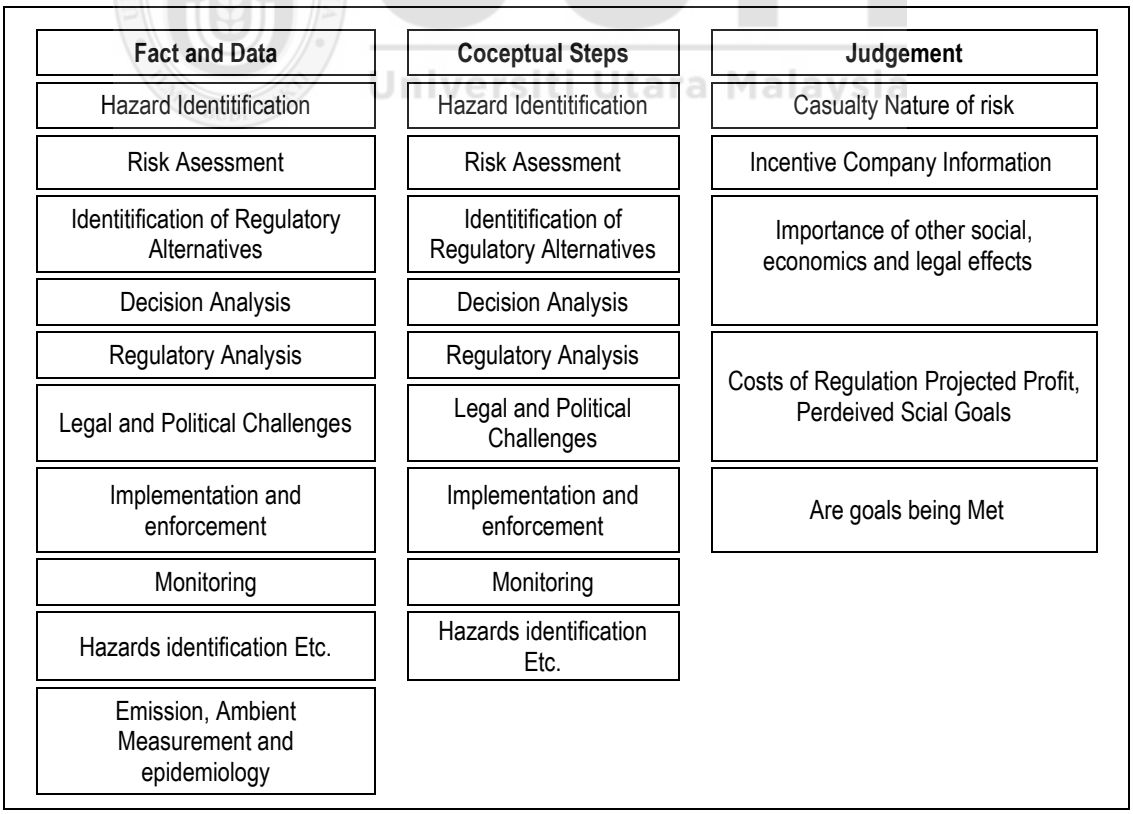


Figure 2. 3*:* Steps of Risk Management
Source: Lave (1986).

In summary Paoli's (1995) description of what a risk management procedure should look like resolves some matters but creates others (particularly within the context of disasters), namely: (l) the struggle of determining the participants' needs; (2) the great number of worries that exist concerning when and where disasters are expected to occur; (3) the lack of concern of vulnerability factors; and (4) the use of benefit/rate enquiry to deal with human and community impacts. Godschalk (1991) and others sight the risk management process as practically a technical task (based on mapping tools) and thus simply avoid having to struggle with some of the practical complications Of dealing with risk and vulnerability assessments. Lave (1986) provides a structure that includes integrating and arbitrating data without ever explaining how to do this. In order to avoid such insufficiencies, I have chosen to use the risk management process defined by the National Research Council (NRC.1991).

2.4.4 Risk Management Process by National Research Council NRC

The NRC list specifies the steps that people concerned with hazard decline should take. It is practical, integrates many of the definitions already recognized for other phases of the HRV process, and is comparatively easy to follow. It also stresses emphasized that the aim of the risk management process is to make approvals for the execution of mitigation plans. It does not, however, integrate any of the criteria that emphasized community participation, the sharing and providing of information, and so on (as is verified later, these criteria can easily be incorporated into this model).

i. The NRC list reads as follows:

ii. Identify natural hazards (incidence, intensity, location).

iii. Map hazard-prone areas and ecologically sensitive areas.

iv. Inventory buildings and areas vulnerable to hazards (e.g., unreinforced masonry, portable homes)

v. Inventory acute services and resources (e.g., health buildings, educational facilities, utilities, and endangered kinds).

vi. Inventory locations comprising hazardous and poisonous materials, source of vulnerability.

vii. Inventory primary response groups (e.g., elderly, people with handicaps).

viii. Manage hazard and risk assessments (vulnerability of community and natural resources to particular hazards).

ix. Organize hazard highlight maps in order to represent vulnerable zones and populations.

x. Monitor and regulate hazard and risk assessments (e.g., geographic information systems).

xi. Improve techniques and schedule for updating hazard and risk assessments.

xii. Transform hazard and risk assessments into recommendations for implementation (e.g., public awareness, mitigation, preparedness rescue programs).

Points one and two have been incorporated in the hazard identification and risk assessment phases of HRV analysis, respectively. Points three, four, and six have been incorporated in the vulnerability assessment phase. The first part of step five (completing an inventory of hazardous and poisonous materials) would be accomplished during the hazard identification phase, and the vulnerability to these hazards would have been incorporated as part of the over-all vulnerability assessment. Point eight compacts with the development of maps that would highlight

the areas of high vulnerability for each hazard being measured. The overlay maps may, in communities that are vulnerable to numerous hazards, prove to be ineffective, as the entire community may be blocked out. However, if there are only a few vulnerable areas and not many hazards to consider, then the overlay maps may be convenient in defining the areas of high vulnerability.

Monitor and regulate vulnerability and risks onto a geographic information system would offer the members in the risk management process with the capability to add on additional information. For example, if a GIS map of the municipal were lacking with concern to soil types, then, as soil studies were completed, they could be added to it. Although, this step is not serious about the overall risk management process. The final step of the risk management process transforming findings into recommendations for action corresponds with the critical goal of conducting an HRV process: to deliver knowledge to populations so they may able to predict disaster through execution of effective mitigation strategies.

2.4.5 Exploration of Disaster Management Process and HRV

Although experts concur that in disaster management process HRV analysis is essential for the disaster management process but the problem is to decide the right time and position where it should take place in the overall practice of disaster mitigation. Hoetmer (1991) responds that community should conduct an analysis of hazards and risks for how to manage a disaster and how to respond it, it's potential in the area and procure necessary plans for meeting the criteria of disaster management. Similarly, Hays (1991) declared HRV analysis is the essential slab towards the whole disaster management process and should not be considered the complete whole of the

process itself. Others such as (Maskrey, 1989; Godschalk 1991 and Scanlon 1991) present the conundrum of how significant is HRV analysis on its own. If we take Goshawk for instance; who provides us with theoretical data on how much significance does HRV possess.

2.4.6 The significance of HRV Analysis

HRV analysis has an ample amount of significance when dealing with disaster management strategies and further developing them to match the criteria of successfully evading the disaster. According to Fischoff (1978) hazards are based on occurrences of events and their aftermath and hence possible options are available (I) stop the occurrence of the event, (II) prevent the aftermath or collateral consequences that follow. (III) Reduce the damage that these aftermaths carry, a fourth option can be supplemented as to further advance the research for procuring damage reduction methods/precautions. It is however certain that lack of HRV analysis cannot produce adequate results in mitigating hazard risks. It is because without properly understanding the situation and the extent of hazards and risks that may arise, a working solution against natural disasters impact will be impossible.

It has been stated by Drabek, (1986) that mitigation is a purposive act designed towards the elimination of, minimize the probability of, or decreases the effects of potential disasters. However, Quarantelli (1986) distinguishes prevention activities as tools and techniques that are applied to prevent the disaster from occurring altogether while mitigation act as tools and techniques that are applied to reduce the impact of the damages occurs in result of natural disaster. It can also be summarized in a way

that mitigation as precaution and response altogether, that the reduction and quick response are the essential elements in the response to the disaster management.

2.4.7 Mitigation

In mid-1990 top experts of the United States on hazard assessment and response gathered for Review of Natural Hazards accomplished course around 1998 in the United States of America, USA (MILETI, 1999). In reference to this research, Mileti stated that the field of disaster management should be modified in order to centralize the efforts towards sustainable hazard mitigation. According to Mileti for successful mitigation of hazards six key points must be compulsory to execute at the same time.

i. Maintaining and enhancing environmental quality
ii. Maintaining and enhancing the quality of life
iii. Developing local resilience and responsibility
iv. Recognizing the volatility of the local economy
v. Ensuring inter and intra generational equity
vi. Adopting local consensus building

Mitigation can be understood by the volatility it was given by FEMA which initiated a project named Project Impact in 2000. it was a partnership between communities, businesses and government to establish and develop a risk-free or impervious to hazard communities. Ecological, community, financial and technical aspects are covered for evaluating and defining hazard risks and vulnerabilities, through a well-organized approach that follows sustainable hazard mitigation.

Mitigation defined is matched by theories of MaCrimmon and Wehrung (1986) regarding risk they state there are three components of risk the magnitude of loss, the possibility of loss and the experience of loss. To reduce riskiness it is necessary to reduce at least of these components. In view of Mileti's conclusions, an understanding can be hypothesized of the statements of MaCrimmon and Wehrung in a way that key objective of mitigation is to reduce the probability of loss or to eliminate the magnitude of loss also the transmission of loss. And in several cases it is not possible to exclude the possibility of occurrence of loss that is caused by natural phenomenon but it can be reduced or eliminated where hazards created by humans come in.

2.5 Hazard Identification

In the 1960s, the literature of disaster management discussed hazards without contemplating its' origins into the debate. This was changed in 1980, hazards as presumed to be caused by a natural occurrence or as a result of the effect of technology (Lindsay, 1993). More so, hazards are categorized into 4 main divisions as Natural hazards hazardous materials, hazardous wastes, hazardous substances and extremely hazardous (Parker, 1992). Parker (1992) also points out that, these classifications vary across countries and even within organizations of a country. Beginning in the 1960s, disaster management literature discussed hazards without considering their origin.

Hazards mentioned as most likely phenomena in the process of disaster management Here literature going to support my literature by using Han-is et al. (1978) definition, in which he declares, hazards are threats to humans and what they value: life, well-

being, material goods, and environment. Hanis (2006) indicate the need for judgment when determining whether or not a potential hazard exists. This converse Hewitt's (1983) concept in which hazard mentioned to the possibility of causing destruction and suffers community. Therefore, according to Hanis, it is not important for a hazardous event actually to take place; it is only important that it is likely to take place. This changed in the 1980s when hazards started to be categorized, as a manmade disaster or natural disaster (Lindsay, 1993). While natural hazards were defined as Acts of God, hazards as presumed to be caused by a natural occurrence or as a result of the effect of technology (Lindsay, 1993). More so, hazards are categorized into four main divisions as Natural hazards hazardous materials, hazardous wastes, hazardous substances and extremely hazardous observed by Parker (1992). However, the significance of these classifications varies across countries and even among agencies within the same country.

2.5.1 Hazard Classification

Above mentioned points justify this proposal in classifying hazards, where a number of experts have objected towards dispersion of the hazards occurs due to the effect of one hazard on other. According to Jovanovich (1988), natural hazards or man-induced hazards are related to one another, since according to him humans have influence over nature and can incur natural phenomenon, similarly, natural phenomenon has influence over the human environment. Although there might be many similar aspects and factors affecting both person-induced and natural occurred disasters, the strategic plans made for both will differ hence signifying the need for classification.

Generally, classifications of hazards are carried out by their cause, as Fishchoff (1978) observes natural disasters and technological disasters to differ from one another both as events and have consequences. Oliver and Britton (1991) differentiate natural and man-made hazards are that one is caused due to lack of control whereas the latter occurs by control lost. They declare three roots of Hazards: (1) Natural; (2) Technological faults (3) technology misuse, though there is lack of justice in planning this assumption, but on the other side it is beneficial for imitative strategies, however, absence justice in relation to planning, while it is significant for application of strategies to control man-made hazards technological hazard. An aircraft crash can be taken as an example, which can occur through numerous reasons from mechanical failure to poor maintenance to excessive load or even a bomb explosion. Hazard classification on its roots is not enough due to different sub-roots responsible that actually source of disaster.

Thus it is desired to distinguish among main disasters earthquakes or explosions due to the high emphasis on carcinogens and other elements similar. Hence more efficient approach towards classification would be to classify on the basis of general cause rather than specific origin, a proposing classification method in this study would be to classify as

i. Natural disaster
ii. Technological disaster and
iii. Person induced disaster.

2.6 Transformation of Natural Disaster into Technological Disaster

According to White (1979), natural hazards are identified as any extreme events in natural systems which have the potentiality of causing major perturbations in social systems. Drabek (1991) states about the three classifications given to disasters according to the probability of their hazardous nature: i) natural ii) technological and iii) civil. The term induced in person-inducing hazards is put in order to clarify that technical hazards are not created by people but are only induced by them through different methods that may include experimenting with dangerous chemicals or explosives or plane crashes, or by simply overlooking the need to construct a necessary structure that may withstand a natural disaster and at times even utilize the abundant resource some natural phenomenon constitute such as flood water.

In this technically advanced world almost 90% of the world population still lives in non-engineered structures that are not suitable for withstanding seismic impacts, hence strengthening such structures is a number one priority (Mallick et al, 2013). Most casualties when a natural hazard strike is on a non-engineered structure. These types of structures are designed by artisans who are not skilled engineers and lack the proper training to dictate a construction that can withstand seismically or any other natural born activity that may cause harm, these structures have little involvement of skilled architects and engineers.

2.6.1 Building's Seismic Performance

When non engineered buildings are evaluated they are not able to fulfill the criteria to withstand seismic activities. Buildings properly engineered have better

performance when compared due to better use of materials and greater engineering skills used in the construction of the structure (Poonsuph, 2006).

2.6.2 Hazard and its response to Emergency Response Plans

Emergency Response in case of a disaster strike is on a debate when the factors arise if one generic plan is enough for all hazards or should each specific hazard should be countered with a specific plan, some experts argue that one generic plan should suffice if there are similarities in two or more disasters. A plan that could be used on all hazards is said to be generic it is highly emphasized and according to Quarantelli (1991), there is ample amount of similarities in different disaster events than differences. Kreps (1991) also hypothesize that a generic plan is a better solution for hazards when preparing for a disaster rather than developing plans for each and every one of specific hazards, this is a key feature in the whole emergency response cycle. According to Quarantelli (1991) choosing a hazard-specific plan over a generic plan means that all hazards are considered to possess a larger difference rather than sufficient similarities to execute generic plans for them.

Quarantelli argues that disaster is socially centralized rather than physically, this would suggest that a disaster's very definition is based on the kind of impact that society would suffer from it and hence physical impact is disregarded. Further, It can be agreed that in any case of disaster evacuation is compulsory in order to secure human life for this warning systems is one of the priorities. To quote Quarantelli "What stimulates people to notice warnings, what kind of warning message is effective, what limits the acceptance of a warning, and so on, Is the same in all cases". As counter-argument to the notion of generic planning Showalter and Myers

(1992) listed differences and similarities between natural and technological disasters, with differences stretching to a number of 19 and similarities stretching to 14. Quarantelli counters this by saying that tactical evacuation and procedures may differ but strategies are consistent.

Table 3. 1
Lists of Differences between Natural and Technological Disasters

Natural Disasters	Technological Disasters
Are an expected aspect of the physical environment	Are created by human development and use of hazardous materials and are usually caused by human error
Are considered uncontrollable	Are considered controllable
Issues of control appear to produce more psychopathology in affected citizens	Issues of control appear to produce lower psychopathology than natural disasters
Humans are not held responsible	Responsibility is perceived as lying with a human or group of humans who calculate an event's predictability
Onset often allows warning/evacuation	Characteristically occur rapidly and without warning
Reluctance to evacuate until the threat is seen as extreme	A large portion of the population will evacuate without formal instructions to do so
Usually, have a clear beginning and end via obvious destruction	Although the onset may be clear (e.g., warning sirens signaling a release), its "end" may not
The event and its effect on people and the environment are generally visible	The event and its effects on people and the environment are generally invisible
Recovery is generally visible (e.g., removal of debris)	Recovery is generally invisible (i.e., removal of radiation cannot be seen)
Individuals can personally observe the effects of a natural disaster	Because the effects are often invisible, individuals are more dependent on authority figures and/or the media for facts
Private individuals, public agencies, and corporations become involved in the response	Corporations and governments respond while private citizens are relegated to roles as victims and/or must be separated from the event's aftermath to ensure their safety
Authority figures are seen as helpful	Authority figures are seen as evasive and unresponsive
Individuals tend to personalize an event	Individuals tend to depersonalize event
Mitigation focuses on human adjustment to potential events or to hazardous areas	Mitigation tends to focus on the technical process
Response/relief efforts more common than mitigation because of perceived lack of control over the event	Because of perceived control, mitigation is more common than response/relief
Familiarity develops due to experience	Familiarity is lacking due to lack of experience
Accumulated experience guides mitigation, management, and preparation decisions	Few accumulated experiences to guide mitigation, management, or preparation decisions
Following an event, community solidarity and consensus generally emerges	Following a technological event, a community may search for a "culprit," and conflict may emerge
No documented increases in naturally occurring hazardous events	A greater potential exists for hazardous technological events because: (1) a greater number of facilities use hazardous materials; (2) greater numbers and amounts of hazardous materials are in the marketplace; and (3) the population, along with its spatial distribution, has increased

Source: Showalter and Myers (1992)

Generic approaches are not accepted at times due to their functioning as cause specific to a disaster. The generic approach however according to Quarantelli does not intend to imply that significant differences are present in each disaster, but it is implied that disasters are not specific to types of hazards.

2.7 Vulnerability

It may be defined as the extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction, and proximity to hazardous terrains or a disaster prone area. It is further divided into two parts, physical and socioeconomic.

2.7.1 Physical Vulnerability

It is a generalization of whatever matter might get damaged by events such as earthquakes or tsunamis. It is centralized on physical attributes of people, property, or infrastructure that may be endangered by the occurrence of an event. This also focuses on the endurance of the building and the technical strategies/materials applied in construction to withstand the disaster.

Damage sustained is also due to inhabitance in an area where natural phenomenon that is catastrophic is high this exposes people to more risk hazards. Sometimes landslides and flooding may cause more damage when unstable slopes are involved when a flood or earthquake strikes a structure that may not be able to withstand it, the probability of failed structure to take down rest of the structure below it becomes a great factor (Pearce, L. D. R. 2000).

2.7.2 Vulnerability Assessment

Vulnerability should not be confused with Risk, which states the resources and deals with the abilities of a particular community to a specific hazard. There are many definitions available on a vulnerability in the context of a measure of risk although they had a high ratio of consensus. According to Godschalk (1991) demonstrate vulnerability is the exposure to injury or destruction from hazards. However, in reference to this definition According to this definition Godschalk, explains that structures and community are deleteriously at risk. More so, it is obvious that the destruction to the contents of built form both are at risk, public spots, sources of movements and built forms or archeological and heritage sites are at high priority to safety. So one can assume vulnerability as,

i. The exposure of harm to individuals and cause vulnerability due to the hazard.
ii. The expose to an individual's property and values at risk of Hazard.

Additionally, Buckle (1995) defines a main assessment of vulnerability as the more community exposure to a disaster it outcomes in an increase of loss. Therefore, It is necessary to specify risk due to disaster, so it's significant to highlight its harmful effects due to disaster. These losses can be categorized as public, administrative, political, ecological, or financial. As We are aware through the definition of disaster, losses and vulnerability occur as a result of disasters. We know that, by definition, disasters are capable of causing death and injury. It has also been known to us that residents and educational buildings may also collapse. Thus, the specific damages may be measured under consideration of community as social impacts, as they disturb the capability of human, groups, and communities to perform their functions

properly. As well, many types of disasters can affect air and water quality for very long periods of time (e.g., Chernobyl). Clearly, it is important to recognize how environmental impacts are compounded when a community is vulnerable to the effects of certain hazards. There is a financial loss, or negative monetary impact, when and where ever the buildings and structural failure occurs, or infrastructure or land property is damaged or collapsed. These losses result mainly in loss of resource generation. (e.g., power). The more vulnerable the community to these types of losses, the greater the economic impact of a disaster. For example, the economic impact of an earthquake in an area that primarily includes buildings made of unreinforced masonry (URM) will be significantly higher than it would be in an area where buildings have been seismically retrofitted. Some disaster managers include geophysical and geographical aspects under assessment of vulnerability procedure, while others are in the risk assessment process. For instance , Pickett and Block (1991) followed Terrence Haney work and discussed the development of a model on an earthquake hazard vulnerability that uses the data from five main areas: (l) topographical, (2) structural facilities (buildings and bridges), (3, demographic factors (4) geophysical, and (5)) transportation and utility infrastructure. In spite of that, it is argued that the consideration of geophysical and topographical factors must come under consideration in the process of risk assessment (Pearce et al, 1993). For example, an investigation that determines the presence of a fault-line increases the probability of an earthquake occurring is part of risk assessment; meanwhile, the vicinity of the community to the fault-line may increase or decrease the community vulnerability.

In relation to this point of view, Anderson (1992) suggested that planners of disaster management should provide special attention to the increasing vulnerability of municipal areas. The study makes a point about the significance of disaster in municipal areas connected to how topographical information has been measured. For instance, that information is supposed to be part of the risk assessment, then vicinity to a fault-line that would lead to method mitigation that could report the requirement to reduce the risk of zoning against construction near the fault-line, acquire existing properties and the other land. On the other side, if such information is supposed to be vulnerability assessment part, then the issue becomes the one minimizing the probability of suffering from an occurrence of the earthquake but what step should be taken in future to minimize the vulnerability by existing in an earthquake-resistant building, improving the infrastructure. It has been observed that the geographic and topographic information is best dealt with in the risk assessment phase of HR V analysis.

2.7.3 Summary

In this chapter several disaster-related evaluation methods and definations has been discussed which were used in this dissertation. It also developed a new definition of disaster a definition that takes into account the incapability of a community to respond to an incident so as to effectively protect its social, environmental, and financial resources as well as to reserve its political stability. It also identified disaster management as a circular process a process that integrates HRV analysis, , education and training, response and recovery planning, mitigation activities, and the application of a plan.

It has been declaring by Pierce, (2005) that HRV is a milestone to disaster management process a process whereby participants plan for and contract with likely and actual disasters. Natural and/or Technological disaster which recognized the requirement for hazard-specific planning rather than general planning. In continuation this chapter also discusses the definition of risk, identification of risk, also defined risk as the likelihood, based on existing data and technical knowledge, of a disaster occurring in a specific area. Furthermore, vulnerability is defined as the defencelessness of people, belongings, business, resources, environment, or historical buildings and products to the negative impression of a disaster and as a role of people, residence, rescue, preparedness, and time. Four potential impacts of a disaster were identified: social, economic, environmental, and political.

It concludes with a definition of risk management and a brief discussion of communities and regions. Utilizing the foregoing definitions the next chapter will proceed to address the methodology of research should conduct in order to tackle with problems and benefits associated with integrating hazard information into local decision-making processes. The following section on the qualitative research findings will interrogate the various activities, actions and processes to provide further substance to the above conclusions and critically examine the practice of disaster risk assessment.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of conducting this research is directed towards the development of a proposed disaster risk assessment model for local government in Pakistan. In pursuing this goal, the research methods adopted in the study range from literature reviews, exploratory studied experiential knowledge, administrating of questionnaires, and field surveys, to focus group discussions and interviews. The strength in qualitative research focuses on its approach of induction, its target on certain conditions or people and its emphasis on words rather than numeric representation.

Maxwell (1996) identifies that the qualitative research method has a lead over quantitative research method in that it inscribes of three main practical goals: (l) generating results and theories that are understandable and experientially credible; (2) conducting formative evaluations, ones that are intended to help improve existing practice rather than simply assess the value of the program or product being evaluated landler (3) engaging in collaborative or action research with practitioners or research participants. He claims that the conceptual context of the thesis is a theory and identifies that this theoretical context has three main sources, (l) experiential knowledge, (II) extant theory and research, and (III) exploratory studies.

3.2 Research Methodology

The strength in qualitative research focuses on its approach of induction, its target on certain conditions or people and its emphasis on words rather than numeric representation. There are two main reasons why qualitative research is better suited to the study of HRV analysis than quantitative research.

Firstly, the qualitative research method, in comparison with quantitative research method, is as concerned with the subjectivity of people as it is with the objectivity of statistics. And, definitely, application of sustainable mitigation policies has additional to do with individuals more than it does with formulae and numeric values. Numerous approaches to HRV analysis have been accessible to disaster managers and community planners, and however, as research shows, availability has not translated into implementation. Understanding the context in which inhabitants, administrators, and politicians impact how and when HRV analysis are executed are serious to the improvement of an effective approach to HRV analysis.

Secondly, the qualitative research, in comparison with quantitative research, rely more on method as it does on outcomes. Implementation of an effective HRV analysis contains a number of individuals from a number of disciplines (e.g., disaster management and community planning); therefore, in order to come up with an effective analysis, these individuals are required to be get involved in the improvement of that analysis. In other words, we can assume that they must be involved in the process. Given the significance of practice, the procedure of conducting my investigative studies is as critical to the final outcome of my research as is anything etc. Maxwell (1996) identifies that the qualitative research method has

a lead over quantitative research method in that it inscribes of three main practical goals:

1) Generating results and theories that are understandable and experientially credible.
2) Conducting formative evaluations, ones that are intended to help improve existing practice rather than simply assess the value of the program or product being evaluated landler.
3) Engaging in collaborative or action research with practitioners or research participants. He claims that the conceptual context of the thesis is a theory and identifies that this theoretical context has three main sources: (A) experiential knowledge, (B) extant theory and research, and (C) exploratory studies.

According to the philosopher Hilary Putnam that there cannot be such a thing as a God's eye view, an observation that proposed the one true objective description. Definitely, according to Maxwell, any view is a view from some perspective, and therefore, incorporates the stance of the observer. It has been observed that there is a high desire to contribute to this research is founded on both professional knowledge and personal experience (Maxwell, 1996).

In the 2005 earthquake, Pakistan’s disaster management was occurring in isolation. It was not part of the communities it was considered to protect. Disaster managers believed that people would panic if they knew the likely for disasters and, therefore, would be incapable to plan reasonably for them. Disaster managers, mostly had armed forces experiences and were involved in as second employment, be seated in

their workplaces and developed disaster management strategies sometimes without even accessing key response activists (e.g. emergency planners, rescue, fire-fighters, ambulance staff, and police). Disaster plans were rarely deliver, rarely implicit, and occasionally up-to-date. They were realized as an essential tool, but they stayed a plan without a process.

The desire to balance analysis of HRV has been properly discussed on the literature of disaster management. However, it is not clearly understood how perfectly one could go to do the completion. Communities are still persistent to develop policies without building resilience to, or struggling to mitigate, expected disasters. The least and vulnerable were still the ones who, while they had little to lose, stood the extreme risk of losing all they owned.

Agreed the financial climate and the many challenging benefits for resources, It was believed that, till those who are maximum at risk are capable to affect how politicians assign community resources for disaster management, there will be no modifications whatever in distribution. Of course, to some extent, every person is at risk from some hazard; therefore, the application of an actual model for HR V analysis (which, by observation can be defined under the definition as is one that indicates to the acceptance of reasonable mitigate strategies) will advantage the whole community. The fewer vulnerable the community in intervals of disaster, the improved and stronger the community in intervals of stability. The optimization and access to an application of an adequate HRV analysis will improve the safety of the communities in such events.

The concerns of an inadequate HRV analysis are several and critical. The significance of HRV analysis is well discussed in the literature, and different methods are available. The first research question is; how can assistance be given to the community-based hazard and vulnerability assessment? Once basic definitions of hazard, risk, and vulnerability have been recognized, HRV research comprises two fundamental steps: (I) conduct a thorough literature review, and (II) recognize existing difficulties to the implementation and exploitation of HRV analysis. The literature review investigates the outcomes of several disciplines and offerings a serious analysis of current obstacles to the application of HRV analysis. From this analysis, a list of aspects is developed as a guideline for any suitable HRV analysis approach. The assessment of the appropriateness of such list of aspect is needed. The necessity for a complete framework within which to situate HRV analysis is hindered by the split nature of the literature on risk. In order to certify completeness, a detailed framework, adjusted and incorporated through existing literature review. This integration supports to develop the fourteen main objectives of an adequate HRV analysis.

The second research question is focuses on how to minimize the effects of vulnerability caused due to natural disasters? It has been answered by completing an extensive literature review in order to recognize and evaluate extant models to HRV analysis. None of them encounters all of the objectives; many meet very few of them. In the third research question, the exploratory review of three disaster risk assessment models has been analyzed which would be further helpful for the development of a model for disaster risk assessment in Pakistan.

The Forth and the final research question deals with the community-based disaster risk management and its benefits? In response to this, a HRV Hazard, Risk, and Vulnerability model was developed ensured by completing an inclusive literature review in Order to define how to implement the objectives in question. It was addressed and examined; if one important objective is confirming that the HRV process integrates public participation, then how should the latter be used and to what extent? Additionally to this, exploratory studies learning much together from the practice of doing so and from the outcomes was done.

3.3 Experiential Knowledge

According to the philosopher Hilary Putnam that there cannot be such a thing as a God's eye view an observation that proposed the one true objective description (Maxwell 1996). Definitely, according to Maxwell, any view is a view from some perspective, and therefore, incorporates the stance of the observer. It has been observed that there is a high desire to contribute this research is founded on both professional knowledge and personal experience. The following reasons supports the subjectivity that has outlined the research into HRV analysis.

Evaluation of deep historical analysis of disaster management, it has been observed that in the earthquake of 2005, in Pakistan, disaster management was occurring in isolation. It was not intended to safeguard communities. Disaster managers believed that people would panic if they knew the likely for disasters and, therefore, would be incapable to plan reasonably for them. Disaster managers mostly had armed forces experiences and were involved in as second employment, be seated in their workplaces and developed disaster management strategies sometimes without even

accessing key response activists (e.g., emergency planners, rescue, firefighters, ambulance staff and police). Disaster plans rarely delivered, rarely implicit, and occasionally up-to-date. They were realized as an essential tool, but they stayed a plan without a process.

In an attempt to provide a solution to planning problem in isolation, my Bachelor of Architecture thesis, titled, "Envisioning Disaster Mitigation aspects," was completed in the year 2006. It advocated a designed based designed disaster recovery and rehabilitation management process. Synthesizing both community planning and resource generation for broken families to share their resources in community premises, It has also been recommended that planning a design based community complex approach to achieve on the following tents' proposed a modular approach of earthquake resistant building techniques in the form of educational buildings, vocational training centers orphanage housing schemes and health facilities serves under community umbrella tried to focus through that approach to make authorities realized that citizens need to be educated regarding hazards and risks; citizens need to be sold on the need for disaster management; citizens need to participate in planning, training, response, and recovery activities; and citizens need to be given responsibility for self-preparedness. Today, with many communities greatly committed to gated communities preparedness activities, and sharing their resources in the form of growth of sustainable disaster management.

The desire to balance analysis of HRV has been properly discussed on literature of disaster management. However, it is not clearly understood how perfectly one could go to do the completion. Communities still persistent to develop policies without

building resilience to, or struggling to mitigate, expected disasters. The least and vulnerable were still the ones who, while they had little to lose, stood the extreme risk of losing all they owned.

Agreed the financial climate and the many challenging benefits for resources, It was believed that, till those who are maximum at risk are capable to affect how politicians assign community resources for disaster management, there will be no modifications whatever in distribution. Of course, to some extent, every person is at risk from some hazard; therefore, the application of an actual model for HRV analysis (which, by observation can be defined under the definition as is one that indicates to the acceptance of reasonable mitigate strategies) will advantage the whole community. The fewer vulnerable the community is in intervals of disaster, the improved and stronger the community in intervals of stability. It indicates that access to an application of an adequate HRV analysis will be followed to improved and safer communities for all.

3.4 Extant Theory and Research

As it has been stated in chapter one, the concerns of an inadequate HRV analysis are several and critical. The significance of HRV analysis is well discussed in the literature, and different methods are available.

The first proposed question is; How can we assist the community-based hazard and vulnerability assessment by using HRV analysis and how to minimize the effects of vulnerability caused due to natural disasters? Once basic definitions of hazard, risk, and vulnerability have been recognized, HRV research comprises two fundamental

steps: (1) conduct a thorough literature review; and (II) recognize existing difficulties to the implementation and exploitation of HRV analysis. The literature review of this research investigates into the outcomes of several disciplines and offerings a serious analysis of current obstacles to the application of HRV analysis. This analysis developed a list of aspects suitable for approaching any HRV analysis. But, how do we identify that either this list is complete and appropriate? The necessity for an complete framework within which to situate HRV analysis is hindered by the split nature of the literature on risk. In order to certify completeness a detailed framework is examined, adjusted, and incorporated it with observations examined in literature review. This integration supports to propose the appropriate model for Disaster Risk reduction based on HRV analysis.

The second research question is; What is the community-based disaster risk management and what are its benefits? In this regard extensive literature review in order to define vulnerability its assessment and how to minimize its effects, It has also been examining and addresses such questions as: if one important objective is confirming that the HRV process integrates public participation, then how should the latter be used and to what extend? Additionally to this, Exploratory studies also conduct studies, which results learning much together from the practice of doing so and from the outcomes.

The third research question is; What are the measures should be taken for disaster risk reduction to assist for local government level entail?In response to this, A Dabrek's HRV model used for analysis of Hazard, Risk and Vulnerability analysis. It

ensures this by completing an inclusive literature review in Order to define how to implement the objectives in question.

The fourth and last research question is; What are the set of recommendations based on which a model will be developed or propose for disaster management in Pakistan?

3.5 Research Framework

This part will provide the conceptual framework based on the literature review. As it has been observed that disasters are not alone its combination of Hazards Risk and Vulnerability. To analyze these factors an equation of Risk i.e.(Risk =hazards + vulnerability) supports that if there will be more hazards and vulnerability the there will be more probability of an increase in Risk. The United Nations International Strategy for Disaster Reduction (ISDR, 2002) report, which spurred world wide evaluation for disaster risk reduction initiatives. In view of this, it's considered a prime responsibility to analyze Disaster Risk Reduction and a model should work based on strategies to reduce Disaster Risk Reduction to achieved disaster risk reduction. It explains the key factors, variables, and the relationship among the models which leads toward the conclusion. Before going for adopting or Proposing a suitable model for Disaster Risk Reduction according to local Government compatibility and in the context of Pakistan it is essential to analyze some models for achieving desired results.

Research Framework

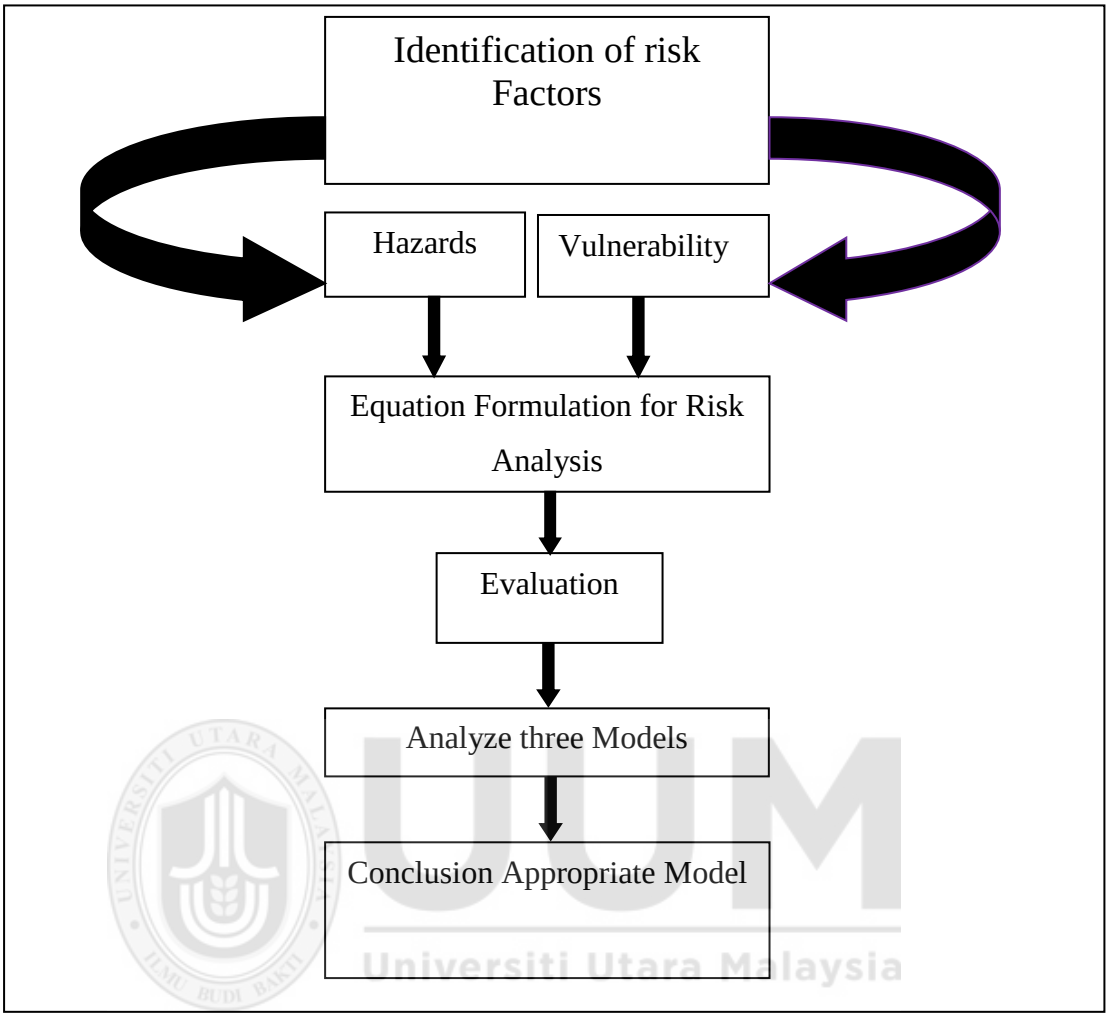


Figure 3. 1: Research Design

In view of above, a conceptual framework has been designed that supports my Research The main objective of this endeavor was to fortify the practice of Disaster Risk Reduction and spread awareness.

3.6 Research Design

Research design defines as the plan and structure of the research with the objective is to obtain an answer for the research question that is of interest of the study (Cooper & Schindler, 2008).

3.6.1 Methodology in Research Design

The methodology is a research strategy that determines *what* is to be studied and *how* it is done. What is to be studied is basically determined by the nature of the research questions that address the specific problem under investigation. How it is done is determined by the techniques used to elicit the information that will give conclusive answers to the research questions. The general procedures or stage of inquiry and techniques are generally carried out through two common approaches, namely, *quantitative* and *qualitative* (Creswell, 2003). In the following sections, each approach is examined in terms of its philosophical underpinnings to a research strategy.

3.6.2 Quantitative Approach

The quantitative methodology relies exclusively on numerical data. It uses a variety of statistical techniques that allow the exploration of relationships between variables (Gilbert, 2011). This method tends to be associated with '*objectivity*' and is independent of the researcher's involvement (Denscombe, 2007) once the data has been collected. The philosophical approach of this method lies in *positivism*, which means that it embraces the notion that '*social reality is out there*' and that the best approach to prove it is through data collection and hypothesis testing (Creswell, 2003; Davies, 2007).

The quantitative approach is helpful in studying statistically the characteristics of the people and in analyzing spatial issues, providing information on '*who*' and '*where*' are the people at risk, but the approach does not specifically address their concern. The approach makes possible the analysis of large data sets and gives the correlation between various parameters. It also provides the exploratory tools for making

inferences, but it does not explicitly explain the *'why'* or specify the cause and effect. Neumann (2006) found that the objectivity of the quantitative approach is often not convenient for exploring the complexities of the social world. Quantitative surveys are undertaken on a large scale to generate statistical data, but they do not help to understand people's emotions and behavior. A qualitative approach is therefore preferable when people's perceptions are the focus of the study (William, 2006).

3.6.3 Qualitative Approach

In contrast to the quantitative, the qualitative approach to research relies more on language and description and the interpretation of the meaning of the findings. Davies (2007) considered that people explain and shape the world in the light of their own experiences, attitudes, and beliefs. This phenomenological approach takes into account the perspectives and lived experiences of an individual in an everyday world. Data collection for qualitative analysis tends to involve close social contact. It is a non-linear and iterative research path that enables the researcher to create and develop new theories (Neuman, 2006). Considering this fact this research also tends to use the qualitative methodology and suggest the appropriate model for the disaster analysis. A qualitative methodology would thus enable the researcher to gain insight into the social world and to study its complexities and subtleties through the use of different tools such as questionnaires, interviews, notes, photographs and audio/video recordings, case studies, focus group interviews, and other participatory activities.

3.7 Data Collection

Data collection is a phase that usually comes after the problem definition and setting of the objectives. Data collection is one of the most important stages in advanced manufacturing analyses, such as studies using modeling, simulation and optimization. If adequate input data is not available when needed, the project will be delayed and the quality of the results will suffer.

When more than one tool is used, it is possible to have a number of input data that can be common in other words; many of the input data for one tool can also be used for the other used tool. Therefore it is important that data collection should be planned and structured in a way that decreases project time. Data collection is a time-consuming process and most simulation practitioners argue that the collection and analysis of input data takes an extremely long time, typically more than a third of the project time (Liyanage and Perera, 1998a). There are a number of factors which can result in longer data collection time, for example, inaccurate problem formulation, lack of clear definition of project objectives, high complexity of the system, high level of model detail and poor data availability (Liyanage and Perera, 1998b). It is therefore important that data gathering should be planned; goal oriented and focused on information that will help to achieve the common objectives of the study (Harrington and Tumay, 2000). The amount of data that needs to be collected is highly dependent upon the project objectives and credibility concerns.

Primary and secondary data are the two types' falls within the scope of statistics and can be used as a part of the research method. Primary data can be defined as the information collected from sources like interviews, survey or questionnaires with a

particular intention on a specific subject by the researcher himself. Unlike collected primary data, data gathered from references who addressed another research question are known as secondary data. Secondary data has the advantage over primary data that it requires less time and capital to obtain. Already available data can be analyzed immediately. Hence, it is very convenient to include accessible and appropriate data and use it for new purposes. Moreover, reanalyzed secondary data can contribute to new perspectives and a broader understanding of the subject. (Blumberg, B., et. al. 2011)

Historic secondary data is the primary source of data for this study. There are a number of reasons for using this approach as it reflects the positives of other studies within the disaster risk management as stated in the literature review. There are three key reasons: • Accuracy • Use of real-life data • A large pool of data Historic recorded data from historical disaster incidents. For this research, secondary data is obtained from public documents, government official websites, brochures, newspaper, and reports etc.

3.8 Data Analysis

A combination of the exploratory literature review and comparative analysis method will be applied in chapter four allowing for a thorough assessment and comparison of the three identified disaster risk assessment models. These models were selected on the basis of their relevance and emphasis to the bottom-up, vulnerability and community-driven perspectives to disaster risk assessment, an approach recommended for local government practice.

3.9 Summary

In this Chapter comparison between qualitative researches method has been discussed along with the quantitative research method. The design framework of research also being presented and the design process has been defined. The method of data collection by using case studies and models analysis has been discussed, more so the detailed analysis of models will be discussed in following chapter 4.

CHAPTER FOUR

ANALYSIS OF DISASTER RISK REDUCTION

4.1 Introduction

As disasters continue to strike and increase in magnitude, complexity, frequency and economic impact, the varied debates around the issue of hazards and vulnerability are strengthened. The natural phenomena which cause disasters are in most cases beyond human control, however, vulnerability is generally a result of human activity, aggravating the risk factors within their environment. Therefore, it is important for society to recognize and improve traditional methods and examine new ways to live with risk and take the necessary actions to prevent and reduce the effects of such disasters. The overarching aim of disaster risk reduction activities is to reduce risk in the ever-escalating number of fatalities and economic losses in countries and communities. To achieve this, it is necessary to have a clear understanding of the evolving nature of disaster risk and its implications for mitigation and prevention strategies are developed through the process of disaster risk assessment.

In view of the above, this chapter aims to provide impetus to the focus on disaster risk reduction and its inherent link to disaster risk assessment. This chapter will commence with a detailed interpretation and analysis of disasters in order to comprehend the complex events associated with disasters. A thorough knowledge of the various dynamics of disasters is fundamental in order to grasp the enduring debate around the hazard, vulnerability, and risk.

Having highlighted the distinction between hazard and disaster, especially within the systems concept of environment and disaster, the discussion follows through attempting to unravel the concept of disaster risk reduction. A broad picture of disaster risk reduction is presented before tracing the need for the paradigm shift from disaster management to that of disaster risk reduction.

A review of the key global strategies on risk reduction, that is, Yokohama Strategy and Plan of Action for a Safer World and the Hyogo Framework for Action heightens the seriousness, commitment, and priority that are attached to promoting disaster risk reduction. This is encapsulated in the Disaster Risk Reduction Model, as an international initiative, providing a generic framework on the crucial elements of risk reduction. A review of the key principles and characteristics of this model paves the path for further deliberations on the objectives and cornerstones of risk reduction. The objectives of risk reduction are explored with special attention to Wisner's seven objectives that draw on and link to the critical principles and actions of the global risk reduction strategies. To finally concretize the basis for successful risk reduction, salient guiding principles are examined. This includes stakeholder participation, public policy actions and development of a culture of prevention to risk assessment. The focal point of interest around risk assessment is the internationally acclaimed notion that disaster risk assessment is the first and most essential step towards the process of disaster risk reduction, alluding to the link between disaster risk assessment and disaster risk reduction.

4.2 Integrating Hazard Information into Local Decision-making Processes

There are a number of difficulties involved in integrating information about hazards into the local decision- making processes, and an adequate framework for estimating the accomplishment of disaster management and HRV analysis must be capable to address them. Using the definitions and background provided in the previous chapter five obstacles to the integration of HRV analysis and decision making are examined: (1) historical factors, (2) technological factors, (3)social factors (including how individuals perceive and estimate risk), (4) organizational factors, and (5) political factors. Chapter three concludes with the identification of an adequate framework within which to situate HRV analysis.

4.2.1 Historical Factors

What follows is a brief historical overview of how the field of disaster management has developed in North America. It shows how the development of disaster management and community planning has led to lack of public understanding and participation. And it has also been found that this deficiency has contributed to a lack of integrated planning at the local level, and an approach towards a retrospective analysis of the importance of public participation in disaster management has been proposed.

4.2.2 Historical Overview

Historically, disaster management planning has been observed from a para-military perception (Scanlon 1982); that is, planning has been developed for, not with, the public (Laughy, 1991). Initially, Disaster management planning invented during the Cold War, when planning for atomic-powered war and the manufacturing of bomb

shelters was encouraged. Once the danger of nuclear-powered war subsided, concern rotated towards challenging response to natural disasters. Drabek, (1991) coincides with this and improves that disaster management in the United States is based on civil defense and natural disaster reactions as well as on social science research. According to Petak (1985), public administration, as a discipline, has generally neglected to consider emergency management within the mainstream of its activities, additionally, Aquirre, (1994) says that it is very seldom that local governments attempt to educate the public to the hazards that threaten them. This is regardless of the fact that surveys specify that the community would welcome such struggles (Drabek 1986). So, in the history, communities have habitually been missing out of the disaster management planning process overall.

However, there may be a connection between the extent to which people admit disaster management planning and the extent to which they experience disasters: the more the exposure to disasters, the greater the concern in disaster management (Drabek 1986). However, if one were to entitle those regions with the resilient community-based disaster management strategies, it would absolutely be those with full-time emergency planners. And, as Kreps (1991) found, the larger the community, the more expected it is to have a full-time emergency coordinator. Moreover, he suggests that whether or not a municipality has an operative emergency management department depends, to an enormous extent, on the authority given to it by local government officials. He determines that, at present, there is no effort, either in Canada or the United States, that shows a complete understanding of local government disaster management policies and their effectiveness. Rubin (1991) states that, just as community participants were becoming increasingly discouraged

with being eliminated from the decision-making practices involved in community planning, so they were becoming increasingly discouraged with being eliminated from those involved in disaster planning. Fortunately, communal participation is increasingly becoming an acknowledged part of the disaster management process. The Australia New Zealand Risk Management Standard (1995) declares that "risk management is a framework for the systematic application of management policies, procedures, and practices to the tasks of identifying, analyzing, is required, it is actually the local-level bottom-up strategy that provides the motivation for the implementation of mitigation policies and an effective disaster management process. Salter evaluating, treating and monitoring risk. It is accepted that while a top-to-bottom down strategy (cited in Disaster Preparedness Resources Centre 1998) reviews the shift in disaster management as follows:

4.2.3 Shift In Disaster Management

From	To
Hazards	Vulnerability
Reactive	Proactive
Single Agency	Partnerships
Science Driven	Multi-disciplinary Approach
Response Management	Risk Management
Planning for Communities	Planning with Communities
Communicating to communities	Communicating with Communities

Source: Disaster Preparedness Resources Centre (1998)

It is a fact that the HRV practice is not fully incorporated throughout the disaster management process at the public and local levels and it may be due to the reason that its significance is not defined it/or may be due to that the tasks involved in finalizing an HRV analysis have not been effectively defined. Mileti (1999) emphases attention on several mitigation tools. He resists that (I) Impact assessments and hazard identification are important to developing widespread land-use policies,

and (2) that hazard-specific understanding is critical to being capable to predict, estimate, and warn people of likely hazards. Deyle et al. (1998) given a stronger statement: The first step in appreciating the potential utility of hazard assessment is to understand how it is conducted and how it has been used and can be applied to land use planning and management.

Further, they go on to declare that hazard identification, risk analysis, and vulnerability assessment are individually important to understanding the full perspective of the disaster management process.

Godschalk et al. (1998) are very strong about the necessity to complete HRV analysis prior to the attempt to incorporate sustainable hazard mitigation and land-use planning. They trust that, although public governments and organizations had an important role to take part in developing mitigation guidelines, it's a job of the municipality to introduce and implement those strategies that will proceed to the implementation of mitigation policies. And they realize land-use planning as central to this process. So, specify the links between HRV analysis and land-use planning, what the correlation between disaster management planning practices and community and local district planning?

Integration of Community Development and Disaster Management Planning.

Though embedded in very diverse ideologies, although community planning and disaster management planning share some common features: both have been accompanied in isolation from the community; both are concerned with the physical community (e.g., buildings, infrastructure, etc.) as well as the social community; both

are based in local government; and both take an analytical approach to planning. The contrast in that community planning has a long educational heritage and is enriched in theory and design, is long scope, is widespread, and has often been criticized for being excessively optimistic (Hodge 1991).

Disaster management, on the other side, has only appeared since the mid- the 1950s. Also, disaster management has frequently been perceived as a second occupation for retired police officers and members of the armed forces, and it is only actual recently that academic institutions have initiated to offer degrees in it. Disaster management has inclined to be associated with the short-term circumstances (e.g., reconstruction damaged homes in floodplains), to have a narrow attention, and to be suspicious Both community development and disaster management can make significant influences on community welfare, thus it is relatively surprising that the two disciplines have not interconnected with one another and tried to organize their efforts. According to Myers (1997). Individuals who effort to manage natural hazards must repackage themselves and what they identify from the local community's perspective, across modifications and across risks, but in a situation of non-hazards community goals. Our research is useful to realizing us that local stakeholders' capability to manage their own environment, resources, and hazards must be improved and that it is the inhabitants who must decide what they are prepared to lose in future disasters.

4.3 Contextualizing

Maskrey (1989) clarifies that natural hazard and natural disaster are two different terms which are used interchangeably but which are frequently confused. For instance, earthquakes, floods, and cyclones are regarded as synonymous with disaster, but although these hazards can be highly destructive, they do not necessarily cause disaster. The hazards themselves are not disasters but rather a factor in causing a disaster. Two other factors are essential *(VIZ)* the events effect on people and their environment and human activities that increase its impact. There is, therefore, a high risk of disaster when hazards occur in a vulnerable situation. Smith (2001) aptly defines a disaster as 'the realization of hazard'. Events such as earthquakes, tsunamis, hurricanes, floods, and landslides have been considered as direct synonyms for disaster. This interpretation had enforced the belief that there was nothing to be done when faced with disasters since they were natural phenomena and were unavoidable (Burton *et a/.* 1993; Smith, 2001; Bank off, *et al. 2004).*

On the other hand Wisner, *et* al (2004), Blaikie, *et al.* (1994), Varley, (1994) and Maskrey (1989); profoundly project that disasters are a result of the interaction of social-economic and political structures and processes and the physical environment. Simply stated, there is no risk if there are hazards but vulnerability is nil, or if there is a vulnerable population but no hazard event. Natural hazards constitute a complex web of physical and environmental factors interacting with social, economic and political realities of society (Tobin & Montz, 1997).

Hence, the crucial point about understanding why disasters occur is that it is not only natural events that cause them. They are also the product of the political and

economic environment and the way it structures the lives of different groups of society (Blaikie, *et al.* 1994*).*

Many aspects of the social environment are easily recognized. For example, people live in adverse economic situations that lead them to inhabit parts of the physical environment that are easily affected by natural hazards; for instance, this may be flood plains of rivers or earthquake zones. There are many other less obvious political and economic factors that underlie the impact of hazards. These involve the manner in which assets and income are distributed among different social groups and various forms of discrimination that occur in the allocation of welfare. Disasters highlight these inherent weaknesses in a society and often force a reappraisal of goals. Generally, the poorer sectors of society are affected to a far greater extent than the middle and upper-class families (Wisner *et al.* 2004; Blaikie, *et al.* 1994).

In order to comprehend the magnitude of the potential for disaster, it is first necessary to understand the nature of a disaster and to place it in a geographic context. Cuny (1983) emphasizes a focal point, that is, a disaster should be defined on the basis of its human consequences and not only on the phenomenon that caused it. Simply stated, natural phenomena such as earthquakes, hurricanes, and excessive rains occur worldwide, but their potential for widespread disaster is more a function of the ability of communities to cope in terms of their physical structures and social and economic systems (Cuny, 1983).

The increase in disaster potential is one result of the cycle of poverty which is common in developing countries. Alexander (1993) pointed out that the roots of

poverty which are also the predominant roots of vulnerability are increased marginalization of the population caused by the high birthrate and the lack of resources to meet the basic human needs. Incidentally, natural hazards and human progress are rooted in the same ongoing processes of global change (Smith, 2001). As the population grows and owns more material possessions, and as the built environment expands to accommodate such changes, greater numbers of people and property are put at risk. These social and demographic trends also impose heavy burdens on precious natural assets such as land and water.

Many people in the poorest countries now, therefore, have a fragile dependence on a degraded resource base which becomes progressively less able to withstand pressures from environmental forces. In the words of Smith (2001) and Varley (1994), this leads to an event, concentrated in time and space in which a community experiences severe danger and disruption of its essential functions accompanied by a widespread human, material and environmental losses which often exceed the ability of the community to cope without external assistance.

Various scholars such as Blaikie, *et al.,* (1999) and Wisner, *et al*.(2004) to mention but a few, have stated that disasters are complex events as many factors often interact in unexpected ways giving rise to problems that were not accounted for in disaster plans. Complexity is not just a question of quantities. In terms of the number of people and artifacts at stake it also derives from qualitative aspects like social and economic factors as we have from the relations that develop historically between settled populations and their environment. Besides physical parameters like building structures, material, age of construction of houses and infrastructure, indicators are

equally important as they are related to how this environment is used, how resources are accessed and rules regulating the function of services (Tobin & Montz, 1997; Alexander,1993; Burton, *et al.* 1993). In other words, "soft" parameters are just as important, in order to grasp the complexity of different environments and society.

Moreover, recognizing poverty (in the discussion by Cuny, 1983; Alexander, 1993; Smith, 2001 and Wisner, *et* al., 2004) as the primary root of vulnerability and disaster in developing countries is the first step toward "developing an understanding of the need for change in current disaster management and response practices. In effect, if the magnitude of disasters is an outgrowth of underdevelopment and poverty, one cannot expect to reduce the impact by providing food, blankets, tents and traditional forms of assistance. So, although floods or earthquakes are natural processes, the disasters associated with them are not. To understand disasters, it is necessary to focus on social processes, that is, human vulnerability rather than just natural hazards (as already justified in Chapter two of the thesis). After all, a better understanding of this concept would lead to more appropriate and successful strategies for effective disaster risk reduction.

In summary, Bhatt (2002) proclaims that a disaster takes place when a community is affected by a hazard, usually defined as an event that overwhelms that community's capacity to cope. In other words, the impact of the disaster is determined by the extent of a community's vulnerability to the hazard. This vulnerability is not natural. It is the human dimension of the disasters, the result of the whole range of economic, social, cultural, institutional, political and psychological factors that shape people's lives and create the environment that they live in (as illustrated in Figure below).

What becomes evidently clear is that disasters are conditioned by human activities. Hazards may be natural in origin, but it is the way in which societies have developed that cause hazards to become disasters.

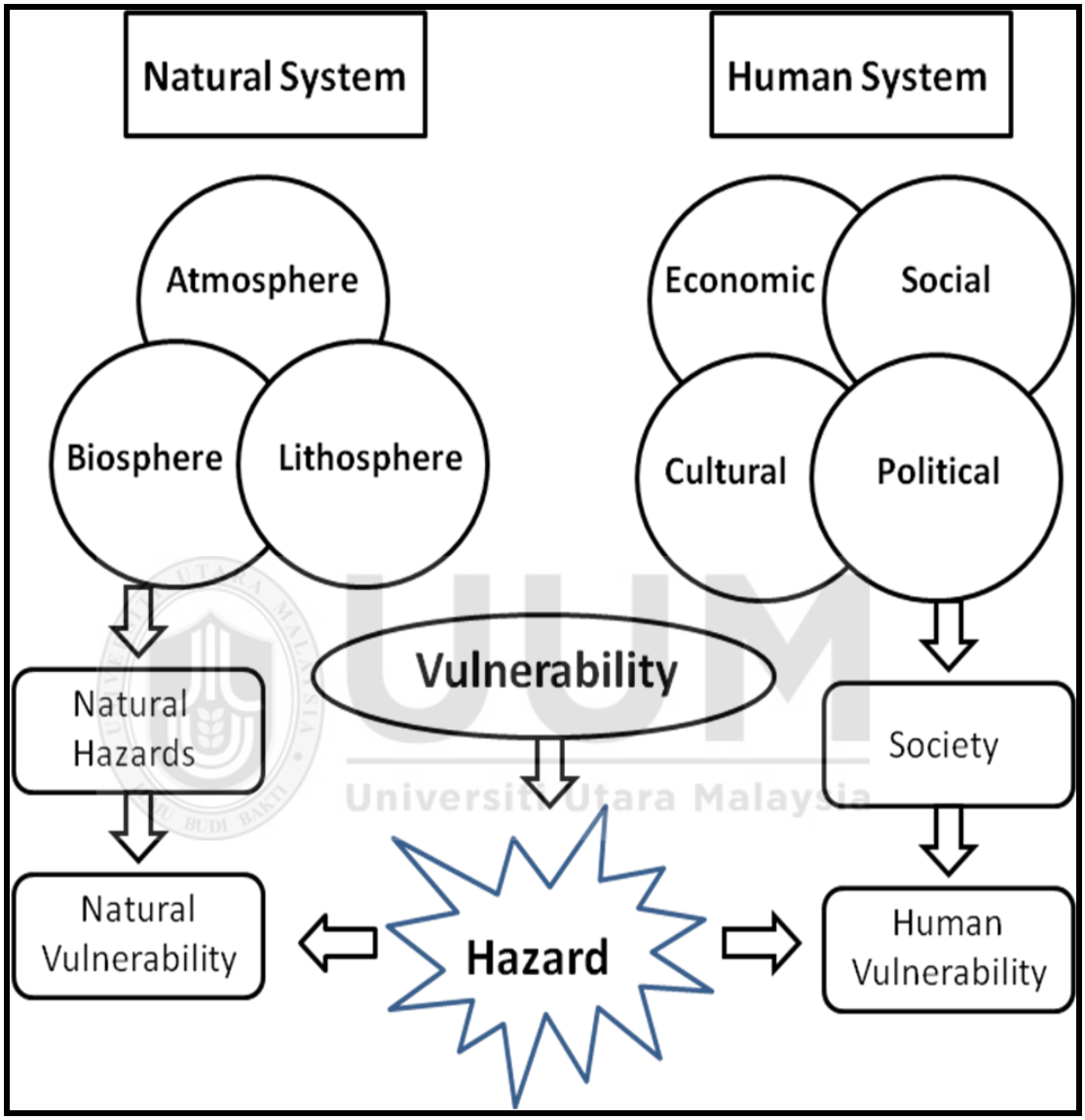


Figure 4. 1: Systems Concept of Environment and Disaster
Source: Alcantara-Ayala, (2002).

As illustrated above, hazards become disasters only when they converge with a vulnerable population and cause significant loss of life and damage to property and exceed their ability/resources to cope. As Kofi Annan (former UN Secretary General) puts it, hazards only become disasters when people's lives and livelihoods are swept away (Annan, 2003). If the ultimate aim is to develop a disaster resilient

society, the starting point in the process of risk reduction should be to shift the focus away from quantifying natural hazards and move towards identifying, assessing and ranking the various risks and vulnerabilities (Bogardi & Birkmann, 2004:75-82). Justifying the importance and relevance of disaster risk assessment and disaster risk reduction.

4.4 The Emergence of the Concept of Disaster Risk Reduction

The relationship between human actions, environmental stewardship, climate change and disaster risks are becoming increasingly crucial reminders that improved management of natural hazards and the reduction of disaster risks must be given the highest priority. In light of this, disaster risk reduction has grown in importance on the international agenda. The natural hazards of 2004 and 2005, that is: the impacts of the Indian Ocean tsunami; earthquakes in Pakistan and Indonesia; heat waves and fires in Europe; hurricane Katrina in New Orleans and Hurricane Stan in Central America, prompted calls for improved disaster prevention and preparedness systems. An important factor in reducing risk before such incidents arise and these efforts are usually referred to as disaster risk reduction.

As the above examples show that while one may not be able to prevent earthquakes, tsunamis, and storms from occurring, there are many ways of mitigating their impact through effective disaster risk reduction practice. The literature of International Strategy for Disaster Reduction (ISDR), 2007; Department for International Development (DFID), 2004 and United Nations Development Program (UNDP), 2004; describe disaster risk reduction as a framework where practitioners and community members work together to explore factors of risk, to implement systems,

policies, practices, and to change living conditions to avoid or limit the destructive impacts of a hazard.

Effective disaster risk reduction roots itself in careful risk identification and analysis before implementing prevention or mitigation actions (Holloway, 2003:34). In essence, disaster risk reduction can be clarified as the systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout societies to avoid (prevent) or limit (mitigate and be prepared for) the adverse impacts of hazards (ISDR, 2007a; DFID, 2004 and UNDP, 2004).

4.5 The Shift in Focus Towards Disaster Risk Reduction

In the late 1990s, increasing disaster losses worldwide highlighted the need to move beyond "managing disaster events" and to better address the risk processes that drive them in the first instance. More importantly, according to UNDP (2004) where many of these risks are compounded, impacts of disasters are often exacerbated. Simply stated, risks accumulate before being released in a disaster. Everyday hazards and vulnerability form patterns of accumulating risk that can culminate in disaster triggered by an extreme hazard event. This explains the increasing use of the expression disaster risk reduction recognizing the importance of risk issues, in contrast to previously employed natural disaster reduction. It was in this context that greater and concerted emphasis was placed on disaster risk reduction rather than disaster management (Salter, 1998; Mileti, 1980; UNDP, 2004; United Nations, 2005; Kobe Report, 2005).

Furthermore, concerned by the upward trend in the number and impact of disasters, the International Decade for Natural Disaster Reduction (IDNDR) was initiated in 1990 to serve as a catalyst for natural disaster reduction. One of the most important gains of the IDNDR is the movement of policy investments from the concepts of hazards and disasters to the concepts of risk and vulnerability (UNDP, 2004:17-18). The declaration of the IDNDR helped to raise the profile of discussions surrounding the social and economic causes of disaster risk. In acknowledging this came the realization that mitigating losses through technological and engineering solutions dealt with the symptoms rather than with the causes of the problem; and that reducing disaster risk required greater attention be given to the social dimensions.

In the early 1980s research by the Swedish Red Cross demonstrated a continuous increase in the number of deaths and injuries from disasters, and their economic impact (Wijkman & Timberlake, 1984). In effect, the increase is in the impact of disasters on people; where more and more people have become vulnerable to hazards because of changes in their social, economic, cultural and political environment. This becomes apparent in economic pressures that force many of the poor to settle in cheap and dangerous locations. Evidence and statistical data have shown that the frequency and impact of disasters have continued to rise (International Federation of Red Cross-IFRC, 1997:116-119; UNDP, 2004; IFRC, 2008b). In response to this devastating reality, one of the main outcomes of the IDNDR was the Yokohama Strategy for a Safer World and the Plan of Action adopted in 1994 at the World Conference on Natural Disaster Reduction held in Yokohama, Japan. The Yokohama Strategy sets guidelines for action on prevention, preparedness, and mitigation of disaster risk. These guidelines are based on a set of principles that stresses the

importance of risk assessment, disaster prevention, and preparedness, the capacity to prevent, reduce and mitigate disasters, and early warning systems (lSDR, 2007).

As the successor to IDNDR in 2000, the UN International Strategy for Disaster Reduction (lSDR) was formed to foster this agenda by focusing on the processes involved in the awareness, assessment, and management of disaster risks. As such, the United Nation's (UN, 2005) International Strategy for Disaster Reduction: Expresses its serious concern about the number and scale of natural disasters and their increasing impact which resulted in massive loss of life and long-term negative social, economic and environmental consequences for the vulnerable societies throughout the world, especially in developing countries;

Recognizes the need to continue to develop an understanding of, and to address socio-economic activities that exacerbated the vulnerability of societies to natural disasters and to build and further strengthen community capacity to cope with disaster risks;

Challenges governments and related international organizations to consider disaster risk assessment as an integral component of development plans and poverty eradication programs.

A considerable incentive for rethinking disaster risk as an integral part of the development process comes from the aim of achieving the goals laid out in the Millennium Declaration (UNDP, 2004). Eight Millennium Development Goals (MDGs) were agreed upon in 2000, with most goals set for achievement by 2015.

Achieving MDG 1 (to eradicate extreme poverty and hunger) and MDG 7 (to ensure environmental sustainability) will have a direct impact on reducing human vulnerability to everyday hazards and the accumulation of risk that contribute to disasters (UNDP, 2004).

Within the Pakistan context, the Disaster Management Act 57 of 2004 was promulgated in 2005 and The National Disaster Management Framework followed in 2004. The primary focus of the above legislation is on disaster prevention and risk reduction aligned to the international call for disaster risk reduction. A milestone was the World Conference on Disaster Reduction {WCDR} which took place in Japan (Kobe-Hyogo) in January 2005, a few weeks after the tsunami in the Indian Ocean. As a contribution to the emerging international agenda for disaster risk reduction, the Hyogo Framework for Action adopted at this conference emphasized the following priorities for the future:

There is a need for disaster and risk reduction to be an essential part of the broader concerns of sustainable development, hence the need to make sure that risk assessments and vulnerability reduction measures are taken into account in different fields such as environment management and poverty reduction;

It is essential to note that current development practices do not necessarily reduce communities' vulnerability to disasters. III-advised and misdirected development practices may actually increase disaster risk;

Political commitment by public and private policy-makers and local community leaders, based on an understanding of risks and disaster reduction concepts are fundamental to achieving change;

Although national and local authorities bear the main responsibility for the safety of their people, it is the duty of the international community to advocate policies and actions in developing counties (that pursue informed and well-designed disaster risk reduction strategies); and

Long-term commitment to support local disaster reduction endeavors are as important as funding emergency assistance following high profile disasters (Kobe Report, 2005).

The above discussions clearly accentuate and map out the need for commitment towards disaster risk reduction. The logical argument propagated by ISDR is that risk reduction is value for money whereby investing in risk reduction strategies will help to drastically reduce the impact and cost of future disasters. There is, therefore, a demand for a generic disaster risk reduction model to guide and promote the concept of disaster risk reduction in a methodical manner.

4.5.1 Disaster Risk Reduction Model

The United Nations-International Strategy for Disaster Reduction (ISDR, 2002) *Living with Risk* report which formed a global review of disaster reduction initiatives is evident of the increasing commitment and documenting of "good practice" for effective risk management (Twig, 2004). This global review gave rise to the

Framework for Disaster Risk Reduction as a means to harmonize and systematize the various elements and achievements in the field of disaster risk management. The ISDR secretariat, in collaboration with the United Nations Development Program (UNDP), developed a model for this framework. This was done in conjunction with a growing number of stakeholders in the United Nations, international, national and local organizations, through the Inter-Agency Task Force on Disaster Reduction as well as by means of an online consultation in August 2003, attracting over 300 participants from around the world (http://www.unisdr.org/dialogue). The basic goal of this collective and iterative process was to encourage and strengthen disaster risk reduction practice. This is reflective of the underlying principles of the disaster risk reduction model.

4.5.2 Principles of the Model

In pursuance of the trends towards good practice, the Disaster Risk Reduction Model promotes information and data collection and capture. The ripple effect is that the dissemination of good practice and positive outcomes can further encourage more commitment to disaster reduction through the following five, key principles (ISDR, 2005), as follows:

Reflecting the multi-dimensional, interdisciplinary and multi-hazard nature of disaster risk reduction where a multi-sectoral process aims at strengthening partnerships across sectors and disciplines, including involvement of community-level organizations, volunteer groups, and the private sector are necessary.

Ensuring a firm basis for political advocacy to promote practical action and the implementation of results. Often, lack of wider political commitment to disaster

reduction is identified as the main barrier to progress in implementation. Reason for this includes the fact that there are other more important priorities for funding and political attention, such as development needs and environmental protection. The weak coordination of advocacy programs and action due to the proliferation and fragmentation of the disaster reduction community along disciplinary and institutional boundaries impact negatively on disaster risk reduction efforts. Therefore, adopting a holistic and integrated approach is essential in overcoming the above complexities.

Assisting users to highlight areas where capacities are to be developed through a strong emphasis on continuous review, monitoring, and evaluation of disaster reduction practices; resulting in the early detection of possible gaps and constraints; allowing for informed decisions and modified action plans for implementation.

Providing a basis for setting goals and targets, adapted to different contexts against which progress can be measured and gaps identified. This will create the platform to build momentum and accelerate the rate of progress in disaster reduction while measuring its results. It also warrants government and organizations accountable for what they promise to achieve through these targets.

Creating strong impetus for the promotion of disaster risk reduction in a coherent and effective manner. Usually, different sectors, disciplines, and institutions, for example, environmental management, poverty reduction and financial management, speak different languages and introduce new practices which need to be harmonized.

These underlying principles collectively add value to such a model which serves to enhance the International Strategy for Disaster Reduction and facilitate the

attainment of the objectives of the Millennium Development Goals, forming a stronger basis to reduce risk and vulnerability.

To increase support and effectively drive these initiatives, the above model is further exemplified by its salient characteristics.

4.5.3 Characteristics of the Model

There are five core areas that underpin the significance and practice of this model (refer to Figure 1.2) that is in consonance with the cornerstones of risk reduction (as clarified towards the end of this chapter). They are (ISDR, 2002; ISDR, 2005):

A political commitment which is expressed in terms of good governance is expected to elevate disaster risk reduction as a policy priority, allocate the necessary resources for it, enforce its implementation and assign accountability for failures, as well as facilitate participation from civil society to private sector.

Risk identification and impact assessment is a well-defined area with a significant knowledge base on methods for disaster impact and risk assessment Systematic assessment of losses, especially the social and economic impact of disasters and mapping of risks are fundamental to understand where to take action. Also, early warning is increasingly identified as a means to inform public and authorities on impending risks which is crucial for timely inputs to reduce their impact

Knowledge management where information management and communication, education and training, public awareness and research are all parts of improving and

managing knowledge on disaster risks and their subsequent reduction. The inclusion of disaster reduction curriculum at all levels of education, sound public awareness and information campaigns, and effective media involvement in advocacy and information dissemination coordinate training for communities at risk and professional staff and target specific research are the main ingredients to support the knowledge base for effective disaster reduction.

Application of risk reduction measures involves the conscious move from merely analyzing and knowing about risks to taking concrete actions to reduce their impact. Of significance, is the fact that ideas and practices of other disciplines will complement what is already practiced within the field of disaster risk management. It is clear that instruments for risk management have proliferated especially with that of environmental management, poverty reduction, and financial management tools as complementary solutions. For example, physical and technical measures such as flood control techniques; soil conservation practices and land use planning are well-known practices and have been implemented with combined results. Their failure is often due to poor governance rather than lack of knowledge as to what to do.

Social and economic development practices with proven results in poverty alleviation such as social protection and safety nets are increasingly regarded as ways of reducing risks and instruments for self-reliance in recovery. Therefore, to promote and enhance effective results, synergies need to be built between sustainable development and disaster risk management practices.

Preparedness and emergency management have always proven to be the most effective instruments in reducing life losses from direct and indirect effects of disasters. A well-planned and prepared system is expected to be effectively informed by early warning, have approved national and local preparedness plans with regularly rehearsed communication and coordination systems, as well as adequate logistical infrastructure and emergency funds to respond appropriately and promptly.

A close review of the above features reflects strongly on a proactive approach towards effective disaster risk reduction. However, there are critical challenges that need to be addressed to further improve the results of the Disaster Risk Reduction Model shown in figure 4.2.

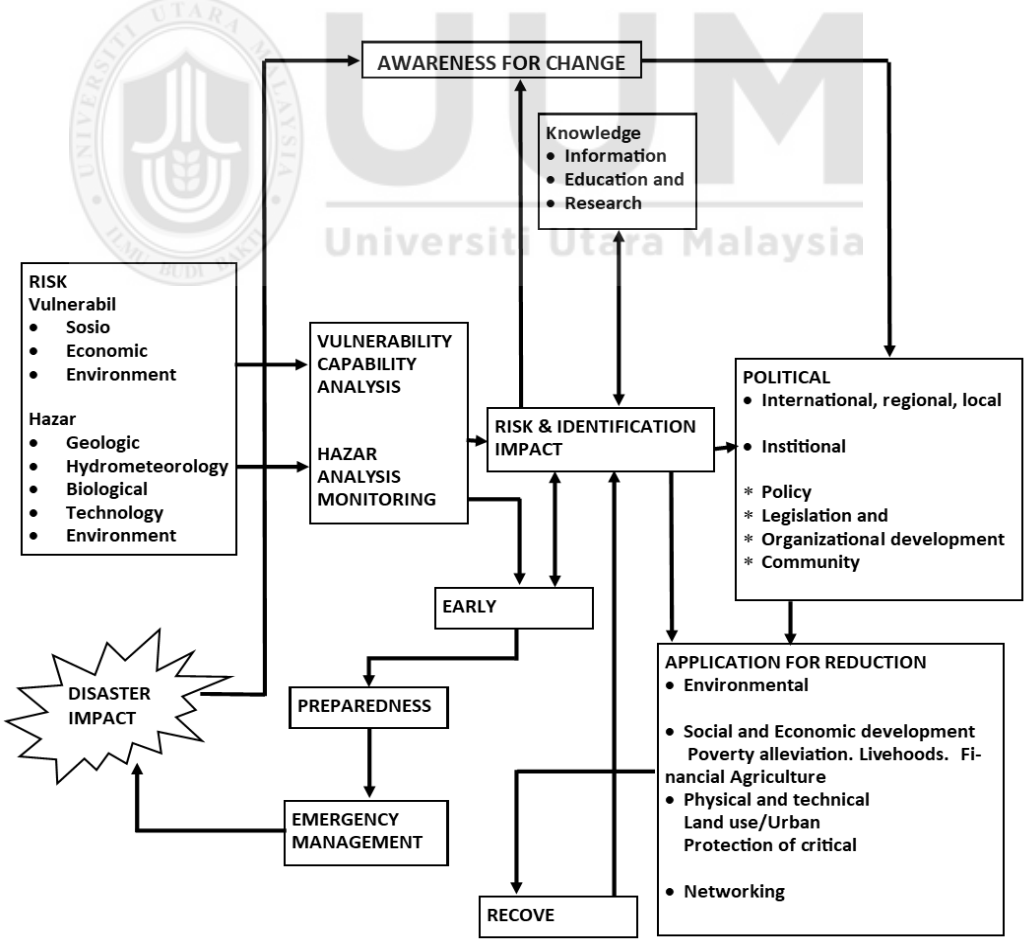


Figure 4. 2: Disaster Risk Reduction Model.
Source: ISDR, (2005)

4.5.4 Challenges Confronting the Effective implementation of the Model

There are two pertinent obstacles that often delay the successful implementation of this model (Mitchell, 2003; ISDR, 2005), *via* disaster risk reduction is often an afterthought in the budgetary allocations with very little political clout. Hence there is a need for disaster risk reduction to be an integral part of the broader concerns of sustainable development and planning. Such an approach needs to be integrated with short-term achievable objectives whilst simultaneously maintaining a strong focus on the long-term objectives of reducing risk to ensure sustainable development. As such, policy-makers, both national and international, have to recognize this move as a step in the right direction and make it their moral obligation to direct resources towards disaster risk reduction as part of sustainable development initiatives. Therefore, mobilization of the necessary resources for its translation at the local level and the allocation of national budget for planning and implementation of disaster risk reduction are crucial. After all, such an investment is cost-effective in the long term as fewer resources will be required to provide relief and reconstruction against effective preparedness and mitigation measures.

The effective and proactive involvement of donors and the business sector is also important where the common dilemma encountered by the government is an endless list of priority needs and demands to be addressed against a very limited resource base. In light of this reality, disaster risk reduction is viewed and rated as low priority when compared with more pressing concerns like poverty eradication and infrastructural development. Therefore, the engagement of donors, both national and international, and the business sector as sponsors or partners will serve to supplement governments' resources and coping capacity. The above will facilitate projects of an

innovative and proactive nature, like disaster risk reduction that may never have been considered previously due to its long-term effect and value.

Secondly, a more technical challenge is getting various interdisciplinary groups to talk the same language. The starting point is to reach consensus on key issues and to contextualize all discussions within clear parameters so as to avoid confusion and ambiguity. For example, clarity around concepts such as disaster risk reduction, risk assessment, and vulnerability need to be established. Another important consideration is that whilst allowing and acknowledging specific and peculiar disciplinary influence, it is crucial that focus is on the inter-disciplinary and multi-disciplinary perspective that is directed towards a common interest. This should serve as the platform for co-coordinating. Integrating and harmonizing risk assessment and vulnerability reduction measures across the various disciplines. The purpose here is to connect to each other as an integrated whole and function synergistically, rather than operate in isolation at cross purposes. More importantly, the rewards in terms of shared expertise and resources, together with improved results, cannot be overemphasized. These challenges should be embraced in a positive light so as to encourage creative and diversified forms of responses towards the risk reduction objectives to be pursued within a flexible and operational framework.

4.6 Risk Reduction Objectives

Despite the ever-increasing knowledge and technological sophistication, losses from hazards continue to rise at least as fast as the increase in global wealth and population. Environmental degradation combined with human activities is the origin

of various catastrophes such as flooding, fires, as well as technological disasters and transport accidents. Therefore, a comprehensive understanding of natural systems coupled with risk assessment can make a major contribution to the reduction of risks and overall disaster risk reduction. Burton *et al.* (1993) justified this concern by arguing that the ways in which humankind deploys its resources and technology in attempts to cope with extreme events of nature are inducing more damage to the environment.

Furthermore, there is also a more serious challenge which is well articulated in the Brundtland Report (Gooneratne & Obudho, 1997), that the careless and uncaring human activities may be responsible for negatively influencing the natural environment resulting in climate change (global warming), together with dangerous levels of pollution and massive amounts of land degradation. This is further aggravated by the processes of rapid social change which in turn places more people at risk, making them more vulnerable. Therefore, reducing hazard or vulnerability contributes to risk reduction; and reducing risk means reducing the possibility of future disaster.

However, risk and disaster are ever-increasing problems with costly implications. This argument can be linked to the absence of political will and support where the focus is more on a responsible approach to emergency situations and less on the execution of a systematic and organized approach towards effective disaster prevention and reduction (Ahrens & Rudolph, 2006).

Regardless of the emphasis placed on the preservation of life and property, the potential for the occurrence of extreme events will always remain capable of overcoming the capacity of society to cope without dramatic changes in its normal operations. However, while hazards cannot be eliminated, the limits of tolerance of every society to their effects can be increased and the potential for disaster risk reduced. The crucial point of interest, therefore, is to examine the key objectives of risk reduction. Wisner, *et* al (2004), identifies seven risk reduction objectives, collectively termed CARDIAC. When interpreted, "CARDIAC" reads as follows:

C = Communicate the understanding of vulnerability

A = Analyze vulnerability

R = Focus on the reverse of Pressure and Release (PAR) model

D = Promote sustainable development

I = Improve livelihood

A = Add mitigation and recovery

C = Extend to culture

The discussion below provides more clarity and a proper perspective on the aforementioned objectives.

4.6.1 Communicating the understanding of vulnerability

In general, training and education programs adopt a two-pronged approach. The first is the acquisition of knowledge relating to the nature of hazards, vulnerability, and capacities. The second is to develop capacities that influence change in daily life, in ways that increase personal and social protection. That is to say, people consciously examine their environment and living conditions through an understanding of the pressure and release model. Thereafter they make rational choices in protecting

themselves from disasters (Twig, 2002). This then leads to the second risk reduction objective where the focus is on risk assessment by analyzing hazards, vulnerabilities, and capacities.

4.6.2 Analyzing vulnerability

In the risk assessment arena, there is a strong bias towards the natural sciences, where disasters are associated with the physical phenomena that generate these natural events (Bank off, *et al.* 2004; Burton, *et al.* 1993; Smith, 2001). Hence, most disaster managers believe that disaster risk assessment is synonymous with scientifically created 'hazard mapping'. This view emanates from the false assumption that once hazards are mapped in terms of their location, duration, frequency, severity and impact characteristics, then the risk assessment process is complete. Therefore, integrated hazard and capacity vulnerability analysis (CVA) rarely happens (Wisner, *et al.* 2004).

Despite such obstacles, there is sufficient evidence of progress in certain areas for example; CVA has been extensively used by the International Federation of Red Cross and Red Crescent Societies (IFRC). The IFRC refers to it as VCA, or Vulnerability/Capacity Assessment. Furthermore, in many developing countries, CVA is also practiced at a local level, stemming from the ground-breaking revelation of Anderson and Woodrow (1989) who in turn built on the efforts of Cuny (1983), Cutler (1984), and Maskrey (1989). For example, in a rural southern African context, the non-governmental organization (NGO) network Peri Peri, explicitly uses the equation R= H x V as a means of stimulating village discussions. Also, the Citizens' Disaster Response Network (CORN) in the Philippines uses a Hazard, Vulnerability,

and Capacity Assessment Matrix (refer to Figure 3) to facilitate constructive dialogue in these areas.

Hazard Assessment	Hazard type Warning signs Forewarning Speed of onset Frequency When Duration
Vulnerability Assessment	Extent Elements at risk and reasons why elements are at risk People at risk Location of people at risk
Capacity Assessment	Resources left and capacity for disaster response

Figure 4. 3: The Citizens' Disaster Response Network (CORN) Hazard, and Vulnerability Capacity Assessment Matrix

Source: Winser, et al. (2004)

As is illustrated in Figure 4.3 above, the systematic gathering of information required for risk assessment, including vulnerability, capacity, and exposure to hazards allows for the appropriate interpretation and analysis of information of a diverse nature that is useful in determining the level of vulnerability to the disaster of specific groups in society. Once this information is available, it becomes necessary to explore means of reducing risk through addressing root causes, dynamic pressures and unsafe conditions which are the third risk reduction objective.

4.6.3 Focus on Reverse in PAR Model

In the Pressure and Release (PAR) model (Blaikie, *et al.* 1994; Wisner, *et al.* 2004) risk is presented as the result of the concurrence of some conditions of vulnerability and of some possible threats. The vulnerability is obtained from identifying the social

pressures and relations from national to local level. At the national level, they are referred to as root causes such as political, economic and social structures. At the intermediate level, they are called dynamic pressures such as population growth, environmental degradation, urban development and population pressures. At the local level, they are known as unsafe conditions such as social fragility, potential harm, and poverty. In this approach, prevention and mitigation are conceived as "releasing" the pressure of what is national over what is local. Therefore, risk reduction signifies intervention at each level, that is, conditions of insecurity, the dynamic pressures and the root causes (Wisner, 1993; Cannon, 1994; Blaikie, *et al.* 1994; Wisner, *et al.* 2004).

In contrast, the access model suggests that risk is generated as a result of the difficulties that some social groups or families have in accessing certain resources over time. In effect, the pressure model can be reversed to provide security instead of risk. Where vulnerable people's access to resources can be improved, and changes in power relations can be introduced. This decreasing vulnerability, and if aid is properly managed and implemented, even the most vulnerable survivors can recover in such a way that future vulnerability is reduced. The underlying principle is to present a transformed version of the pressure model. Hence, the new outcome is safe as opposed to unsafe conditions; sustainable versus unstable or fragile livelihoods; and resilience as compared to vulnerable people. This perspective is encapsulated in Figure 4.4, where the release process is presented as a reversal of disaster pressure (Wisner, et al. 2004).

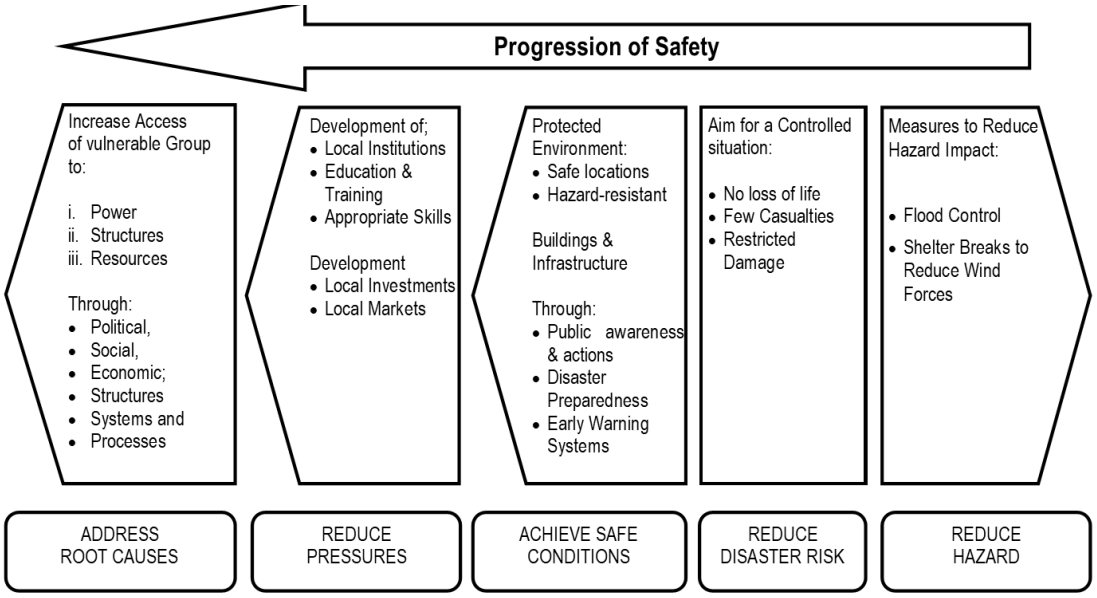


Figure 4. 4: The Release of "Pressures" to reduce disasters: progression of safety
Source: ADPC, (2004); Wisner, et al. (:).

To illustrate this progression of safety in practice, it may be useful to consider the example of poor communities living in squatter or informal settlements. The starting point is to address the root causes by carefully examining the various (social, political, physical, economic and psychological) dynamics of the community. The next step forward would be to provide an increase access of this vulnerable group to power structures (for example, local authorities through the active engagement and representation of Community Based Organizations and Non-governmental Organizations), and resources (for example, clean water).

Thereafter, steady steps should be taken to reduce the various dynamic pressures impacting on the community. The focus should be on disaster and risk management training, public education and awareness, as well as skills development programs. Also of importance is the introduction of Population and Environmental Health Programs. To further achieve safer living conditions, It becomes necessary to ensure protected environments through safe locations and hazard-resistant buildings and

infrastructure. Such initiatives are strengthened through resilient local economy where the skills and training acquired by the community provide them with better jobs and economic opportunities {strengthening livelihoods}. Increased income and disaster and risk management training and awareness promote positive public actions (in the form of disaster preparedness), towards reducing hazards {safer structures} thereby facilitating successful disaster risk reduction (Eade & Williams, 1995; Wisner, *et al.* 2004).

In effect the above processes corroborate with the concept of the "disaster management cycle"; which enunciates the ongoing activities pursued by government together with affected and related stakeholders to plan for and reduce the impact of disasters, respond during and subsequent to a disaster, and take appropriate steps to effectively recover after such occurrence (Coetzee, 2009). Relevant actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. Hence the disaster management cycle incorporates the development of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure. With this progression of safety leading to hazard reduction and ultimately reducing disaster risk, the next step is to integrate risk reduction into sustainable development.

4.6.4 Promoting Sustainable Development

Disasters impact negatively on development, undermining attempts at achieving the Millennium Development Goals (MDGs) (ISDR, 2004; Twig, 2004). Their pervasive influence comes about because impacts are felt both directly (for example, through

the loss of lives, livelihoods, and infrastructure) and indirectly (for example, through the diversion of resources from development to emergency relief and reconstruction, or the wider effects on the economy and society). Therefore, the most far-reaching influence of disasters is on MDG1, which has the twin goals of halving the proportion of people whose income is less than US$1 a day and the proportion of people who suffer from hunger between 1990 and 2015 (DFID, 2004; UNDP, 2004). This influence of disasters on meeting MDG1 is frequently highlighted in national progress reports on the MDGs. For example, China's MDG report cited 'natural disasters' as one of the eight key pressures undermining success in achieving IVIDG1, and directly links disaster risk reduction and poverty alleviation policy. In Nepal, poverty and hunger are related to the sudden loss of agricultural land through flooding and landslides. Whereas, droughts in Tanzania and flooding in Mozambique are cited as the primary causes of increased levels of rural poverty in these countries (UNDP, 2004).

In light of the above, it is important to discuss environmental issues and disaster within the context of development policy. Also, there are positive spin-offs in the consensus reached at the World Summit on Sustainable Development (2002), which could be analyzed and implemented as linking disaster risk reduction and sustainable development (Wisner, *et a/.* 2004). After-all, sustainable development is the building block to improving livelihood opportunities (as will be justified in the fifth risk reduction objective that follows).

4.6.5 Improving Livelihoods

Wisner, *et al.* (2004) claim that development of various aspects of livelihoods can reduce risk substantially. For instance, disaster and risk management training and awareness, together with skills development programs can vastly increase and sustain the access of poorer households to new livelihood options. These new and improved opportunities may include better employment prospects with increased earnings, resulting in better social standings and living conditions, thereby encouraging safer living standards and drastically reducing disaster risk. The next move will then be to incorporate risk reduction into disaster recovery.

4.6.6 Adding Mitigation and Recovery

The notion of having recovered from a disaster implies that a household should have not only re-established its livelihood, physical assets and patterns of access but they should also be more resilient to the next extreme event. Changes in social structures that define access to land and property, employment and information are therefore required to assist households to become more resilient to the next hazard event. Also, recovery interventions should include initiation of future extreme events (Twig, 2004b; Wisner, *et al.* 2004). For example, financial assistance to relocate squatter dwellers into low-cost, safer homes; provision of water, sanitation, and electricity; and more stringent enforcement of building codes in reconstruction. These measures could lead to disaster risk reduction and encourage a culture of safety.

4.6.7 Extension to Culture

The debate on creating a safer environment (Wisner, *et al.* 2004, UNDP, 2004) is multi-dimensional and challenging yet achievable if strategically planned and

implemented using an integrated approach over a given time-frame. The critical elements or cornerstones are political commitment; economic support; and societal adaptation and re-engineering towards a culture of safety and risk reduction.

4.7 Cornerstones of Disaster Risk Reduction

Since disasters impact on socio-political factors, actions aimed at reducing risk should address the social factors that determine the vulnerability as well as the changes in the political environment that could increase the resilience of communities. The following parallel and complementary lines of actions can be considered to reduce exposure to disasters and promote effective disaster risk reduction (Bendimerad, 2002, Ahrens, 2002; Kelman, 2003, Eade & Williams, 1995, Maskrey, 1990):

i. Community/stakeholder participation;
ii. Public policy actions;
iii. Development of a culture of prevention; and
iv. Risk assessment.

These issues are further elaborated on and provide a strong basis for arguments on the link between effective risk reduction and risk assessment.

4.7.1 Reducing Vulnerability through Community Participation

Research by Ryscavage (2003) and Twig (2004) and experience/case studies have shown that some of the most successful risk reduction initiatives have closely involved communities understanding risks and designing appropriate response and mitigation plans. Community-based disaster management transforms vulnerable

groups into disaster-resilient communities. Communities understand the socio-environmental constraints that define vulnerability and the parameters that determine the success of risk reduction policies and actions. Communities also have perceptions that may or may not be based on reality, but nonetheless are important to consider and incorporate in the development of risk reduction initiatives (Maskrey. 1990; Arnold, 2003).

Community involvement ensures transparency and disclosure and favors responsibility sharing as important mechanisms for disaster risk reduction and sustainable resource use. The top-down approach, still in practice in some countries, fails to involve people in vulnerability identification and disaster reduction. The arguments presented in the study by Dorsey and McDaniel's (1999) were that public participation was seen as unproductive in resolving these critical issues and was too time-consuming and costly. Nonetheless, Dorsey and Mac Daniels (1999) point out that while the need for public participation was questioned in the 1980s and 1990s, in the twenty-first century the issue is not 'if community involvement should be considered and utilized, but "how" (Twig, 2004a; ISDR, 2007, ISDR, 2007).

Community participation builds capacity and trust at the local level and reduces political manipulation by special interest groups. Community involvement helps not only in identifying vulnerability, but also the trade-offs involved in achieving sustainability. By its nature, community participation creates partnerships around a common agenda. However, to be successful, communities should be construed as "being part of' rather than "taking part in" an activity (Myers, 1997; Godschalk, *et al.*

1998). Disaster risk reduction issues must be framed within a community's social, cultural, environmental and economic context.

Community participation involves a process that first identifies linkages between formal government structures and a community's social structures and then creates mechanisms to integrate them into a common agenda of institutional processes, risk assessments, and related programs and policies (Arnold, 2003; Burkle; 2003; Gurr & Harff, 2003; ISDR, 2007). Lessons learned with regard to community participation and risk reduction include (Twig, 2004; Twig, 2004; Pelling, 2003; Maskrey, 1990):

i. The basis for sustained work and intervention for disaster prevention, preparedness and response correlates directly with a community's level of organization and information;
ii. Community participation requires an honest commitment to a process from the government, community leaders and stakeholders where the interests of the community at risk determine the final goal; and
iii. Communities often view disaster protection in the context of improved livelihood security; hence disaster reduction should be seen in the light of sustainable economic. Social and physical development.
iv. A well-informed society is a potent force in moving risk reduction forward and in generating responsible. People-oriented policies.

4.7.2 Reducing Vulnerability through Public Policy Action

Disaster risk reduction policy deals with the course of action adopted by government and civil society to understand hazards, assess vulnerability, evaluate risk and adopt measures for risk reduction. Examples of risk reduction policy include legal and

institutional arrangements that govern land use, urban planning, and the enactment and enforcement of construction regulations. However, experience has shown that even in cases where policies have been enacted by law, the absence of enforcement can negate the effectiveness of the legal structure. For example. Most developing countries have competent building codes, yet code provisions are ignored in the implementation process due to a lack of enforcement mechanisms (Ahrens, 2002; Bendimerad, 2002).

More importantly, the government has the responsibility of protecting life and property, maintaining security and providing services. Therefore, the government is obliged to protect citizens from the risks caused by natural and technological hazards. The government uses legal instruments and institutional arrangements to impose a set of societal rules that order and protect society (Bendimerad, 2002; Ahrens & Rudolph, 2006). Unfortunately, pressure from special interest groups, lack of competency and bureaucratic hurdles often hinder the effectiveness of public policy in protecting the environment and reducing vulnerability and risks. Often, these issues are not in line with the objectives of government that may have short-term goals and usually react rather than plan ahead (Ahrens & Rudolph, 2006). Change within governmental structures is slow and sometimes difficult to implement. Currently, advocacy is geared towards risk reduction, yet most public policy is aimed at improving disaster response capabilities and examining prevention alternatives. Disaster risk reduction and mitigation are often too complex to be implemented by the government because it involves proactive, inter-governmental coordination and reaching out to communities and other stakeholders (Pelling, 2003b; Kelman, 2003).

Moreover, risk reduction and mitigation policies often raise fundamental socio-economic issues such as livelihood safety and resource distribution equity which government is reluctant to tackle. Hence, other more dynamic mechanisms to influence disaster reduction policy are needed. These include grassroots advocacy groups, stakeholder partnerships, and knowledge and risk dissemination.

Collaboration between government, civil society, and respective stakeholders provides excellent opportunities to create policies and processes that promote effective disaster risk management. In the face of complex and competing demands, success is strongly correlated with two important factors. First, the ability of government to put in place legislation and administrative arrangements that reduce risk, and secondly, the ability of government and civil society to work together around a common agenda aimed at avoiding catastrophic losses from natural and human-induced hazards (Pelling, 2003b; Ahrens, 2002; Bendimerand, 2002; ISDR, 2007a); towards a culture of prevention and the creation of a "safer" environment.

4.7.3 Reducing Vulnerability through a Culture of Prevention

Developing a culture of prevention to reduce the vulnerability of society to hazards constitutes the foundation of disaster risk reduction. Cultural factors dictate how people perceive risk and their motivation to enhance resilience or aggravate vulnerability. Developing a culture of prevention develops human potential which provides a community with the skills, knowledge and confidence to cope with the impacts of hazards to proactively reduce the negative consequences of future events (ISDR, 2002; Bendimerad, 2002; ISDR, 2007).

The key actions for developing a culture of prevention are:

i. awareness raising;

ii. societal arrangements;

iii. accountability forging; and

iv. Empowerment.

These actions are discussed below, reflecting the value they add as catalysts of positive change in disaster and risk management.

4.7.3.1 Awareness Rising

Kelman (2003) stresses that awareness rising makes individuals, communities, and institutions aware of vulnerabilities and the negative impacts of disasters on their livelihoods. Armed with this knowledge, they can better understand their environment and take an active role in its management. After all, every actor engaged in risk reduction has a competitive advantage and contributes to fighting vulnerability and improving mitigation interventions. However, to be most effective, awareness rising must target several segments of society. Governmental, non-governmental institutions and civil society organizations should aim to reform existing socio-political structures to make them more responsive to community needs. Educational processes aimed at raising awareness must also be put in the context of the everyday challenges of a community in order to attract attention. Everyday risks related to human safety constitute an opportunity for preparing for less frequent but potentially more disastrous events (Pelling, 2003 UNDP, 2002; Bendimerand. 2002). This then demands the need and support for the existence of strong social structures.

4.7.3.2 Societal Arrangements

Societies organize themselves to link individuals in a community. This involves both the strengthening of government institutions and the creation of organizations representing civil society. Active civil society organizations represent the interests of stakeholders in the policy and decision-making the process by including community concerns in discussions surrounding policy development. Civil society organizations can improve transparency by disseminating information and initiating reform (Ahrens & Rudolph, 2006; Ahrens, 2002; Bendimerad, 2002). Societal organizations can also be effective actors in capacity development by providing training and creating partnerships. They can mobilize resources and implement disaster risk reduction programs. However, in developing countries, civil society is often weak due to a lack of resources and capacity. The primary objective then should be to ensure the sustainability of these organizations through the implementation of appropriate empowerment strategies.

4.7.3.3 Empowerment

The process of empowerment is influenced by several sources which include information, and better access to resources of all kinds (Smith, 2004). Good governance empowers individuals and communities and makes them active participants in society (Ahrens & Rudolph, 2006; Bendimerad, 2002). Knowledge is also an instrument of empowerment (Smith, 2004:27). A community that is aware of its vulnerability to disasters is more likely to take action. Knowledge engenders confidence and vigilance. More importantly, knowledge constitutes the active ingredient in the participatory process that enables communities to 48 make informed

decisions about environmental and resource allocation issues (Arnold, 2003; Burkle, 2003; Gurr & Hartf, 2003).

The post-disaster period provides a window of opportunity to build networks aimed at empowering local communities in disaster management, preparedness and response. During this period, when fear and awareness of hazards and feelings of helplessness run high, community members are more receptive to learning about how to cope with life-threatening hazards (Ryscavage; 2003; Twig, 2004). However, sustaining programs for community participation and developing a culture of prevention cannot be motivated by fear and anxiety alone. It should be supported through funding for community training, building networks, and developing a sense of community ownership by involving individuals in the development of action plans for disaster mitigation and preparedness through effective disaster risk assessment.

4.7.4 Reducing Vulnerability through Risk Assessment

Disaster risk reduction is based on a continuous strategy of vulnerability and risk assessment with the fundamental need to assess, monitor and update exposure to changing conditions (lSDR, 2004; ISDR, 2007). This is outlined in Principle 1 of the 1994 Yokohama Strategy and Plan of Action for a Safer World and the Hyogo Framework for Action, where risk assessment is viewed as a fundamental step towards successful disaster reduction policies and practices. Disaster reduction measures should, therefore, be based on firstly, the continuous assessment of vulnerability and hazards, ensuring a comprehensive understanding of disaster risks. After all, the process of identifying, locating, measuring and fully understanding risk is the crucial step towards the design of policies, strategies, and action for disaster

risk reduction. This explicitly highlights the locus of risk assessment within the context of risk reduction. These could range from development planning through to addressing risk in preparedness for a response (ISDR, 2007).

Secondly, risk assessments that reflect the dynamic nature of the environment, taking into account new and complex forms of danger impacting on the environment and society. Emerging trends in hazards and vulnerability that may stem from climate change, urban growth, disease and environmental degradation (Twig, 2004; ISDR, 2004) are crucial factors to be considered in disaster risk assessment.

Thirdly, reliable and accurate data and information for the identification of trends in hazards and vulnerability; to enable decision-makers to take sound disaster risk assessment decisions and adopt appropriate disaster risk reduction strategies, including that of factoring disaster risk reduction into national planning and budgetary processes (ISDR, 2007a; Twig, 2002).

Fourthly, improved communication networks among early warning stakeholders where effective coordination among key stakeholders in the early warning chain promotes informed decision-making and positive response actions towards effective disaster risk reduction interventions (Twig, 2002).

In effect, disaster risk reduction concentrates on hazards, in particular, their characteristics and related impact; vulnerability in relation to social, economic, environmental and political factors; and risk as the outcome of hazard interacting with conditions of vulnerability (Vermaak & Van Niekerk, 2004). Therefore, disaster

risk assessment is identified as an integral component and crucial link in reducing risks and vulnerabilities towards the achievement of the Millennium Development Goals (Briceno, 2004) and the related global risk reduction strategies as alluded to above.

4.8 Summary

Despite the growing recognition and acceptance of the importance of disaster risk reduction, the management and reduction of disaster risk continue to pose a global challenge. One of the major challenges is the need to constantly adapt disaster reduction measures to changes in overall parameters. However, there is international acknowledgment (ISDR, 2007) that effort to reduce disaster risks must be systematically integrated into policies, plans, and programs for sustainable development and poverty reduction. As such, sustainable development, poverty reduction, good governance and disaster risk reduction are mutually supportive objectives of disaster risk assessment, and in order to meet the challenges ahead, accelerated efforts must be made to build the necessary capacities at the community and national levels to manage and reduce disaster risk. This is clearly substantiated within the framework of the Disaster Risk Reduction Model (Figure 4.4).

Summary, many disaster reduction initiatives fail to reach their objectives and only marginally impact on capacity building and vulnerability reduction because they are short-lived. Often, funds and other resources are allocated on a short-term basis and unrealistic expectations are attached to capacity building projects. As presented in this chapter, disaster reduction should be recognized as a difficult process where progress can only be achieved through well-planned and sustained efforts which are

co-ordinated by a systematic process of risk assessment. Therefore, the furtherance and sustainability of the disaster risk reduction objectives require a commitment to providing long-term funding, human resources and institutional support and political backing. These issues form the crux of the discussion on the various disaster risk assessment models in Chapter Five of the thesis, as the guiding principles to effective disaster risk assessment and the development of the proposed model in Chapter Six of the thesis.

CHAPTER FIVE

EXPLORATORY REVIEW OF THREE DISASTER RISK ASSESSMENT MODELS PROMOTING EFFECTIVE DISASTER RISK REDUCTION

5.1 Introduction

The main intention of this chapter is to analyze three vulnerability is driven, disaster risk assessment models used as effective tools towards disaster risk reduction. The criteria, against which these models are to be examined, have been developed in light of the key international initiatives in disaster risk reduction. These criteria will, therefore, serve as a framework for the development of the Pakistan model and work as guidelines for future research. The flow of arguments used in this chapter is drawn from and builds on the previous chapters. The scene is set by reflecting on the practice where the inordinate emphasis has been placed on a response while prevention measures have been limited and halting. The paradigm shift towards disaster risk reduction explicitly explored in Chapter Four highlights key principles to be captured in disaster risk assessment models. The cornerstones of disaster risk reduction so aptly summarized in Chapter Two, as well as the key components and process of disaster risk assessment deliberated in Chapter Four, feature strongly in the assessment of the various models.

The review concentrates on the underpinning principles, salient characteristics and critical challenges confronted by these models. As a means of accentuating the real value of these models, a comparative analysis is undertaken. Where the similarities

are traced and the differences explained, elucidating the research objectives in this chapter. In addition, a comparative table is illustrated, embodying the influential points of note; further endorsed by the outcomes of the research findings in the next chapter. This also sets the tone to be ascribed to propose disaster risk assessment model for Local Government in Pakistan for future research.

5.2 Guiding Criteria for Effective Risk Assessment Models

In light of the global strategies on risk reduction, reviewed in Chapter Three, four guiding criteria based on the principles of good governance (Ahrens & Rudolph, 2006; Lewis & Mioch, 2005; Jacobs, 2005) are considered to be relevant in promoting the key issues of the Yokohama Strategy and Plan of Action for a Safer World (1994), the Millennium Declaration (UNDP, 2004), the Hyogo Framework for Action (Kobe Report, 2005) and the Framework for Disaster Risk Reduction (SDR, 2005) have been identified. Good governance serves as a vehicle for government, civil society (community) and all other relevant stakeholders to jointly participate, share input and enunciate their interests and priorities, reconcile their differing perceptions, and exercise their political and human rights, obligations and responsibilities (Ahrens & Rudolph, 2006; Lewis & Mioch, 2005; Jacobs, 2005). To interpret these rights and responsibilities within the context of disaster risk reduction implies that people have a right to feel safe and protected in their communities (Pakistan, 1996) yet equally need to be aware of their shared responsibilities to protect themselves. Therefore strong political commitment, transparency through the collaborative engagement of the diverse disciplines and sectors, adaptability, community participation, and resilience will contribute significantly to creating less vulnerable communities. These criteria are by no means exhaustive; however, they

are intended to provide a generic framework for the review and development of the risk assessment models in this study.

5.2.1 Political Commitment

Successful risk reduction depends on the political leadership's commitment and ability to implement and enforce appropriate policies (Ahrens & Rudolph, 2006). Real progress may be noted when vulnerability reduction and disaster risk management are integrated into the day-to-day management of local, national, regional and international institutions. Furthermore, risk reduction should be a part of land-use planning, housing and infrastructure development, environmental and industrial management, natural resource management and treasury.

The role of government in institutionalizing disaster risk reduction is therefore vital. This implies that legal and administrative policies and procedures should be enacted and corresponding procedures developed with proper structures, systems, and resources to empower institutions in their disaster risk management mission. A case in point is the actions of the Indian government subsequent to the Gujarat Earthquake.

The second largest recorded earthquake in India devastated the state of Gujarat, on January 26, 2001. It registered 7.9 on the Richter scale and caused more than 20,000 deaths. An estimated 600,000 people were left homeless and total asset losses amounted to US$2.1 billion (World Bank, 2008). The astronomical loss of life and assets convinced the Indian government to reorient their policy approach to disasters. The Indian government now aims at a long-term goal which includes implementing a

comprehensive disaster risk reduction program and improving the disaster preparedness and emergency response capacity of the government to deal with future disasters. The key disaster risk reduction policy in India focus on institutional capacity building, a robust central coordination mechanism with clear lines of responsibility at different levels and mobilize resources at all levels to support policy implementation.

The above example clarifies the point that significant progress can be achieved in disaster risk reduction through political commitment and support; where the quality of appropriate policies and their effective implementation proves to be vital. Therefore political commitment is crucial to making informed decisions and taking resolute and effective actions. Hence, the government is instrumental in directing (through appropriate legislative and policy frameworks), leading (with the creation of necessary structures, systems, and processes) and guiding (by 92 means of procedures and the allocation of required resources} effective disaster risk assessment and risk reduction. By enforcing relevant legislative and institutional requirements, the government can be recognized as the enabler of the multi-disciplinary and multi-sectoral approach in disaster reduction.

5.2.2 Multi-Disciplinary and Multi-Sectoral Approach

The focus and concern of disaster risk management are broad, especially when considering the interactions among elements of the natural, social and human-built systems and its emerging aggregate patterns of vulnerability and risk (as substantiated in Chapter Three in contextualizing disasters). Therefore, disaster risk management cannot be viewed as a single issue but a cluster of developments

including physical and regional planning, environmental management, health, education, and rural development. This underscores the need for a multi-disciplinary and multi-sectoral approach to be adopted in disaster risk management. The integration of these different stakeholders improves disaster risk reduction strategies through collaborative initiatives and fosters the willingness to pursue individual responsibilities towards set goals of disaster reduction. For example, the case study on the Indian Ocean tsunami in Aceh and North Sumatra (Ahmad, Wong & Shiver in Neckline, *et al.* 2008) highlights the importance of a multi-sectoral approach.

In the aftermath of the 2004 Indian Ocean tsunami, despite the challenging terrains of Aceh, mercy relief was successful in securing early access into Meulaboh and Banda Aceh in the first week of the disaster. Medan (North Sumatra) served as the main launching pad for international aid into Aceh with rotary-wing aircraft forming an air-bridge between Medan and the other parts of Aceh. Such an operation was possible due to the long-standing relations and goodwill shared by mercy relief and the North Sumatran Government through continuous engagements and collaborative projects on poverty reduction. Mercy relief was not only able to provide effective and efficient relief and assistance to the remote affected areas 93 of Aceh but also facilitated the process for other non-governmental organizations to set up their bases in Meulaboh. This collective prompt intervention together with other foreign non-governmental organizations and militaries helped to eradicate the risk of a secondary disaster such as an epidemic.

The important lesson is that an integrated approach in the form of a multidisciplinary/sectorial perspective improves the effectiveness of risk reduction

interventions as a shared objective, saves time and is more economical. This, coupled with the reality that disasters have no boundaries and that disaster impacts on all facets of the environment (social, political, economic, technological, physical, and the like) justifies the need for the various disciplines and sectors to adopt the team approach in risk assessment to promote effective risk reduction. Closely linked to the dynamics and ramifications of disaster is the issue of adaptability that will be expounded on in the section that follows.

5.2.3 Adaptability

The conceptualization of disasters in Chapter Two of the thesis alludes to the disparities of vulnerability to disasters as a question of variability to physical processes as well as the demographic difference, political structure, economic system and social order (Weichselgartner & Obersteiner, 2002). Given this complexity and uncertainty, risk reduction actions and strategies must incorporate the principles of flexibility and adaptability. The issue of global warming and abrupt climatic changes remains high on the global agenda (Schipper & Pelling, 2006) and is charged with uncertainty.

The spiraling effects of climate change are changing disaster risk profiles underlying environmental, socio-economic vulnerabilities (such as the global economic recession) and introducing new environmental hazards (including the current health pandemic, that is the H1 N1 strain, and all related viruses) that further challenge risk reduction initiatives. However, John Holmes, in his keynote 94 address of the Global Platform for Disaster Risk Reduction in 2007, identified disaster risk reduction as the front-line of defense in adapting to the impacts of climate change and preventing

future loss of life and property from extreme natural hazards. Everything that is built has to be designed and managed taking climate variables into consideration. This is done through formal procedures such as building codes, standards for wind resistance, heating, ventilation and water levels. However, Kreimer and Arnold (2000) reinforce the fact that the significance of climate does not end with weather-dependent sectors such as agriculture and weather-sensitive infrastructure. It permeates into finance, trade, commercial activities and into human health. It is therefore expected that the public health protection system has inbuilt safeguards against disease vectors such as viruses, bacteria, insects, and parasites. Climate change is having an impact on how environments and communities respond to extreme weather events. Communities cannot rely solely on traditional means as environments are constantly changing. McNaughton (2009: 15) and Pettengell (2010) purports that climate change adaptation should not be addressed as a side issue. Instead, it should be acknowledged that climate change is introducing a range of new risk and hazards. As such, neither a vulnerability nor needs focus fully captures the responses needed for the current and long-term impacts of climate change.

The risk of future climate change will be determined by the evolution of hazards and vulnerability (Adger & Brooks, 2003; Kreimer & Arnold, 2000). In light of the above, it becomes necessary to revise and strengthen disaster risk assessments and risk reduction measures. In effect, there is no single best or stable answer to the question of what adaptation measures are needed, when, where, and by how much, therefore reducing vulnerability by adaptation necessarily involves incremental learning from experience within an inclusive, dynamic and adaptable environment.

Reference to an inclusive environment alludes to all relevant stakeholders in the disaster risk assessment process, that is, various sectors of government, 95 specialists from different disciplines, the business sector, non-governmental organizations, and community-based organizations and the affected community of particular importance are the communities since they possess the local knowledge and first-hand experiences required driving the risk reduction processes forward.

5.2.4 Community Participation

Participation of the community in disaster risk assessment and risk reduction processes enables them to voice their concerns and share their experiences. More specifically the inclusion of those groups from the community most likely to be affected by disasters, giving them the opportunity to explain their vulnerabilities and priorities. This ensures that risk reduction strategies that are developed are socially accepted and more responsive to actual needs of the community (Maskrey, 1990; Gurr & Harff, 2003). Equally important is the inclusion of local expertise and knowledge, facilitating a suitable response to disasters; as depicted in the case study that follows. The case study of the post-flood shelter recovery program in Rajasthan State, of Western India, clearly illustrates the essence of community participation. The community in the Barmer District of Rajasthan experienced excessive floods in 2006. Gupta (in Nicklin, *et al.* 2008:58-61) reported that over 800,000 of Barmer's population of two million were affected.

The official statistics revealed that 103 people died while 95 percent of the villages were left homeless. Houses in the affected villages of the Barmer district were basically made of a mixture of soil, cow dung and some wooden components from

the local area. These houses were circular structures called Dhanis. The damage in these villages was widespread as most of the houses made of such material were easily washed away. The shelter recovery program was undertaken by the Sustainable Environment and Ecological Development Society (SEEDS) in India together with the support from the Christian Aid (a United Kingdom-based charity) and the 96 European Commission's Humanitarian Office. Community participation was the core of this program. Recipients of the shelter were identified through consensus in committee meetings attended by all residents of the village.

The houses were specifically modeled to comply with the socio-cultural and environmental specifications of the village. The model adopted was similar to the previous structure, the traditional Dhanis but with strong earthquake-resistant interlocking earthen blocks. The completion of the houses was left to the beneficiaries and their families as a means of capacity building, education, and awareness of community knowledge and practice. The intention of involving the community is to work with them as partners and to instill a sense of ownership for their own safety outcomes so that they are better equipped to protect themselves and their environment (which is the underpinning motive for the proposed disaster risk assessment model explored in Chapter Six of the thesis). The ultimate goal is to create resilient communities.

5.2.6 Resilience

The process of working together can strengthen communities because it reinforces local organization and builds trust, skills, capacity to co-operate and awareness. Hence, the potential of communities to reduce their vulnerability is increased and

people are empowered as they are enabled to address common challenges through access to information and awareness raising. In turn, this builds on the local capacity and creates local ownership of initiatives, promoting the principles of sustainability and cost-effectiveness in disaster risk reduction (Ryscavage, 2003; Twig, 2004). An encouraging example is the Get Ready and Get Thru program of New Zealand. Since its creation in 1999, the New Zealand Ministry of Civil Defense and Emergency Management has been to collaborate with its stakeholders to increase the capacity of communities and individuals to prepare for, respond to, and recover from disasters (Hamilton in Nicklin, *et al.* 2008).

The Ministry's objective is to make New Zealand and its communities resilient by understanding and managing their hazards. The 97 underlying strategy for achieving resilience is through the risk management approach based on reduction, readiness, response, and recovery. Hence, in 2006 the Ministry launched its Get Ready and Get Thru program, a national public education program directed at increasing individual and community preparedness for disasters. The strategy behind this national program is to empower individuals and communities by supplying clear and appropriate information on what needs to be done to protect themselves and their loved ones during a disaster. People are reminded of the reality that government agencies and emergency services cannot get to respond to and support everyone at the same time. Therefore, it is the communities' responsibility to protect each other and have interventions in place for at least three days until the authorities arrive. Since the launch of the Get Ready and Get Thru campaign, annual benchmark research has been undertaken to monitor its effectiveness and identify issues and gaps that need to be addressed in the improvement and further development of the program. Early

indicators reflect that the primary messages are positively received with heightened levels of awareness of the need to take action in order to be prepared. Promoting effective community resilience is dependent on access to relevant information, education, awareness, and creation of appropriate community structures and systems. As such, good governance contributes to the reduction of vulnerability, enables the development of mitigation and recovery methodologies, and empowers the community to act on its own behalf.

In summary, the above discussion on the selected criteria espouses to their relevance and importance in disaster risk assessment and risk reduction. As such, these criteria will be used to measure the effectiveness of the three disaster risk assessment models explored in the section below.

5.2.6 Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks which all stakeholders must implement. It is integral to follow these priorities for action to promote the framework on a local, national, and global level (Wahlstrom, 2015).

(i) Understanding disaster risk;

(ii) Strengthening disaster risk governance to manage disaster risk;

(iii) Investing in disaster reduction for resilience and;

(iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

It aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years.The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015. The seven detailed global targets that should be achieved by 2030 have been set to assess global progress in achieving the outcome and goal of the Framework.

1. Substantially reduce global disaster mortality by 2030.
2. Substantially reduce the number of affected people globally by 2030.
3. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services.
5. Substantially increase the number of countries with disaster risk reduction strategies by 2020.
6. Substantially enhance international cooperation to developing countries.
7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments by 2030.

5.3 Review Of the Three Disaster Risk Assessment Models

As clearly elaborated in Chapter two, disasters are no longer viewed as extreme events created entirely by natural forces. It is now widely recognized that risk (physical, social and economic) which are unmanaged (or mismanaged) over a period of time lead to the occurrence of disasters. The focus on disasters is therefore

not only on the natural processes but also on its interaction with the human system and its broader environment. Hence, the emphasis on the vulnerability-driven approach in disaster risk assessment. Another important consideration is the evolution of approaches in disaster management from the response and recovery issues to that of risk management and mitigation. Salter (in Disaster Preparedness Resources Centre, 1998) summarizes this shift in disaster management as shown in figure 5.1 below:

Shift In Disaster Management

From	**To**
Hazards	Vulnerability
Reactive	Proactive
Single Agency	Partnerships
Science Driven	Multi-disciplinary Approach
Response Management	Risk Management
Planning for Communities	Planning with Communities
Communicating to communities	Communicating with Communities

Figure 5. 1: Shift in Disaster Management
Source: (Adapted from Salter, 1998; Jiggle, 2001; Comfort, 2004; Jiggle, 2007)

As reflected in above figure there are several interesting aspects to this evolution in disaster management and to highlight the following:

i. It takes the focus away from specific hazards and incorporates general vulnerabilities into the disaster risk reduction process;

ii. The shift from reactive to proactive measures moves the emphasis from response and recovery to that of planning, preparedness, and risk reduction measures;

iii. This multidisciplinary approach strives to create partnerships and attempts to foster the notion of integrative, coordinate efforts towards common goals;

iv. Emphasis on working and relating to communities demands a strong onus on disaster managers and other public management practitioners, to actively engage the community;

v. Continuous information flow is crucial in the planning and implementation phases and must incorporate change and adaptation, to promote effective results; and

vi. Maintaining creativity for disaster reduction through a broader comprehension of the shared goals (Salter, 1998; Jiggle, 2001; Comfort, 2004; Jiggle, 2007).

These new dimensions help in sketching out the changing landscape of the disaster risk management practice and should, therefore, form the basis of all disaster risk reduction and prevention strategies. In effect, the development and implementation of disaster risk assessment models should be guided by these key principles. As a point of departure, the Community-Wide Vulnerability and Capacity Assessment (CVCA) Model (Kuban & MacKenzie-Carey, 2001), the Community Based Risk Reduction Model (Yodmani, 2002), and the Pakistan Disaster Risk Assessment Model (Adapted from ISDR, 2004 and Pakistan, 2005) will be analyzed and compared.

These models have been carefully selected since they reflect on the arguments substantiated on in Chapters Three and Four of the thesis, and positively depict the contemporary disaster risk management practice. Where effective disaster risk reduction strategies must begin with an acknowledgment and conceptualization of the complex and dynamic ways in which social, political, economic and physical

structures result in important differences in the vulnerability of those they are expected to protect and serve. Hence, this can best be attained through community risk assessment beginning at the local level (Morrow, 1999; ADPC, 2000; Haghebaert, 2007).

Further, over the last two decades, there has been an increasing awareness that disaster risk assessment is most effective at the community level where specific local needs, resources, and capacities are met. As aptly described by Haghebaert (2007), the top-down disaster risk reduction interventions often fail to adequately address the specific vulnerabilities, needs, and demands of the community. It is at the local level that these vulnerabilities and needs encountered by the community can be adequately assessed and managed through the application of appropriate disaster risk assessment models, as will be proven in the review that follows.

5.3.1 The Community-Wide Vulnerability and Capacity Assessment (CVCA) Model

This model was developed with the intent of being applied universally across diverse cultures, community sizes, geographic locations, and resource levels (Kuban & MacKenzie-Carey, 2001). The primary purpose of the model is to guide and enhance the disaster risk assessment process at local level thereby promoting disaster planning towards effective disaster risk reduction. These goals are further driven by the strong and clear principles underpinning this model.

5.3.1.1 Underlying Principles of the Model

The CVCA model is founded on a number of principles which emphasise the following (IFRC, 1996; IFRC, 1999):

i. That the population of every community, regardless of size, demographics and geographical location, contains a diversity of needs and expectations. Therefore, it is necessary, to begin with a clear understanding of people as victims, survivors or vulnerable communities in order to contribute to capacity building and vulnerability reduction at the grassroots level. The community-wide vulnerability and capacity assessment model demand a self-reflection process by bringing to light the strengths and shortcomings of current activities and highlighting the unfulfilled needs of the vulnerable groups.

ii. The primary responsibility to prepare for and respond to disaster rests with the individual. As such, this model assists to raise public awareness of hazards, vulnerabilities, capacities and risk taken by society (Comfort, 2004; Smith, 2004). This, in turn, triggers positive responses by communities to initiate programs of mitigation against the shocks to their community.

iii. Individual capacity to respond to disaster varies from person to person and changes over time. This is so because vulnerability is dynamic and varies amongst different people and over time (Brooks, 2003). Certain people are therefore more vulnerable to certain hazards or threats than others due to their exposure to the hazards, their level of resilience and ability to cope. However, this model supports effective targeting of the most vulnerable groups to ensure they are not driven further into destitution by repeat events. The focus is on empowerment of people at risk.

iv. The planning process must consider the unique needs of the "most vulnerable" and enhance their capacity to respond and recover from disasters. For this reason, the model requires the participation of the

vulnerable groups in the planning, implementation and analysis process. Their active involvement is expected to contribute to the development of a greater understanding of core problems associated with vulnerability such as strengths and coping mechanisms already existing locally. Such engagement can offer insights into the development of programs that can help the vulnerable groups achieve self-sufficiency (Smith, 2004).

v. The community-wide vulnerability and capacity assessment process do not necessarily require specific equipment like computers and GIS mapping or a sophisticated level of detail about the population. However, the more detail-rich the process and visually supported through well-structured maps, the more precise and meaningful the outcome.

vi. These core principles form the basis on which this model is structured and implemented as is reflected in the dialogue on its characteristics (Kuban and MacKenzie-Carey, 2001; IFRC, 2007).

5.3.1.2 Characteristics of the Model add Figure

The striking feature of this model is that it is sequential in nature, as illustrated in Figure 5.2 below.

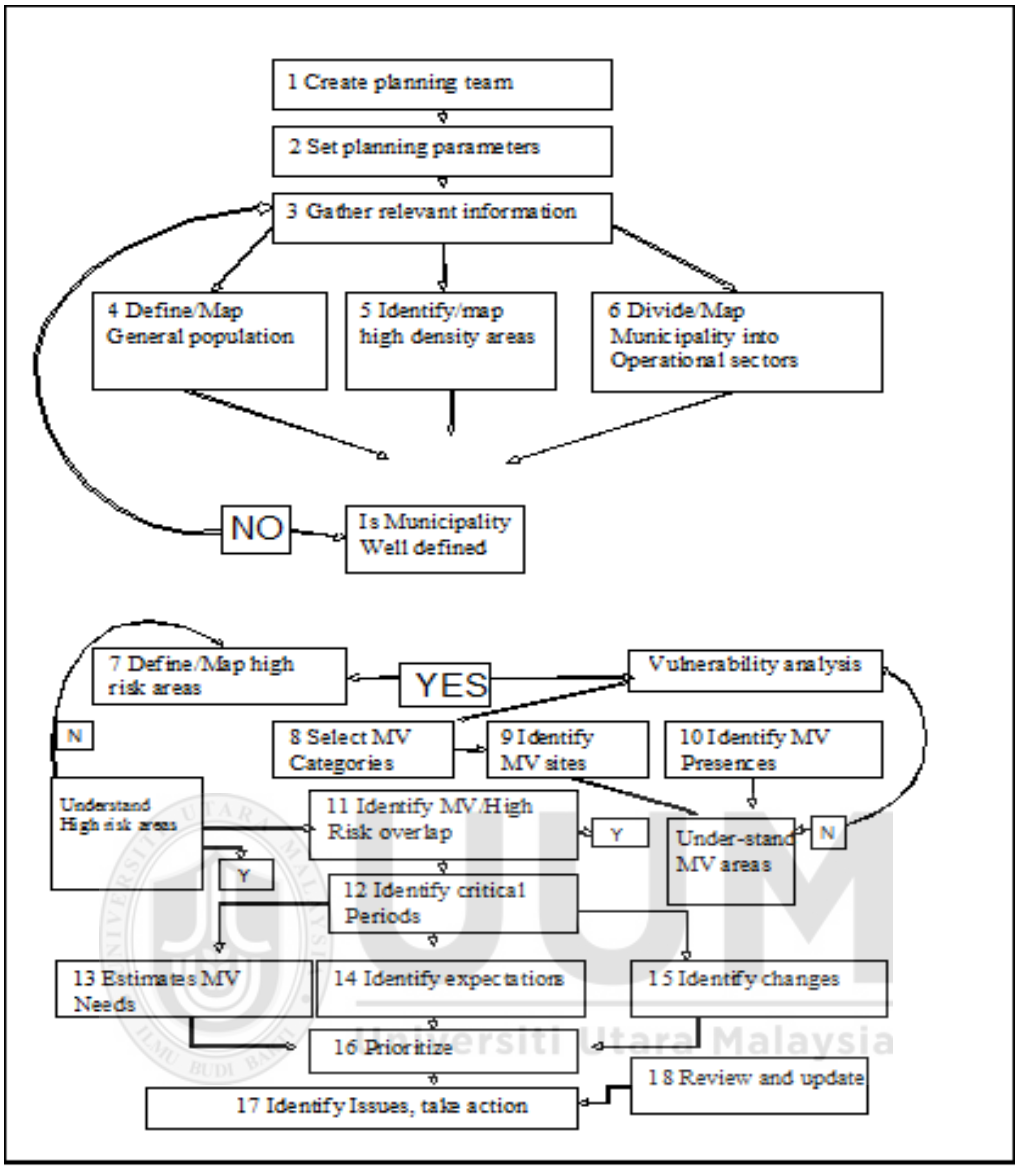


Figure 5. 2: The Community-Wide Vulnerability and Capacity Assessment
Source: Kuban and Mackenzie-Carey, (2001)

The rationale in the CVCA model is to ensure a firm understanding of each step before proceeding to the next. The intent of each step is to provide greater context to the understanding of the most vulnerable segment of the population. The review of the eighteen critical steps (Kuban and MacKenzie-Carey, 2001; IFRC, 2007; IFRC, 2008) will help to trace the relevant characteristics and elements of this model.

Step: 1 Create the planning team This step involves establishing a multi-disciplinary team of "experts" or people knowledgeable about a diversity of issues (Jiggle, 2007)

relating to disaster risk management. The composition of the team should also be based on the information that is required and the best possible role-players to provide and access the desired information. The team should include: representatives from disaster risk management; response/emergency organizations like fire, police, and emergency medical services; municipal planners; health services; social services; from the business sector; non-governmental organizations (NGOs); and key volunteer organizations. While not all of these are required on a continual basis, they should all provide input into the determination of vulnerability and in the development of a meaningful solution to the problem. The involvement of community-based organizations (CBOs) is critical to the success of this process. Typically, these organizations have direct link, knowledge and the confidence of members of the vulnerable groups. Therefore the inclusion of their representatives could provide much needed and valuable information, reliable communication channels or networks with these populations, and increased credibility of the process. These CBOs are often volunteer-based, thus having a greater degree of flexibility and adaptability than public organizations and could better access donors. Once the team has been created, with a leader identified and respective roles allocated amongst team members, it becomes necessary to consider the terms of reference of the team.

Step: 2 Set the planning parameters for the team Immediately after the team has been properly constituted, they should engage in determining parameters for their planning process. This requires defining the boundaries of what they will strive to achieve, how they will function, clarification of their roles and responsibilities, logistical arrangements and resource needs, meeting procedures, and broader network and communication links (Ahrens & Rudolph,2006). Having set the guidelines for the

effective management and functioning of the team enables the team to commence with the collection of data and information.

Step: 3 Gather relevant information Team members should be advised of the basic information required and be tasked to gather it before any other activity is commenced. The emphasis should be on accurate, comprehensive and timely information collected from the correct and appropriate sources. As a rule, all data and information should be presented as visually as possible to provide a better understanding of the set context. This information on the population and their immediate environment serves as a base for critically analyzing the community.

Step: 4 Define and map the general population This step is intended to establish a broad view of the municipality and its population as a foundation upon which additional information is based. The input for this step may be population statistics, census data, and development plans. Whilst the output is a marked map detailing the boundary of the municipality, key facilities within it, as well as a comprehensive list of relevant information on the municipality. This visual map makes it easier to demarcate the high-density areas.

Step: 5 Identify and map high-density areas Using well-defined criteria, the team is expected to highlight and capture the "high-density" areas onto the municipal map. For planning, response and intervention purposes, this categorization of information is crucial as most of the vulnerable are likely to be inhabitants of this zone. To further improve efficiency within the municipality, the next step entails dividing the municipality into distinctive sectors of operation.

Step: 6 Divide and map the municipality into operational sectors An analysis of the municipality is more readily understood and action is more easily defined when classified as manageable segments according to geography and population size. Each sector should be: clearly described; easily identifiable (as conspicuous zones on the map); and manageable during the planning and response processes. Once this information is loaded onto the municipal map, the risk identification process can commence.

Step: 7 Define and map high-risk areas The focus of this step is to gain a broader perspective of risk which would then provide a more meaningful context for the subsequent discussion on the most vulnerable segments of the population. Therefore, historical records, geographical analyses, industrial records, and all reports and records on hazard analyses are a vital source of information. The desired output is a set of markings on the municipal map that identify those areas that are relatively high-risk. The contextualization of the risk factors in terms of the possible or anticipated hazards paves the way for the examination of the vulnerable groups (Bogardi & Birkmann, 2004; Smith, 2004).

Step: 8 Select applicable categories for the "most vulnerable" Well structured criteria to define and determine the "most vulnerable" is developed through broad consultation with representatives from interest groups. social services, education, and the municipal planning section. The team is also required to create a list of identifiable population groups that are deemed to be "most vulnerable" to disasters that are, those who are at the greatest likelihood of being at risk. The next point of concern is for the team to ascertain the location of the "most vulnerable" groups.

Step: 9 Identify categories and map sites related or specific to the "most vulnerable" groups the emphasis here is to trace the sites that either relate to or service the needs of this identified group (most vulnerable). Such sites or facilities may include seniors' homes, frail care facilities, social service access points and health clinics. Each of these sites should be recorded within its appropriate sector and marked on the map to visibly identify its location. Distinct marking on the map 109 makes it easier to move on to the next step and to verify where the large concentrations of the most vulnerable group spend their time.

Step: 10 Identify and map other areas where each of the "most vulnerable" groups has significant numerical presence An understanding of the nature, lifestyle, and limitations of the "most vulnerable" leads to a pattern which points to their presence. Also useful is to solicit information from those who work closely with this group of people for example health services, recreational services, financial services, social services and shopping center. The outcome is a list of key locations within the community where a high concentration of the most vulnerable is, corresponding to precise markings on the map. This output links on to the following action of determining the overlap between the most vulnerable groups and the high-risk areas.

Step: 11 Identify overlap of the most vulnerable groupings or sites and high-risk areas. The aim of this step is to understand where the two vulnerabilities (that is, of people and activities or things) intersect to result in a relatively higher risk level. These overlaps should be abundantly clear if the map has been marked correctly (with the use of different colors, codes, and shading). After all, each step of action

forms the building block to the next. Likewise, this leads to the review of the most critical periods of vulnerability.

Step: 12 Identify critical periods when each group is particularly vulnerable Vulnerability and risk change over time, with relocation or with changes in an activity making it is necessary to provide another layer of clarity regarding the change of vulnerability over time. A simple three-category time-frame analysis is recommended where the distinction involves the workday hours (0), night hours (N) and weekend or holiday hours (H). Simultaneously, a review of the "most vulnerable" groups vulnerability levels (that is High, Medium, Low) during each of the three categories of time need to be clarified and captured. This process reveals the impact of time and the level of vulnerability thereby introducing thought to the possible emergency needs of the most vulnerable.

Step: 13 Estimate likely emergency needs of the "most vulnerable" The intent of this step is to gain a broad understanding of the possible emergency needs of the various vulnerable populations. This is expected to be an on-going effort of refining one's perception of the unique needs, services or resources that may be required by each vulnerable group and within each sector. The outcome should be a comprehensive matrix reflecting the various hazards within the three categories of time against the various sectors of the identified vulnerable groups and the corresponding needs and services (Cardona, 2001). This information will add on to the following section on the actual capacity of the vulnerable groups.

Step: 14 Identify realistic expectations regarding the capacity of each identified group having identified who is involved, where they may be located, and what services or resources they might need, leads to the point of analyzing the capacity of these group members to responding or recovering from disasters (Bogardi & Birkmann, 2004). The outcome should be a list of general expectations by the vulnerable group, prioritized into High, Medium or Low to reflect the impact which they may have on planning or response processes. Further, issues of change on levels of vulnerability need to be incorporated into the comprehensive matrix that has been developed.

Step: 15 Consider conditions that change the presence or vulnerability level of the identified group an important starting point of note is that the community does not remain static. They are constantly adapting to changes in their environment. It is, therefore, necessary to capture these changes and the impact it has on the vulnerability and risk levels of the most vulnerable groups before the process of prioritization can commence.

Step: 16 Categories sectors, facilities or community segments into relative levels of priority having gained all of the above information, it is possible to undertake a more informed assessment regarding risk and the most vulnerable population of the community. Each community sector, vulnerable-group facility, or vulnerable group concentration should be categorized into one of three priority levels (with 1 being the highest and 3 being the lowest). This prioritization informs the planning process and may also be a priority during the response and recovery processes. It is, therefore,

crucial to consider related and broader issues that impact on the process and its outcomes.

Step: 17 Identify issues or groups for further consideration or action The process is likely never over, if for no other reason because people and their capacity undergo change on an ongoing basis. In addition, people physically move in and out of the municipality as well as within it. This results in new and added dimensions to the determined levels of risk and vulnerability. As such, broader and related issues should be reviewed and appropriately addressed to meet the desired outcomes (Comfort, 2004; Jiggle, 2007). Therefore, continuous review and monitoring are vital to the success of this process.

Step: 18 Review and update this process demands that its results be reviewed at least annually and revised and updated accordingly. Revisions must be considered if conditions change significantly (for example, the vulnerability of a group can change due to evolving environmental, social, political, or economic conditions). The above steps clearly map out and capture the complete process of the community-wide vulnerability and capacity assessment model. Each step requires forethought, adequate planning and the layering of information in a way that makes it meaningful and visible, at a glance. Also, the successful implementation of the model is dependent upon the continuous review, and amendment and modification of the information to maintain its relevance and appropriateness. This model has been implemented in various countries and programs yielding positive results, for example integrating community disaster planning program in the Philippine; targeting the most vulnerable in Canada; understanding vulnerability and distress in Finland; and

participatory methods for assessing vulnerable communities in Bolivia and Argentina (IFRC, 1999).

The case study of the Swedish program Local vulnerability and capacity assessment has a mobilizing effect (IFRC, 1999 and Kuban & Mac Kenzie Carey, 2001) illustrates the benefits of utilizing such a model. The Swedish Red Cross (SRC) has been undertaking community-wide vulnerability and capacity assessment since 1994. At the outset, the SRC studied all existing research available such as the standard of living survey. It then examined local assessments of vulnerability and capacity. The main aim of the community-wide vulnerability and capacity assessment was to identify the most vulnerable groups and their capacity to respond. Equally important was the need to raise awareness of the local volunteers and community and to mobilize them to take 113 responsibilities for the changing environment challenging their livelihood. Other important aims included the development of local voluntary work and the promotion of improved co-operation with the local authorities and organizations within the community. As part of the information strategy which included videos and magazine articles, the SRC's chairperson informed the communities about community-wide vulnerability and capacity assessment and actively encouraged them to undertake these assessments. The outcomes achieved were the identificationn of the most vulnerable groups within the community concerned and better relations between local authorities and other voluntary organizations. In effect, it was clear that this model produced positive results and was effective in mobilizing relations between government, voluntary organizations, the business sector and the community. Although the community-wide vulnerability and

capacity assessment model promote effective community disaster risk assessment, there are certain setbacks that may be encountered in the process.

5.3.1.3 Challenges Encountered by this Model

Despite the well structured and logical flow of activities within the model, there are various challenges (IFRC, 2006; IFRC, 2008a) that come to the fore. The major difficulty is that this assessment process is often regarded and used as an end-all-be-all process and is assumed to provide the whole picture. This is certainly not the case nor the intention of this model. More especially with the dynamic nature of risk, the perspective of every analysis changes rapidly and easily with time. The collection of meaningful information must, therefore, involve process layering and be subjected to continuous review and update. "Layering" involves the use of various analyses to refine the current reality. One layer of analysis-gained information helps to clarify or refine previously-gained information. The outcome is a further refinement of the analysis with each successive layer. This indicates that the model should be based on a continuous review and adjustment of information reflecting the changing environment to be relevant and appropriate. Another crucial stumbling block is the quality of data and information available. In most cases, the data may not be available in the time period involved, or usually out of date, inaccurate, partial and not accessible in a format for analysis, which is essential in stimulating appropriate actions and feeding into the planning process. There is a vast quantity of undocumented local knowledge in the field but because of the lack of format with which to systematically collect it and the debate around its unscientific nature; such valuable information is often excluded from the process.

Finally, the fact that this model requires a participatory approach implies a greater need for sensitivity, time and resources to conduct the disaster risk assessment process. The issue of sensitivity begins with securing political will and support to ensure a smooth process. The next stage may be to develop a strategy to sensitize management, staff, volunteers, and all role-players involved. This, in turn, requires time and resources. During the initiation and planning phases of this model, it is critical to secure the necessary resources and take care of all logistical requirements to support such a project. It is also important to take note that the process may be time-consuming and costly because of the level and degree of broad participation. However, the "data rich" information derived as a result of this process is invaluable to the success of the model and its outcomes. Contextualization and examination of the community-wide vulnerability and capacity assessment model assists in setting the parameters for the next model which is the community-based risk reduction model.

5.3.2 Community-Based Risk Reduction Model

The overarching aim of this model is to reduce vulnerabilities and strengthen people's capacity to cope with hazards. A thorough assessment of a community's exposure to hazards and an analysis of their specific vulnerabilities and capacities fun the basis for all activities, projects, and programs directed towards disaster risk reduction (Yodmani, 2002). These issues are further elaborated on within the context of the principles of the model.

5.3.2.1 Main Principles of the Model

This model recognizes community risk assessment as an essential precursor to a bottom-up decision-making process for the development of policies. Strategies and plans towards effective disaster risk reduction. As such, the driving principles are (ISDR, 2007a; ISDR, 2007).

i. To prioritise the community's risks which need to be reduced through the active participation of the community (Jiggle, 2001). The intent of this model is for the community to address all its disaster risks but its actions and resources need to be prioritized according to frequency, the extent of damage and other pertinent considerations which the community members decide on.

ii. Ensure that the risk reduction interventions are going to be adequate and appropriate in light of the risk assessment process. The risk reduction planning should incorporate a balance between preparedness and long-term mitigation planning (Comfort, 2004; Jiggle, 2007).

iii. Ensure that risk reduction will be cost-effective and sustainable. In effect, this requires reducing vulnerabilities by increasing the community's capacities. All existing material, social and attitudinal capacities should be strengthened and areas and strategies for capacity building identified.

iv. To identify external resources and risk reduction strategies which have to be tapped to address vulnerabilities which the community on its own cannot address. This includes community capacity building through training and education activities and materials, network linkages with relevant government organizations, non-governmental organizations and the business

sector to access the required resources and information (Jiggle, 2001; Comfort, 2004; Haghebaert, 2007).

These above principles are further substantiated in the discussion that follows on the characteristics and various phases of the model.

5.3.2.2 Characteristics of the Model

The implementation process of the community-based risk reduction model points to the following essential features:

i. The key resource in disaster risk reduction in the community, both as the main actor as well as the primary beneficiary. The community participates in the whole process from situational analysis to planning and implementation.

ii. Disaster risk reduction is the foundation of this model. The focus is on reducing vulnerable conditions and the root causes of vulnerability (Aryal, 2003; Brooks, 2003). The primary strategy of vulnerability reduction is to increase the community's capacity, their resources, and coping mechanisms.

iii. The involvement of a multitude of community stakeholders to expand their resource base and promote a multi-sectoral and multi-disciplinary approach towards disaster risk reduction. The local community level links 117 up with the intermediate, national and international levels and related sectors to address the complexity of vulnerability issues.

iv. Maintain a dynamic framework where the lessons from practice continue to build into the refining of the actions and outcomes of the process. This flexibility is in correlation with the ever-changing environment and its

impact on vulnerabilities and risk factors within the community (Comfort, 2004; Jiggle, 2007).

The significance of the above characteristics is best determined by the community-based risk reduction process outlined in Figure 5.2 below. The six sequential stages imply that each step grows out of the preceding stage and leads to further action (Yodmani, 2002). Together, the sequence builds up a planning and implementation system for effective disaster risk reduction as shown in Figure 5.2 below.

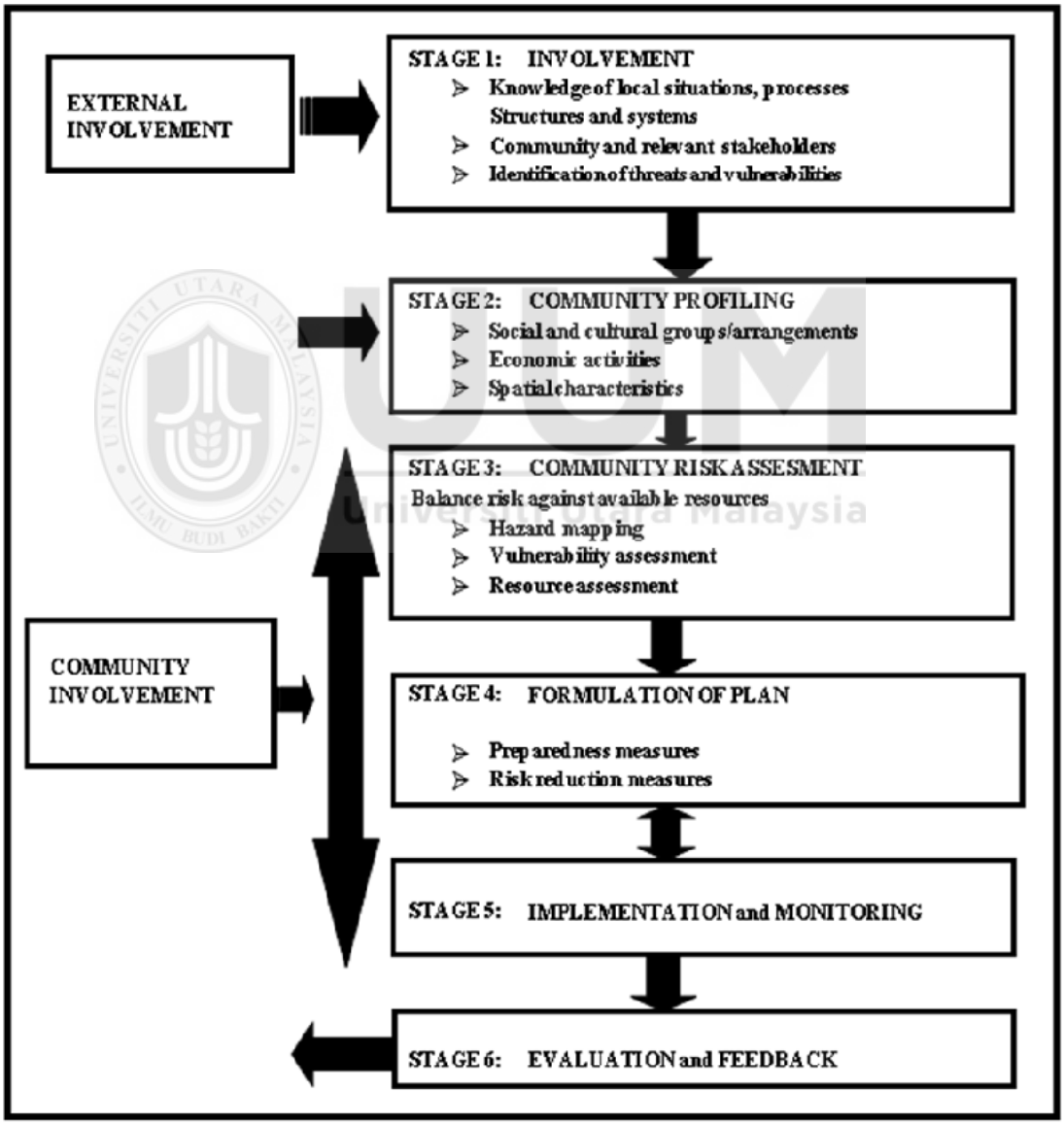


Figure 5. 3: Community Based Risk Reduction Model
Sourec: Yodmani, (2002)

Stage: 1

Initiating the disaster reduction process at present, government departments responsible for disaster management, nongovernmental organizations and donor organizations play a key role in activating the process of community risk assessment. This action is usually in response to requests received from vulnerable communities or to identify vulnerable communities where anticipated risk reduction programs need to be prioritized. This should lead to the close examination of the community and their immediate environment.

Stage: II

Community profiling here the importance is on creating a picture of the nature, needs, and resources of the community as a result of their active participation. It is also a valuable preliminary step in any planning process where the intent is on building rapport and gaining the trust of the community through gathering information on the general community profiling (Hamilton, 2008). The next step will then be to undertake the community risk assessment.

Stage: III

Community risk assessment this is a diagnostic process to balance known disaster risks against available resources. Through the risk assessment process, the community comes to a common understanding of its disaster risks. The dimension of the problem, as well as the resources and opportunities involved, are identified and analyzed. These clarifications facilitate the development of the risk reduction plan.

Stage: IV

Formulation of the disaster risk reduction plan the critical factor is to start off the risk reduction process through community mobilization based on existing capacities and resources within the community's immediate reach (Smith, 2004). The overall objectives and strategies are translated into operational plans, with due consideration given to the resource requirements. At this stage of planning, agreements with intermediary organizations are formalized regarding their support in the implementation process and their commitment to mobilize the required resources. Once the necessary resources are secured and the plan finalized, the implementation process can begin.

Stage: V

Implementation and monitoring the formation and/or strengthening of organizational arrangements (made up of community organizations, volunteer teams and the like) are useful in the implementation of the plan. This core team is responsible for monitoring the progress of implementation and motivates the community through translation of plan objectives and targets into disaster reduction activities. This group is also instrumental in amending targets and plans to keep on course with the set objectives to reduce vulnerabilities and increase capacities in the immediate and long-term. Linking on to the final phase of evaluation and feedback of the disaster risk assessment process.

Stage: VI

Evaluation and feedback Evaluation is concerned with the effects of the risk reduction measures in terms of reducing the vulnerability situation of the community

and determining the impact of risk reduction measures on the community; and the overall quality of their life. The lessons drawn are shared with other groups and communities to promote the concept of effective community risk assessment. The above process reveals that community risk assessment is a participatory approach to determining the nature, scope, and magnitude of negative effects of hazards to the community and its households within an anticipated period of time. In practice, the community-based risk reduction model has been supported for the favorable outputs that it delivers. These are evident in the various projects based on this model, for example, the Bangladesh Urban disaster mitigation project; the Kathmandu Valley risk mitigation program of Nepal; the Community Based Flood mitigation project in Cambodia (AUDMP, 2000), and the most recent one being community-based risk reduction and climate change in Nicaragua (Red Cross and Red Crescent, 2009).

The benefits of this model had been identified as early as 1998 in the "community-based flood mitigation project in Cambodia". This project was initiated to reduce the vulnerability of rural villagers to natural hazards. The project aimed to establish sustainable, replicable non-governmental mechanisms for disaster mitigation and preparedness and improve the capacity and skill of the communities to manage the risk and apply appropriate mitigation skills (AUDMP, 2000). As such, it required the involvement of various stakeholders to oversee and implement the program in the selected communities of the three provinces (that is, Kandal, Prey Veng and Kompong Cham). Each community relied on traditional community processes like village leaders, ward committee members, and the village elders to undertake advisory and or organizational roles to mobilize community involvement and resources. However, the main constraint facing the community was the scarcity of

materials and financial resources. Most of the financial support had to be secured from outside the community. These cost-sharing funds were obtained from non-governmental organizations and donor agencies operating in Cambodia.

The results achieved were enhanced awareness and disaster risk reduction initiatives by the communities themselves and improved community processes and partnerships with non-governmental organizations, the business sector, donor agencies, community-based organizations, and government. These outputs 'reflect the true value of the community-based disaster risk reduction model. However, the smooth implementation process is often delayed by subtle difficulties and stumbling blocks created by the participatory nature of this model.

5.3.2.3 Challenges Facing the Model

One of the most common difficulties is that the community members and external stakeholders usually have differing perceptions of the community's levels of risk and vulnerabilities. The setback here is that the actual resource requirements and intervention measures are determined by the above dynamics. Fortunately, this participatory risk assessment process provides the platform to reach consensus on issues and gain a common understanding of local risk issues within the actual environment. The level and extent of community participation demand a sound knowledge base of disaster risk management in general and a good understanding of the nature and process of disaster risk assessment.

This is usually a slow process, especially trying to get the community to comprehend the basics and ensure that everyone involved is on the same page. An added problem

is that the community capacity building has resource implications which mean that appropriate steps need to be taken to acquire the necessary tools. Also, negotiations around materials, funding, and skilled personnel to undertake training and education of the community create further strain and delays on the time-frames for imp\emendation. This process may, therefore, prove to be long drawn and time-consuming. However, the entire structure and implementation of this model are based on the pivotal role of the community. Community participation cannot be compromised irrespective of the drawbacks that may be experienced. Finally, getting together a multi-sectoral and multi-disciplinary team in itself is a tall order. The issue of availability is usually linked to the degree of priority they attach to disaster risk reduction. If disaster-related issues feature high up on their agenda, then their response and co-operation are easily guaranteed.

In other cases, further attempts are required to demonstrate the relevance, importance, and impact of their involvement before they can be convinced to engage as partners. A further dimension to this difficulty is that these different sectors and disciplines view disaster risk reduction from varying spectrums largely influenced by the thinking and practice within their respective disciplines and sectors. This model allows for the gradual integration and participation of all role-players through a collective engagement process lead by a common agenda of disaster risk reduction.

The third and final model under review, that is the South African Disaster Risk Assessment Model, also hones in on the participatory approach to disaster risk assessment.

5.3.3 South African Disaster Risk Assessment Model

As set out in the National Disaster Management Framework (South Africa, 2005:57-63), this model provides a general guideline for undertaking disaster risk assessment within South Africa. Emanating from a progressive piece of legislation (that is, the Disaster Management Act 57 of 2002), the core principles of this model accentuate the current disaster risk reduction concerns and practice.

5.3.3.1 Key Principles of the Model

Fundamentally. Disaster risk assessment is expected to inform effective disaster planning and risk reduction strategies (AS/NZ4360, 2004; NRAAG, 2007). The primary principles of the model may be regarded as strategic enablers towards this end. First and foremost, disaster risk assessment should be conducted in a systematic and sequential manner. This approach allows for the outcomes of the various stages to be in consonance with and directly inform the requirements of the disaster risk planning process (South Africa, 2005:63). Secondly, disaster risk assessment is to be successively integrated into the development plans of national, provincial and local government so as to ensure that it is considered as part of the strategic planning and resource allocation process. For example, the inclusion of disaster risk assessment requirements and outcomes in the Integrated Development Plans is a means of securing political support and resources for implementation purposes. Thirdly, as a means of increasing the capacity of communities towards minimizing the risk and impact of disasters (South Africa, 2002), community-based disaster risk assessment is essential.

The active involvement of the community improves the quality of the disaster risk assessment process and findings (Smith, 2004) through the application of local and indigenous knowledge (supplementing the technical and scientific information) and experiences. Fourthly, disaster risk assessment requires a diverse team of experts and relevant stakeholders (Jiggle, 2001; De Guzman, 2003; Jiggle, 2007). For example, the process of auditing and compiling disaster risk information must be inclusive of the various disciplines and sectors, government departments, business sector, non-governmental organizations, community-based organizations, and relevant experts and specialists in the field. It could, therefore, be described as an integrated and multi-disciplinary/sectoral process. Lastly, disaster risk assessment must be reliable and valid in order to inform disaster risk reduction planning. The consultative process of risk assessment methods and findings must be subjected to appropriate quality assurance (South Africa, 2005:77-78) prior to the implementation of the outcomes. These principles encompass the structure and characteristics of the model as depicted below.

5.3.3.2 Characteristics of the Model

The South African Disaster Risk Assessment Model reflects the various stages/phases of the disaster risk assessment process (as adapted from AS/NZ 4360, 2004; NRAAG, 2007) wherein:

Stage I: concentrates on identifying the specific disaster risk to be assessed;

Stage II: focuses on analyzing the disaster risk concerned;

Stage III: involves an evaluation of the disaster risk being assessed; and

Stage IV: pertains to monitoring disaster risk reduction initiatives and disseminating disaster risk assessment information.

These different stages function as a collective whole towards disaster risk reduction.As shown in figure 5.4 below.

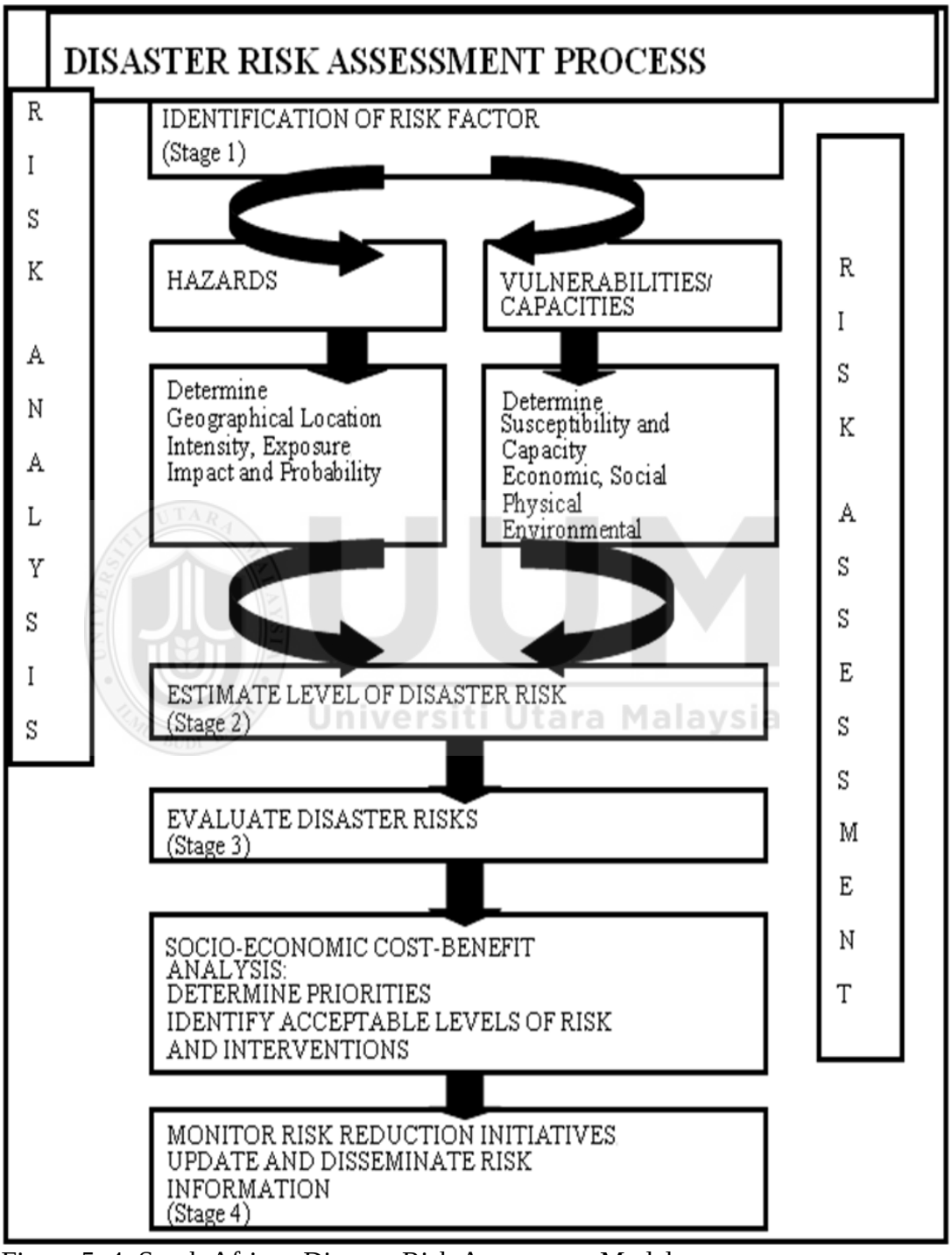


Figure 5. 4: South African Disaster Risk Assessment Model
Source: ISDR (2005) ; AS/NZ (2004); South Africa (2005).

Stage I: IDENTIFICATION OF RISK FACTOR

Identify the Specific Disaster Risk This phase involves the clarification of the hazard with respect to its frequency, magnitude, the speed of onset, affected area, and duration (Tobin & Montz, 1997). It is necessary to analyze and quantify vulnerability to ascertain susceptibilities and capacities. This is undertaken by examining the vulnerability of the people, infrastructure, services, economic activities and natural resources exposed to the hazard. Resulting in determining the most likely losses to be suffered from the action of the hazard on those that are vulnerable and to estimate all likely consequences or impacts of the disaster. In preparation, a review of the relevant capacities, methods, and resources available to manage the risk, should be undertaken. Once the hazards have been clearly identified and the vulnerabilities/capacities determined, it becomes crucial to consider the level of disaster risk.

Stage II: ESTIMATE LEVEL OF DISASTER

Analyze the Disaster Risk during this phase the focus is on estimating the level of risk associated with a specific threat so as to determine whether the resulting risk is a priority or not based on its anticipated impact or consequences (Cutter, 1993; Rogers, 1997). The next step then is to evaluate these risks in order to rank them.

Stage III: EVALUATE DISASTER

Evaluate the Disaster Risk This stage entails the further prioritization of disaster risks when there are multiple threats to assess against the background of limited financial and other resources. Risk evaluation is essential as it is not possible to address all disaster risks at the same time (Smith. 2004; Comfort, 2004). Only those classified as

an absolute priority and marked on the red danger zone are given immediate attention, however, this does not mean that it is the end-all and be-all of the intervention stage. Rather, it is only the start, which implies that all intervention measures in respect of the risk have to be closely managed and monitored.

Stage: IV: MONITOR RISK REDUCTION INITIATIVES

Monitor Disaster Risk Reduction Initiatives, Update and disseminate Disaster Risk Assessment Information During this phase the emphasis is on continuous monitoring to measure the effectiveness of disaster risk reduction initiatives, recognize changing patterns and new developments in risk profiles. Equally important is the updating and dissemination of the information to inform the disaster risk management planning process. Information is the "life-blood" for the success of the disaster risk assessment process thereby developing effective risk reduction measures for implementation. This model is currently adopted by all spheres of government engaging in disaster risk assessment. The well defined and clear process facilitates the easy application thereof. In particular, the example of the Western Cape program on participatory risk assessment for informal settlements bears reference (Holloway & Roomaney, 2008). The main outcomes of this program are to:

i. Involve those most at risk in the consultative process;
ii. Encourage those most at risk to understand the risk better; and
iii. Enable and support those most at risk to reduce recurrent disaster losses that affect their health, assets, and livelihoods.

As such, the community-based disaster risk management approach is utilized to reduce local risk through participatory assessment and planning methods.

Participatory risk assessment is a bottom-up approach that strives to empower communities by engaging them in defining real problems within their environment, deciding on practical solutions, implementing activities and assessing the results of the interventions. This integrated participatory risk assessment and planning process entails three distinct phases (aligned to the South African Disaster Risk Assessment Model) with specific activities and outcomes linked to estimated time frames.

The core element is that of a participatory and inclusive process. In effect, participatory risk assessment is instrumental in guiding immediate risk reduction measures, strengthening cooperation and trust among stakeholders involved in the process, and informing medium to long-term planning (that is, integration into the Integrated Development Planning process). The success of this program has been recognized by the Western Cape Provincial Government as participants in this process. The Western Cape Provincial Government is therefore currently marketing this program as an example of "disaster risk assessment-good practice" in South Africa (Holloway & Roomaney, 2008). In spite of the successful implementation and practice of this model, there are a few critical challenges that need to be recognized and appropriately managed.

5.3.3.3 Challenges of Confronting Model

Like all other participatory, community-based disaster risk assessment models, the difficulties challenging the South African model are not that different. In particular, five problem areas may be isolated for discussion within this context as disclosed below:

i. Issues surrounding effective community engagement especially where the community is regarded as the most crucial role player in the disaster risk assessment process. The degree of community participation is often hindered by their limited background, understanding, and knowledge of disaster risk reduction. Active community participation should be encouraged through a process of education, training, and awareness. Such intervention, as necessary as it may be, has major resource implications, for example materials, finances, personnel, time and generic logistics. Very often this intervention is excluded or forgotten during the planning process and becomes a problem in the implementation phase resulting in unnecessary delays to the approved disaster risk assessment program of action.

ii. The diverse and inclusive consultation process hinges on appropriate timing. Given the fact that a right mix of role players are required to ensure the effectiveness of the process implies that the timing of such activities should be suitable and agreed upon by the respective stakeholders. However, in many municipalities, disaster risk assessment is an afterthought, demanding that a schedule of risk assessment activities be drawn up to fit into a specific time frame to meet legislative or policy imperatives before the end of the budget period where remaining funds have to be utilized. This limits participation as some role players may not be available during the identified period impacting negatively on the assessment results.

iii. The involvement of the different disciplines, government departments and sectors are undertaken on a piecemeal approach based on their availability and interest in this process. As much as these multi-disciplinary and multi-

sectoral stakeholders recognize their role in disaster risk assessment, their commitment to the process is often lacking, for example, attendance at meetings and workshops is represented by different person/SF instead of a dedicated authority figure. This delays the decision process and follow-up action that is usually required.

iv. The difficulties experienced with accessing or retrieving the relevant information to commence the risk assessment process is often linked to conventional practices. Within most municipalities, historical data on previous disaster encounters may be available but may not be in a usable format, For example, original copies of records may be available but to be useful in the risk assessment process, it would have to be captured in the required format to provide the desired output for ascertaining levels of risk and vulnerabilities and determining the associated consequences thereof. Furthermore, communities do not maintain records of incidents and experiences within their environment, yet they possess rich data that is essential to create the parameters of the disaster risk assessment process. Municipalities are therefore expected to explore strategies to involve the community in the information gathering. Sharing and analysis stages.

v. Staffing problems within the disaster risk management units, like the shortage of staff and the lack of adequately skilled personnel to carry out the disaster risk assessment process. This constitutes one of the major drawbacks of pursuing the core activities of disaster risk reduction. Many municipalities are forced to engage the services of consultants or technical specialists to carry out the disaster risk assessment for their municipality.

vi. In so doing, municipalities are required to specify clear terms of reference to guarantee the outcomes and output of the process. However, many municipalities, in a haste to fulfill the procurement requirements of government, fail to stipulate specific terms of reference to be adhered to by the service provider. So, with the omission of such criteria, municipalities usually have limited control over the deliverables and methodology applied in the risk assessment process. The foregoing discussion presented both the positive attributes of the models as well as the various obstacles impacting on their progress. The next logical point of interest is to undertake a comparison of these models. The similarities that they share will be highlighted and the striking differences that set them apart clarified.

5.4 Comparative Analysis of the three Models

The purpose of this exercise is to trace the common threads running through these models, to clarify their differences and the resultant effect on the disaster risk assessment process. This analysis will be undertaken against the set criteria developed and expounded on at the beginning of this chapter. The lessons drawn out of this process will serve as the foundation for the development of the proposed model for Local Government in Pakistan, Muzaffarabad in Chapter Six of the thesis. At the outset, it is interesting to note that the similarities shared by these models are in consonance with the cornerstones of disaster risk reduction presented as a key component of Chapter Three in the thesis. Firstly, recognizing the value and importance of engaging the political-office bearers and community leaders in securing their political commitment and support in disaster risk reduction.

This unveiled a host of opportunities by placing disaster risk assessment and risk reduction in the political spotlight. Beginning with raising awareness and developing a culture of prevention at the community level and extending towards a more strategic level of acquiring resource support and over-all commitment to encouraging effective disaster risk assessment practice. All three models reviewed in this chapter, show strong support for political commitment through the emphasis on the involvement of these political office bearers and community leaders throughout the disaster risk assessment process. Such engagement is crucial in changing the "mindset" towards disaster preparedness, prevention, and risk reduction. By being intimately involved at the practical level, these role players begin to grasp the relevance and merits of disaster risk assessment and risk reduction. As such, they may be instrumental in channeling the outputs of the process into tangible risk reduction initiatives.

Since these political-office-bearers serve on government decision-making bodies, they are better informed through their involvement in the process, to clarify any misunderstandings and uncertainties that may arise during deliberations; and really positive support and commitment for the implementation process. This is, however, the intended outcome of soliciting political commitment, but the reality is somewhat different. For example, in the above models, there is no question about political participation but this seems to be confined to the activities within the disaster risk assessment process. It is, therefore, necessary to link the risk assessment and implementation process to clear actions and responsibilities for follow through and accountability.

Secondly, the need to create multi-disciplinary and multi-sectoral teams to promote integrated disaster risk reduction is expressed as non-negotiable. Such diverse teams of experts and relevant stakeholders serve to lead the process of integrated planning thereby ensuring that disaster risk reduction initiatives are cost-effective and sustainable. After all, disaster risk exists in all ambits of society and all segments of their environment. An inclusive, multi-disciplinary/sectorial approach promotes the notion of shared responsibilities as equal partners in this quest to reduce disaster risk. More importantly, the issue of shared governance is acknowledged within these models and appropriately addressed through a clear understanding and acceptance of roles and responsibilities towards the predetermined goals for effective disaster risk assessment and risk reduction.

The diverse planning team approach is central to the success of all three models. Specific input from the respective disciplines, sectors and broader stakeholder groups is vital in setting the risk assessment process into motion. This type of arrangement based on trust and transparency encourages "ownership" of the process and its outputs. Hence, there is a commitment to integrated planning and sharing of resources and responsibilities (as a team) towards effective risk reduction. Thirdly, the structure and processes of the models allow for flexibility and adaptability. The firm point of departure is that risk assessment issues are dynamic and ever-changing in line with the constantly changing landscape and environment within which it prevails. The true value and relevance of the process can only be maintained through constant and appropriate adaptation. An important component of these models is that of the monitoring, evaluation, and feedback.

This guarantees the relevancy of the process and its outcomes by reviewing the effectiveness of the risk reduction interventions against set targets by taking into consideration changing climatic conditions and new developments within the broader environment, for example, increasing environmental degradation plagued by new infections and viruses (N1 H1, bird flu, foot and mouth disease) and the escalating cost of living due to the global economic recession resulting in increased poverty levels. Hence, giving rise to the necessary adjustments, amendments, and modifications to the action plans and risk reduction strategies to sustain the relevance and effectiveness of these interventions.

Fourthly, community participation forms the nucleus of the disaster risk assessment and risk reduction initiatives within all three models. The community is identified as a critical resource and is required to guide the disaster risk assessment process through their wealth of local and indigenous knowledge. As such, the community is instrumental in identifying the risk and vulnerability realities within their environment. The focus is a bottom-up approach where the community is afforded the lead role in sketching out the persistent problems, concerns, and challenges affecting their safety and livelihood. This serves to ensure that all disaster risk reviews, risk prioritization and subsequent decisions and plans of action are grounded within the context of the community and their respective environment fifthly; the models display a genuine and intentional drive in empowering the community at risk, towards resilience. This is initiated through the active engagement of the community throughout the risk assessment process. As partners in the various activities, the community develops a sense of trust and belonging. This becomes evident in the interactive involvement of the community volunteering

valuable information and sharing personal experiences and past practices. Community capacity is further improved through education, training and awareness programs. Being more informed, the community begins to share ownership of risk reduction initiatives within their environment.

More importantly, the community is empowered to recognize that minimizing disaster risk is their primary responsibility thus challenging them into a process of self-reflection of daily risk practices within their environment; so that they may equip themselves to cope with and adapt to anticipate risk situations as and when they occur. In addition to the five guiding criteria, these models accentuated two further principles, that is: Information is the essence of successful disaster risk assessment. The risk assessment process is reliant on clear, correct, timely, reliable and valid information; hence risk assessment is only as good as the information that is applied to its process.

In turn, the information is only as good as the team that strives to collect, analyzes, communicate and act on it. This reinforces the concept of a well represented and inclusive team of relevant stakeholders sharing in the activities. The emphasis is not necessarily on the most expensive and highly technical equipment, system and methodology being administered in the process; instead, the caution is to keep it simple, understandable and reliable (especially within this context of community risk assessment). Also relevant is the promotion of local and indigenous knowledge to supplement the scientific and technical information in a logical and structured manner. Lastly, disaster risk assessment is described as an iterative process. In this light, the outcomes are construed as a means to an end and not an end in itself, that is

to say, that the recommended risk reduction strategies may not necessarily be the final product and are subject to change and adaptation gave the ever-evolving environment of disaster risk management.

These models encourage process monitoring and reviewing of the intended outcomes and action plans, thus allowing for the relevant adjustments and modifications to be incorporated without unnecessary delays and chances of compromising the disaster risk reduction measures. The above analysis reveals that the three models measure positively against the key international agenda and initiatives on disaster risk reduction (UNDP, 2004; UN, 2005; Kobe Report, 2005 and ISDR; 2005) and the subsequent criteria emanating from them. All five principles were adequately addressed and attained by the models. In effect, these models portray an appropriate starting point towards effective disaster risk assessment and risk reduction.

This is further exemplified in the selected examples of the successful practice of these models. To progressively enhance the practice and benefits of these models, it is imperative that the challenges confronting them are critically reviewed and appropriately sanctioned. It is important to link the disaster risk assessment process to enabling systems, structures, and procedures within government (like the reporting and decision-making systems and structures, and the procurement/supply chain procedures) and the community (for example, existing community-based organizations, volunteer groups and active non-governmental organizations). Such mechanisms are vital in providing support and facilitating the outcomes and actions of the risk assessment process. In light of the above deliberations, all five criteria, that is: political commitment; multi-disciplinary and multi-sectoral approach;

adaptability; community participation; and resilience will be used as the framework in the creation of the proposed model for local government in Pakistan.

These salient principles are compulsory in the pursuit towards the international agenda on disaster risk reduction. The similarities shared by the above-mentioned models crystallize their core principles, characteristics and functioning. As such, these similarities overshadow the apparent differences that arise. The primary differences between these models occur during the planning and resource allocation stage. In model one (community-wide vulnerability and capacity assessment model), the planning process considers resource needs and demands for immediate intervention to reduce vulnerability and positively alter the risk profile of the community.

The next step of planning dwells on the medium to long-term goals in accordance with priority settings linked to the critical levels of risks and vulnerabilities of the community. In model two (community-based risk reduction model), during the planning stage, due cognizance is taken of the resource imperatives for effective implementation of the risk reduction measures. At this point, the commitment and support of government and relevant stakeholders are solicited to guarantee access to and ensure the availability of resources, materials, and equipment, facilitating the implementation of the planned risk reduction interventions.

In the third model (South African Disaster Risk Assessment Model), the focus is on the disaster risk assessment process and is not so strong in the implementation process. Disaster risk reduction initiatives are usually overlooked during the planning

and budgetary process which implies that risk reduction is usually placed lower down on the political agenda. As such, the limited resource base available to government is usually allocated to priority areas before risk reduction issues are tabled, debated and considered for government intervention and support Fortunately for integrated planning through the multi-disciplinary and multi-sectoral approach currently being encouraged by this model, disaster risk reduction measures may be pursued through for example: environmental management, poverty eradication and national social and economic development programs. The above differences once again strengthen the argument around commitment and support as being the driving force of the disaster risk assessment process and the lack thereof delays and challenge the whole process.

The worst case scenario is when the entire process is derailed and all hopes of progress and success are confined to a beautifully developed disaster risk reduction plan. After all, well structured and carefully devised risk reduction plans lose their value if not timely implemented. During the initiation and planning stage, it is imperative to harness the necessary support and commitment from all relevant stakeholders who will be crucial in unleashing the resources required to promote effective disaster risk assessment and enhance the practice of disaster risk reduction.

Table 5.1:
Comparative Perceptive of three models

Categories of Comparisons	**Model 1** Community-wide Vulnerability and Capacity Assessment Model	**Model 2** Community-Based Risk Reduction Model	**Model 3** South African Disaster Risk Assessment Model
Similarities	Endorsees political Component Encourages a multi-disciplinary and multi Sectoral approach Promotes flexibility and Adaptability Hinges on community participation Influences community Reliance Emphasizes information Indigenous knowledge Maintains the Iterative Process		
Differences	Focuses on short-term planning resource provisioning	Planning and Resource allocation to the implementation process	Planning confined to Disaster Risk Assessment and not the Implementation Stag
Similarities	The assessment process is misconstrued as the end results Quality and availability of data and information Pre-requisites of a participatory approach	Differing Perception of risk Level and extent of community participation Co-ordination of a multi-disciplinary and multi-sectoral team	Staff shortage in disaster management units/management Degree and extent of community participation Co-ordination of a multi-disciplinary and multi-sectoral team Access and availability of a relevant information Diverse and inclusive consultative process

In summary, to further enunciate the comparative review of the three models, a simple table (refer to Table 5.1) has been developed, tracing the key variables of comparison.

The above analysis portrays a visual context for the interpretations and deliberations on the comparison of the three models. These significant elements will be depicted in the development of the disaster risk assessment model for local government in Chapter Six.

5.5 Summary

In view of the above exposition of the models, it is evident that strategies for the reduction and prevention of disasters may be universal but their applicability needs to take into account the particular characteristics of the threatened entity. The intention should be to get a better understanding of the hazards, risk, and vulnerabilities of that society and their environment. This leads to the development of appropriate risk assessment tools and risk reduction strategies for the society concerned in light of their peculiarities within the context of their broader dynamic environment. In essence, risk assessment is the outcome of the investigation of the cause-effect relationship between hazard and vulnerabilities. A thorough analysis of these factors through the use of an appropriate risk assessment model enables the identification and implementation of relevant disaster risk reduction interventions. With this background, the initial concerns echoed by Blaikie, (1994) and Twig (2004). At the outset of this chapter becomes less troublesome and a strategic challenge for purposes of planning and implementation. Furthermore. The shift in focus from the hazard intensive review to a more holistic approach with growing

emphasis on the human/social dimensions signals a step in the right direction. In keeping with this perspective, it is necessary to stress that the underlying principles, structures, and processes of the models presented above are based on flexibility, adaptability, continuous monitoring, review and modifications. This notion is further supported by the fact that these models are merely tools enabling the process of risk reduction and they should be recognized as a means to an end and not an end-in-itself; promoting the concept of inherent modification and adaptation.

The critical issues emanating from this chapter of the thesis will be fundamental in providing insight, guiding parameters and depth to deliberations in Chapter Six of the thesis on the development of a disaster risk assessment model for local government in Pakistan. The vulnerability driven approach, aligned with the guiding criteria will form the frame of reference together with the lessons drawn from the review and comparison of the three models presented. The ultimate goal in the following chapter is to carefully examine the research findings so as to provide sound recommendations to be pursued in Chapters of the thesis.

CHAPTER SIX

CONCLUSION

6.1 Introduction

This chapter concludes the research. The first chapter focuses the achievements of outlined objectives and will continue with the review of pertinent theories and concepts of developing strategies and development control currently has been in use in Muzaffarabad Pakistan with reference to the impact of earthquake on housing units, institutional level and local infrastructure at private and public sectors. This approach will give a wider scope of the concept pertaining to reduce the effect of earthquake and to minimize the loss destruction due to use of in proper planning and construction techniques and inadequate use of the material.

The entire research study was guided by different chapters intended towards research outcomes. It was structured on specific research objectives which operationalize every stage of research. The established research objectives and exploratory review of three models will support to the development of a model for disaster management in Pakistan. The research findings explore the communicated challenge added value to support the final model development. The respective challenges are addressed and appropriate recommendations are proposed to manage the gaps. This will further endorse the key objective for the development of a model for future research.

6.2 Recommendations and Conclusions

Recommendations and conclusions below are a validation to the deduced formulation achieved by research findings and by directing educational debate towards effective disaster risk assessment and disaster risk reduction.

Recommendations taken in account for formulating the model are directed by the legislative criteria (as expressed at the beginning of this chapter) and the five noted requirements for effective disaster risk assessment models (developed and applied in chapter four of thesis).This will in evidently starting the development of an appropriate disaster risk assessment model for the local government in Pakistan

In the beginning of this research (in chapter two and four) the imperative focus on contextualizing disasters stated that disasters are not inevitable consequences of natural hazards. Rather as supported by Twigg (2001) human concept of disasters and the outcome of the overall span of individual lives and the environment created by these people in which they reside. All over the world, it is recognized that every day and everywhere human lives are at risk (Winser 2004, Smith 2004; ISDR 2005). The level of obstacles encountered by the disaster risk management team cannot be dependent on the sole basis of statistics or numbers alone. The following table from the World Disasters report (2008bL209-211) can be taken as an illustration. The following data is noted from period 1998 to 2007.

Table 6.1:
World Disaster Impact

Total number of people reported killed	Total number of people reported affected (in thousands)	Total number of Disaster estimated damage (In millions of US Dollars)
1,134,073	2,817,440	US $ 966,980

Source: World Disaster Report, (2008).

6.3 Recommendations

The incorporated disaster risk assessment model is a deliberate perspective that in-depth addresses numerous concerns, obstacles and loopholes blocking the progression of effective disaster risk management and disaster risk reduction actions. Below basic fundamental elements are given that the model focuses on;

i. Encouraging community participation and resilience;
ii. Facilitating a multi-disciplinary and multi-sectoral team;
iii. Promoting an adaptable and flexible framework;
iv. Advancing political will and commitment;
v. Maintaining an iterative process; towards achieving effective disaster risk reduction.

Therefore this approach is deliberated to incorporate, compliment and improve existing disaster risk reduction strategies. In substantiating the above perspective, the research findings explained from the focus group interview schedules heavily emphasizes implementation of a disaster risk assessment model for local government. The following points acknowledge the worth of a disaster risk assessment model to be;

i. promoting a coordinated, uninformed and standardized approach in undertaking disaster risk assessment in line with the requirements of the Disaster Management Legislation

ii. providing proper guidance, structure, and logic to improve disaster risk assessment planning and facilitation processes

iii. adding value to the process by integrating and coordinating the various activities across different disciplines and sectors

iv. facilitating the sharing and harmonizing of resources towards the attainment of common goals; and

v. Fostering the principles of co-operative governance by encouraging and supporting stakeholder participation.

Nevertheless, the actuality presented by the research findings points out that some obstacles anticipated need to be worked on before such a tool can be successfully applied. In the beginning suitable structures, systems and procedures will need to be formed and improved then applied to support such mechanism. Current formal and informal structures, systems and procedures will need to be modified in order to integrate the well-defined principles of the incorporated disaster risk assessment model. The focus should be on making these institutional arrangements functional through well-defined terms of references and a detailed interpretation of the allotted functions and responsibilities serving the efficient application thence. In addition, suitable processes (like reports and plans) should be monitored to verify whether the institutional setups are supporting and maintaining the necessary results in accordance with the sanctioned mandate. If required the suitable alterations to these setups can be done without the delay in the application process. Resource planning

and supplying and procuring requires being completed through integration and coordination planning procedure pursued by a multidisciplinary team and multisectoral team. This should endorse the efficient consumption of limited resources through a shared and mutual perspective of disaster risk assessment and disaster risk reduction. Furthermore, the advancing addition of disaster risk assessment into development and disaster risk management plans connected to the incorporated development plan of the municipality as a planned measure to procure more resources and give importance to the disaster risk management activities, are crucial. As an outcome, this process should push the priority of disaster risk assessment and disaster risk reduction onto the political agenda along with other essential services planned to be delivered and issues required development. So much to justify the construction of effective stakeholder involvement and exhibiting the principles of co-operative governance. Finally a paradigm shift for those who believe in maintaining the prioritization of the current disaster risk assessment practice through the policy procedure incorporating the implementation of the integrated disaster risk assessment model across all bodies of government. The resultant will implement the application of the model, therefore, aiding in endorsing and procuring senior management support, for the disaster risk management functions and affecting positively on the disaster risk assessment process and its outcomes. The efficient practice of disaster risk reduction interventions and strategies should be resulted after its completion (without delays) to improve its significance and propriety; while maintaining the constant monitoring, review, and assessment of these interventions and its effect so as to guarantee and uphold the applicability and prevalence of these disaster risk reduction strategies.

Recommendations provided above should be perceived from a statistical, practical and cost-efficient view articulating its easiness of application and effectiveness in the disaster risk management environment as given in the final conclusive remarks.

6.4 Conclusions

The shortage of a uniformed, organized and coordinated model to direct the disaster risk assessment practice within local government given thrust to pursue the study For future research. Therefore there is a need for an incorporating disaster risk assessment model to be developed for local government that contributes to a standardized, organized, interconnected and uniform style endorsing pro-active disaster risk assessment and disaster risk reduction practices.

The model should be informed and guide coordinated and incorporated disaster risk assessment and disaster risk reduction planning and application by converting and converting the results of the disaster risk assessment process into suitable disaster risk reduction plan to be applied. Essentially the detailed, yet the basic and flexible structure of the model should promote according to its context feasibility and requirement and acceptability across all sectors of government nationally, regionally and internationally, by all those involved in disaster risk assessment and disaster risk reduction activities. The functional and successful application of the proposed model will guarantee the necessary policy involvement enforced by government to be indulged into practice. It is at this stage of analysis that further research to the study may be considered focusing on a crucial review of the discussed three models in the research for selecting an appropriate model for further development to disaster risk assessment and disaster risk reduction methods nationally, regionally and

internationally. It is open for future research and it may conclude to propose or design a model appropriate for disaster risk assessment and disaster risk reduction in Pakistan, this research may continue for the design of an appropriate model in further Ph.D. study or for future research. As of yet the research has not been concluded and will be further pursued by me in future with the conclusion of the three models researched in this dissertation.

REFERENCES

Adger, W.N. & Brooks, N. (2003). Country level risk measures of climate-related natural disasters and implications for adaptation to climate change. In Working Paper 26. Tyndall Centre for Climate Change Research.

Ahmad, H., Wong, A. & Shiever, S.R. (2008). Peacetime Strategies for Disaster Risk Mitigation. In Nicklin, S., Cornwell, B., Dodd, J., Griffiths, J. & Townsend, S. (eds), Risk Wise. United Kingdom: Tudor Rose.

Ahmed, Z. (2013). Disaster risks and disaster management policies and practices in Pakistan: A critical analysis of Disaster Management Act 2010 of Pakistan. *International Journal of Disaster Risk Reduction*, *4*, p.15-20.

Ahmed, Z. (2013). Disaster risks and disaster management policies and practices in Pakistan: A critical analysis of Disaster Management Act 2010 of Pakistan. *International Journal of Disaster Risk Reduction*, *4*, p.15-20.

Akinlolu, M. T. (2018). *Framework for the effective implementation of total quality management in the maintenance of tertiary instituition buildings in South Africa* (Doctoral dissertation, Cape Peninsula University of Technology).

Albala-Bertrand, J.M. (1993). Political Economy of Large Natural Disasters: With Special Reference to Developing Countries. London: Oxford University Press.

Anderson, Mary B. (1992) "Metropolitan Areas and Disaster Vulnerability: A Consideration for Developing Countries." In *Environmental Management and Urban Vulnerability, ed., AlciraKreimer and Mohan Munasinghe, p.77-92. New York: World Bank.*

Alteus, P. (2017). Earthquake Risks in Haiti: An Analysis of Response and Preparedness Strategies for the Design of a New Mitigation Approach.

Annan, K. (2003). Message for the International Day for Disaster Reduction - 8 October 2003.Retrieve from :http://www.unisdr.org/eng/public.

Ansell, J., & Wharton, F. (1992). *Risk: analysis, assessment, management*. John Wiley & Sons Inc.

Ariyabandu, M. M. (1999). Defeating Disasters: Ideas for Action. South Asia: Duryog Nivaran Publishers

Arya, A. S. (2000). Non-engineered construction in developing countries-an approach toward earthquake risk prediction. *Bulletin of the New Zealand Society for Earthquake Engineering*, *33*(3), p.187-208.

Arya, A. S. (2000). Non-engineered construction in developing countries-an approach toward earthquake risk prediction. *Bulletin of the New Zealand Society for Earthquake Engineering*, *33*(3), p.187-208.

Aryal, K.R. (2003). Vulnerables' Perceptions of Disaster and a Disaster Management Project: A Case Study from Nepa/. DPRI-IIASA 3rd International Conference on Integrated Disaster Risk Management, Japan, 3-5 July

Asian Disaster Preparedness Center. (2000). Community Based Disaster Management: Trainer's Guide.Retrieve from: http://www.adpc.ait.ac.th.

Asian Disaster Preparedness Center. (2004).Environmental Degradation & Disaster Risk.Retrieve from :http://www.unisdr.org/eng/riskreduction/wssd/pdf].

Azar, D., & Rain, D. (2007). Identifying population vulnerable to hydrological hazards in San Juan, Puerto Rico. *GeoJournal*, *69*(1-2),p. 23-43.

Banerjee, M. M., & Gillespie, D. F. (1994). Linking disaster preparedness and organizational response effectiveness. *Journal of Community Practice*, *1*(3), p.129-142.

Batterham, A. M., & Hopkins, W. G. (2006). Making meaningful inferences about magnitudes. *International journal of sports physiology and performance*, *1*(1), p.50-57.

Benson, C., Twigg, J., & Rossetto, T. (2007). *Tools for mainstreaming disaster risk reduction: guidance notes for development organisations*. ProVention Consortium.

Bhatt, M.R. (2002). Corporate Social Responsibility and Disaster Reduction: Local overview of Gujarat. Case Study for Corporate Social Responsibility and Disaster Reduction: A Global Overview. Retrieve from :http://www.benfieldhrc.org/SiteRootldisaster-studies/csr/csr.

Björck, A. (2016). Crisis Typologies Revisited: An interdisciplinary approach. *Central European Business Review*, *5*(3).

Blaikie, P. (1994). At risk. *Natural hazards, people's vulnerability, and disasters*, *23*.

Blaikie, P., Cannon, T., Davis, I. & Wisner, B. (1994). At Risk: Natural Hazards, People's Vulnerability and Disasters. London: Routledge.

Boorse, C. (1975). On the Distinction between Disease and Illness. *Philosophy and Public Affairs*, 5: p.7-10.

Bothara, J. K., & Hiçyılmaz, K. (2008). General observations of building behaviour during the 8th October 2005 Pakistan earthquake. *Bulletin of the New Zealand society for earthquake engineering*, *41*(4), p.209-233.

Briceno, S. (2004). Global Challenges in Disaster Reduction. *The Australian Journal* of *Emergency Management,* 19(1): p.3-5.

Buckle, P. (1995). A framework for assessing vulnerability. *Australian Journal of Emergency Management, The*, *10*(1), 11.

Cardoso, J., Mendling, J., Neumann, G., & Reijers, H. A. (2006, September). A discourse on complexity of process models. In *International Conference on Business Process Management* (p. 117-128). Springer, Berlin, Heidelberg.

Careem, M., De Silva, C., De Silva, R., Raschid, L., & Weerawarana, S. (2006, December). Sahana: Overview of a disaster management system. In *Proceedings of the international conference on information and automation* (p. 361-366).

Chapman, D. (1994). *Natural Hazards.* New York: Oxford University Press.

Chen, K., Blong, R. & Jacobson, C. (2003).Towards an Integrated Approach to Natural Hazards Risk Assessment using GIS: With Reference to Bushfires. *Environmental Management,* 31 (4): p.546-560.

Choi, J. J., Green, D. L., & Gilbert, M. J. (2011). Putting a human face on crimes: A qualitative study on restorative justice processes for youths. *Child and Adolescent Social Work Journal*, *28*(5), p.335-355.

Christoplos, I., Mitchell, J. &Liljelund. A. (2001). Reframing Risk: The Changing Context of Disaster Mitigation and Preparedness. *Disasters,* 25(3):p. 185-198.

Clarke, S., & Cooper, C. (2004). *Managing the risk of workplace stress: Health and safety hazards*. Routledge.

Climate, Change and Disasters. In Kreimer, A. & Arnold, M. (eds), *Managing Disaster Risk in Emerging Economies: Disaster Risk Management.* Washington, D.C.: The World Bank: p.45-50.

Coetzee. C. (2009). *The Development, Implementation and Transformation of the Disaster Management Cycle.* South Africa: North-West University.

Comfort, L. K. (2005). Risk, security, and disaster management. *Annu. Rev. Polit. Sci.*, *8*, p.335-356.

Comfort, L., Wisner, B., Cutter, S., Pulwarty, R., Hewitt, K., Oliver-Smith, A., ... & Krimgold, F. (1999). Reframing disaster policy: the global evolution of vulnerable communities. *Global Environmental Change Part B: Environmental Hazards*, *1*(1), 39-44.

Comfort, L.K. (1988). *Managing Disaster: Strategies and Policy Perspectives.* London: Duke Press Policy Studies. 231

Comfort, L.K. (2004).Disaster: Agent of Diplomacy or Change in International Affairs? *Cambridge Review of International Affairs,* XIV (1):p.277-294.

Cooper, J., & Schindler, M. (2008). Perfect Sample Size in Research. *New Jersey*.

Creswell, J. W. (2003). Chapter 1: A framework for design. *Research design: qualitative, quantitative and mixed methods. Sage Publications, Thousand Oaks, CA.*

Creswell, J.W. (1994).*Research Design: Qualitative and Quantitative Approaches.* Thousand Oaks, CA: Sage Publications.

Cuny, F.C. (1983). Disasters *and Development.* New York: Oxford University Press.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008). A place-based model for understanding community resilience to natural disasters. *Global environmental change*, *18*(4), p.598-606.

Cutter, S.L. (1993). *Living with Risks: The Geography of Technological Hazards.* London: Edward Arnold.

Cutter, S.L. (1996). Vulnerability to environmental Hazards. *Progress in Human Geography,* 20(4): p.529-539.

Cutter, S.L. (ed). (1994). *Environmental Risks and Hazards.* New Jersey: Prentice Hall.

Davies, G., & Dwyer, C. (2007). Qualitative methods: are you enchanted or are you alienated?. *Progress in Human Geography*, *31*(2), 257-266.

De Blij, H. (1994). *Nature on the Rampage.* Washington, DC: Smithsonian Books.

De Guzman, E.M. (2003).*Towards Total Disaster Risk Management Approach.* Retrieve from :http://www.adrc.or.jp/publications/Asian-Conference].232

De Satge, R., Holloway, A., Mullins, D., Nchabaleng, L. & Ward, P. (2002). *Learning About Livelihoods: Insights from Southern Africa.* Oxford: Oxfam Publishing.

Degg, M.R. (1992). Reducing Vulnerability to Earthquake Hazard in the Third World: Recent Initiatives by the International Reinsurance Market. In Varley, A. (ed), *Disasters, Development and the Environment.* London: Belhaven Press.

Delamont, S., Atkinson, P. &Parry, O. (1997).*Supervising the Ph.D.* Buckingham: Open University Press.

Denscombe, M. (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of mixed methods research*, *2*(3), p.270-283.

Department for International Development. (2004). *Disaster Risk Reduction:* A *Development Concern.*Retrieve from :http://www.dfid.gov.uk/pubs/files/drr].

Dilley, M., & Boudreau, T. E. (2001). Coming to terms with vulnerability: a critique of the food security definition. *Food policy*, *26*(3), p.229-247.

Dorcey, A.H.J. &McDaniels, T. (1999). *Great Expectations, mixed results: Trends in citizen involvement in Canadian Environmental Governance.* [web:http://www.interchg.ubc.cafdorcey/trends}.

Drabek, Thomas E. (1986). Human System Responses to Disaster: An Inventory of Sociological Findings. New York: Springer- Verlag.

Drabek, Thomas E. (1991). "The Evolution of Emergency Management.' for Local Government, ed., Thomas E. Drabek and Gerard J. Hoetmer,p. 3-29. Washington, DC: International City Management Association.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of management review*, *14*(1),p. 57-74.

Elo, O. (1995). Environment and Disasters, Stop Disasters. *Building* a *Culture of Prevention*, 27(1): 3.

Emmerson, D. K. (2008). Critical terms: Security, democracy, and regionalism in Southeast Asia. *Hard choices: Security, democracy and regionalism in Southeast Asia*,p. p.3-56.

Emmi, P.C., &Horton, C.A. (1995). A Monte Carlo simulation of error propagation in a GIS-based assessment of seismic risk. *International Journal of Geographical Information Systems*, 9(4):p. 447-461.

Ezell, B. C. (2007). Infrastructure vulnerability assessment model (I-VAM). *Risk Analysis: An International Journal*, *27*(3), 571-583.

Ferrier, N. &Haque, C. E. (2003). Hazards Risk Assessment Methodology for Emergency Managers: A Standardised Framework for Application. *Natural Hazards*, 28:p. 271-290.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy sciences*, *9*(2), p.127-152.

Fischhoff, Barusch, Christoph Hohenemser, Roger Kaspeson, and Robert Kates. (1978). "Handling Hazards: Can Hazard Management be improved?" Environment 20 (7): p.16-20; p.32-37.

Godschalk, David R. (1991). "Disaster Mitigation and Hazard Management." In Emergency Management: Principles and Practice for Local Government, ed. Thomas E. Drabek and Gerard J. Hoetmer, 131-60. Washington, DC: International City Management Association.

Godschalk, David R. , Edward J. Kaiser, and Philip R. Berke. (1998). "Hazard Assessment: The Factual Basis for Planning and Mitigation." In Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities, ed. Raymond Burby, p.85-118. Washington, DC: Joseph Henry.

Gooneratne, W. &Obudho, R.A. (eds). (1997).*Contemporary* Issues *in Regional Development Policy: Perspectives from Eastern and Southern Africa.* Kenya: Ashgate Publishing Ltd.

Gratt, L. B. (1987). Risk analysis or risk assessment; a proposal for consistent definitions. In *Uncertainty in risk assessment, risk management, and decision making* (p.241-249). Springer, Boston, MA.

Gupta, M. (2008). Building Inherent Resilience. In Nicklin, S., Cornwell, B., Dodd, J., Griffiths, J. &Townsend, S. (eds), *Risk Wise.* United Kingdom: Tudor Rose.

Gurr, T.R. &Hartt, B. (2003). From Surveillance to Risk Assessment to Action. *Emergency Relief Operations: 3-31.* 235

Hall, AD. (1962). *Some Fundamental Concepts* of *Systems Engineen'ng.* Harmondsworth: Penguin.

Halvorson, S. J., & Parker Hamilton, J. (2010). In the aftermath of the Qa'yamat: 1 the Kashmir earthquake disaster in northern Pakistan. *Disasters*, *34*(1), p.184-204.

Hammersley, M. (2006). Handbook of qualitative research.

Handmer, J. W., & Penning-Rowsell, E. (1990). *Hazards and the Communication of Risk*. Gower Pub Co.

Hays, Walter W. (1991). "Hazard and Risk Assessments in the United States." Episodes 14 (l): p.7-12.

Hazard Assessment: the factual basis for planning and mitigation. In Burby, R. (ed), *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.* Washington, DC.

Hewege, C. R., & Perera, L. C. R. (2013). In search of alternative research methods in marketing: Insights from Layder's adaptive theory methodology. *Contemporary management research*, *9*(3).

Holmes, J. (2007).Global Platform for Disaster Risk Reduction: Keynote Speech. *Disasters Update*, 712:p. 3-6.

Intergovernmental Panel on Climate Change. (2001).*Climate Change 2001: The Scientific Basis.* Contributions of the Working Group 1 to the Third Assessment Report of the IPCC. Cambridge: Cambridge University Press.

International Decade for Natural Disaster Reduction. (1992).*Report* of *the Scientific and Technical Committee on its Third Session,* Geneva: 16-20 March.

International Federation of Red Cross (IFRC) and Red Crescent Societies. (2006).*Vulnerability and Capacity* Assessment: Lessons *Learnt and Recommendations.* Geneva: InterWorks. 237

International Federation of Red Cross (IFRC) and Red Crescent Societies. (2007). *How to do* a *Vulnerability and Capacity Assessment:* A *Practical step-by-step Guide.* Geneva: InterWorks.

International Federation of Red Cross (IFRC) and Red Crescent Societies. (2008a). *Vulnerability and Capacity Assessment Training Guide: Classroom training and /earning-by-doing.* Geneva: InterWorks.

International Federation of Red Cross (IFRC) and Red Crescent Societies. (2008b). *World Disasters Report 2008: Focus on HIV and AIDS.* Switzerland: ATAR Roto Press.

International Strategy for Disaster Reduction. (2002). *Living with Risk:* A *Global Review* of *Disaster Reduction Initiatives.* Preliminary version. Retrieve from:http://www.unisdr.org/unisdr/Globalreport.

International Strategy for Disaster Reduction. (2005). *Living with Risk:* A *Global Review* of *Disaster Reduction Initiatives. Future Challenges:* A *Common Vision for Disaster.* Retrieve from:http://www.unisdr.org/dialogue.

Jeong, J., & Kim, S. Management practices and its performance in exporting manufacturers.

Johnson, B. L., & DeRosa, C. T. (1995). Chemical mixtures released from hazardous waste sites: implications for health risk assessment. *Toxicology*, *105*(2-3), p.145-156.

Khan, A. N., Shaw, R., Pulhin, J., & Pereira, J. (2010). Climate change adaptation and disaster risk reduction in Pakistan. *Climate change adaptation and disaster risk reduction: An Asian perspective*, *5*.

Khan, H., & Khan, A. (2008). Natural hazards and disaster management in Pakistan. *MPRA paper*, (11052).

Khan, H., Vasilescu, L. G., & Khan, A. (2008). Disaster management cycle-a theoretical approach. *Journal of Management and Marketing*, *6*(1),p. 43-50.

Kreimer, A. & Arnold, M. (eds). (2000). *Community-Wide Vulnerability and Capacity Assessment (CVCA).* Ottawa: Office of Critical Infrastructure Protection and Emergency Preparedness.

Kreps, Gary A. (1991). "Organizing for Emergency Management." In Emergency Management: Principles and Practice for Local Government, ed. Thomas E. Drabek and Gerard J. Hoetmer, 30-54. Washington, DC: International City Management Association.

Kreps, Gary A. (1995). "Disaster as Systemic Event and Social Catalyst: A Clarification of Subject Matter." International Journal of Mass Emergencies and Disasters 13 (3):p.255-84.

Laughy, Laurie. (1991). A Planner's Handbook for Emergency Preparedness. Vancouver: Centre for Human Settlements, University of British Columbia.

Lave, Lester B. (1986). "Approaches to Risk Management: A Critique." In Risk Evaluation and Management, ed. V. Corello, J. Manker, and J. Mumpane, p.461-86. New York: Plenum.

Lindsay, J. R. (2003). The determinants of disaster vulnerability: Achieving sustainable mitigation through population health. *Natural Hazards*, *28*(2-3), p.291-304.

Lindsay, John Roderick. (1993). Exploring the Interface ofUrban Planning and Disaster Management. Winnipeg: University of Manitoba Press.

Liyanage, K., & Perera, T. (1998). Design and development of a rapid data collection methodology.

Love, T. D. (1996). Deterring Irresponsible Use and Disposal of Toxic Substances: The Case for Legislative Recognition of Increased Risk Causes of Action. *Vand. L. Rev.*, p.*49*, 789.

Lowrance, W. W. (1976). Of Acceptable Risk: Science and the Determination of Safety.

MacCrimmon, Kenneth and Donald Wehrung. (1986). Taking Risks: The Management of Uncertainty. New York: Free Press.

Mallick, D. V., Dritsos, S. E., & Sonda, D. (2013). Construction and Strengthening of Non-Engineered Buildings in Developing Seismic-Prone Countries. *Structural Engineering International*, *23*(2), 225-228.

Manzoor, A. (2013). Toward resilience: a guide to disaster risk reduction and climate change adaptation.

Marshall, C., &Rossman, G. (1980).*Designing Qualitative Research.* Newbury Park, CA: Sage Publications.

Maskrey, A. (1989).The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies. *World Development,* 26(1): p.1-19. 241

Maskrey, Andrew. (1989). Disaster Mitigation: A Community Based Approach. Oxford: Oxfam.

Maxwell, J. A. (1996). Qualitative research design (Vol. 41). *Thousand Oaks*.

McEntire, D. A. (2001). Triggering agents, vulnerabilities and disaster reduction: towards a holistic paradigm. *Disaster Prevention and Management: An International Journal*, *10*(3), p.189-196.

Mileti, Dennis S. (1999). Disaster by Design. Washington, DC: Joseph Henry Press.

Miller, S., Muir-Wood, R., &Boissonnade, A. (2008). An exploration of trends in normalized weather-related catastrophe losses. *Climate extremes and society*, p.225-247.

MRM (Research Group for Major Risk Management). (2003). Integrated "Natural" Risk Management: The Basic Assessment; An Essay. *DRPI-IIASA 3rd International Conference on Integrated Disaster Risk Management,* 3_5th July: Japan.

Mumtaz, H., Mughal, S. H., Stephenson, M., &Bothara, J. K. (2008). The challenges of reconstruction after the October 2005 Kashmir earthquake. *Proceedings of the New Zealand Society for Earthquake Engineering. Wairakei, New Zealand*.

Musa, Z. N. (2018). *Satellite-Based Mitigation and Adaptation Scenarios for Sea Level Rise in the Lower Niger Delta*. CRC Press.

Myers, M.F. (1997). *Insights Emerging from the Assessment* of *Research and Applications for Natural Hazards in the United States.* Vancouver: Disaster Preparedness Resources Centre: University of British Columbia.

Myers, Mary Fran. (1997). Insights Emerging from the 'Assessment of Research and Applications for Natural Hazards' in the United States. Vancouver, British Columbia: Disaster Preparedness Resources Centre, University of British Columbia.

National Research Council (1989). Improving Risk Communication. Washington, DC.: National Academy Press.

National Research Council (1991). A Safe Future: Reducing the Impacts of Natural Disasters. Washington, DC: National Academy Press.

National Research Council (Ed.). (1989). *Improving risk communication*. National Academies.

National Risk Assessment Advisory Group. (2007). *A National Risk Assessment Framework for sudden onset Natural Hazards.*Retrieve from: www:http://www.ga.gov.au

Natural Disasters and Vulnerability Analysis. Report of Expert Group Meeting on Vulnerability Analysis. Geneva: United Nations. Oliver-Smith, A. (1990).

Oxford dictionaries http://www.oxforddictionaries.com/definition/english/disaster

Parker, D. J. (1992). Flood disasters in Britain: lessons from flood hazard research. *Disaster Prevention and Management: An International Journal*, *1*(1).

Parker, Ronald Steven. (1992a). "Vulnerability and Resiliency: Environmental Degradation in Major In Environmental Management and Urban Vulnerability, Metropolitan Areas in Developing Countries." ed. AlciraKreimer and Mohan Munasinghe, P.108-52. New York: World Bank.

Pasila, A. (2013). Changes, challenges and opportunities in the wood energy supply chain. *Agronomy Research*, *11*(2), p.529-532.

Patton, M.Q. (2002).*Qualitative Research and Evaluation Methods.* 3m ed. Thousand Oaks, CA: Sage Publications.

Pearce, L. (2003). Disaster management and community planning, and public participation: how to achieve sustainable hazard mitigation. *Natural hazards*, *28*(2-3), p.211-228.

Pearce, L. (2005). The value of public participation during a hazard, impact, risk and vulnerability (HIRV) analysis. *Mitigation and Adaptation Strategies for Global Change*, *10*(3), p.411-441.

Pearce, L. (2005). The value of public participation during a hazard, impact, risk and vulnerability (HIRV) analysis. *Mitigation and Adaptation Strategies for Global Change*, *10*(3), p.411-441.

Pearce, L. (2005). The value of public participation during a hazard, impact, risk and vulnerability (HIRV) analysis. *Mitigation and Adaptation Strategies for Global Change*, *10*(3), p.411-441.

Pearce, L. D. R. (2000). An integrated approach for community hazard, impact, risk and vulnerability analysis: HIRV (Doctoral dissertation, University of British Columbia).

Pearce, Laurie, Henry Hightower, Barry Konkin, Sophie Megalos, and James Pernu. (1993). British Columbia Hazard, Risk and Vulnerability Analysis. Vancouver: DPRC, University of British Columbia.

Pelling, M. (2003a). *The Vulnerability* of *Cities: Natural Disasters and Social Resilience.* London: Earthscan Publications.

Pelling, M. (ed). (2003b). *Natural Disasters and Development in* a *Globalizing World.* London: Routledge.

Penguin. Palm. R.1. (1990).*Natural Hazards: An Integrative Framework for Research and Planning.* USA: John Hopkins University Press.

Penning-Rowsell, Edmund, and John Handmer. (1990). "The Changing Context of Risk Communication." In Hazards and the Communication of Risk, ed., John Handmer and Edmund Penning-Rowsell, P.3-15. Vermont: Gower.

Petak, W.J. &Atkisson, A.A. (1982). *Natural Hazard Risk Assessment and Public Policy: Anticipating the Unexpected.* New York.

Pettengell, C. (2010). Climate Change Adaptation: Enabling People Living in Poverty to Adapt. *Oxfam International Research Report.*

Pickett, J. H., & Block, B. A. (1991). Day-to-day management. *Emergency management: Principles and practice for local government*, p.263-310.

Preston, V., Taylor, S. M., & Hodge, D. C. (1983). Adjustment to natural and technological hazards: A study of an urban residential community. *Environment and Behavior*, *15*(2),p. 143-164.

Quan, H., Li, B., Couris, C. M., Fushimi, K., Graham, P., Hider, P., ... & Sundararajan, V. (2011). Updating and validating the Charlson comorbidity index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. *American journal of epidemiology*, *173*(6), p.676-682.

Quarantelli, E. L. (1988). Disaster crisis management: A summary of research findings. *Journal of management studies*, *25*(4), p.373-385.

Quarantelli, E. L. (2001). The sociology of panic.University of Delaware Disaster Research Center.

Quarantelli, EL. (1981). "Sociology and Social Psychology of Disaster." In CompleteRecord of the Proceedings 9th World Civil Defense Conference, part 2. #147. (n.p.) Delaware, USA: Disaster Research Center (Reprinted Quarantelli, E.L., and Louis Walter. (1997). "Natural Hazards and Global Change." In The Elements of Change 1996. Susan Joy Hassol and John Katzenberger (eds.). p.1-80. Aspen: Aspen Global Change Institute.

Quarantelli, EL. (1986). Planning and Management for the Prevention and Mitigation of Natural Disasters, Especially in a Metropolitan Context. Delaware: Disaster Research Center, University of Delaware.

Quarantelli, EL. (1993). "Converting Disaster Scholarship into Effective Disaster Planning and Managing: Possibilities and Limitations." International Journal of Mass Emergencies and Disasters 1 1 (l): 15-40 m. (1991). Different Types of Disasters and Planning Implications. Delaware: Disaster Research Center, University of Delaware.

Rogers, G. (1997). The Dynamics of Risk Perception: How does perceived risk respond to risk events? *Risk Analysis*, 17: p.745-757.

Rossetto, T., &Peiris, N. (2009). Observations of damage due to the Kashmir earthquake of October 8, 2005 and study of current seismic provisions for buildings in Pakistan. *Bulletin of Earthquake Engineering*, *7*(3), p.681-699.

Rowe, W.D. (1991). "The Social Genesis of Risks and Hazards." In Risk and Society: The Interaction of Science, Technology and Public Policy, ed., M. Waterstone, 17-31. Netherlands: Kluwer Academic Publishers.

Ryscavage, R. (2003). The Transition from Conflict to Peace. *Emergency Relief Operations:* p.284-294.

Salter, J. (1997). Trend Report: Risk Management in a Disaster Management Context. *Journal of Contingencies and Crisis Management,* 5(1): p. 60-65.

Salter, J. (1998). The Mitigation Symposium: Towards a Canadian Mitigation Strategy. In Disaster Preparedness Resources Centre. *Comprehensive Symposium Proceedings.* Vancouver, BC: University of British Columbia.

Savory, C. J., Hocking, P. M., Mann, J. S., & Maxwell, M. H. (1996). Is broiler breeder welfare improved by using qualitative rather than quantitative food restriction to limit growth rate,*Animal welfare*, *5*(2), p. 105-127.

Scanlon, T. Joseph. (1991). "Reaching Out: Getting the Community Involved in Preparedness." In Emergency Management: Principles and Practice for Local Government, ed., Thomas E. Drabek and Gerard J. Hoetmer, p. 79-100.

Scheidegger, A. E. (1994). Hazards: Singularities in Geomorphic Systems. *Geomorphology*, 10: p. 19-25.

Schipper, L. &Pelling, M. (2006). Disaster Risk, Climate Change and International Devlopment: Scope for, and Challenges *to,* Integration. *Disasters,* 30(1): p.19-38.

Shaw, R. (2015). Hazard, vulnerability and risk: the Pakistan context. In *Disaster Risk Reduction Approaches in Pakistan* (p. 31-52). Springer, Tokyo.

Showalter, P. S., & Myers, M. F. (1992). *Natural Disasters as the Cause of Technological Emergencies: A Review of the Decade, 1980-1989*. Natural Hazards Research and Applications Information Center, Institute of Behavioral Science, University of Colorado.

Sitkin, S. B., & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *Academy of management review*, *17*(1),p. 9-38.

Srnka, K. J., & Koeszegi, S. T. (2007). From words to numbers: how to transform qualitative data into meaningful quantitative results. *Schmalenbach Business Review*, *59*(1),P. 29-57.

Strauss, A. & Corbin. J. (1998). *Basics* of *Qualitative Research: Techniques and Procedures for Developing Grounded Theory.* California: Sage Publications, Inc.

Susman, P., 0' Keefe, P. &Wisner, B. (1984). Global Disasters: A Radical Interpretation. In Hewitt, K. (ed), *Interpretations* of *Calamity from the Viewpoint* of *Human Ecology.* Boston: Allen & Unwin:p. 264-283.

Sylves, R. (2014). *Disaster Policy and Politics: Emergency Management and Homeland Security: Emergency Management and Homeland Security*. CQ Press.

Tang, C., van Asch, T. W., Chang, M., Chen, G. Q., Zhao, X. H., & Huang, X. C. (2012). Catastrophic debris flows on 13 August 2010 in the Qingping area, southwestern China: the combined effects of a strong earthquake and subsequent rainstorms. *Geomorphology*, *139*, p. 559-576.

Temesgen, B., Mohammed, M. U., & Korme, T. (2001). Natural hazard assessment using GIS and remote sensing methods, with particular reference to the landslides in the Wondogenet area, Ethiopia. *Physics and Chemistry of the Earth, Part C: Solar, Terrestrial & Planetary Science*, *26*(9), P. 665-675.

Thomalla, F., Downing, T., Spanger-Siegfried, E., Han, G., &Rockstrom, J. (2006). Reducing Hazard Vulnerability: Towards a common approach between Disaster Risk Reduction and Climate Adaptation. *Disasters,* 30(1): p. 39-48.

Tobin, G.A. &Montz, B. *Natural Hazards: Explanations and Integration.* New York: The Guilford Press.

Tomasini, R. M., & Van Wassenhove, L. N. (2009). From preparedness to partnerships: case study research on humanitarian logistics. *International Transactions in Operational Research*, *16*(5), P. 549-559.

Turner, B.L., Kasperson, RE., Matson, P.A., McCarthy, J.J. &Corell, RW. (2003).A Framework for Vulnerability Analysis in Sustainability Science. *Proceedings* of *the National Academy* of *Sciences* of *the United States* of *America (PNAS),* 100(14): p. 8074-8079.

Twigg, J. (2001). *Corporate Social Responsibility and Disaster Reduction: An Overview.* London: Benfield Greig Hazard Research Centre.

Twigg, J. (2004a).*Good Practice Review: Disaster Risk Reduction - Mitigation and Preparedness in Development and Emergency Programming.* London: Humanitarian Practice Network (HPN).

Twigg, M. (2004b).*Disaster Risk Reduction: Mitigation and Preparedness in Development and Emergency Programming.* London: Overseas Development Institute.

Twigg, J. (2015). Disaster risk reduction. *Overseas Development Institute: London, UK*.

Varnes, D. J. (1984). *Landslide hazard zonation: a review of principles and practice* (No. 3).

Vermaak, J & Van Niekerk, D. (2004). Development Debate & Practice: Disaster Risk Reduction initiatives in South Africa. *Development Southern Africa,* 21 (3): p.555-574.

Wahlström, M. (2015). New Sendai Framework Strengthens focus on reducing disaster risk. *International Journal of Disaster Risk Science*, *6*(2), 200-201.

Weichselgartner, J. (2001). Disaster mitigation: the concept of vulnerability revisited. *Disaster Prevention and Management: An International Journal*, *10*(2), 85-95.

Weichselgartner, J., & Pigeon, P. (2015). The role of knowledge in disaster risk reduction. *International Journal of Disaster Risk Science*, *6*(2), p.107-116.

Weichselgartner. J &Obersteiner, M. (2002).Knowing Sufficient and Applying More: Challenges in Hazards Management.*Environmental Hazards;*:p.73-77.

Weiman, C.; Kruger, F. & Mitchell, B. (2005). *Research Methodology.* 3rd ed. Cape Town: Oxford University Press.

Westgate, K.N. &o'Keefe, P. (1976). *Some Definitions* of *Disaster.* Disaster Research Unit Occasional Paper No 4, Department of Geography, University of Bradford.

White, G.F. (1973). An Interaction of People and Nature. **In** Alcantara-Ayala, I. *Science-Direct Geomorphology, 47p.(2-4).*

White, G.F., Kates, R.W. & Burton, I. (2001). Knowing Better and Losing even more: The use of Knowledge in Hazards Management. *Environmental Hazards,* 3: p.81-92.

White, Gilbert. (1979). "Natural Hazards Policy and Research Issues." In Natural Hazards in Australia, ed. R.L. Heathcote and B.G. Thom, p.15-22. Sydney, Australia: Australian Academy of Science.

White, P. S. (1979). Pattern, process, and natural disturbance in vegetation. *The botanical review*, *45*(3), 229-299.

Wilson, J., & Oyola-Yemaiel, A. (2001). The evolution of emergency management and the advancement towards a profession in the United States and Florida. *Safety Science*, *39*(1-2), p.117-131.

Wilson, R., & Crouch, E. A. (1987). Risk assessment and comparisons: an introduction. *Science*, *236*(4799), 267-270.

Wilson, Richard, and E.A.C. Crouch. (1987). "Risk Assessment and Comparisons: An Introduction." Science, April,p. 267-70.

Wisner, B., Blaikie, P., Cannon, T., &Davis, I. (2004). *At Risk: Natural Hazards, People's Vulnerability and Disasters.* 2nd Ed. New York.

Wolcott, H.F. (1990). *Writing up Qualitative Research.* San Franscisco: Sage Publications.

Woods, P. (1999). *Successful Writing for Qualitative Researchers*. London: Routledge.

World Bank. (2008).*World Bank Good Practice: Disaster Risk Reduction.*

World Disaster Report (AFRC): *Focus on HIV &AIDS.* Switzerland: ATAR Roto Press. Kobe Report. (2005).*Environmental Management and Disaster Reduction: Building* a *Multi-stakeholder Partnership.* World Conference on Disaster Reduction. Japan, p.18-22.

Zhao, B., Taucer, F., & Rossetto, T. (2009). Field investigation on the performance of building structures during the 12 May 2008 Wenchuan earthquake in China. *Engineering Structures*, *31*(8), p.1707-1723.

Zsidisin, G. A., & Ellram, L. M. (2003). An agency theory investigation of supply risk m anagement. *Journal of supply chain management, 39*(2), p.15-27.