

INTEGRATING COMMUNITY FACTORS IN PAKISTAN'S FLOOD DISASTER
MANAGEMENT FRAMEWORK

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Dedicated to all those who lost their lives in natural disaster

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ABSTRACT

Asia continues to experience a high number of natural disasters, especially floods, with an increased number of deaths and structural losses. Approaches to address these disasters have emphasized on improvement to geophysical and technical mechanisms. An equally useful contribution to disaster management is community development, characterised by enhanced local knowledge. However, there is a lack of study addressing factors which make up local knowledge, thus this research aims to identify those factors among vulnerable communities affected by flood disasters in Pakistan. Based on literature review, factors which form community knowledge were identified and consequently utilized as the latent variables for developing the Structural Equation Model (SEM) for community local knowledge in flood management. In the first phase of the study, a total of 385 questionnaires were administered in seven flood-prone districts of Pakistan. The survey examined the perception on factors making up local knowledge of the selected communities. ANOVA test, Post hoc tests and Confirmatory Factor Analysis (CFA) were undertaken before comparing the factors to SEM construct. A separate Exploratory Factor Analysis (EFA) was also conducted on the results of a pilot survey before applying the full data to find the underlying structure of local knowledge variables. The results of SEM showed a satisfactory degree of fit explaining R^2 45 % of the variance with flood experience, flood risk perception and social capital having a high influence on flood disaster management. The second phase of the study involved an in-depth interview with 30 personnel from government institutions working in the disaster management related fields. The interviews revealed that the flood disaster management in Pakistan is relatively unsatisfactory due to poor planning and weak coordination between various stakeholders. Lack of communication between professionals and vulnerable local communities leads to poor handling of floods in the region. The findings of this thesis highlight the need to enhance community local knowledge generally and in particular to strengthen community readiness and improve stakeholders' collaboration as measures to reduce disaster risks in the region.

ABSTRAK

Asia terus mengalami bencana alam terutama banjir dengan peningkatan jumlah kematian serta kerugian struktur. Pendekatan bagi menangani bencana ini memberi penekanan kepada peningkatan mekanisme geofizik dan teknikal. Sumbangan yang sama berguna kepada pengurusan bencana adalah pembangunan komuniti yang dicirikan oleh pengetahuan tempatan yang dipertingkatkan. Walau bagaimanapun terdapat kekurangan faktor bagi menangani kajian yang menyumbang kepada pengetahuan tempatan, oleh itu kajian ini bertujuan mengenal pasti faktor-faktor dalam kalangan masyarakat yang terjejas oleh bencana banjir di Pakistan. Berdasarkan kajian literatur, faktor yang membentuk pengetahuan tempatan telah dikenal pasti dan seterusnya dijadikan faktor bagi membentuk konstruk Model Persamaan Struktur (SEM) untuk pengetahuan masyarakat setempat dalam pengurusan banjir. Pada peringkat pertama kajian, sejumlah 385 soal selidik telah diedarkan di tujuh kawasan yang sering mengalami banjir di Pakistan. Kajian ini meneliti persepsi mengenai faktor yang membentuk pengetahuan tempatan dikalangan komuniti terpilih. Ujian ANOVA, ujian Post hoc, dan Analisis Faktor Penentu (CFA) telah dilakukan sebelum membandingkan faktor tersebut dengan konstruk SEM. Analisis Faktor Eksploratori (EFA) yang berasingan juga dijalankan ke atas hasil kajian perintis sebelum menggunakan data penuh untuk mencari struktur asas pembolehubah pengetahuan tempatan. Hasil SEM menunjukkan tahap memuaskan yang sesuai dijelaskan oleh varians R^2 45% dengan pengalaman banjir, persepsi risiko banjir dan modal sosial memiliki pengaruh yang tinggi terhadap pengurusan bencana banjir. Fasa kedua kajian melibatkan temubual dengan 30 kakitangan dari institusi kerajaan yang bekerja dalam bidang pengurusan bencana. Hasil temubual menjelaskan bahawa pengurusan bencana banjir di Pakistan agak tidak memuaskan kerana perancangan yang kurang baik dan kurangnya penyelarasan antara pelbagai pihak yang berkepentingan. Kurangnya komunikasi antara profesional dan komuniti tempatan menyebabkan kepincangan pengurusan dan pengendalian banjir di rantau ini. Dapatan kajian ini mengetengahkan keperluan untuk meningkatkan pengetahuan tempatan komuniti secara umumnya dan secara khususnya untuk mengukuhkan ketersediaan komuniti dan meningkatkan kolaborasi pemegang taruh sebagai langkah untuk mengurangkan risiko bencana di wilayah ini.

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LIST OF ABBREVIATION

AMOS	-	Analysis of Moment Structures
ANOVA	-	Analysis of Variance
AVE	-	Average Variance Extracted
Avg.	-	Average
ASV	-	Average Squared Shared Variance
CBDM	-	Community Based Disaster Management
CBDP	-	Community Based Disaster Preparedness
CBDRM	-	Community Based Disaster Risk Management
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
Chi-sq	-	Chi Square Statistics
CR	-	Composite Reliability
Cr	-	Critical Ratio
DCOs	-	District Coordination Officers
DDMAs	-	District Disaster Management Authorities
Df	-	Degree of Freedom
DRM	-	Disaster Risk Management
DRR	-	Disaster Risk Reduction
EFA	-	Exploratory Factor Analysis
e.g.	-	For Example
etc.	-	Etcetera, and so on
F	-	F- Statistics
FFC	-	Federal Flood Commission
GFI	-	Goodness of Fit Index
GIA	-	Geographic Information System
HFA	-	Hyogo Framework for Action
i.e.	-	That is,
KM	-	Kilo Meter
KMO	-	Kaiser-Meyer-Olkin test
KPK	-	Khyber Pakhtunkhwa

Mm	-	Millimetre
M.Phil	-	Master of Philosophy
Max.	-	Maximum
Min.	-	Minimum
MS	-	Master in Science
MSV	-	Maximum Shared Variance
N	-	Number of Sample
Na	-	Not available
NDM	-	National Disaster Management
NDMA	-	National Disaster Management Authority
NDRMF	-	National Disaster Risk Management Fund
NFI	-	Normed Fit Index
NGOs	-	Non-Government Organisations
NVivo	-	Software for Qualitative data analysis
P	-	P-Value
PDMAs	-	Provincial Disaster Management Authorities
Ph.D.	-	Doctor of Philosophy
PMD	-	Pakistan Metrological Department
POST-HOC	-	From Latin “after that”
R	-	Coefficient of Correlation
R^2	-	Percentage of the Variance
RMR	-	Root Mean Square Residual
RMSEA	-	Root Mean Square Error of Approximation
SEM	-	Structure Equational Modelling
SD	-	Standard Deviation
S.E.	-	Standard Error
SIC	-	Squared Inter Construct Correlations
Sig.	-	Significance
SOPs	-	Standard Operating Procedures
SPSS	-	Statistical Package for Social Science
Sq-km	-	Square Kilo Meter
TLI	-	Tucker- Lewis Index
UN	-	United Nation

UNDP	-	United Nations Developing Programme
UNISDR	-	United Nation International Strategy for Disaster Reduction
WMO	-	World Metrological Organisation
X^2	-	Chi Square Statistics

LIST OF SYMBOLS

%	-	Percent
<	-	Less than
>	-	Greater than
≤	-	Less than and equals to
=	-	equal to, is, are
\$	-	dollar

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GLOSSARY OF TERMS

- Adaptation - *“The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”*
- Capacity - *“The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals”*
- Capacity Building - *“The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions”*
- Coping Capacity - *“The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters”*
- Climate Change - *“A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”*
- Contingency Planning - *“A management process that analyses specific potential events or emerging situations that might threaten society or the environment and establishes arrangements in advance to enable timely, effective and appropriate responses to such events and situations”*
- Disaster - *“A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”*
- Disaster Risk Management - *“The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster”*
- Disaster Risk Reduction - *“The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and*

- property, wise management of land and the environment, and improved preparedness for adverse events”*
- Disaster Risk Reduction Plan - *“A document prepared by an authority, sector, organization or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives”*
- Early Warning System - *“The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss”*
- Environmental Degradation - *“The reduction of the capacity of the environment to meet social and ecological objectives and needs”*
- Exposure - *“People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses”*
- Extensive Risk - *“The widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts”*
- Forecast - *“Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area”*
- Hazards - *“A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage”*
- Land Use Planning - *“The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses”*
- Mitigation - *“The lessening or limitation of the adverse impacts of hazards and related disasters”*
- Natural Hazard - *“A serious disruption of functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources”*

Preparedness	- <i>“The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions”</i>
Prevention	- <i>“The outright avoidance of adverse impacts of hazards and related disasters”</i>
Public Awareness	- <i>“The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards”</i>
Recovery	- <i>“The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster affected communities, including efforts to reduce disaster risk factors”</i>
Resilience	- <i>“The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”</i>
Response	- <i>“The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected”</i>
Risk	- <i>“The combination of the probability of an event and its negative consequences”</i>
Risk Assessment	- <i>“A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend”</i>
Risk Management	- <i>“The systematic approach and practice of managing uncertainty to minimize potential harm and loss”</i>
Social Natural Hazards	- <i>“The phenomenon of increased occurrence of certain geophysical and hydro-meteorological hazard events, such as landslides, flooding, land subsidence and drought, that arise from the interaction of natural hazards with overexploited or degraded land and environmental resources”</i>
Structural and non Structural	- <i>Structural measures: “Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard</i>

Measures	<i>resistance and resilience in structures or systems”</i>
	<i>Non-structural measures: “Any measure not involving physical construction that uses knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education”</i>
Sustainable Development	- <i>“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”</i>
Vulnerability	- <i>“The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard”</i>

(Glossary of terms from the UN International Strategy for Disaster Reduction – ISDR, 2009)

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

A disaster has been defined as a serious disruption of the normal functions of a life and caused extensive human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources UNISDR (2009). In the past decades, the world has seen more natural disasters occurring in forms of hydro meteorological or climate-related events such as storms and floods. The Asia-Pacific region alone experienced 40 percent of the total number of disasters and is extremely susceptible to disaster hazards because it has 60 percent of the world population living in this region. In addition, the region has varied hydro-metro-topographical features i.e. large river basins, flood plains, mountain ranges and highly seismic and volcanic zones which contribute to frequent large-scale natural disasters.

Among the prevalent natural disasters, flood is probably the most frequent accounting to about 30 percent of all natural disasters in the world (UNISDR, 2012). Marahatta *et al.* (2009) argued that Climate Change which potentially affects the level of precipitation, temperature increase and others parameters can affects the socioeconomics and biophysical circumstances of societies. Disaster risk is also magnified by climate change, and the Asia-Pacific region is predicted to be the most vulnerable, because the local people of this region are mostly dependent on local natural resources for their livelihood. In events of flood and disasters, majority of the victims in Asia-Pacific region are poor and marginalized communities. Often, these communities become the first casualty of these flood incidents since they limits and lack in protective measures due to not having adequate flood management means and therefore, they have minimal capacities to cope up with the losses of property and income (IPCC, 2001).

In addition to all the physical factors that point to increase natural disaster vulnerability, the events of natural disasters also become more hazardous due to poor disaster management (Kumagai *et al.*; 2006). Disaster management is often referred to as the systematic organization and management of institutional roles and responsibilities in dealing with emergencies (UNISDR, 2009; Wisner *et al.*, 2004). This generally includes actions, plans and arrangements organized before, during and after a disaster situation through coordination of various stakeholders i.e. Government, NGOs, communities and the private sector (Chen *et al.*, 2013; Quarantelli, 1997). However, disaster management, are generally underpinned by top-down approach, often emphasising on disaster response to reduce losses and impacts rather than formulation of risk reduction strategies (Tingsanchali, 2012).

The beginning of 1990s witnessed more attention given to the abilities of affected communities to cope with disasters. Local communities in particular tend to develop their own strategies to deal with floods because floods occur in a recognizable pattern (Few, 2003). These strategies are based on local knowledge, practices, and social arrangements and this regularly changes according to each community's needs and learnings. According to Dekens (2007b) local people know better their local environment and this can contribute to better disaster preparedness and disaster management in general. Several factors which affect the communities' knowledge including personal experience, culture, norms and other factors, for example, collaboration with other stakeholders, help to develop their abilities to become ready when facing natural disaster. Most often, disaster preparedness among local communities are the results of the accumulation of past experiences of natural disasters and the evolution of local people's learnings on the physical vulnerability of hazards which can change the way local people handle hazardous situations for example, finding the escape routes. The government also has to play an important role to further strengthen the local community by providing the required facilities, incentives and resources. Thus the local knowledge of disasters is a collective set of knowledge by local people, government, local leaders and the disaster management authorities. This disaster local knowledge could be beneficial in terms of many ongoing disaster management projects' performances and implementation of better disaster management processes. Moreover, local knowledge limits external dominance

and increases more locals' participation; this leads more acceptances of disaster management projects and reduces extra financial burdens to be taken externally. Therefore, local knowledge of communities' used in managing natural hazards is important (Corburn, 2003; Dekens, 2007 a, b,c,d).

The importance of local knowledge is also due to the existence of social ties between members of communities (Cantrell and Stafford, 2013). This is implied by measures collectively taken by local communities in addressing disaster vulnerabilities. A study by Singh and Devkota, (2015) demonstrated that communities living in flood prone area of the Koshi River Basin have vast knowledge about the causes and impacts of floods. They have also derived measures to handle the various phases of flood events thus be able to reduce the adverse effects of the floods. Thus, local knowledge of communities' practices should not be ignored in managing disaster due to diverse knowledge and abilities accumulated by various communities which are useful in disaster preparation (Brennan and Flint, 2007). Beside local knowledge of communities, professionals' knowledge also plays an important role to fill the gaps in local disaster management (Thayaparan *et al.*, 2015). And if, communities knowledge is integrated with professional knowledge, it can further improve the management of natural disasters (Aldunce and Leon, 2007; Gaillard and Mercer, 2012). The factors which make up the local community knowledge is therefore varied and highly linked to the area where they are staying. This study attempts to contribute to further improvement of disaster management by exploring the factors that make up the local knowledge of the communities in flood prone areas.

1.2 Statement of the Research Problem

Disaster management strategies have relied heavily on geophysical knowledge and technical systems as the most effective disaster response mechanisms. Thus structural measures defined as physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques to achieve hazard resistance and resilience in structures or systems are widely applied

in public policies in the context of disaster management. Commonly employed structural measures for disaster risk reduction include dams, flood levies, ocean wave barriers, and earthquake-resistant construction and evacuation shelters. Equally important but less commonly applied are non-structural measures such as land-use planning laws and their enforcement, information resources and public awareness programmes. Thus, local traditional mitigation knowledge and strategies are less considered due to its non-technical social dimension (Cavallo *et al.*, 2013; Cutter *et al.*, 2015; Gaillard and Texier, 2010; Loayza *et al.*, 2012; Weichselgartner and Pigeon, 2015; Wisner *et al.*, 2004). Management approaches increasingly depended on scientific information and government technical reports while neglecting local knowledge and participation, thus giving more confidence to the capacity of infrastructure to stand against future disasters.

The importance of local knowledge has been recognized the International Union for Conservation of Nature (IUCN) as an approach for natural conservation which emphasises participation with local community to overcome issues to restore the natural eco-systems and specifically to adapt to natural environment. Local knowledge is expected to contribute to cost-effective, participatory, and sustainable natural resource management (Chen *et al.*, 2013). In recent years, the importance of local communities' knowledge in disaster management begins to be increasingly acknowledged. Numerous studies are carried out on local communities' knowledge largely due to regional variation thus varied vulnerability to natural disaster (Aldunce and Leon, 2007; Aryal, 2014; Combaz, 2013; Dekens, 2007a, b,c,d; Gaillard and Mercer, 2012; Hossain, 2013; Hosseini *et al.*, 2014; Islam and Walkerden, 2014; Kafle and Murshed, 2006; Khawaja *et al.*, 2014; Khwaja, 2009; Mercer *et al.*, 2010; Mirhashemi *et al.*, 2007; Salmon *et al.*, 2011; Syafwina, 2014; UNISDR, 2008). The importance of local knowledge and practices in disaster is acknowledged in two international frameworks, the Hyogo Framework for Action (2005–2015), which continued in the Sendai Framework for Disaster Risk Reduction (2015–2030). However, local and indigenous knowledge is yet to be included in policies on disaster risk reduction or climate change adaptation (Adger *et al.*, 2011). The difficulty of validating such knowledge is the main reason hindering the

incorporation of local knowledge in the overall disaster management (German, 2010).

Although the first self-assessment report of HFA progress by 168 governments indicated incomplete implementation of HFA, it does indicate a gradual and continuous (Lavell and Maskrey, 2014). Although it evidently indicates achievement of HFA goal in terms of reduced disaster losses and impacts, the losses however, is not satisfactory. There are gaps between the technical achievement in disaster management and information that experts generate, the information coming from the local people in terms of disaster risk knowledge shows their own experiences in previous disasters, which can be critical in generating appropriate solution (Fischer, 2000). Thus this research aims to identify the factors of local knowledge in disaster management in selected regions of Pakistan. The 2014 Global Climate Risk Index ranked Pakistan as number three among the counties most affected by extreme weather events in 2012 (Kreft *et al.*, 2013).

Since 2010, floods which affected more than 20 million people, Pakistan have experienced annual flooding. To address this problem, Pakistan has over time make changes to way it manage the related hazards. From 1955 to 2005, numerous efforts were focused on technocratic and technical solutions, giving little consideration to communities living in the affected areas. During this period, not much efforts was given to communicating risks, assessing social vulnerabilities and capacities or promoting a cultural shift towards reducing disaster risks and management (Mustafa and Wrathall, 2011; Westcoat *et al.*, 2000). In 2005, a 7.5 magnitude earthquake occurred, consequently triggered the establishment of the National Disaster Management Authority (NDMA) and in 2007, subsidiary authorities were set up in each province of Pakistan. The NDMA, however, remained unable to increase the disaster resilience, especially in those parts of countries which are located in the floodplains or are regularly exposed to natural hazards (Cheema *et al.*, 2016). The lack of capacity of flood disaster preparedness and mitigation indicates that neither the local communities nor the government authorities improved in terms of managing floods.

One of the main challenges in achieving the Disaster Risk Reduction Framework's principles in Pakistan is the lack of attention given to local community knowledge in flood management. This is partly due to the complexity of integrating community knowledge in the overall flood management since this knowledge is difficult to validate. This study therefore attempts to identify the factors that make up community knowledge in order to make them more feasible to be integrated in the flood management framework. Structural equation modeling (SEM) will be employed to analyse the structural relationship between measured variables and latent constructs. It will explore the capacity in terms of local knowledge and how authorities can contribute in the overall disaster management strategies.

1.3 Research Questions

The following research questions are expected to achieve the research objectives of the study;

- 1: What are the factors that form the local communities' knowledge in terms of flood management?
- 2: To what extent the latent variable of local knowledge on disaster management fit into the local knowledge of the selected communities?
- 3: How can the communities and related stakeholders assist in improving flood management in Pakistan?
- 4: How can factors of local knowledge contribute to the overall framework of flood management?

1.4 Aims and Objectives

The aim of this study is to determine the local knowledge of flood vulnerable communities in order to determine strategies to enhance local knowledge for better disaster management in Pakistan. The specific objectives are as follow;

- 1: To identify factors that makes up community knowledge on flood disaster and its management;
- 2: To examine the factors that makes up flood disaster knowledge of communities in the study area;
- 3: To relate the factors of community knowledge using SEM on flood disaster management and to understand disaster management authorities flood management perception.
- 4: To recommend strategies to incorporate community factors in the overall disaster management framework.

1.5 Scope and Methodological Framework of the Study

In brief, this section will outline the scope and methodology framework of the study. The study used both quantitative and qualitative mixed methods to investigate the proposed research. The detailed methodology of the study is discussed in chapter 4. The study methodology covers three main aspects. The first aspect of the study was to identify disaster knowledge factors which can help in managing disasters. The variable/factors identified in the study assume that these can increase the ability/performance or knowledge of vulnerable person/people/community with respect to handling the extreme effects of natural disasters, for example, floods. The second aspect of the study was based on exploring flood disaster knowledge in vulnerable local communities and in authorities; this based on exploratory and deductive mix approaches using both quantitative and qualitative data sets. The quantitative portion of the study describes and examines variables which make up local knowledge of communities from floods and disaster. For example, personal experience or exposure with floods, flood risk perception, social capital, stakeholders' collaboration and flood readiness. The study significantly identified

and validates these factors that these could help in flood management practice in the study area. The household survey in this study also finds the general perception of local communities on historical floods, this point out their concerns on floods and the reasoning of flood disasters in the region. This perception of vulnerable communities highlights some of the requirement and assessment in current flood management practice. Similarly, the third aspect of the study was to find how current disaster management practice is limiting appropriate flood management practice and how an integrated flood management practice including local people knowledge and authorities can further improves disaster management practice in the study area. Thus the scope of the study excluded technical variables for example structural measurements and focuses on only non-structure measurements.

1.6 Significance of the Study

In recent years, Pakistan is the country which suffered largely due to flood disasters. Therefore, the significance of the study was to find better flood management in the region. In this context, evaluating current flood disaster management practice could lead better flood management. The study intentions were to understand how local communities and authorities can significantly play their role in better flood management in Pakistan. In this context, the study significantly focus community's knowledge on floods and how their information/exposure and perception further helps to improves flood management framework. In this regard, initially, the study significantly develops theoretical conceptual framework in terms of disaster management and identifies variables which can contribute in better flood management. In the study, the identified theoretical model based on the local knowledge variables/factors significantly applied in the quantitative household survey to know the level of information/knowledge of local people in flood vulnerable regions of Pakistan. The selections of questionnaire sampling and regions were based on the vulnerability of flooding and past records of flood disasters near River Indus Pakistan. The study also conducted interviewing of government professionals working in disaster management authorities. The professional interviews significance was to find the changing knowledge of local communities

and authorities especially learning from past flood experiences and if this perception could help in better flood management/practice. Secondly, the professionals' interviews were to look how authorities can involve local communities or if there is any limitations in local communities' involvement in flood management. Thus the proposed study tries to find concerns of both professionals and vulnerable communities' on floods management and finds an integrated flood management framework to strengthen flood management in the region.

1.7 Structure of Thesis

The thesis consists of six chapters which are as follows:

Chapter 1 introduces the organization of this thesis which includes general background of disaster and particular local disaster management knowledge importance. Further chapter identifies general problems regarding disasters and natural disasters. The problem identification also highlights in context with floods in regions of Asia Pacific and study area Pakistan. The broader aim of the chapter was to identify problem statement and identify disaster management problems associating with local communities' limiting disaster resilience/management. Moreover chapter briefly describes research questions, research objectives, methodology, scope, significance and organization of the dissertation.

Chapter 2 explores the disaster management literature including terms and definitions. The chapter broader aim was to understand the conceptual framework of local knowledge and how this fits in disaster management. In this context, the chapter identifies some variables which makeup as disasters local knowledge. Moreover, beside identify local knowledge disaster management variables the chapter also reviews how local people disaster knowledge can be improved with help of disaster management institutions.

Chapter 3 briefly introduces study area and the historical flood disasters in Pakistan. Moreover, the chapter identifies important features of study area including topography of the region. The chapter also highlights disaster management institutions and critical procedures of disaster management strategies with local communities, it was found that the study area is experience floods since long and the disaster management institutions are still premature.

Chapter 4 of this study presents methodology used in data collection and analysis, including quantitative and qualitative. For quantitative analysis, the chapter serves as a linkage between conceptual framework and survey questionnaire items. The chapter also discusses required number of sample size for this study, reliability and validity of the survey. The chapter also explains the formulation procedures of EFA and requirements to achieve CFA normality, goodness of fit indices, construct validity, convergent validity, and discriminant validities required for SEM model. The qualitative data collection and analysis includes interview procedures using NVivo 11 software.

Chapter 5 of the study presents both quantitative and qualitative findings. The quantitative finding includes demographic characteristic and respondents' perception on flood disasters and knowledge. The findings of quantitative analysis also shows local communities knowledge variance on the bases of demographic characteristic. In addition, the chapter shows results on the bases of CFA and SEM model construct. The validity and reliability assessment includes identification of CFA measurement model. The chapter also includes the characteristics of qualitative interview respondents, main themes and propositions linking interview transcripts concerns of the respondents. The chapter also link qualitative data analysis and coding procedures of the study.

Chapter 6 of the study gives conclusions and recommendations on the bases of chapter 5 research findings. The main aim of the chapter was to develop an improved disaster management framework specifically in terms of local communities' disaster management practices and to give a roadmap "by involving *local communities and filling the gaps in flood management practice in the region.*"

The chapter also includes policy recommendations and suggestions for future research.

1.8 Conclusion

The primary focus of the chapter was to give introduction of this study. On the bases of research background the chapter briefly introduces local knowledge and its importance in disaster management practice. The chapter links disaster management gaps is due to not giving preference to local peoples' knowledge/suggestions in disaster management strategies/practice. The local knowledge factors in disaster management could help current disaster management for better future strategies in managing disasters. Thus, the professional perception on disaster management strategies and involvement of local communities in the study could lead better flood management in the study area. The chapter in the end also briefly highlights study scope, methodology and significance of the study including brief chapter wise structure of the thesis. The next chapter will review literature to identify factors which make up disaster vulnerable communities knowledge managing natural disasters.

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