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Wilfrid Laurier University

Faculty of Arts

Department of Geography and Environmental Studies

Assessing Resilient Post-Disaster Recovery of A Flash-
Flood-Prone Area: A Study of the City of Jeddah,
Kingdom of Saudi Arabia

by

Abdurazag Tammar

A Thesis

Presented to Wilfred Laurier University

in fulfillment of the

Thesis Requirement for the Degree of

Doctor of Philosophy

Waterloo, Ontario, Canada, 2017

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

The increased incidence of natural disasters over recent decades has been accompanied by a corresponding dramatic proliferation of human casualties, economic damage and recovery costs. Post-disaster processes are therefore increasingly becoming the paramount focus of disaster-management stakeholders. Current research has noted the importance of improving community resilience with respect to household capacity, organizational capacity, and social capital, as the three main assessment dimensions to enable communities to recover effectively and efficiently from future disaster events. Community resilience involves proactive preparedness and mitigation initiatives. In the context of the Kingdom of Saudi Arabia, the lack of either precedent research or functioning post-disaster recovery policies made the 2009 and 2011 flash floods in the City of Jeddah extremely serious natural disasters.

The principal objective of the research conducted for this thesis was to evaluate the importance and implications of the role of the three main assessment dimensions as well as the effect of religious aspects that characterized Saudi society during and post-disaster with respect to improving flood resilience, speeding recovery, and minimizing the detrimental impact on vulnerable communities. In addition, the optimal utilization of social capital, efficient internal cohesion, and effective resource-sharing within and across any community groups to ensure their advance preparedness and contribution are also fundamental and critical factors that must be addressed if post-disaster recovery is to be sustainable and resilient.

The research entailed a literature review, including an examination of the lessons learned from the 2009 and 2011 flash floods in the City of Jeddah. Drawing from the literature, an initial resilient post-disaster assessment framework (RPDR-AF) was developed. The field case study involved three sources of information: secondary data, interviews, and field observations. Interviewees included household members, government officials, community leaders, and

participating NGOs and CBOs. The empirical analysis combined qualitative and quantitative techniques focusing on themes derived from the RPDR-AF.

The results of the research indicate a strong correlation between the incorporation of all three assessment concepts and the successful planning of a long-term recovery strategy. The research also shows that religious practices and leaders can be strong motivators for the implementation of effective overall post-disaster responses and can also deliver significant spiritual, emotional, and psychological support for alleviating the trauma associated with the recovery process. Based on the empirical analysis of the research results, a refined framework was developed. In addition, general and strategic recommendations were outlined to improve disaster resilience for the City of Jeddah. The framework would be useful for local government, decision-makers, volunteer organizations, local citizens (e.g., for perceiving the relevant tasks during a flash flood and act quickly accordingly), and relevant major stakeholders related to disaster management and recovery. The model was built based on a hypothetical notion that it would suit the study area considering the religious affiliation of the local citizens. However, improvement might be extended considering geographical locations and different socio-economic circumstances.

Future avenues of investigation include improving the implementation of recovery planning and management as well as enhancing the knowledge and efficiency associated with the restoration, reconstruction, and rehabilitation of the assets and areas affected. In conclusion, the developed framework will provide Saudi authorities with a strategic tool for assessing and improving flood resilience and recovery and for reducing the multiple effects of a natural disaster, while effectively facilitating an enhanced capacity for resilience in other at-risk Saudi communities.

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Chapter 1: Introduction

1.1 Background

Natural disasters are relatively frequent occurrences. For example, at the international level, during the ten-year period from 1992 to 2001, losses associated with natural disasters averaged about US\$65 billion per year, which represents a seven-fold increase since the 1960s (Freeman, Keen, & Mani, 2003). For the same period, the overall damage and impact costs totaled more than \$1.3 trillion. Munich Re estimated that by the year 2050, the costs associated with disaster events could exceed US\$300 billion per year (UNISDR, 2002). In terms of populations affected, approximately 144 million people worldwide were displaced by disasters between 2008 and 2012 (Sendai Framework, 2015). Statistics have shown that in many countries, particularly those less developed, appropriate of governmental capacity and hazard prevention measures were either not in place or were unable to deal with the disasters that occurred (Joakim, 2013). In the event of a disaster, relief and recovery operations constitute the initial tactics aimed at bringing a stricken community back to its former condition. However, many scholars have acknowledged that returning communities and households to pre-disaster levels leaves them in a position of susceptibility to future disasters (Mileti, 1999; McEntire, 1999; McEntire, Fuller, Johnston, & Weber, 2002; Wisner, Blaikie, Cannon, & Davis, 2004; Birkmann & Fernando, 2008; Joakim, 2013).

In many societies affected by disasters, religious ties and beliefs have been important features of the cultural and social fabric (Clarke & Jennings, 2008). Despite the importance of religious beliefs, some researchers have considered religion-based interpretations of responses to disasters as indicating superstition and backwardness (Chester, Duncan, & Dibben, 2008; Lunn, 2009; Chester & Duncan, 2008). However, research has revealed that people may use religion-based beliefs to rationalize disasters or other traumatic events (Chester et al., 2010; Stephens,

Fryberg, Markus, & Hamedani, 2012; Aten, Bennet, Hill, Davis, & Hook, 2012). In Saudi Arabia, floods have becoming an annual disaster with high impact in this region. Jeddah, a coastal Saudi city on the Red Sea to the west, has experienced severe flood events in November 2009 and December 2011, when flooded waters and sediments (flash flood) inundated the urban areas and resulted in deaths of many people and damaged the infrastructure and homesteads at urban centers.

The disaster-management process or cycle of action is characterized by four pillars: (1) preparedness, (2) mitigation, (3) response, and (4) recovery (Henstra & McBean, 2005). The research reported in this thesis was focused on resilient recovery skills as arguably the most important pillar for the survival of human communities. Recent studies of hazards and disasters have revealed that, when dealing with the impact of disasters and post-disaster recovery, stakeholders experienced recovery processes characterized by a variety of resilience levels (Blaikie, Cannon, Davis, & Wisner, 1994, p. 265). Highfield, Peacock, and Van Zandt (2014) claimed that in the wake of a disaster, poor and marginalized groups are often subject to higher rates of casualties and damage (Highfield et al., 2014), while they are more likely to struggle desperately during their recovery (Fothergill & Peek, 2004; Cutter et al., 2008; Tafti, 2015).

Vale and Campanella (2005) perceived resilience as the ability of impacted stakeholders to create a range of survival opportunities, based on their location, economy, and human relations (Vale & Campanella, 2005). Achieving resilient post-disaster recovery therefore involves establishing provisions for mitigating and minimizing the impact of future disaster events and exploiting available resources and capacities to their maximum potential. Early concepts of disaster recovery focused on the dark side of disasters that leads to the disruption and subsequently to the disorganization of social, economic, and ecological systems. However, more recently, disaster experiences are also being understood to be valuable learning opportunities.

Communities recover more strongly through better communication and cooperation among community groups, experts, authorities, and different organizations as a result of the increased contribution of social capital (Drabek & Key, 1984). In general, social capital is regarded as the capacity of social networks and connections to contribute to enabling and improving the interaction of individuals and groups in order to create resilient post-disaster recovery. The researchers believe that taking into account the role and contribution of social capital is a significant asset for the development of more resilient, faster, and better recovery after a community is hit by a disaster (Nakagawa & Shaw, 2004; Dynes, 2005; Bankoff, 2007).

Resilience is a crucial concept that must be taken into consideration whenever appropriate and responsive post-disaster recovery plans are developed and implemented, especially for communities vulnerable to potential disasters. For these plans to be effective and efficient, they should be drawn well in advance of any anticipated disaster event, and provisions should be made for urgent relief needs, such as temporary shelter and medical, food, and drinking water supplies, as well as for long-term implementable and affordable rebuilding and restoration strategies.

As stated by Berke and Campanella (2006), the elements of a basic post-disaster recovery plan for any community should include the following provisions:

1. The envisioning of post-disaster situations along with their potential impact and damage
2. A directive framework for achieving the vision based on strong facts, goals, and policies
3. The merging of long-term resilience and short-term recovery considerations in order to promote post-disaster rebuilding and restoration capacities that are socially justified, economically viable, environmentally sustainable, and less vulnerable
4. Alignment with the comprehensive picture of regional, provincial, and national disaster response and rebuilding policies and plans

In a broad sense, Zhou (2009) defined the concept of resilience as “the capacity to resist and recover from loss”, and stated that it is “an essential concept in natural hazard research and is central to the development of disaster reduction at the local, national, and international levels” (Zhou, 2009, p.21-41). The notion of resilience originally came from the field of ecology (Holling, 1973), but has also been employed in other disciplines (Adger, 1997), such as those that integrate social sciences and systems with other human-and-environment interactions (Carpenter, Walker, Marty, & Abel, 2001; Folke, 2006). More recently, the concept of resilience has begun to be applied in the field of climate change (Timmerman, 1981; Dovers & Handmer, 1992), as well as in disaster-resistance and -recovery systems (Tierney, 1997; Bruneau et al., 2003; Rose, 2004). However, there is still no common consensus about the meaning of resilience in relation to post-disaster recovery, especially with respect to low- and middle-income communities across countries.

To ensure a quick disaster response, rapid rescue intervention, and resilient post-disaster recovery, researchers in the disaster-management domain have expressed a need for the development of comprehensive and standardized assessment tools that will include, as much as possible, all contributing variables, players, and stakeholders that are important for a more accurate representation of the impact of a disaster and post-disaster recovery (Bates & Peacock, 1992). Such a tool will be a crucial source of long-term strategies for building more effective sustainable communities and efficient, resilient recovery and restoration efforts. In the context of KSA, due to there was neither a precedent research nor implemented post-disaster recovery policies; the 2009 and 2011 flash floods in the City of Jeddah were the most serious natural disaster events. The principle objective of this research is to develop a framework to help guide the assessment of resilient post-disaster recovery, minimizing disaster impacts and contributing to the efficient recovery of vulnerable communities.

1.2 Problem Statement

Researchers, humanitarian aid agencies, and government departments have recently recognized the importance of improving community resilience with respect to recovering sustainably and resiliently from future disaster events. Enhanced community resilience incorporates the implementation of preparedness and mitigation initiatives as part of the post-disaster recovery process (Joakim, 2013). While there is an abundance of published literature related to the notions of resilience, recovery, and social capital, there is still a need to explore more thoroughly the relationships among these notions, particularly within the domain of post-disaster recovery (e.g., Nakagawa & Shaw, 2004; Aldrich, 2012). In the context of the Kingdom of Saudi Arabia (KSA), there is virtually no precedent research or post-disaster recovery framework that emphasizes household capacity, government roles, and organizational capacity. The key hypothesis of this research is that stronger relationships and coordination between the household and organizational capacities with special attention to religious dimensions of a community are necessary for achieving higher levels of utilization of social capital. Likewise, higher levels of resiliency can be achieved through effective facilitation between internal cohesion of stakeholders and resource sharing, whose preparedness and contribution are essential to sustainability and resilience after disaster recovery.

1.3 Research Objectives and Questions

Based on the literature review conducted for this research, and building on the experience provided by the case study of the 2009 and 2011 flash floods that occurred in the City of Jeddah, KSA, this study identifies current research gaps and emphasizes the important role of social capital with special attention to religious dimensions in increasing the resilience of post-disaster recovery conditions at the levels of locally- and geographically- related communities. Based on observed, measured, and derived lessons from actual experience acquired from the 2009 and

2011 flash floods, a framework was first developed and then tested and revised during the use of empirical analysis for assessing the importance and role of contributing factors for building a resilient post-disaster recovery framework for flash-flood-prone coastal communities, with a special focus on the incorporation of the context of household capacity, organizational capacity, and social capital in the City of Jeddah. The research also provides strategic recommendations to authorities for enhancing flood resilience and recovery in other Saudi communities at risk.

The objectives of this research were as follows:

- 1) Focusing on building resilience for post-disaster recovery, develop and test an evaluation framework that expressly incorporates the religious dimensions which have a significant impact on Saudi society
- 2) Using the 2009 and 2011 flash flooding in Jeddah city as case study evaluate the key factors that contribute to resilient post-disaster recovery, with a special emphasis on the investigation of how religion, religious leaders and institutions affected resilience and recovery during and after the two flash flood events
- 3) Provide recommendations regarding the enhancement of Jeddah's capacity to be more resilient to future flash flooding

This research project poses several research questions, as follows:

- a) How does household capacity, organizational capacity, and social capital with special attention to religious dimensions, contribute to resilient post-disaster recovery?
- b) To what extent were there community strengths/deficiencies/gaps during the post-disaster recovery phase in the 2009 and 2011 flash floods?
- c) What should the government and community do to improve community resilience and post-disaster recovery for the City of Jeddah?

1.4 Organization of the Dissertation

This thesis is organized into seven chapters. Chapter 1 provides a general overview of hazards, disasters, disaster resilience and impact, and post-disaster recovery, as well as a summary of the context of hazard research. Key definitions are introduced, and the importance of recovery research in the context of the increasing costs and expected frequency of disaster events is highlighted. Chapter 1 also states the research problem, explains the research goals and objectives, lists the research questions, and briefly describes the organization of the thesis.

Chapter 2 provides a comprehensive review of the literature related to pre-disaster and post-disaster theories, practices, and acquired experience, as well as the procedures, variables, and factors that influence disaster events and disaster recovery. The importance and roles of the relationships among all stakeholders are reviewed, along with an examination of how they can contribute to the achievement of sustainable and resilient post-disaster recovery.

Chapter 3 introduces the contextual background of KSA and the City of Jeddah including location and size, topography, and climate overview. Chapter 3 also includes background information about the historical and legal disaster preparedness and responses and an overview of the impact of the 2009 and 2011 Jeddah flash flood events. This chapter lays the foundation for a better understanding of the ways in which the contextual recovery operations, historical circumstances, roles and contributions of a variety of stakeholders, and how the relationships in place have contributed to the conditions of resilience and marginalization throughout the City of Jeddah.

Chapter 4 explains the research methodology, including the data collection sources and methods and the combined quantitative/qualitative assessment technique used. The explanation of the research methodology also elaborates on methods of data collection and analysis, as well as the manipulation and cross-checking of the data sources. Based on the lessons learned and the

resilience exhibited in the post-disaster recovery experiences, theories, and practice, a conceptual framework for resilient post-disaster recovery is presented, with a special focus on how the concepts of household capacity, organizational capacity, and social capital are organized under the proposed assessment framework. The criteria for selecting the four impacted sites are also outlined, thus providing an overview of the living conditions at the affected sites, including population, economics, and the significance of cultural and religious factors. A brief synopsis of living conditions and other important factors for the four selected sites is provided, which serves as the basis of guidelines for the development of an effective long-term recovery and risk-reduction strategy. An overview of the long-term recovery efforts after the 2009 and 2011 Jeddah flash floods is also outlined and discussed.

Chapter Five presents the results and findings of the empirical analysis and learned lessons from the case study. This chapter is organized according to the developed framework and tests its key tenets and components. The results are summarized following the concepts of household capacity, organizational capacity, and social capital.

Chapter 6 provides a discussion of the results, which establishes practical insights into these results and links between the findings and resilient post-disaster recovery. . These links, insights, and the empirical evidence derived from the case study were utilized for improving the resilient post-disaster recovery conceptual framework discussed in Chapter 4.

Chapter 7 connects all of the research and provides an overview of how the work achieved the research objectives. A number of suggested resilience-enhancing post-disaster recovery concepts and strategic recommendations for a variety of stakeholders involved are also presented. To contribute to ongoing research related to resilient post-disaster recovery and associated risk reduction, additional topics for further research are highlighted.

Chapter 2: Literature Review

2.1 Background

Henstra and McBean (2005) defined disaster management as the process by which societies, groups, and individuals sustainably prevent, reduce, and/or recover from the impact of disasters and hazardous events. According to the International Federation of Red Cross and Red Crescent Societies (IFRCS), the four pillars of disaster management are identified as “the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters” (IFRCS, 2017). Disaster management can thus comprise the notions, operations, and aspects related to four main areas: (1) preparedness, (2) mitigation, (3) response, and (4) recovery (Henstra & McBean, 2005). Figure 2.1 illustrates the IFRCS definition of disaster management.

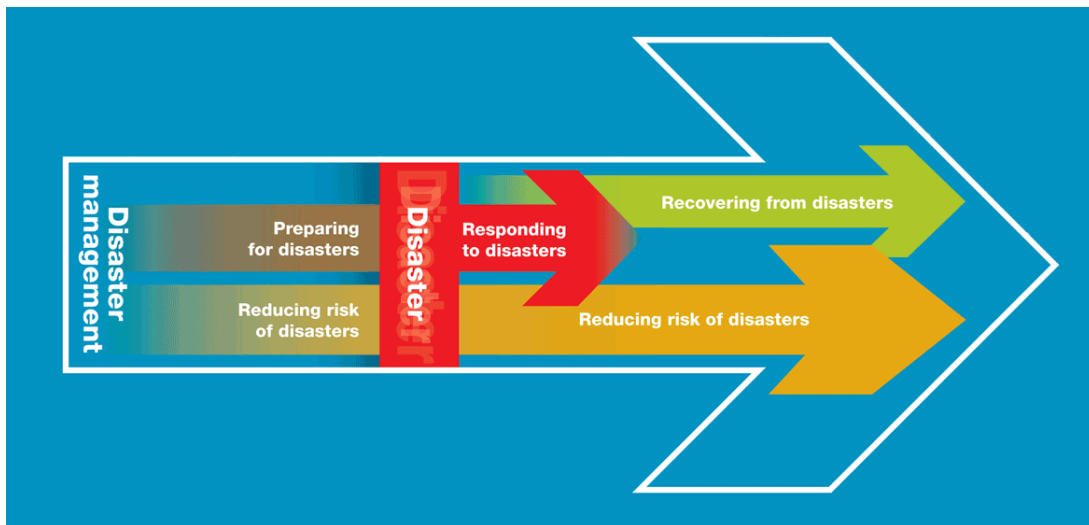


Figure 2.1: Disaster Management (IFRCS, 2017)

Simply put, mitigation and preparedness occur prior to a disaster event, while response and recovery occur after the event. Mitigation focuses on activities designed to reduce and/or eliminate the risks associated with particular hazards, whereas preparedness includes actions for

improving the ability of a community to respond effectively to a disaster event. Response and recovery activities occur during the post-disaster period and represent attempts to meet basic needs and then a transition to longer-term rebuilding and recovery processes (EC, 2011). These four pillars of disaster management are intended to be combined in order to reduce potential human, infrastructure, and economic losses related to a disaster event (Phillips, 2009). Of the four, resilient post-disaster recovery experience has been the least studied (Barton, 1969; Saperstein, & Barbee, 1985; Schwab, 1998; Lloyd-Jones, 2006; Coppola, 2007; Joakim, 2013).

As a means of acquiring an understanding of the importance of resilient post-disaster recovery in the aftermath of a natural disaster event, a review of the concept, operations, processes, and impact of disaster recovery and the related literature was conducted, and the key concepts of household and organizational capacities and social capital were examined. The review provides a solid foundation for building the proposed resilient post-disaster recovery framework for addressing future flash floods in the City of Jeddah, Kingdom of Saudi Arabia (KSA).

2.2 Disaster Management Cycle

As illustrated in Figure 2.2, the disaster-management cycle describes the process through which individuals, communities, and organizations prepare for the prevention of, and response to, a disaster as well as recover from its extreme impact. An event is considered a disaster when it involves the threat of severe risk of destruction to a community, which will (1) adversely affect the community, (2) devastate its local capacities, and (3) trigger the need for external assistance and support (Guha-Sapir et al., 2010).

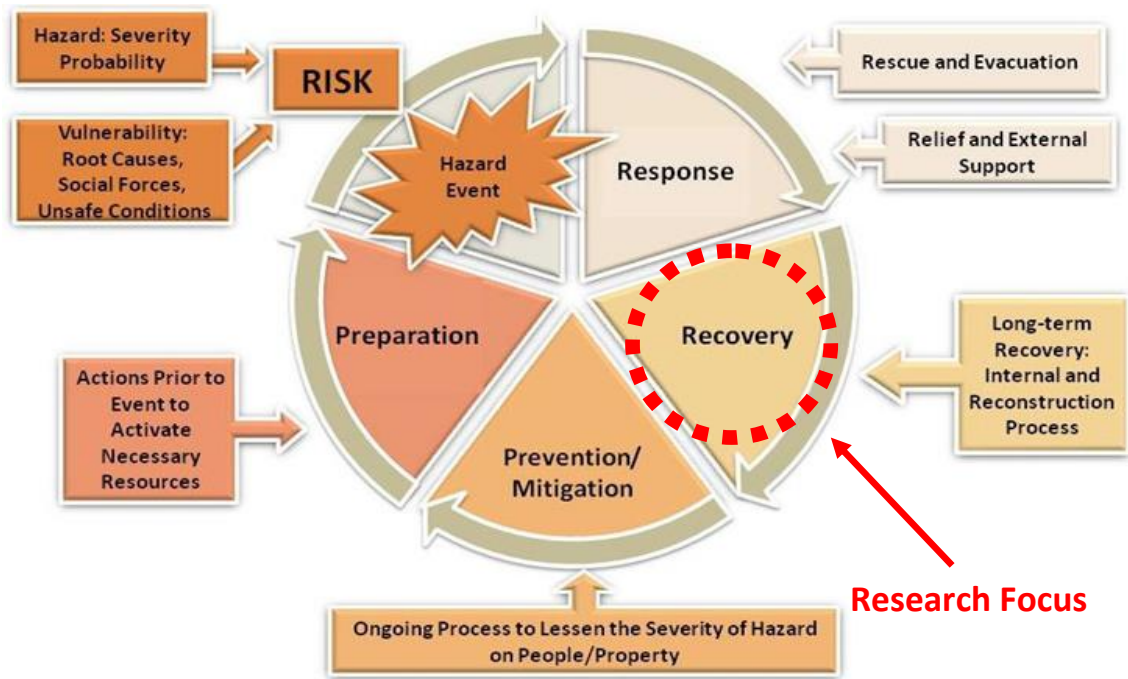


Figure 2.2: Disaster Management Cycle (Wood, Boruff, & Smith, 2013)

Disaster management can start at any stage in the cycle due to the cyclical nature of a disaster occurrence. As shown in Figure 2.2, disaster-management across the cycle involves: (1) the *prevention/mitigation* phase, which ideally involves measures that will prevent or reduce the impact of future events, including, for example, the implementation of disaster-resistant building codes and appropriate land-use planning; (2) the *preparation* phase, which includes actions that will proactively integrate available resources and local capacities and see related strategies enacted; (3) the *response* phase, which begins immediately after a disaster event and is focused on search and rescue, and the provision of medical care and temporary shelter; and (4) the *recovery* phase, which begins as individuals, communities, and organizations start the rebuilding process (Smith & Petley, 2009). While prevention is often regarded as the initial starting point in the disaster-management cycle, for the purposes of this thesis work the discussion begins with the recovery phase, since recovery operations and efforts in the aftermath of a disaster event create critical conditions and windows of opportunity to increase resilience to future events

(Wood et al., 2013).

2.3 Disaster Recovery Goals

Following a disaster, the primary concern for most people is to restore their personal, commercial, and administrative activities to pre-disaster levels (Lindell, 2013). However, restoring everything to its previous condition can also be understood as ensuring a return to the prior risk state, which is considered unsustainable when associated with activities such as building on floodplains or in earthquake-prone areas (Lindell, 2013). Thus, increasing disaster resilience in a community means determining which areas are at greater risk and then defining which infrastructure resources and buildings are unfit to withstand the effects of future risk events. According to the American Federal Emergency Management Agency (FEMA), proactively prepared communities that implement disaster-control practices and protection approaches will sustainably recover their buildings, assets, land use, and local economies (FEMA, 1986; Lindell, Prater, & Perry, 2006). In agreement with Lindell (2013), mitigating the impact of a disaster, for example, by managing vulnerable populations and areas in order to control expected debris flows, is considered a community-protection approach. Minimizing the construction of new buildings in high-risk areas and ensuring that permitted construction adheres to building codes designed to mitigate the impacts of likely hazards, falls into the category of optimal land-use practices. Similarly, protecting building contents, including personal belongings such as appliances, furniture, and equipment is considered to be an important component of resilience. For instance, using suitable building construction methods, technologies, and materials that will resist wind loads and earthquake shakes will protect the structural elements of buildings at risk (Lindell, 2013).

2.4 Disaster Recovery Process

The term “recovery” refers to all aspects of post-disaster activities and outcomes, whereas terms such as “reconstruction,” “rehabilitation,” and “restoration” refer to specific recovery operations (Joakim, 2013). Reconstruction almost exclusively denotes the rebuilding of physical assets that were damaged or destroyed in the event of a disaster. Restoration indicates a return to pre-disaster conditions related to the physical, economic, and social aspects associated with community infrastructure, such as transportation and communications (Haas, Kates, & Bowden, 1977).

According to Hass, Kates, and Bowden, (1977), there are three operational stages in a post-disaster recovery period. The first is the restoration stage, which can take days or weeks and refers to "temporary measures" implemented for repairing affected social systems and infrastructure assets in the period immediately following a disaster in order to restore a community to its basic functionality. The second is the reconstruction stage, which can take months or years and is aimed at rebuilding fundamental assets to their prior disaster condition and returning their status in the community to acceptable service levels. The third stage is the commemorative stage, also known as disaster risk reduction, which is an open-ended process intended to inspire, drive, and encourage the foreseeable future development and economic growth of the impacted communities (Hass et al., 1977). Today, the term “commemorative” is associated with improvements in pre-existing conditions as opposed to simply a return to pre-disaster conditions (Quarantelli, 1999).

2.5 Concept of Post-Disaster Resilience

Resilience as a concept and its definition have increasingly appeared in the recent literature related to disasters. The term “resilience” comes from the Latin word *resilire*, meaning “to jump back” or “to recoil”. Within the current social and biological sciences

research domain, resilience indicates a "capacity for successful adaptation in the face of disturbance, stress, or adversity" (Norris, Stevens, Wyche, & Pfefferbaum, 2008, pp.127-150). Accordingly, many scholars refer to resilience as the resources and capacities that allow communities and societies to withstand a disaster event or to be restored following an event (Foster, 1995; Ronan & Johnston, 2005; Paton, 2006; Joakim, 2013). Since the concept of resilience has been defined and applied differently in a wide array of fields and domains, establishing a standardized definition is difficult.

In fact, credit for viewing resilience as a concept goes back to Holling's (1973) contribution, and his interpretation has subsequently become more recognized and accepted. Today, the term is applied in many fields, including research, practices, mitigation, and relief of hazards and disasters. Timmerman (1981) was likely the first to use the concept of resilience with regard to disasters and hazards (Klein, Nicholls, & Thomalla, 2003). Resilience was defined by Timmerman (1981) as "the degree to which a system or part of a system can deal with and recover after a hazardous event" (Klein et. al., 2003, pp.35-45). Following Timmerman's (1981) definition, many other versions emerged in other fields that deal with hazards and disasters (Mayunga, 2007). Ferrier (2008) defined resilience as the "relative ability of a community to absorb the effects of a hazard event and quickly return to normal, or near-normal, operations" (Ferrier 2008, p.108). According to this definition, at least six aspects of post-disaster resilience can be identified: "(1) personal and familial socio-psychological wellbeing, (2) organizational and institutional restoration, (3) economic and commercial resumption of services and productivity, (4) reliably restored infrastructure systems, 5) operational regularity of public safety and governance, and (6) resilience of ecological systems" (McCreight, 2010, pp.4-5).

Paton (2006, p.8) defined resilience as "a measure of how well people and societies can adapt to a changed reality and capitalize on the new possibilities offered." Alternatively,

resilience is also seen as being the opposite of vulnerability, meaning that when social susceptibility to disaster is high, resilience levels tend to be low and vice versa. As stated by Klein et al. (2003), the challenge with this definition of resilience is that it involves a circular argument. In other words, a community might be vulnerable because of a lack of resilience, and lacks resilience because of its vulnerability to risk (Mayunga, 2007).

Accordingly, Maguire and Hagan (2007) conceptualized resilience as involving three different dimensions: “resistance, recovery, and creativity” (Adger, 2000, pp.347-364). They defined resistance as related to the capacity to withstand an initial impact, while recovery is the capacity and time involved for a community to return to its former functionality, and their conceptualizations of resilience are commonly found in the literature related to hazards. Maguire and Cartwright (2008) argued that the resistance and recovery dimensions are deterministic since they failed to take into account the dynamic nature of people and communities. As the third dimension of Maguire and Hagan’s (2007) model, the creativity dimension relates to improving the resilience of a community and restoring its functionality after a disaster event. To incorporate the element of communities actually improving their situations during post-disaster recovery, the definition of the creativity dimension includes the capability of “adapting to new circumstances and learning from the disaster experience” (Maguire & Hagan, 2007, p.17; Adger, 2000).

As a graphical illustration of the concept of resilience and how it can mitigate the impact of a disaster, Figure 2.3 depicts hypothetical recovery paths for two communities. The first path, indicated by the bolded line, represents a more resilient community, while the dotted-line path designates a less resilient community (Zhang, 2006). These two paths denote sequential changes in the hypothetical communities over time during the following four phases: (1) pre-disaster, (2) disaster, (3) restoration, and (4) long-term recovery. Figure 2.3 suggests that a more resilient

community will often be subject to fewer effects and will recover more quickly, while a community with less resilience will endure a more significant impact and will take longer to recover (Mayunga, 2007).

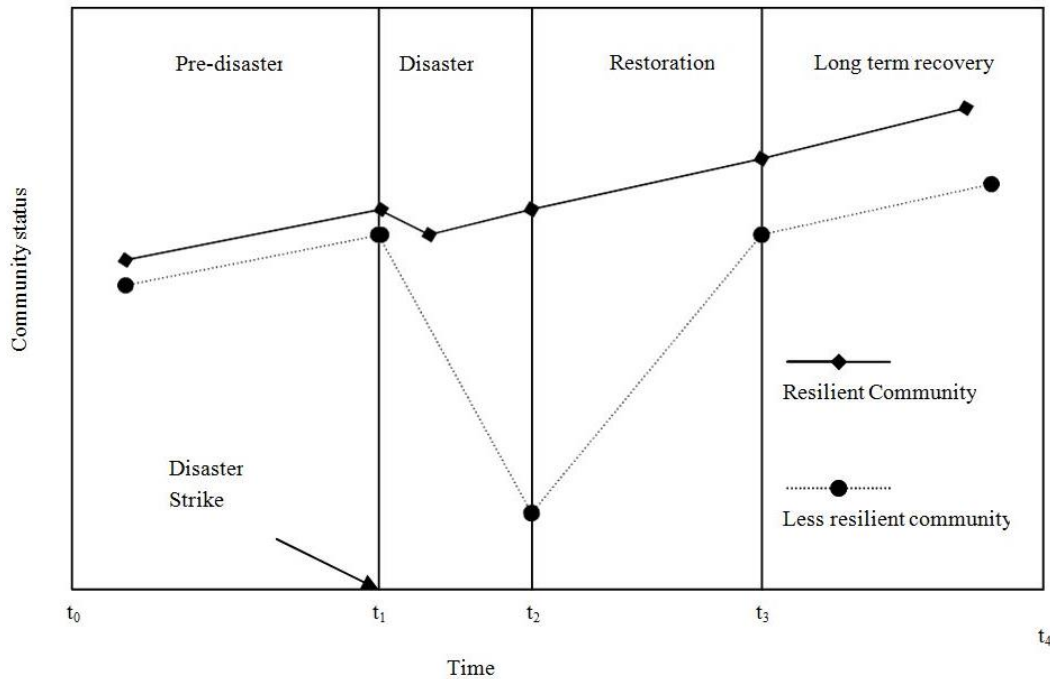


Figure 2.3: Hypothetical Trajectories for Resilient and Less Resilient Communities (modified from Zhang, 2006)

2.6 Social Capital

Social capital is related to the ties that bind people together (Cohen & Arato, 1992; Putnam, 1993, 1995, 2000; Castiglione, van Deth, & Wolleb, 2008). Social capital can be also understood as the ability of individuals, groups, and governments to participate in social networks to connect with and influence others (Tolsma & Zevallos, 2009). Although most people recognize the influence of personal contacts and social networks in their lives, decision-makers and scholars of disasters have lagged in incorporating social capital into their theoretical frameworks (Aldrich, 2012). Hurlbert, Haines, and Beggs (2000) claimed that during the post-disaster stage, people who have stronger ties, relationships, and connections with other

stakeholders are able to obtain more help than those who do not. In addition to rapid-intervention and rescue crews, the first to respond to rescue calls when a disaster hits are usually neighbours, blood relatives, friends, and local groups (Murphy, 2007). Aldrich (2012, pp.254-269) argued that such quantitative and qualitative measures provide evidence that demonstrates that “social resources, at least as much as material ones, prove to be the foundation for resilience and recovery.” Social capital can also be impacted by a disaster due to the consequent disruption of social networks and social ties (Varda, Forgette, Banks, & Contractor, 2009; Kaniasty & Norris, 1993), which will negatively affect the delivery of resources to individuals who need them in communities with low levels of social resilience (Stack, 1975; Domínguez & Watkins, 2003; Tobin-Gurley, Peek, & Loomis, 2010; Sadeka, Reza, Pereira, & Sarkar, 2015).

2.6.1 Conceptual Roots of Social Capital

A review of the historical development of the concept of social capital reveals that it dates back to the Aristotelian age, when human conduct was regarded as a paramount force in the pursuit of a common interest. Over time, the evolution of the notion of social capital has been influenced by many factors, individuals, associations, organizations, neighbourhoods, communities, regions, and societies that have refined its meaning and shaped the present understanding of the term. For example, many current studies have included social relations within and outside families, as well as within companies and other organizations.

In reference works, research conducted by Bourdieu (1985) and Coleman (1990) is generally credited with the creation of today’s theoretical concept of social capital. Bourdieu (1985) established the concept as part of his larger scheme aimed at understanding the perpetuation of inequality in society (Wahab, 2012). The amount of social capital to which individuals have access is dependent on both the extent of their network connections, as well as

the total amount of capital that each member of the network possesses (human, cultural, financial, etc.) (Glanville & Bienenstock, 2009).

From its debut as a modern term, social capital has been characterized as a concept strongly associated with notions of action and application. Bourdieu (1985) and Wahab (2012) described social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (Bourdieu, 1985, p.248; Wahab, 2012). Social networks are not formed naturally or effortlessly but rather are built through investment approaches, with the goal of institutionalizing group relations and making them a reliable source of beneficial assistance (Wahab, 2012; Hanna, Dale, & Ling, 2009; Portes, 1998).

2.6.2 Definition of Social Capital

Bourdieu’s (1985) initial definition of social capital was later modified by Putnam (1995, pp.65-78), who stated that social capital comprises “features of social organization such as norms, networks and trust that facilitate cooperation and coordination for mutual benefit.” Putnam (2000, pp.35-49) also explained that “physical capital refers to physical assets and human capital refers to the properties of individuals; social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them.” Coleman (1988, pp.95-120) further stated that social capital “consist[s] of aspects of social structure, obligations and expectations, information channels, and a set of norms and effective sanctions that constrain and/or encourage certain kinds of behavior.” When looking at the connections among national economic success, social capital, and trust, Fukuyama (2001) defined social capital as “the ability of people to work together for common purposes in groups and organizations, ..., the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them” (Fukuyama, 2001, pp.7-20). Woolcock (1998) defined social capital

as “the information, trust and norms of reciprocity inhering in one’s social networks.” With regard to organizations, the Organisation for Economic Co-operation and Development (OECD) (2001) described social capital as “networks together with shared norms, values and understandings that facilitate cooperation within or among groups.” From another perspective, Lin (1999, 2001) believed that social capital consists of social connections and commitments between members of a group characterized by two major features: robust social networks and the availability of resources that can be shared via the network ties.

Another aspect of social capital is that the benefits that apply at group or community levels can also apply to individuals (Walkup, 2003), who can gain an advantage from the social capital that exists even if they themselves have not contributed to it (Edwards & Foley, 1997). During the 1995 Chicago heat wave, for example, mortality was found to be much higher among socially isolated elderly residents living in more disconnected communities (Semenza et al., 1996). A further consideration is that both individuals and communities can suffer the adverse effects of living in a community that lacks social capital regardless of individual stocks of resources (Kawachi, Kennedy, Lochner, & Prothrow, 1997).

2.6.3 Relationship between Social and Human Capital

Social capital is considered a complement to human capital. It is generally understood that individuals who are networking successfully in their personal life are also considered to have better social connections with their immediate community network than those who do not. A number of scholars have described networking as an essential element of social capital but with considerably different definitions (Burt, 2000; Woolcock & Narayan, 2000; Bhuiyan, 2005; Putnam, 2007). For example, with respect to politics, the literature related to social networks contains a great deal of analysis of the circumstances that could motivate citizens to become engaged in democratic processes (Hays & Kogl, 2007; Wahab, 2012). In this context, social

networks encompass some sort of shared obligations, which do not always involve ordinary or casual contacts. Community-engaged networks promote the idea that “I will do this for you now, in the expectation that you will return the favour” (Putnam, 2000, p.20).

The differences between networks with and without social capital interaction are important because of their implications for both theory and policy. To elaborate, residents of poor neighbourhoods might have mutual support networks and tend, for example, to help one another with babysitting, car maintenance, or haircutting (Hays et al., 2007). In contrast, social capital in the form of trust and social networks is considered to provide economic or political returns. As Wong (2008) stated, “Dense social networks and high levels of trust among community members are considered to have spill-over effects which facilitate social co-operation” (Wong, 2008, p.1413). Putnam (1993) argued that, along with social networks, trust is a vital component of social capital. He also maintained that “social networks allow trust to become transitive and outreaching: I trust you because I trust her and she assures me that she trusts you” (p. 169). Underlying social networking theory is the idea that connections with others make it easier to seek the participation of other people in collective activities. Such participation can take different forms: official or unofficial, cooperative or confrontational. In some cases, it might involve becoming engaged in efforts undertaken by community neighbours such as activities for dealing with a disaster scenario.

From another perspective, studies have demonstrated that social networks can promote local capacity-building (Murphy, 2002, p.593), which could include tangible (e.g., a region’s infrastructure, natural resources, and trade regime) and intangible (e.g., local knowledge, skills, social networks, and institutional endowments) elements. Social networks can thus play a significant role, for example, in increasing the employability of immigrants by connecting them

effectively with successful earlier immigrants from their home countries (Portes, 1998; Lelieveldt, 2004; Wahab, 2012).

Lin (2001) demonstrated the significance of social capital in his graphic model, depicted in Figure 2.4, which shows that the strength of individuals' positions inside a network determines their ability to leverage their relative social capital contribution. As illustrated in Figure 2.4, individuals in higher positions are able use their relatively higher levels of reputation and connections to obtain more resources than someone in a lower position (Lin, 2001).

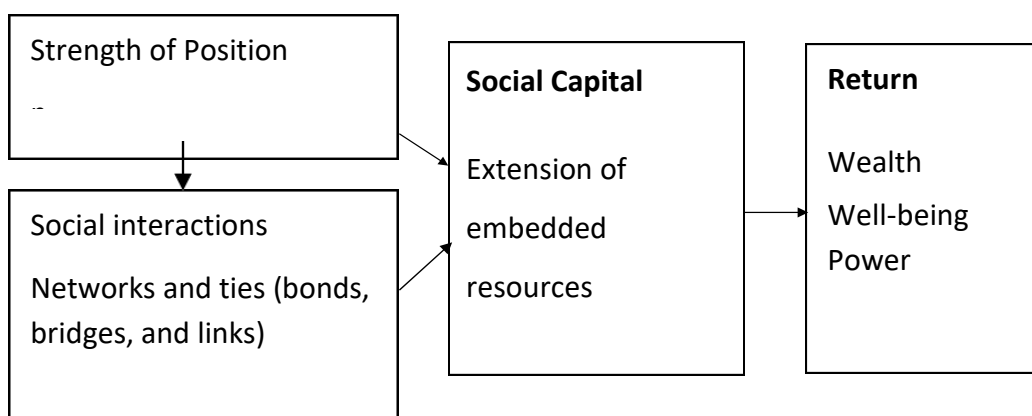


Figure 2.4: Schematic Illustrating Social Capital (Lin, 2001)

One of the definitions of social capital is “The stock of active connections among people: the trust, mutual understanding, and shared values and behaviors that bind the members of human networks and communities and make cooperative action possible” (Cohen & Prusak, 2001, p.4). Therefore, this definition resonates with the focus of this research, i.e., with regard to the role of social capital in relation to disaster events; as bonding, bridging and linkage relationships have within the community and other communities proved to be a positive contribution to the overall recovery of the community. Conceptually, the notion of social capital implies increased recognition of the various forms it can take. Scholars have defined three types of social capital: (1) bonding social capital (e.g., connections between similar members of a network), (2) bridging social capital (e.g., across heterogeneous organizations and networks), and (3) linking social capital

(e.g., connections with individuals and organizations with stronger power or status) (Putnam, 1995, 2000; Schuller, Baron, & Field, 2000; Szreter & Woolcock, 2004). Each person's levels of preparation and resilience are determined according to the amount of access to information and material resources; personal support networks; and the level of preparedness and ability of the community to obtain resources from local authorities, government officials, and other aid agencies at the national and international levels (FEMA, 2004; Dynes, 2006). As depicted in Figure 2.5, the relationships and differences among bonding, bridging, and linking social capital are particularly relevant with respect to consideration of how individuals and communities deal with disasters and adversity.

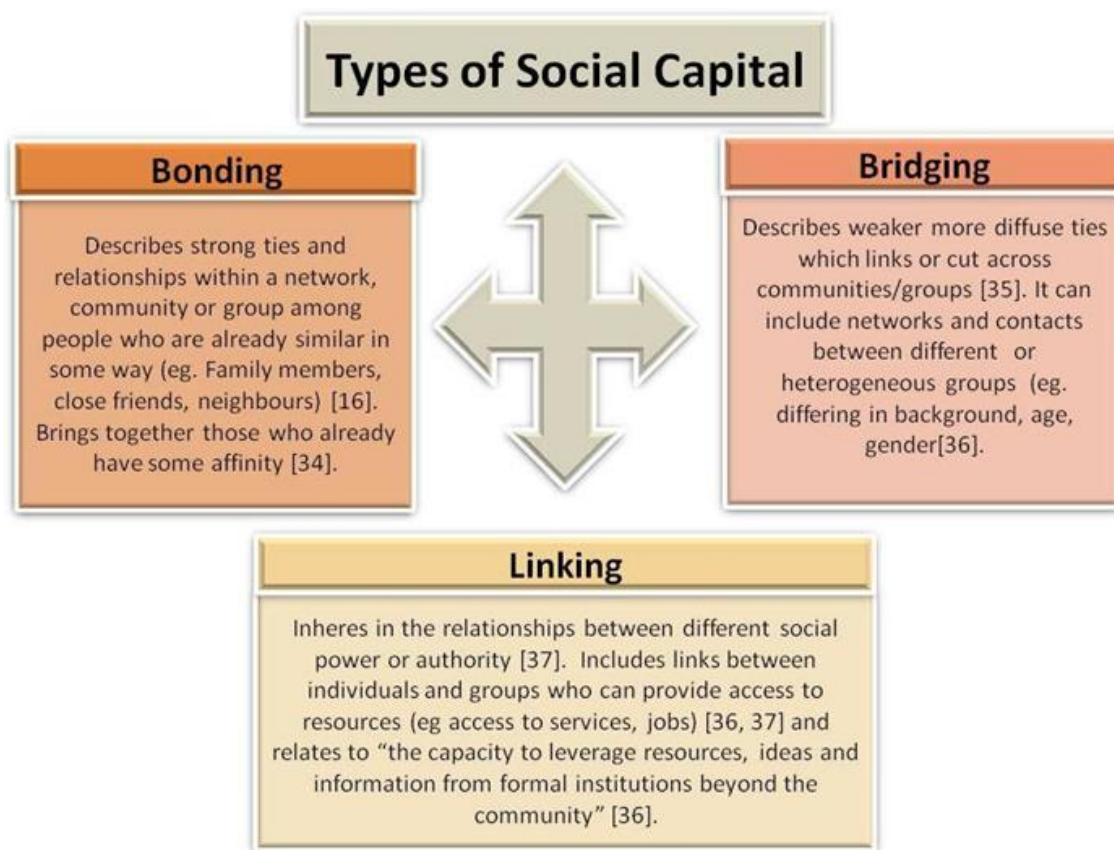


Figure 2.5: Types of Social Capital (Wood et al., 2013)

For example, Putnam (2000) suggested that bonding social capital is an excellent resource for mobilizing solidarity and fostering reciprocity in similar groups. Hence, for example, neighbours

will help one another when their homes have been damaged by a fire or hit by a storm. The networks afforded through bridging social capital are better for diffusing information among heterogeneous groups, because that type of social capital acts to help disseminate warnings by spreading the word via people's affiliations with different networks within a community (Wood et al., 2013). Linking social capital is more vertical or distal in nature and usually facilitates access to external individuals or organizations with resources, influence, or authority. In the event of disasters, having effective or ineffective connections can impact the levels of recovery of both the individual and the community. In addition, social relationships and bonding networks have even been shown to have a positive impact on survival rates as well (Wood et al., 2013). In the aftermath of the 2004 Indian Ocean tsunami, for example, villages with stronger links to outside organizations were observed to receive aid and assistance more quickly and to experience superior post-disaster recovery (Aldrich, 2011).

2.6.4 Social Capital and Disaster Management

For communities confronted by disasters to successfully perform rescue, restoration, and recovery tasks, they must act collectively, highlight the importance of social linkages, reestablish trust, and capitalize on internal and external relationships during the overall disaster-management process (Patterson, Weil, & Patel, 2010). Eisenman, Cordasco, Asch, Golden, and Glik (2007) identified social networks as important channels for decision-making and the spreading of information after Hurricane Katrina hit the Gulf Coast of the USA in 2005, and recognized them as a crucial factor affecting an individual's decision to evacuate. Limited access to information can be detrimental. People who had sparse networks were often left behind. For these reasons, disaster-management authorities (especially those from outside a community) must be extra alert to considering the social fabric and internal capacity of a community when planning future response and recovery scenarios (Eisenman et al., 2007).

2.6.4.1 Social Capital and Disaster Response and Recovery

The first evacuation intervention activities carried out in a disaster-affected community are considered the beginning of the response phase. These activities include tasks such as search and rescue, emergency sheltering, and the provision of medical services (Wood et al., 2013). Thus, the attainable level of social capital within an affected community contributes in a highly positive way to the effectiveness of the rescue and relief phase of the disaster-management cycle (Nakagawa, 2004). Individuals and collective actors have been helpful in the rescue of trapped victims and in providing emergency care for the injured, especially in situations when local emergency personnel are overwhelmed or unable to respond due very high demand and substantial damage (Poteyeva, Denver, Barsky, & Aguirre, 2007). For example, during the 1980 earthquake in Italy, it was noted that individuals who lived alone were less likely to be rescued and experienced a death rate 2.4 times higher than did people living in households with more than one person (Dyne, 2006). Likewise, an analysis of mortality rates during the 1995 Chicago heat wave revealed that socially connected individuals were less likely to die (Semenza et al., 1996). More recently, bonding social capital was an evident in the influx of individuals who arrived to offer support and aid to their neighbours in the aftermath of Hurricane Katrina (Hawkins & Maurer, 2010). Nevertheless, it has also been argued that although some of the communities affected by Hurricane Katrina had strong bonding social capital, they lacked bridging and linking relationships at the societal and institutional levels (Trainor, & Quarantelli, 2006; Rodriguez, 2006; Hawkins & Maurer, 2010).

As articulated by Smith and Hoffman (1999), during the 1991 Oakland, California, firestorms, individuals escaping on foot were picked up by passing motorists, while other individuals went door-to-door to ensure that everyone, including neighbours, children, the elderly, and pets, was rescued and safe. Similar solidarity was demonstrated by other members of the community who joined householders who were attempting to enter their burning homes to save irreplaceable items so

that they would not have to face the flames alone. In another example, during the 2010-2011 Queensland floods in Australia, volunteer groups called “Broom Brigades” would gather every morning at centralized meeting points to be bused to the devastated communities where they helped with the cleanup process (Wood et al., 2013). Smith and Boruff (2011) stated that in the case of the 1999 Moora floods, in a very few hours, strong horizontal relationships were evident in the community search and rescue assistance units who arrived when responses from state authorities fell short.

An additional factor is the sentiment confirmed by stories from outside authorities while rescuing local residents, who observed that a lack of confidence in emergency responders from outside the community meant that some elderly people were willing to be evacuated only by trusted community members. The greater the strength of community trust in local leadership, the more effectively that leadership can successfully facilitate the local coordination of necessary emergency response operations (Smith & Boruff, 2011). Bridging social capital can thus play a significant role in informal disaster-response and -recovery tasks. Likewise, with respect to addressing new and unanticipated problems that require instant attention, collective pre-existing social networks are often utilized (Poteyeva et al., 2007). Hence, reliance on local experiences, capacities, and resources enables people to extend help to others in time of need, and also explains how communities with strong social capital and collective trust (even if unprepared) can achieve impressive results. Thus, communities with more coherent and interactive social capital can take the initiative and self-develop long-term localized effective pre- and post-disaster strategies and techniques, which can be put in place to withstand future disasters. These strategies and techniques can be crucial emergency survival tools that invest the local and bridged resources and capacities of the community while waiting the disaster responses from the other stakeholders. It can also be argued that communities

that have taken stock of their local resources and developed plans to respond to extreme events will likely demonstrate the most resilience during future disasters (Wood et al., 2013).

With respect to the recovery phase, the aim is to return the community at least to the pre-disaster situation or a stronger state and conditions (Cardona, 2004). While the scarcity of literature has focused on recovery in general, many researchers have noted the strong role of social capital in many aspects of the recovery process (Nakagawa & Shaw, 2004; David & Li, 2010). According to Sobel (2002), strong bonding, bridging, and linkage relationships have proved to be a positive contribution to the overall recovery of the community. After the 1995 Kobe Earthquake, Schellong (2007) noted that the links that form the social fabric of a society can have a significant impact on the speed of community recovery. Olsen (2011) argued that in the wake of Hurricane Katrina 2005, the households who best managed their recovery were those who had a strong network of family and friends. In addition, social networks play a distinctive role in developing a common vision for community recovery and advocacy to meet local needs (Evans et al., 2008). During the recovery phase, information on resource allocation, recovery management is disseminated through social networks (Wood et al., 2013).

2.6.5 Social Capital and Religion

In many communities affected by disasters, religious ties and beliefs have been important attributes that strengthen the cultural and social fabric (Clarke & Jennings, 2008; Adeney-Risakotta, 2009; Kong, 2010; Ramsay, Manderson, & Smith, 2010; Joakim & White, 2015). However, only limited attention has been paid to the role of religious ties and beliefs in post-disaster response and recovery phases at either the individual or community level, and their supportive role in preventing and preparing for future disasters has gone unexamined (Gaillard & Texier, 2010; Joakim & White, 2015). Despite the importance of religious beliefs, some researchers have considered religion-based interpretations of responses to disasters as indicating

superstition and backwardness (Chester et al., 2008; Chester & Duncan, 2010; Lunn, 2009).

However, research has revealed that people may use religion-based beliefs to rationalize disasters or other traumatic events (Chester et al., 2010; Stephens et al., 2012; Aten et al., 2012). This behaviour is true even if the affected population has higher educational qualifications and sophisticated perceptions of the science behind a given disaster, such as plate movements or tectonic activity. Their knowledge can often co-exist in parallel with their spiritual, mythological, or religious convictions (Schlehe, 2010; Merli, 2010; Joakim & White, 2015). The result of downplaying these beliefs is that humanitarian aid organizations and donors often fail to make good use of religious groups after a disaster because of their lack of appreciation of the benefits to be derived from capitalizing on the faiths of the impacted people (Clarke et al., 2008). Declining to invest in and utilize religion-based groups thus means failing to make use of significant social capital resources within disaster-stricken communities (Joakim & White, 2015).

2.6.5.1 The role of Religion during Post-Disaster Recovery

Earlier researchers who concentrated on connections between disaster events and the contribution of religion often looked at interpretations of and answers to questions about a disaster as provided by local religious leaders (Schlehe, 2010). As stated by Paradise (2005), “One of the most significant resilience factors is religious faith” (pp.167-180). For example, religious culture and its social significance during the recovery process, including explanations, coping mechanisms, and rituals, have often been highlighted as important elements in both community and individual post-disaster recovery (Falk, 2010; Ramsay et al., 2010; Joakim & White, 2015). Religious leaders can play important roles in encouraging and promoting community responses to a disaster and to working toward effective recovery afterwards. In situations involving a lack of trust between communities and governments, religious leaders can

act as authority officials whenever the communities need trusted leaders for guidance and support (Bagir, 2012).

Keeping in mind the comments made above, it can also be the case that, while religious leaders can offer encouragement for community recovery, they may sometimes promote the disasters as a form of divine punishment (Reale, 2010; Joakim & White, 2015). Such promotion could diminish disaster mitigation and hinder preparations because it denies human responsibility for creating low levels of resilience (choosing unsafe locations such as floodplains for buildings, employing poor construction materials and techniques, etc.). Chester and Duncan (2010) found that the roles of religious leaders with respect to dealing with low resilience levels and to the enhancement of disaster resilience can be quite complex. For example, instances exist of local leaders and governments in the USA calling disaster events “acts of God”. Such labels enable those in authority to dodge responsibility for members of society who are poor and marginalized.

2.7 Organizational Capacity

As stated by Bryan (2011), organizational capacity is a concept that has received increased attention from public and non-government organizations and has been the subject of studies published in the literature over the last several years. Organizational capacity, broadly defined as the ability of an organization to fulfill its goals, has been a particular focus of scholars, as well as a topic of interest to outside funders such as the charity community. Outsider funders have been increasingly focusing on investing community effort in the building of effective capacities, especially for organizations that provide services to the general public (Bryan, 2011).

Key characteristics of organizational capacity include financial resources, staffing, technical expertise, communication and information-sharing, leadership, and commitment to

disaster prevention, such as flood protection (Hartvelt & Okun, 1991; Grindle & Hilderbrand, 1995; Hartig et al., 1995; Handmer, 1996). This conceptualization of organizational capacity is based not solely on funding or the amount of technical expertise, but also on the ability of individuals within an organization or community to work together to achieve a set of common goals. Capacity, in this sense, can be conceptualized as the ability of community organization to anticipate disaster events, make informed mitigation decisions, and implement effective policies (Honadle, 1981).

Organizational capacity thus constitutes a foundation on which rest strong strategies for the mitigation of the impact of a disaster as well as risk-reduction programs. For example, fundamental capacities of an organization include planning and ensuring the availability of funds. In previous studies, researchers concluded that increasing the number of planning staff and the amount of financial resources for executing a program leads to higher-quality mitigation policies (Burby & May, 1998). The more established the planning capacity of an agency for a given jurisdiction, the more technical expertise and personnel can be devoted to the implementation of disaster-mitigation techniques (Olshansky & Kartez, 1998; Brody, 2003b; Laurian et al., 2004). Greater financial resources can, for example, lead to more extensive engineering approaches to mitigation or to community-wide programs for preparing residents for flooding events.

Public organizations do not operate in isolation, but within a larger context of a variety of stakeholders such as communities, active stakeholder networks, complex relationships, and collective human values (Brody, 2008). The groups include other government entities, as well as private and non-government interests. Stakeholder groups and individuals can offer valuable knowledge and innovative ideas about their community that can increase the quality of any plans adopted and better ensure their implementation. It is often argued that stakeholder collaboration

can act as powerful leverage for generating trust, credibility, and sustainable commitment to the implementation of policies (Innes, 1996; Wondolleck & Yaffee, 2000). Collaborative activities within and among organizations and communities include the sharing of data and information, access to communication channels, the establishment of informal networks, and joint project management (Ivey, Loe, & Kreutzwiser, 2002).

2.7.1 Government Organizations

A government organization has the following characteristics:

1. Similar entities exist at other levels of the public sector (e.g., federal, provincial, territorial, and local governments; government organizations; government partnerships; and school boards).
2. The entity normally has no transferrable ownership interests.
3. The entity is organized and operated exclusively for social, educational, professional, religious, health, charitable, or any other not-for-profit purpose.
4. Its members, contributors, and other resource providers do not, in their capacity, receive any financial return directly from exercising their powers and conducting their duties (FRASC, 2016).

The role of government organizations in disaster relief is complex. Most of the related debates are focussed on centralized versus decentralized approaches, including networked governance. The involvement of central governments is not atypical in disaster compensation even in the presence of private insurance. Central governments often subsidize the incurred costs associated with a disaster through premium subsidies and relief funds (Aakre et al., 2010). However, this pattern contrasts with calls for decentralized management in other areas of disaster management such as disaster response and reconstruction, for which community-based management and the invocation of the subsidiary principle are popular solutions (Boin & Hart, 2003; Dynes, 2006).

For the United States of America (USA), Rubin (1991) set out six nationwide variables that affect the functioning of local governments with respect to their contribution to community recovery: (1) federal influence and conditions, (2) state influence and conditions, (3) community-based needs and demands for action, (4) personal leadership, (5) ability to act, and (6) knowledge of what action to take. According to a study by Rubin et al. (1985) of fourteen recovery cases in the USA, the shared dependent attribute that was common to all cases and that defined the speed, efficiency, and equity of community recovery was the ability of the local government to provide effective recovery strategies. In other words, if a local government was able to identify and respond to specific disaster concerns quickly, the community tended to recover faster and more sustainably. Recent scholarly consensus suggests that government recovery plans developed prior to a disaster lead to quicker and more effective post-disaster recovery for a community (Wilson, 1991; Olson, & Olson, 1993; Schwab, 1998; Wu & Lindell, 2004). Ideally, recovery plans and work accomplished in the aftermath of a disaster should not return a community to previous risk levels, but should aim to increase resilience to future events. Governments should also clearly communicate the goals and strategies of all recovery plans to their citizens (Smith & Wenger, 2006; Lindell, 2013).

In the event of a disaster, local authorities must act promptly and in a coordinated manner to execute a large number of tasks in a very condensed time period. In practice, response and recovery phases and operations overlap to such a degree that it becomes difficult to establish a borderline, especially in emergencies, when some community areas might be in response mode while others are moving into recovery mode at the same time. Therefore, once an emergency response has begun, there is little room for disaster-recovery planning to take place. Advance planning of resource allocation can thus provide an effective and efficient means of increasing the chance of fast and comprehensive community recovery (Lindell, 2013). It is therefore crucial

for local governments to plan ahead of time for effective disaster responses and recovery strategies (Schwab, 1998; Lindell, 2013). During the recovery phase, lack of accurate knowledge or readily available resources could result in the failure of businesses and households to recover to acceptable levels. Local governments should therefore step in and provide the necessary recovery help in addition to their specific routine tasks, such as restoring infrastructure assets. They should also return to performing the duties for which they are accountable in order to ensure more responsive and inclusive regulations and rules that ensure the enactment of preventive risk management measures related to land use and building construction (Lindell, 2013).

2.7.2 Non-Government and Community-Based Organizations

Community participation generally refers to the organized involvement of people in any project directed at running a social activity, solving their own problems, or maintaining or developing their socio-economic conditions. In line with the aims of the organization, leading community members participate in setting goals and in preparing, implementing, and evaluating plans and programs (Hossain, 2012). The United Nations (1970) defined participation as collective action by various strata of people or interest groups. Basically, the term indicates a dynamic group process in which all members of a group contribute to, share in, or are influenced by cooperative ideas and activities targeted toward a problem-solving or decision-making goal (Banki, 1981; Samad, 2002). As stated by Sastry (2001, pp. 19-22), “The crux of community participation is the exercise of the ‘voices and choices’ of the community and the development of human, organizational and management capacity to solve problems as they arise in order to sustain the improvements made over time.” Hossain (2012, pp.159, 171) noted that “community participation motivates people to work together, where people feel a sense of community and recognize the benefits of their involvement.” According to Barton (1969), due to the variety of

organizations involved in recovery efforts, there may be competition and breakdowns in coordination.

NGOs are civil society associations that operate independently of the government. NGOs usually deliver resources or services to support a social or political purpose. The World Bank classifies NGOs as either operational NGOs, which are concerned primarily with development projects, or advocacy NGOs, whose main interest is the promotion of a specific cause (Margaret, 2015).

Community-based organizations (CBOs) are well positioned to carry out activities and assist government agencies in implementing plans that affect the lives of their communities with regard to socio-economic development, natural resources management, environmental conservation, or disaster management. CBOs are established by community representatives to serve specific purposes and objectives, one of which is to ensure that decision-makers are taking into consideration the concerns of their local communities. Work conducted by CBOs can be classified into themes that include human services, natural environment conservation or restoration, and the safety and revitalization of an urban environment. Examples include the following (Tangui, 2014):

- Neighbourhood revitalization
- Affordable housing
- Food security
- Accessible transportation
- Senior citizen associations
- Environmental protection/conservation
- Community sustainability
- Humanitarian/disaster response

- Medical relief funds
- Youth homes and centers

As strong examples of social capital resilience, a variety of community-based organizations have participated in recovery efforts in order to assist in recovery programs and the distribution of aid.

The disaster-relief roles of community-based organizations (CBOs) and non-governmental organizations (NGOs), such as the Red Crescent, the Red Cross, religious institutions, and service organizations, are becoming increasingly recognized and more widely publicized (Willettts, 2002). These organizations are coming to be regarded as reliable strategic partners of the local governments. Such community-based associations provide help for disaster sufferers, including financial assistance, housing, food and water supplies, clothing, and medical aid. In general, NGOs are counted as strategic partners of government social service agencies, playing a decisive and enhanced role by performing the recovery tasks they are expected to carry out during the disaster recovery phase (Dynes, 1970; Lindell, 2013). CBOs, NGOs, and government agencies can together create an unmet needs committee, which is considered an emergent organization to help people who are not being adequately taken care of through regular disaster recovery programs. In some cases, such emergent organizations can also be formed by local grassroots activist groups who feel that their recovery concerns are not being heard by government agencies or are not being adequately addressed (Murphy, 2007).

2.7.3 Religious Organizations

The role of religious institutions, such as masjids and churches, in dealing with post-disaster recovery is also an important factor (Joakim & White, 2015). During and after a disaster, community-based religious organizations can supply a number of warning and rescue services; for example, alerting the population by using church bells or mosque loudspeakers, providing temporary shelter facilities, offering psychological support, and accommodating and

supporting the poor and vulnerable. They can also be a significant pathway for the collection of aid for affected communities (Benthall, 2008; Chester et al., 2008; Falk, 2010; Wisner, 2010; Joakim & White, 2015). Because faith-based organizations are often present in a community prior to a disaster, they are generally in a good position to be a valuable avenue of assistance with respect to risk reduction and disaster-recovery efforts (Fiddian & Ager, 2013). Faith-based organizations have often been known for their humanitarian and social welfare services in addition to their roles in religious activities, which means that not only are they able to connect with their congregations, but they are also often linked with broader support networks that can help them mobilize larger institutional and social networks (Clarke, 2006; Deneulin & Rakod, 2010; Joakim & White, 2015).

2.8 Household Capacity

According to Lindell (2013), the four main social entities involved in the recovery of a community after disaster events are government agencies, civil society organizations, local and national businesses, and household capacities. Businesses and household capacities are responsible mainly their own recovery, while government and civil society organizations share collective responsibility for post-disaster operations and the recovery of the overall community (Lindell, 2013).

2.8.1 Household

A household is defined as a residential dwelling unit that has one or more persons living in it, collectively sharing meals, food supplies, and living accommodations. A single family, partners, or a group of people who have social or ethnic ties could be counted as a household (Haviland, 2003). Based on its considerable importance in the fields of economics and inheritance, the household is the basic unit of analysis in many social, microeconomic, and government models (O'Sullivan, MacGill, & Yu, 2003). At the household level, a disaster could

result in major illness, death, or substantial economic or social misfortune (John Hopkins and the International Federation of Red Cross and Red Crescent Societies, 2006).

2.8.2 Household Resources

Community resilience is dependent on individuals and families within the community (Van Breda, 2001; Alshehri Rezgui, & Li, 2013). When there is a great level of familial responsibility, the community is better placed to respond quickly and effectively to disasters (Kulig et al., 2012). The capacity of households for resilient post-disaster recovery is highly dependent on two types of resources: financial and non-financial. The first type is also known as intangible resources, which are those that the household holds only for their convertible financial value. Examples of financial resources include money held in savings and chequing accounts, certificates of deposits, savings bonds, stocks, retirement accounts, cash value life insurance policies, trusts, annuities, commodities futures, royalties, awards from lawsuits, and cash on hand (Bucks, Kennickell, Mach, & Moore, 2009). The second type is the non-financial assets, which include possessions that are evaluated on a basis other than financial worth and are typically tangible. For example, residential and business property – both land and buildings – are forms of non-financial household assets, which also include possessions that have value, such as vehicles, electronic devices and equipment, art items, jewelry, furniture, appliances, and souvenirs (Bucks et al., 2009).

2.8.3 Household Recovery

The main consideration associated with household recovery is the effectiveness and sustainability of the household capacity, which refers to the ability of the members of the household to return to their usual way of life after the recovery process. According to recent research studies, household capacity is affected by the number of people living in a particular house, their education and income levels, their access to community organizations, and their

connections to local religious and social associations. The household recovery process entails three main components that require specific resources: 1) housing recovery, (2) economic recovery, and (3) psychological recovery (Bolin & Trainer, 1978). In fact, households require investments of time, including time to secure food, clothing, shelter, and household appliances and equipment (Yelvington, 1997), as well as time to file proper insurance claims, apply for grants or loans, and search for jobs, all of which also require huge effort as well as being time consuming (Morrow, 1997). In addition, the stakeholders affected by the disaster must be self-confident, self-motivated, and patient in dealing with the bureaucratic processes involved in approaching a variety of entities to seek assistance during the post-disaster period (Morrow, 1997). Vulnerable communities can learn from local and international practices with respect to pre-disaster preparedness. In addition, communities will become better resilient when combining these best practices with their past disaster recovery experiences. This combination can enable communities to develop some practical emergency tactics and procedures, as well as securing sustainable provisions for critical resources during the disaster times.

2.8.4 Sources of Household Recovery Assistance

According to Bolin and Trainer (1978), three types of assistance are correlated with three respective types of household recovery capacities: (1) institutional (i.e., governmental), (2) blood-relative relationships (i.e., extended family resources), and (3) independent (i.e., personal resources). Although few households actually rely on only one source, the ability of independent recovery is directly related to a household's financial, physical, and human resources. For example, local and central governments are obligated to provide the necessary recovery assistance based on its collective social responsibilities. Likewise, the religious beliefs and norms of the Saudi society strengthen the bonding between the community members and make everyone accountable for providing assistance, as long as he or she has the capacity to do so. In

addition, personal resources through business contacts or other social and political networking will allow some members of the communities to exploit their linkages outside their communities.

A great example of lateral initiatives between government institutions, businessmen, for-profit organizations, and individuals with religious dimension is donating tangible and non-tangible goods to the affected communities. Through utilizing the existing links, governments effectively can manage the distribution of these good in collaboration with NGOs and CBOs. The contribution of these organizations in providing recovery assistance is normally built on the bonding and bridging capacities between these organizations and members of the affected communities.

Another illustration of the role of religious beliefs of individuals, either within the community outsiders, is paying their Zakat, which is equivalent to taxes, directly to the impacted people. The payments can be in the form of food, household appliances, or cash. The extent to which the members of a household can generate income from revenues arising from capital interest, dividends, rental of physical assets, or employment determines the human recovery resources that are available for exploitation and their preparedness to live more frugally. The successful recovery of a household is also substantially affected by how many undamaged resources and possessions remain (vehicles, crops and animals, buildings, equipment, land, clothes, furniture, etc.), as well as the ability of the household to acquire substitutes relatively inexpensively. Likewise, significant factors in accelerating household recovery are the availability of financial assistance and the ease and immediacy of gaining access to it, such as cashing in insurance policies, liquidating stocks and bonds, and withdrawing funds from bank accounts. Similarly, the flexibility of creditors with respect to deferring mortgage and loan payments can, to a considerable extent, hinder or facilitate the recovery of a household. A final consideration is the fact that, to be eligible for recovery assistance, an affected household must

meet specific qualification criteria, such as the length of their residency in the area concerned and evidence of their losses (Bolin & Trainer, 1978; Lindell, 2013).

2.8.5 Types of Household Recovery

Household recovery can be categorized according to four duration-related types that are typically needed following a disaster event (Quarantelli, 1982). Since the impacted population and families differ in number, characteristics, causes of movement, and duration of stay, their movement patterns through various housing types also vary (Cole, 2003). The first recovery type is called *emergency shelter*, which involves spaces in temporary accommodation for rapid and short-term protection and could be just mobile units or an open yard (Bolin & Stanford, 1991, 1998). The second type is temporary *sheltering*, which denotes longer-term facilities for sleeping, water supplies, and food preparation. This type of household recovery may be obtainable through relatives or friends, or could be provided in commercial lodgings such as motels or, to some extent, in church auditoriums and school gymnasiums. According to Islamic teachings, neighbours are regarded as relatives or even part of the extended family. Therefore, community members whose properties were undamaged will offer their homes as emergency or temporary shelters; either for relatives or non-relatives; as a practical example of illustrating bonding between the community members. The third type is called *temporary housing*, which allows disaster sufferers to re-establish their daily life activities in less than ideal settings, buildings, or locations. The fourth type is designated *permanent housing* and enables impacted people to resume their normal lives in safe, regular dwellings and locations. Based on the cultural traditions and norms, Saudi people usually tend to reach out their relatives, friends and officials in close or even remote communities to seek recovery assistance. Linking and bridging capacities are well exploited in these instances as it is usually correlated with social and economic ties and demographic backgrounds.

Correlated demographic household characteristics reveal significant differences among households during the recovery stage (Peacock, Dash, & Zhang, 2006). The availability of nearby relatives and close friends and the degree of damage determine who can stay with people they already know, while age, homeownership and income are decisive factors in establishing who can host relatives or friends after a disaster (Morrow, 1997). Likewise, groups of impacted relatives will generally try to find a shared shelter, particularly if all of them are primary sufferers (Yelvington, 1997; Lindell, 2013). Members of higher-income households but no nearby friends or relatives will often stay in motels, hotels, etc., whereas open spaces in public facilities may be the only sheltering option for lower-income households (Lindell, 2013).

2.8.6 Problems Associated with Household Recovery

Scholars have stated that during the restoration and rebuilding stage, households can confront a number of problems, which include breaches of the terms and conditions of contracts, poor-quality building work, and high repair costs (Bolin, 1991, pp.25-34). Lower-income households generally have a greater chance of being impacted simply because (1) their location is often more vulnerable to disasters, (2) the home may have been poorly maintained, (3) the building might have been constructed with lower-quality materials, and (4) standardized building codes might have been violated, all of which would mean that they would have lower levels of physical resilience (Bolin & Bolton, 1986; Lindell, 2013). Another factor could be the longer time that these households might take to restore their housing status because of insufficient resources for self-sustenance and recovery (Girard & Peacock, 1997).

2.9 Summary and Conclusion

To acquire a comprehensive understanding of the different phases of disaster management and the research related to this topic, a literature review was conducted, with a special focus on the recovery phase. The review therefore involved an exploration of the disaster-management

cycle and recovery goals and entities. Social capital and its conceptual roots were defined, and the investigation included an examination of the relationships between social capital and the disaster-management process, the disaster response phase, religion, and human capital. Studies related to the role of religion and religious institutions during and after a disaster were also surveyed. Household capacities and social capital have been considered pivotal assets, main drivers, and valuable resources in recent research related to resilient post-disaster recovery and the building of resilient capacities in communities vulnerable to disasters. For this reason, a review was conducted of the literature related to types of household recovery and associated problems, the functions and roles of local governments, NGOs, CBOs, and religion-based organizations, and sources of household recovery assistance.

Chapter 3: 2009 and 2011 Flash Floods in Jeddah, Kingdom of Saudi Arabia

3.1 Location and Size

The Kingdom of Saudi Arabia (KSA) is located in a highly strategic geographical position in the extreme southwestern part of Asia. The KSA occupies about 80 % of the Arabian Peninsula and, with 1,960,582 km², is counted the third-largest Asian country by area after China and India. The KSA shares its northern boundary with Egypt, Jordan, Iraq, and Kuwait. The United Arab Emirates, Qatar, Bahrain, and the Arabian Gulf lie on the eastern borders. Oman and Yemen are the southern neighbours, while the Gulf of Aqaba and the Red Sea form natural boundaries to the west. As shown in Figure 3.1, the KSA enjoys long, rich coastlines and land borders, whose lengths are estimated to be 2,640 km and 4,431 km, respectively (World Atlas, 2011).



Figure 3.1: Location of the Kingdom of Saudi Arabia (World Atlas, 2011)

3.2 Saudi social hierarchy

The Saudi population is characterized by a high degree of cultural homogeneity and a similar degree of social class division. The history of the Kingdom of Saudi Arabia begins properly on 1932, when by royal decree the dual kingdom of the Hejaz and Najd with its dependencies, administered since 1927 as two separate units, was unified under the name of the Kingdom of Saudi Arabia. The territory that was formed in Saudi Arabia in 1992 was composed of four distinct regions and diverse population groups. Each region maintained a nomadic and original population: in 1950, an estimated half of the Kingdom's population was nomadic (Metz, 1992).

Hijaz (western region) is home to the holy sites of Islam, and a host of pilgrimage. The populations of Mecca, Medina, and Jeddah have been infused for centuries by descendants of foreign Muslims who had come for the pilgrimage and stayed. In Makkah there were large Indian and Indonesian communities, and Jeddah had descendants of Hadramis (from Hadramaut, or Aden), as well as Africans and people from other parts of the Arabic-speaking world e.g. Egypt, Jordan, and Syria. The cities of Hejaz have benefited from donations from religious Muslims around the world and have become major centers of Islamic scholarship and learning. Jeddah was almost unrivalled as a commercial center in the Kingdom until the 1960s, and in all the cities of the Hijaz cities, business families comprised powerful elite (Metz, 1992).

The values and practices of Islam were at the core of cultural harmony between societies. Society as a whole, valued the behaviour that shows generosity, hospitality and willingness to support other family members. In addition, Saudi communities are characterized by a high degree of family cohesion. This description was reflected in the common Arabic language and in adherence to the teachings of Islam. Above all, the cultural homogeneity of the Kingdom was based on the dissemination of family values and attitudes, in particular the values and attitudes concerning relations within the family and family relations with the rest of society.

The family was the most important social institution in the Kingdom of Saudi Arabia. For Saudis in general, the family was the basic foundation of identity and status for the individual and the direct focus of individual loyalty. Families have formed alliances with other families that share common interests.

The structure of Saudi households is traditional and patriarchal, where males are heads of household and responsible for duties that are usually outside the family, such as protecting and providing for their family. The identity of the family is also associated with the father and, therefore, has custody of the child if the matter arises.

Women are taught to participate in roles that affect life in the household, such as housekeeping, childcare and some decisions on child-rearing. It is not limited to these roles, as evidenced by the growing number of successful women entrepreneurs. In Saudi Arabia, the role of women is essential to maintain the family structure and thus society (Long, 2003).

3.3 Saudis and Non-Saudi Populations

Estimates of the population holding Saudi citizenship have varied widely. The 1992 Saudi census indicated an indigenous population of 12.3 million people and a growth rate of 3.3 % (Mets,

1992). The Saudi Department of Statistics and Information announced last year (2016) that the Saudi population was estimated at about two thirds of the population 67 %, about 20.7 million people, while the non-Saudi population accounted for about one third of the population, 33 %, about 10.1 million people (Saudi Arabia Centre of Statistics and Information , 2017).

3.4 Illegal Immigrants

Illegal immigration to Saudi Arabia is one of the challenges facing local authorities. For five decades, the kingdom has become the target of massive and illegal immigration from some African and Asian countries, and infiltrators across the border with Yemen, including large numbers of Somalis, Ethiopians and Eritreans (Al-Arabiya, 2017). There are also large numbers of people who remained in KSA illegally after their pilgrimage and Umrah (Alyom, 2012). Efforts are on in full swing to ensure that no visitors overstay their visas and that other illegal immigrants also leave the country. Saudi Arabia has developed an Amnesty scheme to encourage illegal immigrants to leave KSA. For those living in remote areas of the Kingdom, help centers arranged necessities such as water, food and housing to arrange for their deportation. Community organizations have proposed chartering private trips and providing free transportation during repatriation. The current initiative is different from the one in 2013 in two important ways. First, this time the violators of local laws can leave for their home country without any penalty. Second, there is option for those repatriated to become expatriates in the kingdom again (Arab News, 2016).

3.5 Topography

The narrow plain of Tihamat ash-Sham runs parallel to the Red Sea coast, and the Hijaz Mountains to the north have elevations ranging from 910 m to 2,740 m. The Asier region in the south has the highest mountains, which reach upward to more than 2,740 m. To the east of the Hijaz Mountains lie the central uplands (Najd). The Dahna desert separates Najd from the lower-lying Hasa plateau to the east. Approximately one-third of the country is sandy desert. The KSA has neither lakes nor permanently flowing waterways except for the artesian wells in the eastern oases.

3.6 Overview of the KSA Climate

According to the Kopper-Geiger climate-classification world map provided in Figure 3.2, the KSA belongs to the semi-arid category (Peel, Finlayson, & McMahon, 2007). This type of climate is generally characterized by hot summers and warm-to-mild winters. Influenced by seasonal sea breezes, summer temperatures in the City of Jeddah are often above 40° C during the daytime and decline to an average of 30° C overnight. Average daily temperatures during the winter are around 23° C to 33° C, dropping to 16° C at night (Zerbonia, Zatar, Al Fawaz, & Daggag, 1986).

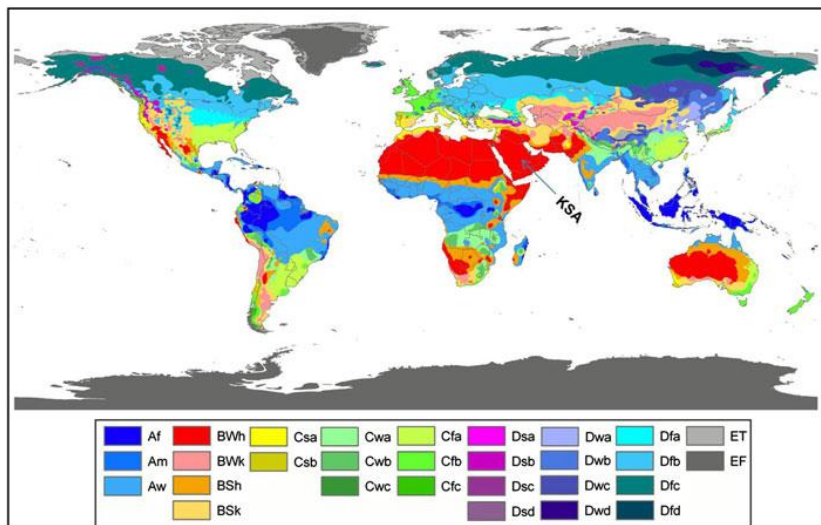


Figure 3.2: Kopper-Geiger Climate Classification Map (Peel et al., 2007)

Jeddah's rainy season occurs between October and April of each year, with annual mean rainfall ranging between 30 mm on the coastal plains and 60 mm in the inland areas, which are more mountainous (Şen, 1983; Bayumi, Alyamani, Subyani, Al-Dakheel, & Al-Ahmadi 2000; Subyani & Al-Dakheel, 2009; Subyani & Al-Modayan, 2011). Because the precipitation is below the potential evaporation level, rainfall is sparse, irregular, and temporally and spatially variable. As indicated in Figure 3.3, the average annual precipitation level can reach more than 600 mm in the mountains but decreases to 120 mm on the coastal side to the west and to 100 mm toward the east (Youssef & Maerz, 2013). Due to its higher rainfall amounts, the southwestern region of the KSA has the greatest extent of water resources, including renewable waters, and is as well the most populated and cultivated area.

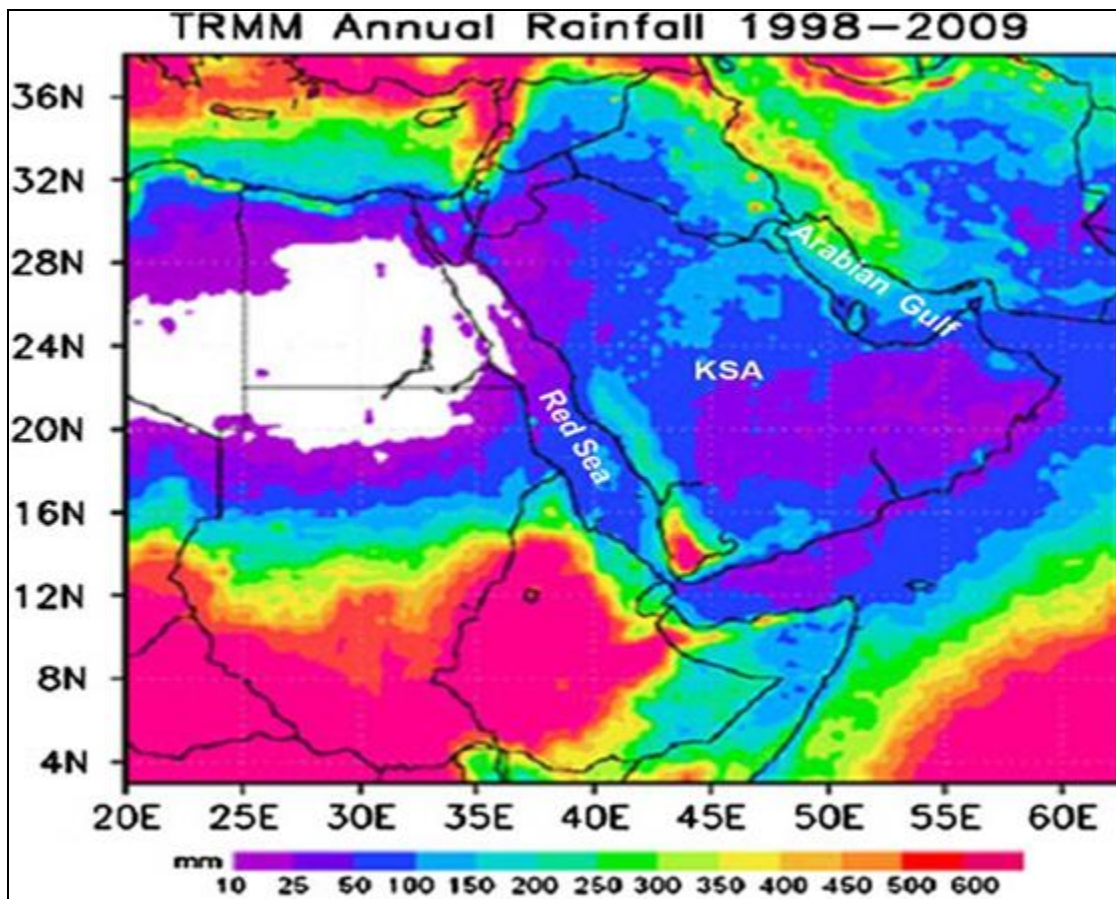


Figure 3.3: 1998–2009 Annual Rainfall Distribution in the KSA (Al-Mazroui, 2010)

In the Jeddah area, rainfall is rare and highly variable (Momani & Fadil, 2010). For example, according to the Presidency of Meteorology and Environment (PME), the total rainfall in 2008 was only 26.3 mm.

3.7 Climate change in the KSA

Climate change is already felt in the Middle-Eastern countries and KSA is no exception. As per the recent documents published in international journal (Youssef and Sefry 2015), climate and precipitation conditions have been changing since 1970. Another study (Sharif, 2015) has demonstrated that mean surface yearly average temperature has changed almost 0.8°C in the time window of 1950 to 2000. The study also depicts that the eastern part of the country suffers the most with an average increase of temperature to 1°C in 50 years period of time (Sharif, 2015).

Different climate models also support this notion and in case of Jeddah, it is revealed that the global climate model has predicted an increase of up to 2.5°C mean surface yearly average temperature in next 50 years. The average yearly rainfall (precipitation in this case as it does not snow in Jeddah) has also changed. In 1970, the yearly average rainfall has been recorded as 36 mm whereas in 2011, the average yearly rainfall is recorded 125 mm. The notion from this information implies that the pattern of average yearly precipitation and temperature is changing in the City of Jeddah based on historical data. As the climate is changing, the population is also increasing, and poor land use planning is putting a greater number of people in harms way. Natural disasters such as flash floods are therefore increasing and leading to escalating impacts (Sen, 2017). Table 3.1 shows annual daily maximum rainfall for Jeddah between 1970 and 2011.

Year	Annual daily maximum rainfall (mm) J134	Annual daily maximum rainfall (mm) SGS	Annual daily maximum rainfall (mm) KAU	Back-analysis value (mm)	Aggregate maximum rainfall (mm)
1970	36	n.d.	n.d.	n.d.	36
1971	70	n.d.	n.d.	n.d.	70
1972	15	n.d.	n.d.	n.d.	15
1973	16	n.d.	n.d.	n.d.	16
1974	15	n.d.	n.d.	n.d.	15
1975	13	n.d.	n.d.	n.d.	13
1976	6	n.d.	n.d.	n.d.	6
1977	5.5	n.d.	n.d.	n.d.	5.5
1978	46.2	n.d.	n.d.	n.d.	46.2
1979	72.8	n.d.	n.d.	n.d.	72.8
1980	0	n.d.	n.d.	n.d.	0
1981	0	n.d.	n.d.	n.d.	0
1982	0	n.d.	n.d.	n.d.	0
1983	0	n.d.	n.d.	n.d.	0
1984	3.7	n.d.	n.d.	n.d.	3.7
1985	49.8	n.d.	n.d.	n.d.	49.8
1986	1	n.d.	n.d.	n.d.	1
1987	21	n.d.	n.d.	n.d.	21
1988	17.4	n.d.	n.d.	n.d.	17.4
1989	30	n.d.	n.d.	n.d.	30
1990	0	n.d.	n.d.	n.d.	0
1991	38.4	n.d.	n.d.	n.d.	38.4
1992	38.4	n.d.	n.d.	n.d.	38.4
1993	18	n.d.	n.d.	n.d.	18
1994	1	n.d.	n.d.	n.d.	1
1995	17.4	n.d.	n.d.	n.d.	17.4
1996	46.5	n.d.	n.d.	n.d.	46.5
1997	52	n.d.	n.d.	n.d.	52
1998	27.3	n.d.	n.d.	n.d.	27.3
1999	21	n.d.	n.d.	n.d.	21
2000	24.5	n.d.	n.d.	n.d.	24.5
2001	51.2	n.d.	n.d.	n.d.	51.2
2002	29	n.d.	n.d.	n.d.	29
2003	18.4	n.d.	n.d.	n.d.	18.4
2004	20	n.d.	n.d.	n.d.	20
2005	25	n.d.	39	n.d.	39
2006	25	n.d.	25	n.d.	25
2007	10	n.d.	10	n.d.	10
2008	17	n.d.	17	n.d.	17
2009	80	n.d.	80	150	150
2010	n.d.	41	41	n.d.	41
2011	125	111.6	111.6	n.d.	125

Table 3.1 Annual Daily Maximum Rainfalls for Jeddah (source: Youssef 2015)

3.8 History of Disasters in the Kingdom of Saudi Arabia

According to and International Disaster Database (IDD) records of disasters in the KSA, most major KSA disasters stem from low levels of resilience and failure to learn effectively from previous events (Hahne, & Group 2002; Thompson et al., 2004; Aguilera, Perrocheau, Meffre, Almulla, 2008; Lerner et al., 2007; Alamri, 2010; International Disaster Database (IDD), 2010).

Table 3.1 lists, in chronological order, significant KSA disasters for the past 50 years.

Table 3.2: Top 10 Disasters Causing Major Damage in the Kingdom of Saudi Arabia between 1960 and 2010 (NDA = No Data Available) (Alamri, 2010)

Type of Disaster	Date	No. Affected	No. Killed	Estimates of Effect
Heavy rains	April 1964	1,000	20	NDA
Fire during Hajj	December 1975	NDA	200	NDA
Militant occupation of	November 1979	600	250	NDA
Floods in northwestern	December 1985	5,000	At least 32	\$450,000
Iranian riots during Hajj	July 1987	649	402	NDA
Stampede inside pedestrian tunnel during Hajj	July 1990	NDA	1,426	Compounded by failure of
Fire during Hajj	April 1997	More than 1,500	343	
Rift Valley fever	September 2000	500	87	NDA
Jizan floods	April 2004	430	5	Destroyed 2,680 km ² of housing,
Jeddah floods	November 2009	More than 10,000	116	\$1.5 billion
Jeddah floods	January 2011	5,000	10	\$2.5 billion

3.8.1 Flash Flood Hazards in the KSA

The majority of KSA areas receive most of their rainfall in the form of one or two intense, short-lived heavy thunderstorms. However, in areas such as the Jizan Mountains, Sarawat, Abha, and Taeif, rainfall occurs much more often. Flash flooding is thus relatively

frequent in the steeper areas of the western escarpments, mainly between the Yemen border and the City of Jeddah (Youssef & Maerz, 2013).

3.9 Saudi Disaster Response Plans

The KSA national government has disaster-planning offices in the capital city of Riyadh. These offices provide guidance and representation for each of the provinces, which are indicated in Figure 3.4. The principal formal disaster-planning responsibility was under the jurisdiction of the Municipality of the City of Jeddah during the 2009 and 2011 floods, but has since changed.



Figure 3.4: Map of the Saudi Provinces

3.9.1 Saudi Disaster-Management Planning

Saudi disaster-management planning has grown from a narrow focus on fire response, and its mandate now includes comprehensive disaster-management responsibilities. The first KSA emergency response team was formed in 1926 in the city of Makkah, which later was declared a presidency in the General Security Service organizational structure. The fire brigade presidency evolved into the General Directorate of Firefighting under the Ministry of the Interior

(MoI) in 1960, and the name was changed to the General Directorate of Civil Defense in 1986 (MoI, 2013, p.1; Abosuliman, 2014). In 1963, the first fire brigade was established in the City of Jeddah, and the cities of Al Madinah and Riyadh also acquired brigades. The KSA Directorate of Civil Defense is nested under the Civil Defense Council, which draws up civil defense plans and policies (Ministry of Interior, 2013). When a disaster occurs, the orders of the Directive Council for firefighting, ambulance services, and search and rescue are implemented by the Regional Committees for Civil Defense, which have the authority to lead and direct military and civil organizations, as well as to exploit appropriate resources as necessary. The regional committees execute local response plans, communicate with all relevant organizations, and direct all response activities and tasks (Saudi Arabia Ministry of Interior, 2013; Abosuliman, 2014).

3.10 City of Jeddah

The City of Jeddah is located between 21° 20' and 21° 30' north latitude and 39° 06' and 39° 25' east longitude on the Red Sea coast at the western edge of the KSA. The city has a 1,765 km urban boundary that encloses a total land area of roughly 5,460 km². After the capital, Riyadh, Jeddah is the second-largest city in the KSA and is the country's commercial centre. The city is well known mainly because it is the common entry port for Muslims who travel from around the world to the two holy Islamic cities of Madinah and Makkah (Jeddah Municipality, 2011). Figure 3.5 shows the location of Jeddah.

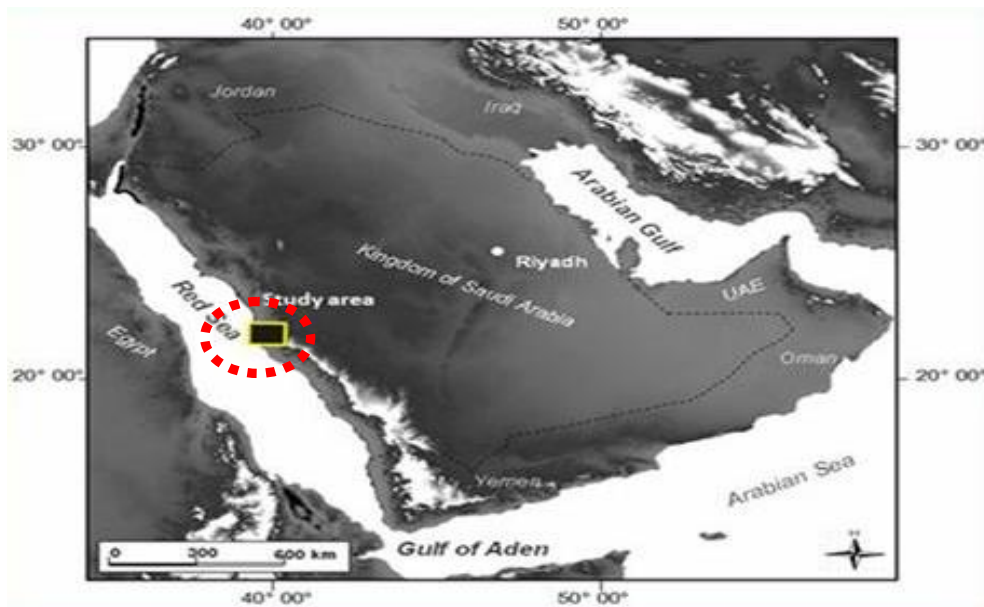


Figure 3.5: Location of the Jeddah Study Area

According to the Saudi Central Department of Statistics & Information (CDSI), the population of the city was recently estimated at 3.4 million (CDSI, 2010). Figure 3.6 indicates the growth of Jeddah's population in modern times.

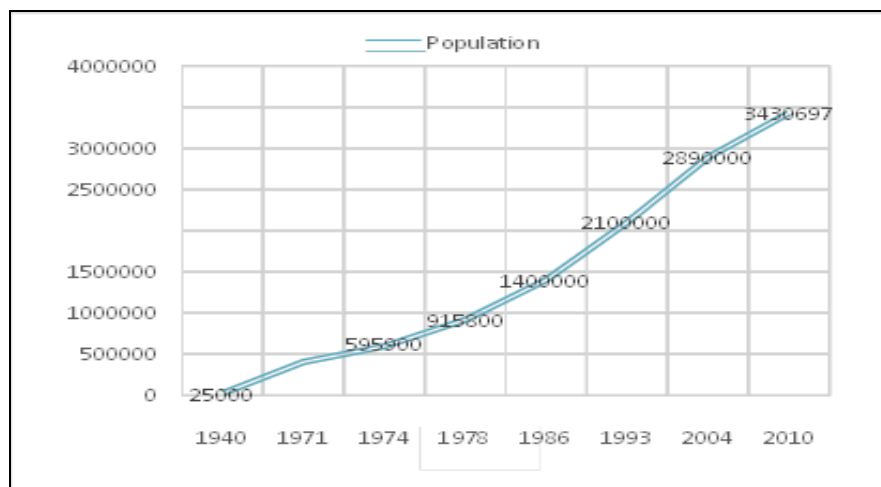


Figure 3.6: Population Growth for the City of Jeddah (CDSI, 2014)

3.10.1 History of Jeddah

The foundation of Jeddah dates back about 3,000 years to the times when fishermen would stop there after their excursions. About 500 years later, the 'Quda'ah' tribe arrived and established their first settlement. In 647 CE, the third Caliph, Othman Bin Affan, ordered Jeddah to be turned into a port in order to welcome Hajj visitors on their pilgrimage to Makkah. Eventually, Jeddah was transformed into a commercial hub and became a trading centre (Jeddah Municipality, 2011). The Ottoman Turks occupied the city in 1517 (Pesce, 1977; Alsiary, 2015). Although many changes have occurred in the operation of Jeddah and the western part of the KSA in general, its character, size, and functions were preserved for the next several hundred years (Facey, 2005). Figure 3.7 is an aerial photograph of Jeddah in 1938.

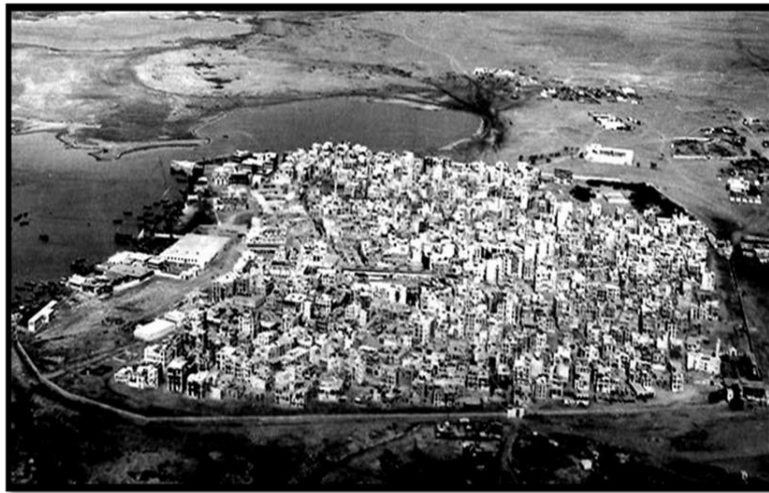


Figure 3.7: Jeddah in 1938 (Facey, 2005)

Significant development did not begin in Jeddah until 1955, when the KSA's King Abdul Aziz Al Saud ordered the defensive wall of the city to be demolished, with the intention of expanding the city beyond it.

Historically, Jeddah was an important seaport for shipping spices and luxury goods between the Far East and Europe, and was a trade hub for spices and incense (Taylor & Ghazi, 1994; Alsiary, 2015). Over time, the city became a well-known focal-point trade destination because of its industrial, economic, and tourism endeavours and modern development, as well as its function as a center for Saudi financial services (Jeddah Chamber of Commerce and Industry (JCCI), 2013). According to the statistics collected by the Saudi Ports Authority (SPA), in 1946 the port of Jeddah processed approximately 150,000 tons of cargo, which had increased substantially to more than 8 million tons by 1977. By 2009, that number had reached roughly 28 million tons (Saudi Ports Authority (SPA), 2014).

During the last five decades, the total area of Jeddah has increased from 18,315 ha in 1964 to 54,175 ha in 2007, with the residential areas expanding from 1,945 ha to 21,365 ha over the same period. Likewise, the commercial areas have also enlarged by about five times from 298 ha in 1964 to 1,555 ha in 2007. Following the more recent fast growth of the city, as depicted in Figure 3.8, in 2009 the Municipal Strategic Planning Department of the City of Jeddah enacted policies to decrease the costs of development and encourage more mass transportation and modern development (Abdullah, 2012; Aljoufie, 2014). As a result, Jeddah is now considered a very modern city (JCCI, 2013; Alsiary, 2015).

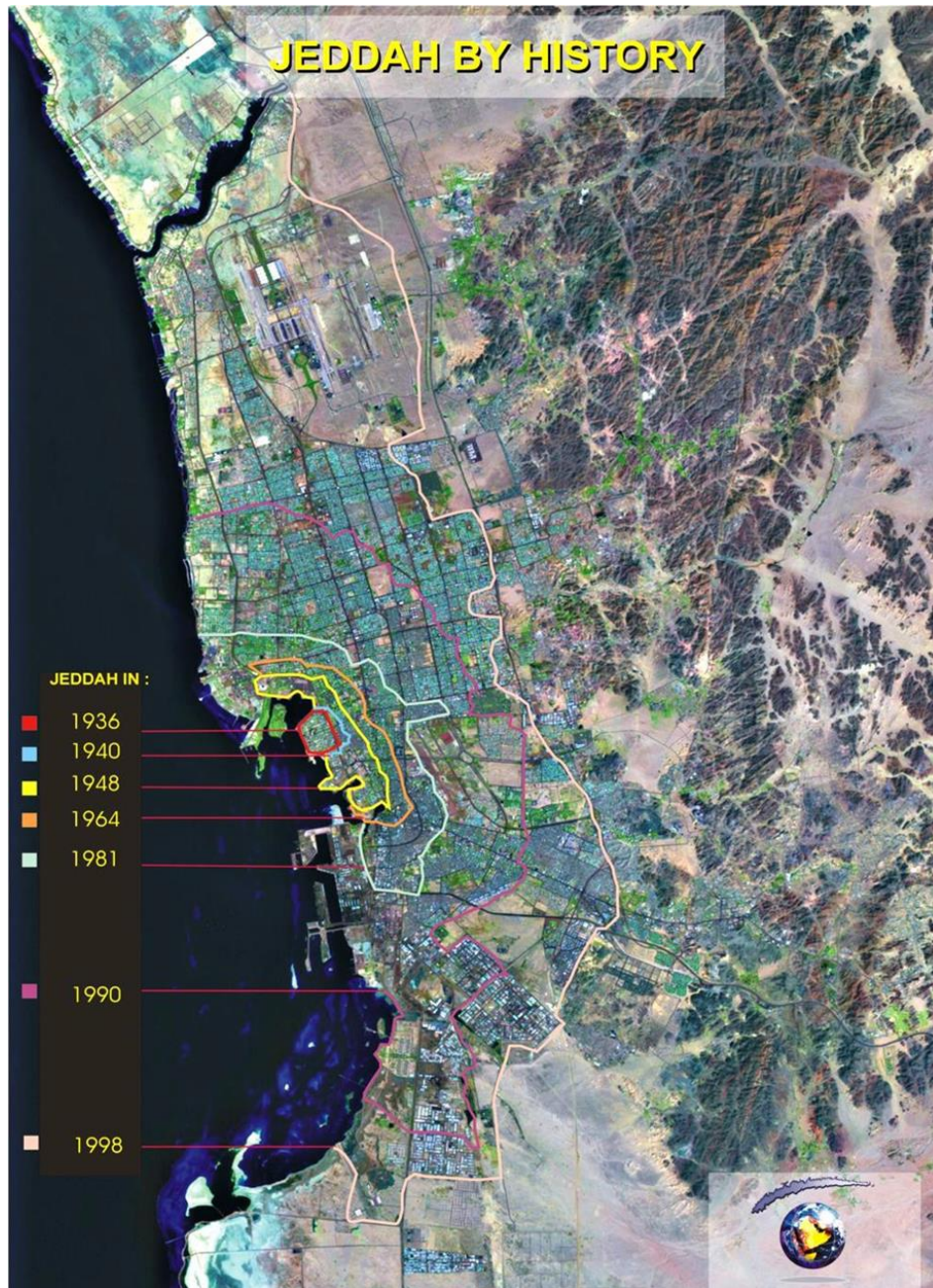


Figure 3.8: Jeddah: (1936 – 1998) (SGS, 2014).

3.10.2 Flooding in Jeddah

Several decades prior to 2009 (i.e., 50 to 75 years ago), the country had not experienced such devastating events. According to Maghrabi (2012), the main floods which happened in Jeddah are: The floods of 1968, which came from the valleys east of Jeddah and destroyed many constructions as well as the walls of the old airport. However, the built-up area was not then as

large as the current area. The flood of November 1972: the quantity of rain reached 83 mm in a short period of time and left its destructive action on the streets of the old districts and formed swamps, which polluted the environment. Flood of 1979, which resulted from continuous rain. The water rose in the streets above 1 meter, and life stopped for three days. Flood of November 1985, which happened after heavy rain over Jeddah and the surrounding area. The two flash flood events during 2009 and 2011 in the City of Jeddah were the most serious natural disasters in the history of that city and had a considerable effect on the people, civilian areas, and infrastructure. In the wake of the 2011 floods, the region witnessed similar events in 2015 when floods hit the western and northern parts of the kingdom.

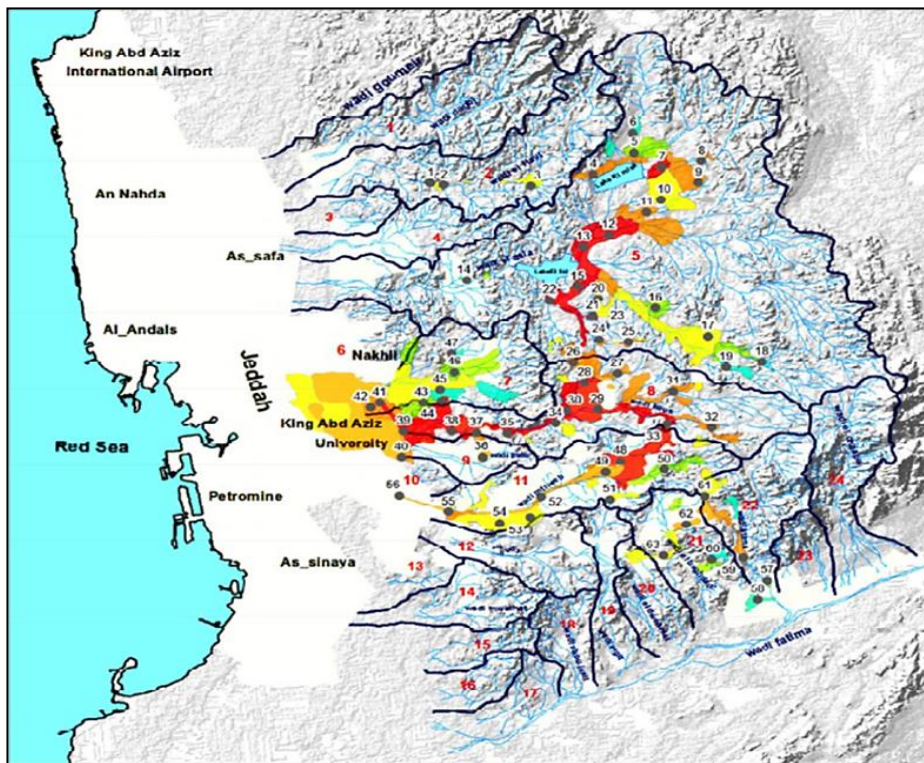


Figure 3.9: Watersheds and Flooding in the City of Jeddah, 2009 (Al Saud, 2010)

3.10.3 Physical and Geographical Factors Affecting the Jeddah Floods

It is important to study regions that have been exposed to repeated natural disasters in order to identify the mechanisms of their occurrence and to evaluate the extent of their impact. It is apparent that the rainfall was concentrated in specific geographic locations during the two flood events that occurred in Jeddah during November 2009 and January 2011. According to Al-Saud (2015), the study area clearly shows the existence of two principal regional basins. As depicted in Figure 3.10, the first basin is rocky, semi-closed, and located in a mountainous area. This basin is surrounded by several mountain chains with altitudes about 300 m to 550 m above sea level. The second basin is a large, flattened basin close to the northern side of a rocky basin. It is located in a flat region with an altitude of less than 150 m.

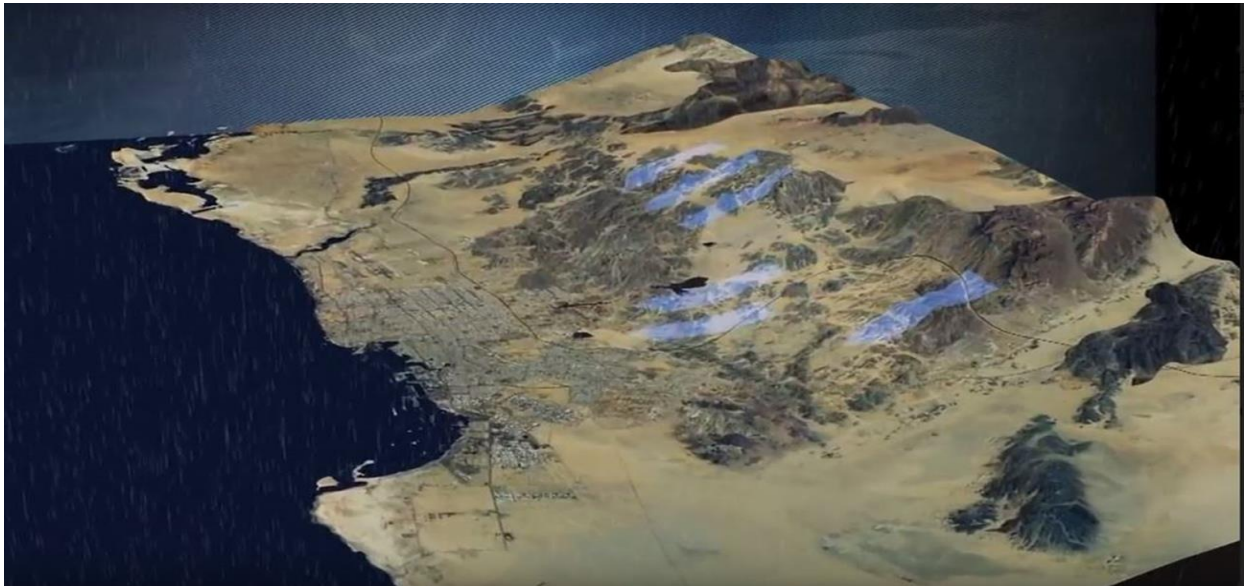


Figure 3.10: 3-D Map of the Study Area (Ministry of Interior, 2015)

The cross-section of the area contains two major terrain shelves, one flat and the other somewhat elevated, as illustrated in Figure 3.11 (Al-Saud, 2015). It is clear that the structure of the terrain played a key role in the rapid flow of the floodwater toward the city (Figure 3.11).

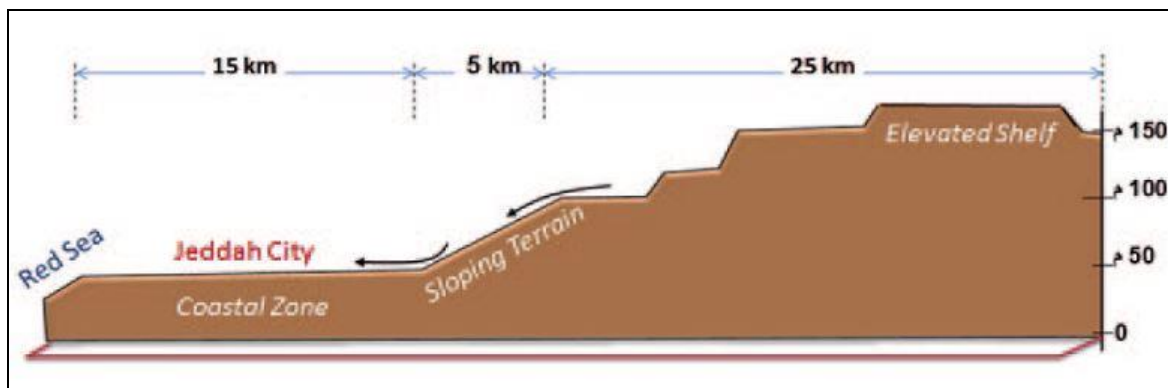


Figure 3.11: Cross-section Showing the Major Shelves in the Study Area (Al-Saud, 2015)

The two basin areas encompass several wide valleys formed as a result of faults and extending for a number of kilometers. They are characterized by thick deposits of sediments and sand as a result of aeolian erosion processes. Alluvial fans created by run-off water from the adjacent mountains are another common component of the study area. Al-Saud (2015) noted that the bed load of these valleys features an enormous amount of sediment consisting of different-sized particles. An additional factor is that unstable and non-combined rocks and sediments are easily eroded during flood events, causing an increase in the bed load transported by the flood water, which in turn, as in the 2009 and 2011 floods, caused severe damage to Jeddah's infrastructure.

3.10.4 2009 Jeddah Flood

The City of Jeddah has experienced two recent major thunderstorm-based flash flood events. The first one was on November 25, 2009, with a rainfall amount of 90 mm, and the second was on January 26, 2011, with 111 mm. The flooding caused 116 deaths in 2009, and although the amount of rainfall was greater, only 10 in 2011 (; Murphy, 2010; Wagner, 2011; Swiss Reinsurance, 2012; Abosuliman, 2014). In the wake of the 2011 floods, the region witnessed similar events in 2015 when floods hit the western and northern parts of the kingdom, and the civil defense authority announced the deaths of 12 people. The local valleys of the city usually serve as flood-draining channels, especially in the foothills of the Hijaz (Al Saud, 2010).

According to the statement made by the Deputy Mayor in the wake of the 2009 flood, “a third of the city had a drainage system which could handle just 25 mm of rain, and the Municipality planned that Jeddah would be flood-free by 2014” (Momani & Fadil, 2010; Abosuliman, 2014). As a result, the poor preparedness and inadequacy of the city infrastructure were revealed. The northern parts of the city (i.e., the Al-Azahra, Al-Shati, and Al-Arawdah districts) were relatively prepared and sustained the least damage. In contrast, the central area of Al-Azziyah was poorly equipped and hence severely impacted (Wagner, 2011). Table 3.2 presents the timeline of the 2009 disaster (Momani & Fadil, 2010). Figure 3.9 indicates the watershed areas and the extent of the flooding during the 2009 event.

Table 3.2 Events Relating to the 2009 Jeddah Floods (Momani & Fadil, 2011)

Date (2009-2010)	Actions
Nov. 25	Rain swamped the City of Jeddah from 8 am until noon, with initial reports of 10 deaths and more than 100 rescued.
Nov. 26	The Saudi Civil Defense Authority reported that the death toll had reached 48, with 900 rescued from flooded properties using inflatable boats.
Nov. 27	The Director of Health Affairs of the City of Jeddah warned people to stay away from flood water because it was polluted by sewage overflows and reported that rescue operations were continuing.
Nov. 28	The death toll reached 122. As a result, a local lawyer declared that he would sue the Municipality of the City of Jeddah on behalf of the flood-impacted families of casualties that resulted from the failure of the sewage system.
Nov. 30	At transportation nodes, floods stranded Hajj pilgrims trying to return home. People were still being reported missing. Accordingly, King Abdullah announced the formation of a commission led by the governor of the province of Makkah to investigate the disaster. He authorized a reimbursement payment of one million SAR (\$US 267,000) to the family of each casualty. He also directed that accommodation be provided for those unable to return home.

Dec. 1	A special commission was established to provide emergency assistance for flood-affected people. An investigative task force was sent to Lake Musk, which is the sewage-treatment station in the Jeddah foothills to ensure its security and functionality during the rainfall.
Dec. 2	The search for missing people continued on the ninth day. The names of the 116 dead were announced.
Dec. 3	The mandated High-Level Disaster Committee held its first meeting and nominated subcommittees to pay the families of the casualties and to monitor the emergency response.
Dec. 5	The disaster committee called for citizens and residents to provide information about the floods. The Municipality cancelled leave for engineers and experts so that they could help with the investigations.
Dec. 9	Civil Defense announced 133 deaths, 39 missing, and 7,167 people in temporary accommodation provided by the authorities. An additional 221 families were sheltered and another 784 individuals were affected.
Dec. 10	Death toll reached 138.
Dec. 23	Businesses and schools in Yanbu were closed as a result of an electricity blackout due to further heavy rainfall.
Dec. 25	King Abdullah called for an investigation into the Jeddah disaster, with those responsible for the sewer failures to be held accountable. He insisted that there would be no compromise for anyone remiss in this respect.
Dec., 30	25 employees of the Municipality of the City of Jeddah were taken into custody.
Feb. 20	The Ministry of Transport began to investigate actions by contractors who restricted the operation of the disaster-management plan and to set up safeguards for future occurrences.

The flooding had a widespread, devastating impact, including numerous damaged residences and public institutions across the city. For example, some facilities at King Abdulaziz Hospital and King Abdulaziz University, as well as the King Abdullah Bridge in the southern part of Jeddah were severely affected. A large number of medical records, specimens, and equipment were either badly damaged or destroyed. The high waves and floodwaters shown in Figures 3.12,

3.13, and 3.14 blocked streets and highways around the city, washing away many cars in their path.



Figure 3.12: Flood Wave in the City of Jeddah, 2009 (Civil Defense, 2010)



Figure 3.13: Photo of the 2009 Flooding in Jeddah (Civil Defense, 2010)



Figure 3.14: Most of Jeddah Flooded

From a broader perspective, telecommunications and the power supply and service were also completely disrupted, causing an all-inclusive blackout for the entire western area of the KSA, including the cities of Jeddah, Medina, and Makkah. As a result of the power blackout and the disconnection of communication networks, many residents found themselves trapped alone and unable even to make a phone call to ask for assistance from police, medical services, or civil defense forces. About 116 people died from the floods, either due to car accidents or drowning (Arab News, 2011). Approximately US\$900 million was needed to help affected communities and restore the functioning of the city (Momani & Fadil, 2011). The flooding indicated that Jeddah had no mandatory or inclusive disaster-management systems or frameworks in place (Momani & Fadil, 2011). In addition, the Civil Defense department was poorly prepared to carry out its responsibilities effectively during such events (Abosuliman, 2014).

Following the disaster, the Municipality of the City of Jeddah was widely criticized by media broadcasters, who condemned its poor planning and the ineffective responses of its emergency teams (Howard & Hussein, 2010; Murphy, 2010; Al Saggaf, 2012; Al Saud, 2012;

Spitzberg, Tsou, An, Gupta, & Gawron 2012; Wagner, 2012; Abosuliman, 2014). In his report submitted to the Arab Forum for Environment and Development, Assaf (2010) stated that the effects of and damage caused by the flooding would have been minor if the drainage infrastructure systems had been properly planned and built.

3.10.5 2011 Jeddah Floods

On January 26, 2011, according to the King Abdulaziz University Meteorology Department, the eastern part of Jeddah was again flooded as a result of a 111 mm heavy rainfall. Although infrastructure assets and residences sustained significant damage during this incident, quick action by the Civil Defense Department kept the death toll to only ten (Agence France-Press, 2011; United Press International, 2011). According to the Director General of the Civil Defense Department, General Saad bin Abdullah Al-Tuwaijri, his ground teams were able to rescue 1,451 people, the rescue helicopters saved 498 residents, and more than 1,500 families were provided with temporary shelter. Approximately 5,000 residents were without power. As reported by the Saudi Electricity Company (SEC), as of the afternoon of Thursday, January 27, power had been restored to 65,000 customers (CNN, 2011). Al-Dhibyani (2011) reported that by March, the governor of the Province of Makkah had approved the establishment of a Centre of Crisis Management to coordinate the collaborative responses of different service and security authorities (Abosuliman, 2014).

3.11 Summary

As explained earlier, during the 2009 flooding in Jeddah, there was a lack of appropriate preparedness and effective responses on the part of the relevant authorities, as well as poor coordination and networking among various emergency and aid organizations. This tragic situation led to an excessive number of deaths and an enormous amount of damage (Abosuliman, 2014). In addition, although under the rule of law in the KSA, those in charge of disaster

management are held liable for any failures or misconduct that occur under their jurisdiction, the authorities failed to communicate openly with the public, thus exacerbating the situation (Al-Saggaf, 2012). However, with respect to the 2011 Jeddah floods, the responses were much improved, partly as a result of the criticism on social media after the 2009 disaster, which expressly pointed out the gaps and failures and helped change the attitude of the government authorities. While a number of infrastructure improvement projects were still under construction during the 2011 flooding, there was much better coordination and training among crews and the various emergency teams, such as health and security organizations. Despite the heavier rainfall, the enhanced coordination resulted in fewer deaths and much less destruction than occurred during the 2009 flood (Alriyadh, 2012).

Chapter 4: Research Methods

4.1 Background

The primary objectives of the research were to acquire an understanding of and to evaluate the importance and role of the household capacity, organizational capacity, and social capital, assessment dimensions. The investigation also covered the impact of these dimensions and that of networking mechanisms with respect to building resilient post-disaster recovery. To achieve these objectives, a field case-study approach was adopted as a means of exploring and analyzing the role and importance of these three dimensions and their detailed aspects during and in the aftermath of the 2009 and 2011 Jeddah flash floods.

According to Bryman (2001) and Joakim (2013), when the focus is on understanding social communities through their actors and stakeholders, qualitative research techniques are helpful tools for examining and analyzing these communities. Likewise, Denzin and Lincoln (2005) claimed that qualitative approaches enable researchers to determine and understand how people perceive events, identify their impact, and feel about them (p.3). For these reasons, the primary research tool chosen for data collection for this study was a qualitative-based approach in combination with quantitative assessment techniques.

To achieve the research goals, facilitate the necessary networking during the fieldwork, and save time and effort, a short-term collaborative relationship was developed with the Department of Environmental Science at King Abdul-Aziz University (KAU). This relationship provided access to several sites impacted by the flooding, which were severely damaged and received outside assistance during the post-disaster period. Through this collaboration, the researcher was able to contact stakeholders who were actively involved in the post-disaster recovery process. In general, the fieldwork carried out provided abundant opportunities for exploring and comparing the recovery processes of differently impacted communities, including

the identification of weaknesses, strengths, learned lessons, and more. Through the examination of these events and the opportunity to work and interact with people who experienced them, the Jeddah flash floods also presented an all-inclusive situational example and important case study for surveying, exploring, analyzing, and establishing principles for building a resilient disaster-recovery framework. The work was conducted within a context of learning and change aimed at increasing the sustainability of effective future recovery and risk-reduction initiatives and strategies.

4.2 Development of the Conceptual Framework for Assessing Post-Disaster Resilience

In this section, a preliminary conceptualization of a resilient post-disaster recovery framework is developed. For the purposes of this research and in line with its scope and objectives, community disaster resilience refers to the ability of the community to withstand, respond to, adapt to, and recover rapidly from a disaster event (Joakim, 2013). Resilient post-disaster recovery can thus be defined as the capacity and readiness of individuals, communities, and institutions to collaborate in order to resist, respond to, recover from, and adapt to a disaster; to restore conditions following an event; and to maintain their capacity and structure in order to deal with future disasters. Likewise, the key principles of resilience – resistance, recovery, and creativity – were considered to relate to the ability of households, communities, and organizations to absorb the impact of disasters; to recover quickly afterward; and to learn, transform, reduce risk, and adapt to future stresses and shocks (Adger, 2000).

Despite the considerable advanced body of literature related to the concept of resilience and its principles and areas of application, the term and the idea of resilient post-disaster recovery are rarely understood or applied in the context of disaster management in the KSA. This deficiency could be rooted in its absence from relevant Arabic literature, the lack of translated research studies into Arabic, the lack of recognition of the concept in formal disaster-

management documents, and other factors. The word “Morunah” in Arabic has the closest meaning to the word “Resilience”. The framework developed for this thesis is used to evaluate post-disaster recovery in Jeddah City, KSA. The first version of the Resilient Post-Disaster Disaster Recovery Assessment Framework (RPDR-AF) whose structure is illustrated in Figure 4.1 depicts the foundations of the conceptual modeling of the framework used to guide the empirical research phase.

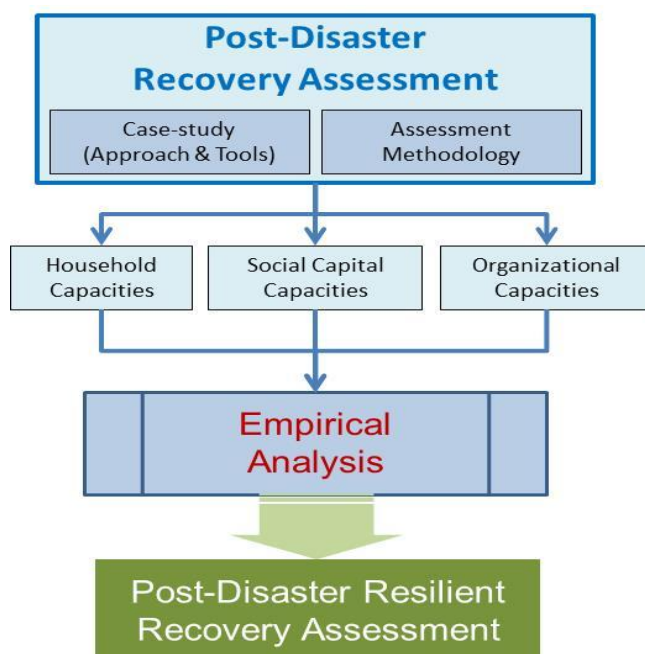


Figure 4.1: Resilient Post-Disaster Recovery Assessment Framework

As illustrated in Figure 4.1, the focus of this research is on three dimensions: household capacity, organizational capacity, and social capital. The final framework, refined and modified based on the empirical analysis of the case study and the research results, is presented in subsequent sections of this chapter. An approach that incorporates the notions of resilience and recovery and that elaborates on the dimensions of households, organizational capacities, and social capital was adopted in building the framework. This method was applied for the assessment of flash flood resilience in the local Jeddah community because that city offers opportunities for the critical

analysis of resilient post-disaster recovery procedures and operations. The analysis afforded an opportunity to discover the advantages of these dimensions in the context of disaster recovery and to obtain insights with respect to the nature of the relationships among these dimensions in the context of the City of Jeddah. The framework developed provides a method for holistically evaluating whether recovery efforts have effectively increased the capacity of the city to withstand future events, and also addresses some of the causes of slow recovery and low resilience observed during previous events.

The assessment was based on the collected and analyzed data, which were obtained through: (1) interviews with local residents and other key stakeholders in the zones affected by the Jeddah floods; (2) municipal documents, inter-ministerial responses, and contingency plans that were reviewed as secondary sources of information, along with other sources such as media and NGO reports; and (3) direct field observations that provided additional data to build on real experiences and lessons learned. Conclusions were then drawn and recommendations developed in order to build an effective, systematic, resilient post-disaster recovery assessment framework.

4.3 Research Methodology

The research methodology employs a case-study approach, using four sites within the City of Jeddah. Joakim (2013) stated that case-study methodologies offer an exceptional tool for comprehending how individuals' knowledge enables recognition to be given to human beings, organizations, and social and political experiences. In this way, case studies provide a perfect opportunity to uncover the interactions among different small- and large-scale social, economic, political, and environmental operations that are associated with disasters and that affect post-disaster recovery (Yin, 2003, p.2). A case-study approach also gives a diverse range of actors in the post-disaster recovery process the chance to share their unique perceptions, experiences, values, professional expertise, and further thoughts. Based on the 2015 Sendai Declaration that

promotes the development of sustainable disaster recovery and resilient principles (UNISDR, 2015), this study assessed a variety of perspectives with respect to households, social capital, and organizational capacity. In addition to the experiences and opinions of local residents, CBOs, and NGOs, the assessment process also incorporated input from decision-makers and implementers, those who were involved in ensuring sustainable development, and urban planners. The research methodology included the following tasks:

1. Literature review: The literature review highlighted current knowledge regarding resilient post-disaster recovery and identified key gaps that this research was designed to address. This task included the following elements to be completed by the researcher:
 - a. Develop an awareness of all aspects of the contextual characteristics and features of the events as well as the varied post-disaster recovery experience of the impacted communities.
 - b. Build a background for understanding and assessing the impact and importance of social capital and networking as well as households and organizational structure mechanisms with respect to flood resilience during post-disaster periods by using specific case studies from the 2009 and 2011 flash floods.
 - c. Select the best tools and techniques for collecting and analyzing data, as well as identifying best practices for building a resilient post-disaster recovery assessment framework.
2. Field investigation of the four sites selected, using a case-study approach: This task included the following steps:
 - a. Select the assessment dimensions, which include household capacities, organizational capacities, and social capital.
 - b. Define, explore, and model the detailed concepts and factors associated with these three dimensions in order to provide a basis for building the resilient post-disaster recovery assessment framework.

3. Definition of data-collection tools: These tools included interviews, formal and non-formal documents and sources, and field observations, all of which were used for investigating how the roles of the three dimension contributed during and after the events.
 4. Data analysis: Drawing from the identified framework themes, empirical analysis began with the development of a Likert scale assessment to undertake a review of the interview data using frequency counts (e.g. 15 of 40 interviewees) and identify the pertinent sections of the interview recordings that needed translation from Arabic to English. Following this step, the recordings were reviewed again to identify further important themes and passages for translation and thematic organization. Additional insights were drawn from the secondary data and field observations to verify the interview data and provide additional depth to the results.
5. Results and discussion: With the case-study outcomes and empirical analysis as a basis, the knowledge gained, experience shared, and lessons learned were examined so that conclusions could be drawn to assist with the review and revision of the conceptual framework. The role and involvement of religion and religious leaders and institutions was explored, and the way they affected resilience and recovery during and after the Jeddah flash flood disasters was examined.

4.4 Interview Approach

Interviewing is the one of the most common methods used in social research (Warren & Karner, 2010; Joakim, 2013). Interviews are an appropriate method for obtaining information about events, opinions, and experiences and how these may vary among different groups (Dunn, 2010; Joakim, 2013). In-depth interviews offer an opportunity to go beyond the data gathered and obtain a deeper understanding of the complex behaviors, motivations, and decisions of the individuals and communities under study (Dunn, 2010; Joakim, 2013). Particularly in the context of post-disaster recovery, the interview method allows the impacted population to share

their experiences of, and their thoughts and opinions about, the recovery process and the programs implemented by local, regional, national, or even foreign organizations. For these reasons, in this research, interviews, specifically semi-structured household interviews, were used as a tool for examining the in-depth experiences of households and communities who were impacted by the 2009 and 2011 flash floods and subsequent recovery efforts. Due to the nature of the cultural structure of Saudi society and the fact that direct personal contacts are the primary form of communication when local residents interact with one another, individual semi-structured interviews were considered a suitable option for collecting the required data. Interviews can take a range of forms, including structured, semi-structured, and unstructured, as follows:

1. Structured interviews are centered on focused questions that are directed at all participants in the same order.
2. Semi-structured interviews are interviews in which the questions are used as a guide, while follow-up questions are content-focussed and deal with issues judged to be relevant to the research questions.
3. Unstructured interviews are ones that are interviewee-focused and that highlight personal perceptions and histories (Hay, 2010, pp. 109-111; Joakim, 2013).

During the semi-structured interviews conducted for this research, a series of open-ended and targeted questions were asked, with the goal of looking for additional detail and specific contextual facts, information, and particulars. During interviews based on open-ended questions, respondents are not confined to selecting an answer from a limited number of predetermined choices; more rational and contextual interpretations and validation are required (Altheide & Johnson, 1998, p.286). The answers obtained from the respondents provided rich, in-depth information which proved a valuable source for understanding the uniqueness of situations and

event conditions; the common circumstances in which the participants lived, suffered, and recovered; and the values and meanings that they attributed to their experiences and that shaped how they perceived events.

In line with the objectives of this research, the interviews were classified into two sets of semi-structured interviews. The first set dealt with flood-affected residents, while the second set was targeted at key informants.

4.6 Household Interviews

Given the background of Saudi Arabian society, customs, and traditions, the most appropriate interviews were deemed to be with members of households located at the four selected sites, identified in a subsequent section. Participants were selected based on a purposive sampling technique (approximately ten interviews were conducted per site) in order to identify people who had been directly impacted by the flash flood events. They were chosen to be representative of the various key actors in the community and a variety of levels of wealth, political power, and effort exerted during the events. Also included were the groups most impacted, whose household incomes were low and dwelling locations are considered high-risk.

The ten interviewees for each site were chosen based on the guidance and connections of the imams in the mosques and key informants from that locale. Each site included three or four mosques, and the imams were able to identify local households and individuals who had been impacted directly by the flooding. The key informants facilitated the classification of the interviewees selected. Additional participants not on the original lists were solicited by the researcher, who walked around the four sites in order to identify households that fell into the classified categories (time lived in the area, age, damage from the flood, etc.).

The household interviews took place from June 2015 until mid-September 2015, approximately four years following the second flash flood disaster. Although the interviews were

conducted over a three-month period, the researcher was also involved in community meetings and visits with leaders and households at each site for a seven-month period beginning in early July 2014. Each interview was two to three hours long, depending on the amount of collaboration and the interpretation of the responses from the interviewee. The purpose of the semi-structured household interviews was to obtain demographic information (household size, education level, age, period living in the area, etc.), information about their recovery experience and daily living conditions, and the ongoing characteristics of their social connections and resilience capacity.

Drawing from themes identified in the literature, Figure 4.2 outlines the themes that guided the interview questions. The first section of the interview was a set of questions that followed a standard question format focused on exploring the aspects of the three assessment dimensions, as well as insights into the recovery process, social connections, and resilience issues of the respondents. The second set were tailored questions, which were designed to provide a flexible structure that allowed the interviewer to investigate and extract further detail or to engage in further discussion on relevant topics (Dunn, 2010; Warren & Karner, 2010; Joakim, 2013). The interviews were conducted in Arabic; a copy of the English interview instrument is available as Appendix 1.

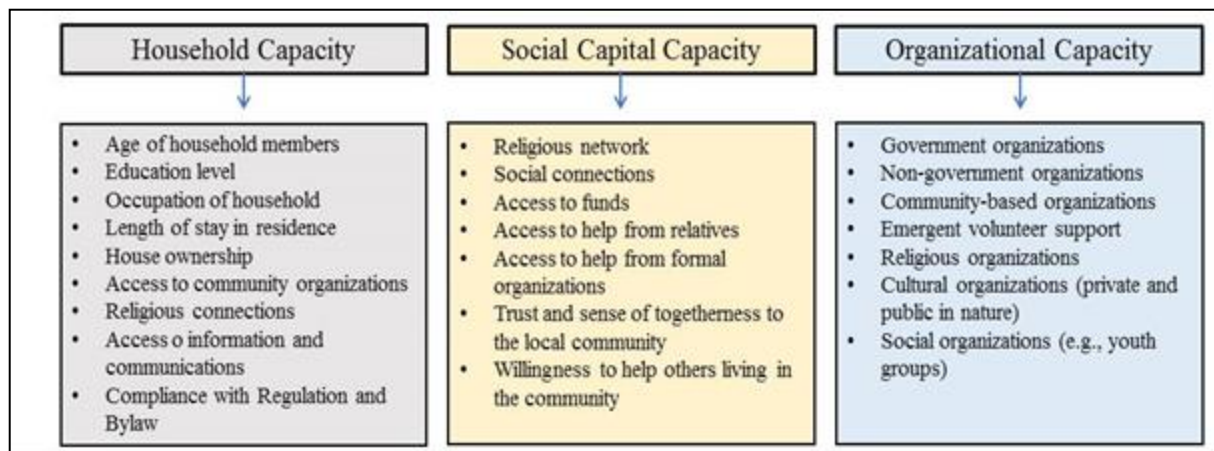


Figure 4.2: Detailed Aspects of the Three Assessment Dimensions

4.6 Key Informant Interviews

Key informants can offer a great deal of help with research, because they can provide access to other members of the community and/or share important information with respect to the issue under investigation (Wahab, 2012). The ten key informants chosen for this research belonged to the following groups: government officials, leaders of community-based associations, managers and members of CBOs, religious leaders, and other stakeholders. With consideration of the specific research objectives and methodology tasks, the key informants were chosen to provide particular insights and expertise about post-disaster recovery in the City of Jeddah after the two floods. Unstructured interviews were conducted using a topic-based interview guide. The information supplied essential background knowledge for assessing the overall recovery effort and evaluating the resilient post-disaster recovery assessment framework.

The content of the interviews varied from a few questions to extended interviews. The interviews lasted from 60 minutes to 3 hours. The author conducted the interviews in Arabic, either in person or, in the case of interviewees who had moved in order to work outside of Jeddah, over the telephone. A copy of the English interview instrument is available as Appendix 2.

4.7 Field Observations and Secondary Data Collection

Many scholars have emphasized the importance of direct field observations during a case study. Although household interviews and key informant interviews represented the major source of data collection, this research also included direct field observations and the collection of secondary data as a means of acquiring additional information related to the overall post-disaster recovery effort (Meredith, 1998; Pettigrew, 1990; Sampson & Raudenbush, 1999). Direct observation was used as an ongoing research method for enriching the overall understanding of the people and cultural context of the City of Jeddah, as well as the post-flooding recovery experiences of the stakeholders involved (Angrosino, 2005, p.741; Joakim, 2013). The field observations also comprised informal discussions for a more in-depth grasp of the daily living conditions across the city on the one hand, and a deeper appreciation of the issues, elements, and processes in the recovery that occurred after the flooding on the other. The informal discussions were held with community leaders (Omdah), local volunteer research assistants and academics, and a variety of other individuals from Jeddah. These observations and informal discussions were documented through field notes, journal entries, and photos. The gathered information is presented and discussed in the Results chapter.

Selected secondary data sources for providing further information about the specifics of the recovery effort constituted the third data-collection tool employed for this study. These secondary sources included information from NGOs, humanitarian aid organizations, and academic and government institutions. During each interview with a key informant, the respondent was asked whether they had access to any documents, case reports, or evaluations related to the recovery operations and activities, because the information contained in these documents could be a valuable addition to the research. Many of the humanitarian organizations provided copies of their annual reports and internal assessments. Likewise, academic institutions

such as KAU provided access to their flood-related resources and facilities, which granted the researcher the opportunity to access a number of reference materials and documents to support this study. These documents were useful for placing the recovery experiences of each of the sites within the context of the larger-scale recovery efforts, and they also provided qualitative and quantitative information about reconstruction, restoration, and other recovery programs.

4.8 Research Ethics

To meet the requirements of the Research Ethics Board at Wilfrid Laurier University (WLU), ethical guidelines were integrated into the design of the questions for the interviews and the implementation of this study. The primary ethical concern was to avoid exacerbating any painful psychological feelings by asking the interviewees to recall sad and distressing memories. Extra attention was paid to dealing with the interviewees while they were reflecting on the traumatic events. The research methods adopted were submitted to the WLU Office of Research Services for review and authorization. The submission process involved the completion of a number of required forms, the submission of an outline of the research proposal that incorporated the details of the study and research methods, as well as the identification of potential risk to the participants. The process requirements also included provisions for informed consent, a methodology format that maintained the anonymity of the participants, and steps for ensuring the confidentiality of the data and the dissemination of research results. Recruitment scripts and interview guidelines were reviewed by the WLU Research Ethics Board. To improve the quality and the procedures involved in recruiting potential participants and obtaining consent, a few minor recommendations were made. The approved informed consent documents were then translated into Arabic by the researcher. To guarantee confidentiality, the names of all interviewees were replaced with pseudonyms, with the exception of Mr. Tayseer Alhibshy, who agreed to have his full name and title published.

4.9 Case Study Sites

When considering the vulnerability of local communities, it is very important to consider the different characteristics of the population affected by the natural disasters: gender, age, education, income, ethnicity, marital status, and family size (Ivanov & Cvetkovi, 2014). The 2009-2011 flash floods attracted unprecedented local and international coverage and assistance, which highlighted the crucial need for an effective long-term disaster recovery plan. The 2011 event provided a real-life opportunity for a large number of recovery practitioners from government and humanitarian aid organizations, to implement the lessons they had learned from the 2009 flash floods. The rationale for adopting a case study approach and selecting the sites was:

1. The flash floods had a tremendous impact on the communities at those sites, which provided an important opportunity to explore the intersections among the three concepts employed as the basis for defining a resilient post-disaster recovery framework.
2. These sites offered the chance to explore long-term recovery operations and the role of participating stakeholders in the context of a shifting approach to the mitigation of disasters in the Kingdom of Saudi Arabia (KSA).
3. The recovery efforts at those sites gave governments and humanitarian aid organizations an occasion to implement and enhance what is called a recovery cluster system, which was first used by the relief and recovery operations in Jeddah in 2011.
4. The sites are good examples for testing the effect of increased recognition by the Saudi government officials of the need to implement a formal disaster-management framework, as well as to set in place risk-reduction initiatives, as opposed to simply restoring communities to their previous condition.
5. The sites satisfy the parameters of what scholars have noted with respect to the long-term

nature of post-disaster recovery and the period required for rebuilding, which usually takes at least 4 to 5 years from the date of the disaster event to a subsequent ideal time for research evaluations. For these cases, the field research was carried out between 2015 and 2016, which aligns with the recommended 4 to 5 years post-disaster needed for the unfolding of the reconstruction (Joakim, 2013). In fact, by the time of the study, the majority of reconstruction projects had been completed and many organizations had left the area or had begun phasing their work into longer-term development initiatives (Edgington, 2010).

At the beginning of the site-selection process, a total of nine sites were visited for initial assessments. Pilot meetings and investigative discussions were held with local residents, community leaders, and key informants. Since the impacted sites were relatively new to the researcher, Mr. Tayseer Alhibshy, who was the head of the Civil Protection Volunteer Institution for Disaster Management, was approached and asked to be a mentor for the site visits. Mr. Alhibshy was an experienced professional with exceptional knowledge of the affected areas. He was very helpful and voluntarily agreed to assist with the conducting of the field visits. His experience was extremely valuable because of his significant participation in the rescue operations and in the delivery of humanitarian aid to the affected areas during the 2009 and 2011 flash floods.

Based on the high levels of damage in the eastern part of Jeddah, the decision was made to focus on this area and to select the most representative four sites for data collection. The four sites selected for the case studies provided an opportunity for data gathering with respect to the three assessment dimensions: household capacity, social capital, and organizational capacity during the post-disaster recovery period. The four sites selected included communities that satisfied the following criteria: (a) they were located within the City of Jeddah, (b) they experienced the flash flood disaster, and (c) they comprised varied socio-economic status and

ethnic backgrounds. After several visits to the affected areas by the researcher and Mr. Alhibshy, the four case-study sites were identified; they are listed along with their characteristics in Table 4.1.

Table 4.1: Characteristics of the Case Study Sites

Site	Site area	Number of households	Total population
Nakheel	0.67 km ²	530	1923
Rughamah	0.71 km ²	620	3430
Goyzah	0.96 km ²	970	10,000
Mraykh	0.23 km ²	1215	854

The geographical locations of all sites in the City of Jeddah are indicated in Figure 4.3. They can be described briefly as follows:

1. Site #1 (Rughamah): middle-class residents and ethnic diversity
2. Site #2 (Mraykh): lower-class community in terms of income and education; a good example of a hub hazard and an overcrowded district that lacks organization, has poor infrastructure, and is inhabited by low-income and illegal immigrant residents
3. Site #3 (Nakeel): well-organized upper-class neighbourhood of modern dwellings, whose residents have high educational levels
4. Site #4 (Goyzah): randomly organized district inhabited by people with low income and educational levels

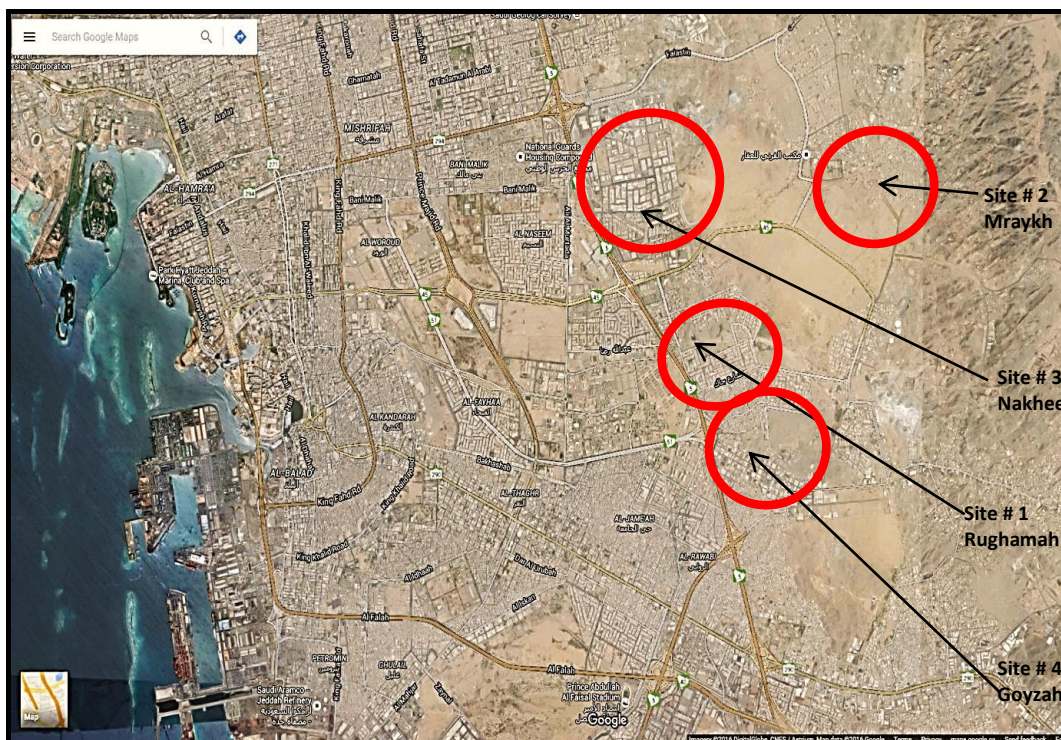


Figure 4.3: Geographical Location of the Four Selected Sites (Google Earth, 2016)

The following sections provide an overview of each of the selected sites, with the goal of providing sufficient background information about each site for the reader to acquire a comprehensive understanding of: (a) the similarities and differences among the sites; (b) the recovery experiences at each site after the 2009 and 2011 flash floods; and (c) information about the sites that the leaders and community members felt was important to share regarding the characteristics, history, and conditions at each site.

4.9.1 Rughamah Site

The Rughamah district (Site 1) is 7 km from the Goz Valley, which threatens the district when it is filled with rainwater. With an area of 0.71 km², a population of approximately 3,430 people, and about 720 houses, Rughamah was an ethnically diverse district whose residents represented many different nationalities. The majority of the populations were middle class in terms of income and education.

Because it is located adjacent to the Goz Valley, the Rughamah district was severely impacted by the flash floods. Over 70 % of the buildings in this community were destroyed or damaged. Regardless of the limited coordination of the distribution of aid, just several hours after the floods hit, the affected population received assistance in the form of generous food donations and health services from the government and major relief organizations. Figure 4.4 shows examples of the severe damage caused by the 2011 floods.



Figure 4.4: Rughamah District: Impact of the Flooding (Okaz, 2011)

4.9.2 Mraykh Site

The second site selected was one of the poorest in Jeddah. The main reason for choosing Mraykh was a preliminary impression that the site very obviously exhibits a lack of resilience and adaptive capacity. Located approximately 4 km east of the Al-Haramain express road, which connects the cities of Jeddah and Makkah, Mraykh covers the smallest site area selected for this research: about 0.23 km². The population at the time of the research was estimated to be approximately 1,215, living in about 750 houses. This site lacked proper public infrastructure, such as water and sanitation facilities, and was very vulnerable because of its location downstream of many surrounding mountain and valley drains, which put it at serious risk of flash flooding. Figure 4.5 presents photographs of the poor conditions around this site.



Figure 4.5: Poor Conditions in Mraykh (Source: Okaz)

The majority of the inhabitants of Mraykh were illegal immigrants, engaged mainly in seasonal or part-time labor. Their income and education levels were very low, with many lacking even elementary school education or skills. During the first two to three weeks of the initial emergency period, i.e., during the initial relief and early recovery operations, limited relief was provided to the Mraykh site. The greatest concern for many individuals, community leaders, and community-based groups was therefore ensuring that enough food and money could be secured to meet their daily needs. In acts of solidarity, other communities, along with friends and family members from other areas, gave small donations and personal assistance. A few days later, assistance was provided in terms of more substantial food supplies, donations, and health services from the government and other large organizations. However, there were accessibility difficulties related to reaching the site, as well as limited logistical coordination, which disrupted the distribution of this aid. As a result, most of the houses remained unrecovered following the flash flood, many without even floors or finished walls. Figure 4.6 shows residents of Mraykh being interviewed about their experiences.



Figure 4.6: Interviewing Households in Mraykh (Author, 2015)

4.9.3 Nakheel Site

The third site, the Nakheel district, was selected because it is representative of a modern neighbourhood approved in accordance with the urban planning guidelines of the Municipality of the City of Jeddah. The site was inhabited by approximately 1,930 people, whose average education levels were fairly high. The majority belonged to the upper middle income class. The area is at risk of flooding because it is located on the upper side of the Goz Valley. During the 2009 flood, the dam at the eastern boundary of the district overflowed and was breached by the flooding, immersing all nearby neighbourhoods. Hundreds of homes and vehicles were either destroyed or severely damaged, as depicted in Figure 4.7. More than 90 % of the homes at this site were totally inundated, and entire families were forced to climb to their roofs to escape the rising floodwaters.



Figure 4.7: Breached Dam near Nakheel (Al-Madinah, 2011)

Civil Defense teams used rubber boats and heavy equipment to evacuate residents from their homes, as depicted in Figure 4.8. The General Directorate of Civil Defense authorized the use of furnished apartments in another part of Jeddah for the accommodation of families whose homes had collapsed or were damaged by the flooding.



Figure 4.8: Using Rubber Boats to Evacuate Residents at the Nakheel Site (Al-Madinah, 2011)

4.9.4 Goyzah Site

The fourth and largest site selected for this research is Goyzah, located south of the Rughamah district, with an area of 0.96 km², a population of approximately 10,000 people, and a total of 970 dwellings. The majority of the populations were lower middle class with respect to income and education. A core residential area surrounded by the Goz Valley, the Goyzah site is characterized as a semi-randomly patterned neighbourhood, in which the majority of houses are located in close proximity to one another. Following the disaster, officials acknowledged that Goyzah was situated on a floodway leading to the valley, which should not be the case. A number of documents were released to state that over a hundred people had died and thousands left homeless. As depicted in Figure 4.9, the scenes of massive property destruction gave the impression of the impact of a hurricane or a tsunami rather than just a heavy rainstorm.



Figure 4.9: Massive property destruction in the Goyzah District (Civil Defense, 2011)

As buildings in this area began to collapse, the Civil Defense authorities were unable to reach or operate in this district, and they declared the district a closed site so that no vehicles were permitted to enter or exit. These conditions prompted the Civil Defense authorities to call on

people to move to stronger buildings that were still standing and not to leave the area for safety reasons (Asharq al-Awsat, 2011).

4.10 Initial Quantitative Analysis

For an effective evaluation of the various data sources, a series of separate data analysis techniques were implemented. The analysis helped with the comprehension of the large amount of data collected, the classification of comments according to common themes, and the mining of the data sets in order to generate theories about the disaster recovery process. The following sections outline the processes involved in organizing and analyzing each type of dataset. The researcher reviewed all of the data, information, documents, and written and audio records, with the goal of finding significant ideas, hypotheses, and compelling facts. The review also helped the researcher become more familiar with the properties and characteristics of the research materials and all of the dimensions involved in the research objectives. Due to the complications of translating the interview data from Arabic into English, the initial round of analysis adopted a quantitative technique using Likert scale analysis to parse the data and locate the key themes. This provided a clear and simple method to undertake an initial analysis. A Likert scale is defined as “a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. Likert scales are a non-comparative scaling technique and are unidimensional (only measure a single trait) in nature” (Pohl 2008, pp.41- 63). For this research, drawing from the framework's key themes, Likert scale measures were used for quantifying household participant answers in a more systematic manner in order to facilitate the analysis and discussion of the results.

The five-point levels of the Likert scale technique were applied in three formats. The first format used was a set of questions, for which the interviewee's answers were ranked according to the following scale: (1) strongly disagree, (2) disagree, (3) neither agree nor

disagree, (4) agree, and (5) strongly agree (see Fig. 4.10). The second format involved a set of questions that asked the interviewees to choose one of the five prepared model answers, which the researcher then ranked on a scale from 1 to 5. Depending on the nature and objective of each question, an answer ranking of 1 could mean the best, highest, etc., or the worst, lowest, etc. Likewise, a ranking of 5 for a model answer could mean the best, highest, etc., or the worst, lowest, etc. The third format was used by the researcher to evaluate additional sets of data, information, observation scripts, and his personal reflections in order to rate their usefulness. A ranking of 5 was defined as “containing information very useful for analysis”, while a ranking of 1 was defined as containing information not at all useful for analysis.

4.11 Analysis of Household Interviews

Once the Likert scale data was incorporated into a Microsoft Excel spreadsheet, descriptive statistics were generated. A visual representation of the data was provided through the use of graphs. A sample MS Excel spreadsheet of household interview responses is provided in Figure 4.10, and of key informant interview responses in Figure 4.11.

Q9	Q10	Q11
most people in this neighborhood are willing to help	who helped your recovery	how long did it tak you to build your house
5	1	1
4	3	2
5	1	2
5	1	2
4	1	1
5	1	2
5	1	1
5	1	1
5	1	1
4	4	1
5	3	3
4	3	2
5	3	1
5	2	1
4	4	1
5	2	4
4	3	1
5	3	2
4	3	2
5	3	1
5	1	2
5	1	2
5	1	2
1	1	3
5	1	2
5	1	3
5	1	3
5	1	3
5	1	3
5	1	2
5	1	1
5	1	1
4	1	2
5	1	2
5	1	2
5	1	1
5	1	1
5	1	1
5	1	1
5	4	1
1=strongly disagree	1=government	1= less than a month
2=Disagree	2=relatives	2= a month to 3
3=Undecided	3=non-government	3 = 3 to 6 months
4=Agree	4=others	4 = 6 months to a year
5=strongly agree		5=more than a year

Figure 4.10: Sample MS Excel Spreadsheet Record of Household Interview Responses

According to the answers to Question 9, people in all four sites showed their strong social bonding and connections, as participants indicated that about 65% of the community members were very helpful to each other, while from the answers to Question 10, it is noted that Mraykh had the lowest level of government assistance in comparison to the other three sites.

Although the government announced a generous compensation program to help recovery in all affected sites across the city of Jeddah, the residents of Mraykh community were not able to

apply as many were illegal immigrants, and thus they were not able to provide the formal documentation required to support their applications. It was noted that the only sources to help the residents of the Mraykh community were NGOs and CBOs. Another decisive factor for the fast recovery of Mraykh was that most of its residents were construction labor, in contrast to the other sites. Those residents had the required skills and tools to start rebuilding their damaged houses, which in fact were very simple structure-wise. In contrast, recovery took longer in the other sites, as since most of the residents were employees, professionals, etc., they had to depend on hiring external contractors as well as receiving the government compensation to start their rebuilding activities. However, some residents in Rughamah, Nakheel, and Goyzah used their personal savings, links, and bridging contacts to secure some initial and basic funds to start rebuilding while waiting for government compensation.

4.12 Key Informant Interview Analysis

The idea was to access as much valuable information as possible with respect to specific issues and aspects of the assessment dimensions from key informants who had detailed insights and reflections about a number of specific questions and problems related to resilient recovery. The results of these interviews were also recorded in MS Excel spreadsheets, an example of which is provided in Figure 4.11.

Q2	Q3		Q4
Were the people you helped well connected	Recovery in 2009	Recovery in 2011	Within the community aid was fairly distributed
4	3	5	3
4	2	5	4
3	4	4	4
4	4	5	5
5	3	4	4
4	2	4	4
3	3	4	4
5	4	4	4
5	4	4	5
5	3	4	3
1=Strongly disagree	1=Not at all satisfied	1=Not at all satisfied	1=Strongly disagree
2=Disagree	2=Not so satisfied	2=Not so satisfied	2=Disagree
3=Neutral	3=Neutral	3=Neutral	3=Neutral
4=Agree	4=Moderately satisfied	4=Moderately satisfied	4=Agree
5=Strongly agree	5=Totally satisfied	5=Totally satisfied	5=Strongly agree

Figure 4.11: Sample Spreadsheet Record of Key Informant Interview Responses

For example, according to the answers provided (Q. 2), 80% of the key informants indicated that there were strong connections between all studied communities, and they were willing to help each other. This suggests that all sites were strongly bonded. People and volunteers were actively collaborative with even local residents in searching and exchanging information in providing the necessary rescue and recovery assistance to neighbors and other residents in coordination with the key informants as quick as possible within the time and capacity frames. In addition, from the answers provided for question 3, key informants indicated that overall recovery was better in 2011 than 2009. This can be contributed mainly to the increased coordination and collaboration between NGOs and government authorities, and also due to increased levels of risk awareness and preparedness initiatives in the community. With respect to how fairly the aid from different sources was distributed, 80% of the key informants agreed that it was fair enough taking into consideration the priority, linking, and bridging capacities of the community members, except for the Mraykh site, where residents lacked outside connections with other communities as many were illegal immigrants. However, most of the NGOs put the residents of Mraykh at the top of

the assistance list to ensure fair distribution of the aid.

4.13 Challenges, Limitations, and Mitigation

A variety of research challenges and limitations were encountered. The following list summarizes the challenges involved in conducting the research and the limitations associated with the data collected, as well as the mitigation strategies employed to circumvent those challenges and limitations.

- (a) Household and the key informant interviews: Many of the interviews and other secondary data sources were conducted in Arabic or derived from Arabic sources. Although the researcher is a KSA citizen and Arabic is his mother tongue, difficulties still arose with the translation of some specific concepts into English. For example, extra effort was needed first to understand the ideas expressed by the participants and then to translate them into English.
- (b) What could be called a sort of social distance was encountered in the form of a lack of bilateral trust with respect to some of the affected illegal immigrants who were interviewed, since they believed that the researcher might belong to a governmental agency and might report them for deportation. The researcher was therefore required to be alert to any misunderstanding of the questions asked. With the help of the key informant Mr. Alhibshy, the majority of the participants appreciated the significance of the research and actively participated and shared their ideas and perceptions. Most interviewees viewed the researcher as a potential advocate who would express the needs of their community and shed light on their experiences.
- (c) The concepts of resilience and the role of the household capacity, organizational capacity, and social capital are relatively new and have not often been discussed in Saudi communities, so another challenge was the struggle to put these concepts and related

ideas into understandable and plain language that could be comprehended by the interviewees, some of whom had poor educational backgrounds. To overcome this challenge, the author presented and explained the research proposal using colloquial language that could be easily understood, and also provided more detailed answers with respect to any questions or aspects that were unclear to the participants.

- (d) The location of the selected case study sites in the City of Jeddah created a challenge related to the unstructured diversity associated with the hierarchical order of the local society with respect to class, income, education, and ethnicity, which constituted additional assessment aspects that required consideration during the data collection process and the conducting of the field case-study procedures.
- (e) Due to the limitations of Saudi culture, it was not possible to interview female household members.

4.14 Summary

This chapter has outlined the case-study methodology adopted for the investigation of the four case study sites selected for the field study. It also outlines the conceptual resilient post-disaster recovery assessment framework that was initially developed based on the literature review. Data and information collected during the empirical phase were then used to test and revise the framework. The revisions to the final framework are explained further in Chapter Six.

Data collection included the case-study interviews, field observations, reflections of the researcher, observation of a variety of participants, and analysis of secondary sources. A total of 40 household interviews were completed across the 4 case study sites. The interviews with 10 key informants, such as experts, government officials, and NGO practitioners, provided larger-scale perspectives on issues related to recovery, resilience, and social capital. These methods were utilized for collecting data and gathering important relevant information and details about

experiences in the four selected sites, which were severely impacted by the 2009 and 2011 Jeddah flash floods. The assessment of each affected community was focused on three main dimensions: household capacity, organizational capacity, and social capital.

All the data and information collected from the different sources were organized, archived, and coded using MS Excel spreadsheets, which formed a database for further analysis and the reporting of simple statistics. A Likert scale technique was adopted as the clearest and simplest data-gathering technique for providing a comprehensive understanding of the recovery efforts from the multiple perspectives and viewpoints of the interviewees. A number of challenges and limitations associated with the conducting of the research were discussed and detailed. Examples of these challenges include time limitations as well as language and cultural barriers. Mitigation strategies were presented in order to show the accommodation of the participants and the active facilitation of the implementation of the research.

Chapter 5: Results

This chapter presents the results obtained from the assessment of the three research dimensions. The assessment was based on the case-study interviews with households and key informants and on the collection of data and information through field observations, the reflections of the researcher, and secondary sources. As explained, these results were summarized, organized, and coded into categorized files for producing further analysis beyond the quantitative analysis and, where possible, were subdivided with respect to the four selected case-study sites in order to provide a more distinct perception of the post-disaster recovery phase and assessment.

5.1 Household Capacity

Based on the definition suggested by Lim et al. (2016), household characteristics and capacity-related factors were investigated. These characteristics and factors included: (1) age and education, (2) household occupation, (3) number of years of residence in the house, (4) home ownership, (5) individual faith, and (6) access to information and communication. The use of six indicators is important within the context of Saudi society for a number of reasons. Age and education was included since the literature suggests that these two factors can impact post-disaster recovery (Schlehe, 2010). Saudis are also very stable residents in their home communities, meaning that moving from one city to another is not a common practice and home ownership is high. The literature suggests that these two factors will likely affect the level of their sense of belonging and their willingness to help one another. In Saudi society job type is important, since it is associated with hierarchal social status and access to resources. An evaluation of resilience will enable the authorities to be better prepared at earlier stages in the disaster cycle, which could minimize the impact of potential disasters.

5.1.1 Age and Education of Interviewees

Improved health and educational status helps to increase resilience and limit the loss of life during natural disasters (Ivanov & Cvetkovi, 2014). The fact is that a better-educated population generally behaves more appropriately to warnings and in accordance with the evacuation orders (Ivanov & Cvetkovi, 2014). Age is an important factor that can determine the level of household capacity and thus affect overall community resilience. On the one hand, seniors residing in a community might have lower self-evacuation capacities, and require higher-priority assistance from the community. On the other hand, community elders can provide subject-matter wisdom based on their extensive expertise and historical knowledge of past events (Thomas, 2006). In contrast, if the community is dominated by younger age groups, since they can more easily help one another physically during and after a disaster, the community might have superior resources for a resilient recovery. An individual can thus rely on the lessons learned, reflections, and opinions of key informants and households with older people, who can offer practical tips and useful information about their communities and recovery operations, while younger household members can provide the heavier work associated with disaster recovery and reconstruction. Figure 5.1 indicates the average age of the interviewees.

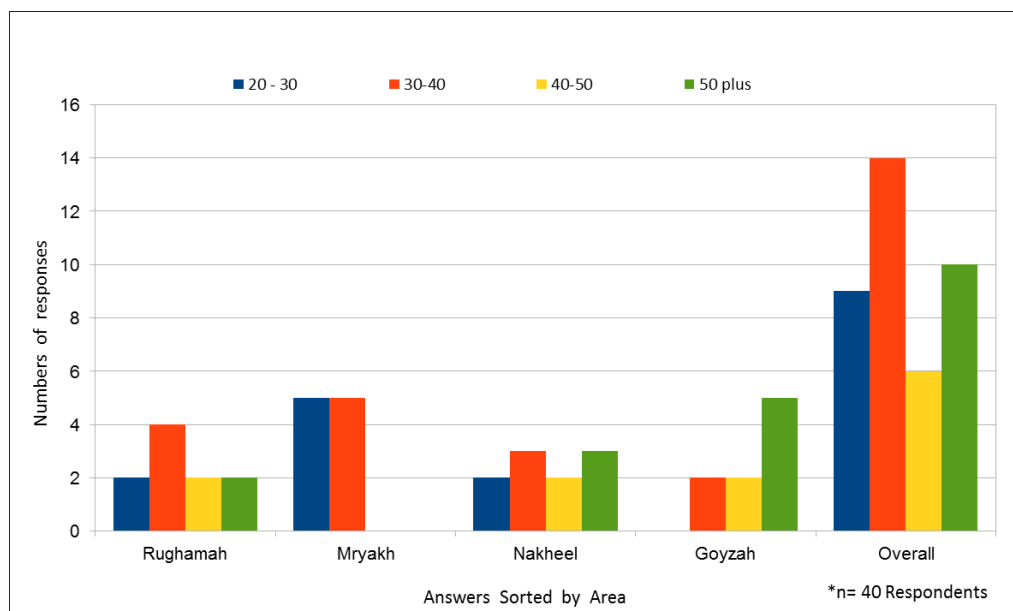


Figure 5.1: Average Age of Interviewees

Most of the participants stated that young people were able to provide extensive assistance during the flash floods. Based on the collected data, and as shown in Fig. 5.1, most interviewees in the Mryakh area were young residents, and that was one of the factors that contributed to a faster recovery compared to other areas. Youths and young men offered volunteer support to trapped residents during the events. In contrast, older people were more vulnerable to severe physical harm and in need of special care, especially during evacuation and sheltering processes, which require strong collaboration and coordination among families and community members. Figure 5.2 shows younger community members forming a human chain to rescue others. As stated by Ali (all names of the interviewees are pseudonyms), a 65-year-old resident of Goyzah:

My son and my two grandchildren helped me and my wife to evacuate our house. The[y] hosted us in their house for more than three weeks before we return[ed] to our restored home ... and ...I think we were not able to make it if they didn't come on [sic] time.



Figure 5.2: Young People Forming a Human Chain (Alriyadh, 2011)

In the Kingdom of Saudi Arabia (KSA), as in the vast majority of other cultures around the world, seniors are highly respected, and it is understood and appreciated that they can positively influence the decisions of younger generations with respect to future milestones in their lives. During natural disasters such as flash floods, seniors can thus play an important role in providing wisdom and advice. In Saudi society, weekly family gatherings at the house of the older family member are a sign of respect for elderly people. These sentiments constitute strong evidence of a sense of attachment and belonging, which strengthens social bonds between family members and contributes to higher level of household capacity. Figure 5.3 is a photograph taken during a field investigation and interview in Jeddah with a senior head of household.



Figure 5.3: Author interviewing a senior in Rughamah

As explained by both key informants and several participants, because of the teachings of the Islamic religious faith, in the KSA older people are generally well taken care of by their children and blood relatives, who are accountable based on their religious obligation to do so. The culture of respecting and helping seniors in the community is a social norm for younger people, performed with pleasure and esteem. As noted by one key informant, neighbourhood associations can also take the initiative in encouraging seniors to come forward to provide expertise and wisdom to the community with respect to the tasks involved during potential future floods. For example, seniors could be highly influential with respect to future community decisions related to emergency management plans and post-disaster recovery operations.

With respect to education and disaster resilience, Chester et al. (2010) stated that people may use educational qualifications and sophisticated perceptions of the science to rationalize disasters or other traumatic events. Ivanov and Cvetkovi (2014) argued that a better educational status helps to reduce the vulnerability and limit of the loss of life during natural disasters. A better-educated population is more inclined to follow warnings, and generally has a better access, understanding, and capacity to promote information related to the disaster from a variety of

sources, such as websites, social networking sites, and they behave properly in accordance with the evacuation orders. There were significant differences in the level of education between household members in each of the four selected sites, as shown in Fig 5.4. In terms of education analysis, the selected sample of interviewees showed that Nakheel had the highest educational levels, followed by Goyzah and Rughamah, while Mraykh had the lowest mean educational levels. Based on the gathered information, these low educational levels can be attributed to social and demographic features, such as large populations of foreign laborers, residents, and illegal immigrants. Further discussion is included in Chapter Six.

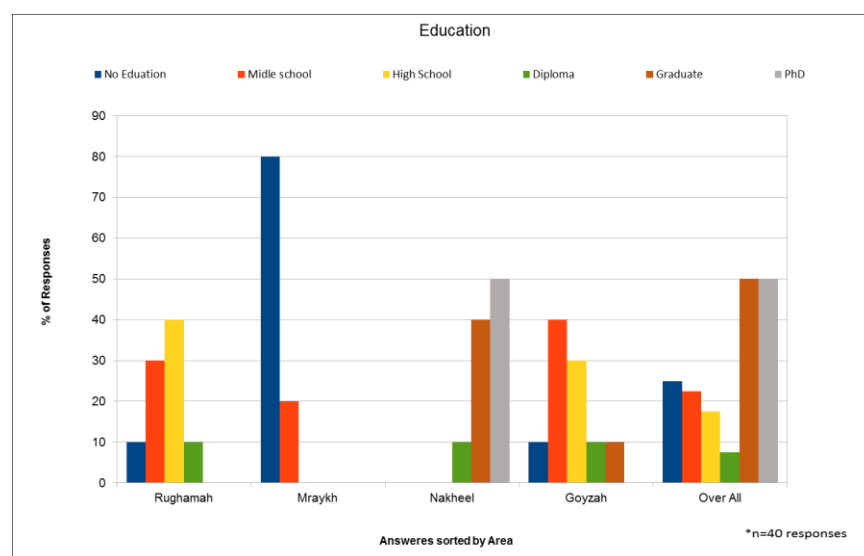


Fig. 5.4 Average levels of education in the selected areas

5.1.2 Household Occupation

The study provided evidence that many of the interviewees held jobs working with a variety of employers. The distribution of occupations was diverse, with Mraykh seeming to have less prestigious professions and the only site where participants held service provision jobs (e.g., construction, maintenance workers, etc.). As shown in Figure 5.5, most of the interviewees in the four sites under investigation worked for government and non-government organizations in the public service sector. Others were employed by real-estate companies and the construction

industry, while a number were university or college professors. The results revealed that people who worked in service jobs stated that they had a wide network of relationships, because they routinely dealt with customers on a one-to-one basis. Real-estate and construction industry workers and staff explained for example, that they practiced building social relationships in their daily work connections and therefore have a greater social bridging and linking capacities to exploit in times of disaster. As a result, they acquire high levels of social capital and resources that enable them to connect with others in their local communities, people in other neighbourhoods, and high-profile government officials during disaster, restoration, recovery, and development phases.

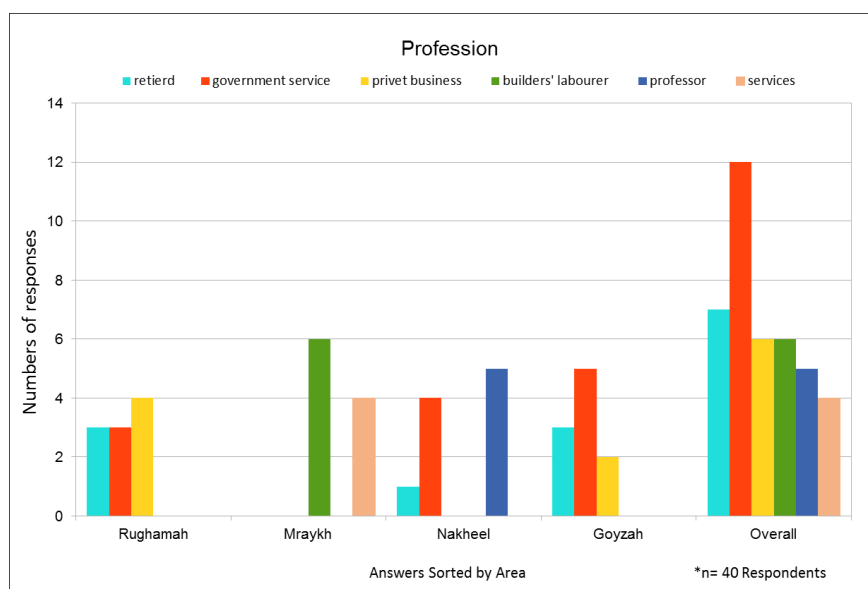


Figure 5.5: Occupations of the Interviewees

5.1.3 Length of Residence in the Dwelling Unit

As noted by several key informants, the length of residence correlates positively with the resilience capacity of a community because the longer people reside in a specific place, the more likely they are to become aware of local problems and challenges, and to have a comprehensive understanding of the various needs and demands of their local community through their daily

social interactions with other members of that community. Longer-term residents have a special bond with their place of residence, which facilitates the opportunity to know and build social relationships with their neighbours. These relationships provide backup support that is available whenever they need to seek assistance during a crisis. As is evident from Figure 5.6, most of the participants had lived in the same house for more than five years. However, in the Mraykh area, it is clear that most of the interviewees lived there less than five years because the majority was illegal immigrants who kept changing residences due to their work and immigration status.

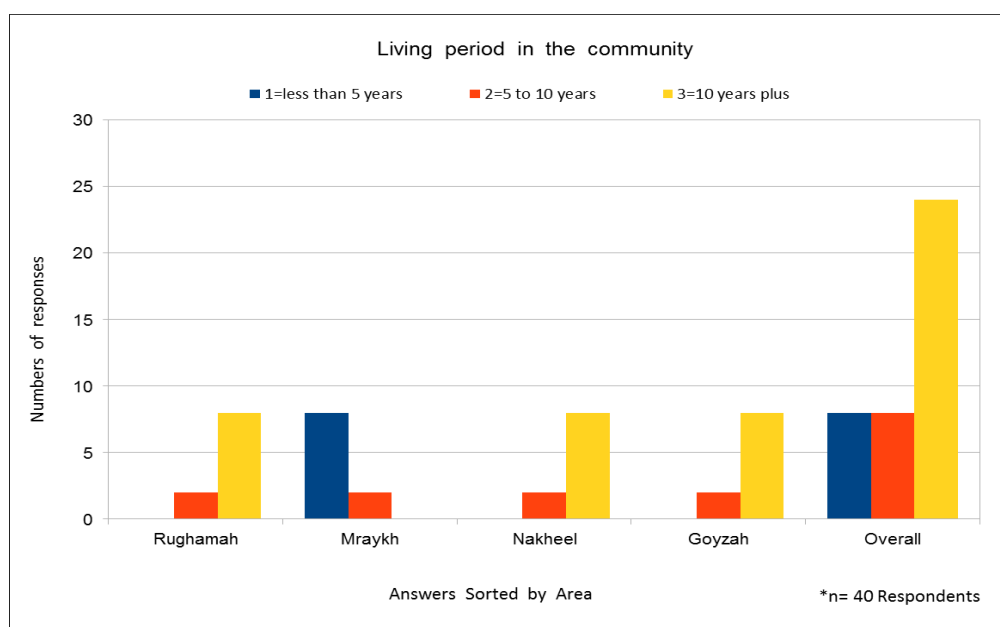


Figure 5.6: Length of the Interviewees' Residence in the Community

Most interviewees in Nakheel, Rughamah, and Goyzah expressed a stronger sense of togetherness and friendship when compared to Mraykh. It was observed that social relationships and integration created stronger social bonds among community members. Participants argued that because they usually meet in the masjid to pray together, and also meet during special social occasions, they feel more connected to one another and forge bilateral links. In addition, common public spaces, such as coffee shops, stores, and shopping malls—as well as recreation activities and cultural events—were other places residents usually gather for scheduled or unscheduled meetings

and chats. Over time, these opportunities increased a sense of community which was found to be helpful during the flood evacuations and recoveries. In Nakheel, Rughamah, and Goyzah, most people were very proactive in evacuating their neighbours (despite the fact that they too had been impacted by the floods). Several respondents noted that the length of stay in the neighborhood allowed residents to know each other closely, how the members of each family, their age and status, and whether there were elder people in need of special assistance.

As mentioned, most Mraykh residents were illegal immigrants who had resided there no longer than two to three years. During the interviews, it became clear that the Mraykh residents did not have a sense of togetherness, which hindered their capacity and led to limited access to help from their neighbours.

In contrast to the other three sites, residents of Mraykh mentioned that, because the whole district was impacted by the floods, during the flash floods they had to rely heavily on nearby communities instead of seeking help from their immediate neighbours. They therefore waited anxiously for evacuation support from these nearby communities. Zakariya, a building laborer who had lived in the Mraykh area for two years said:

My house was flooded with water and I tried to seek help from my next-door neighbour; however, I found him in a situation not better than me. There was no relief or rescue staff to ask for their help. We had to wait for seven hours before people from nearby community and other volunteers [came] to rescue us.

5.1.4 Housing Ownership

As Brown and Crawford (2006) argued, home ownership is one of the important elements of resilience in human societies with respect to recovering from disasters. Collective ownership of a multi-storey building may also help reduce environmental degradation, which increases susceptibility to natural disasters, e.g., several people can share the same land, infrastructure, and

utility services. People are psychologically more likely to invest in places where they can achieve long-term stability for themselves and their dependents. In the Saudi culture, investing in ownership of a house or a place in a specific community makes citizens more stable. Owning a home is also one of the important factors that determine an individual's local status in Saudi society. Owning a house represents a valuable asset that residents are strongly willing to defend. They are thus keen to return home following a disaster, especially those who grew up in that location and have created memories and long-lasting social relationships as they have grown older.

One interviewee from Goyzah noted that people who rent an apartment or house develop a weaker attachment to the community and fewer social relationships, especially if their motivation to live in that community was driven by the availability of a job. Therefore, when their homes are damaged during a disaster, the chances are that they will be more willing to relocate and the sooner the better, since they do not own any assets to worry about. Because of the human need for a safe place to reside, they are therefore more willing to consider settling in other communities rather than waiting a long time for the completion of the recovery process. As indicated in Figure 5.7, on average, most of the people interviewed in the Rughamah, Nakheel, and Goyzah districts owned their homes. Only about 18 % lived in rented housing, while private property owners represented about 82 %. Based on the field observations, most of the residents of these sites were Saudis, and large numbers of them were blood relatives with strong social relationships.

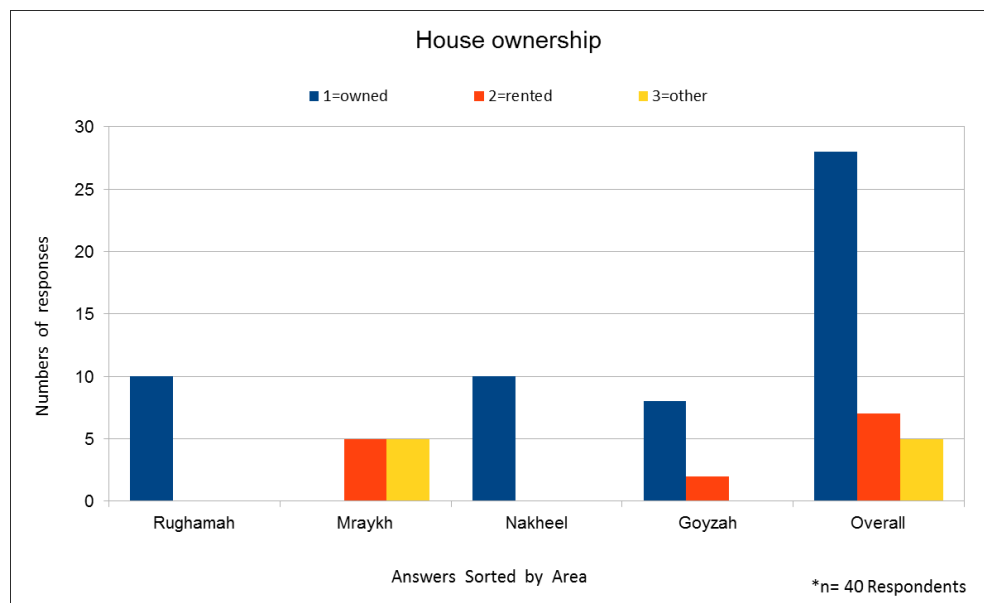


Figure 5.7: Home Ownership Status of the Interviewees

Other dimensions of why home ownership is important were observed in the Nakheel community, where almost 60 % of homeowners had hazard and disaster insurance policies. They also displayed an additional organizational capacity in the form of interactive ties through local homeowners' societies. The interview data suggests that these assets were crucial for resilient and fast recovery since insurance policies and societal organizational capacity provided immediate sources of relief and aid. According to the statement from Sameer, a retired resident of the Rughamah area:

I owned this house for more than eight years. I know almost everyone [who] lives in the area. We used to pray together in the masjid five times a day. All my three children grew up in this house and they are attached to it. They used to walk to school with their peers, neighbours, and friends. Simply, I can't leave this community.

Sentiments such as these constitute strong evidence of a sense of attachment and belonging, which strengthens bonding social capital and contributes to post-disaster resilience.

As expected, none of the Mraykh participants reported that they owned their home. This finding is expected, given that the majority of the residents are illegal immigrants from different nationalities. Notwithstanding the comments made above by Saudi citizens, and although the participants of the Mraykh area (Site 2) were considered the poorest (with the lowest social status and shortest period of residence), the post-disaster recovery of the site was the fastest because it contained predominately small, single-storey separate dwellings, and most of residents owned inexpensive furniture and vehicles, few electronics and appliances, and almost no collectibles. According to Ghulam, a Mraykh resident, “It took me only five days to come back to my house.” He added, “I only rebuilt the wall, [and] cleaned the house; the aid I received from the NGO [food, clothes, and some household items] was enough for me to come back to my house.” Figure 5.8 offers an example of the aid supplies distributed by NGOs to the residents of the Mraykh site. Based on field observations, the primary motivation for the Mraykh residents, who were illegal immigrants, to return to their home was that they had no other place to go. Thus, despite the fact that interviewees had frequently changed their residence in the past, most said that after the floods they preferred to repair damaged homes and return to that location in order to avoid dealing with Saudi authorities.



Figure 5.8: Distributing Housing Supplies in the Mraykh Area (*Arab News*, 2011)

For the other three sites – Nakheel, Rughamah, and Goyzah – the level of post-disaster recovery varied depending on the severity of the damage and according to financial assets, size of the home, and the contribution of NGOs and other government agencies. A sample of the comments from the field observations includes one from Mr. Ali Khan: “I lost everything because of the flash flood. I spent all of my savings to build this house, purchase [the] best furniture and appliances, and a new car. Unfortunately I lost everything...” Likewise, another resident mentioned that he had installed a new sewer system that was completely ruined due to the 2011 flood. He also claimed that he had bought a taxicab to operate as a way of earning additional income. It was noted during the field observations that the amount of damage to the infrastructure systems was the most influential factor that determined the speed of the post-disaster recovery and the restoration of a community, e.g., sewer system, electricity, and main water pipes. Well-designed, planned, and protected infrastructure systems as well as the availability of additional assets and easy access to emergency and aid resources therefore increase the levels of resilience and facilitate post-disaster recovery.

5.1.5 Individual Faith

In a country dominated by Muslims and in the context of Saudi Arabian culture, Islam is itself an important and powerful form of household capacity. In line with their religious teachings, people are very enthusiastic about volunteering their help and assistance in any emergency or crisis, and this was made evident during the post-disaster recovery. Research has shown that established religious faith can be an important a positive contribution to community resilience (Joakim & White, 2015). According to the results of the field case studies and the observations of the researcher, the strong religious faith evident in each of the four selected sites influenced and promoted the levels of resilience in those communities.

One interpretation of the interview results suggests that lower levels of resilience could be seen in interviewees who tended to believe in destiny and assumed a fatalistic attitude toward the occurrence of disasters and hazards. Based on definitions expressed by Taylor (1962) and Joakim and White (2015), fatalism is defined as the belief that there is nothing people can do to alter their fates, and that future events are subject to the will of God. The results of the interviews showed that all 40 of the participants (100 %) attributed the flash flood disasters to the will of God. They also believed that it was written in the Book of Destiny that God had scripted all events from the beginning of time until the Day of Judgment. Thus, due to this belief, some people argued that nothing could or should be done to prepare for disasters. As an interviewee from the Goyzah area put it, “For humans, they cannot do anything. Anything that is the will of God will happen and humans can’t stop that.” Rami, another respondent, who is from the Nakheel area, said,

Everything that happened in the world, especially the disasters – God already arranged for that. What happens next has already been arranged. If I will live or die, it has been already written in my Book of Destiny so I don’t feel afraid.

Despite this fatalism, when investigated interviewed in further detail, with respect to the supportive anticipatory and preparatory measures that could have averted or mitigated the impact of the disaster, the majority of household respondents believed that there were a number of proactive measures that could have helped reduce the amount of damage and the number of casualties. These measures included improved building codes, construction standards and specifications, community familiarity with basic first aid, and knowledge of emergency evacuation procedures. Interestingly, this belief corresponds with Islamic teachings, which insist on advance preparedness in all aspects of the life of a Muslim believer. As stated by Imam Ahmed, leader of the Rughamah Mosque, the historical religious scholar Anas Ibn Malik reported that “A man said, O Messenger of Allah, should I tie my camel and trust in Allah, or should I untie it and trust in Allah?” Imam Ahmed went on to say, “True believers should follow the Hadith Sharif of the Prophet Mohamed (Teachings) on reliance narrated by Anas Ibn Malik: “Trust in Allah, but tie your camel and give regard to worldly causes.” The interpretation of this reading is that a person must prepare by implementing all potential preventative measures, must be ready to react according to a plan, and then must rely on God.

In addition, many of the participants underscored the role of prayers and honest faith, as well as the desire to be a good person, as psychological preparation for any future disasters. It has been observed that, after experiencing the risk of death and suffering, people will turn to their religion and prayers, a phenomenon called “religious comfort seeking” (Sibley & Bulbulia, 2012; Joakim & White, 2015). As claimed by Grandjean et al. (2008) and Joakim and White (2015), this behavior usually helps people develop a sense of control and allows them to create strategies for coping with a disaster. This perspective offers evidence that faith-based interpretations of a disaster can provide spiritual resilience for the people affected. For example, Mohamed from the Nakheel district noted,

In a difficult time or unexpected time, maybe people need someone that can make people attached with [sic] one another [and] create a comfort space and a hosting community, which preferably would have the same religion. People therefore will feel closer than before. Sometimes they will have more trust because they have known each other in previous relaxed times.

Thus, while fatalism appeared to suggest an unwillingness to mitigate risk and low levels of resilience, the role of religious beliefs was much more nuanced. Participants noted that no matter how well the community was prepared or how well homes were constructed; there was still the potential for them to be affected by a disaster because the will of God would prevail. The interviewees also recognized that there is always some degree of a risk of failure associated with any technology or human-made structure regardless of whether that failure can be attributed to the power of nature or to some sort of divine intervention. The data suggests that religious belief systems, when combined with interventions designed to reduce risk, can serve to enhance resilience capacities.

5.1.6 Communication and Access to Information

Information can be collected from various formal and informal sources such as news media, experts, government officials, friends and families (Howe, 2011). The case-study investigations revealed that most of the interviewees learned about the floods from sources other than official authorities or local government agencies (Figure 5.9). Family members, neighbours, friends, social media, and other media broadcasters were the primary sources of immediate information. Avenues of acquiring news included phone calls and text messages received from close family members and other relatives who were living in other districts in Jeddah. Flood footage shot by rescuers and relief volunteers went viral on social media and were instantly seen by millions across the KSA and even worldwide. These videos have contributed

to identifying affected areas, facilitating faster aids delivery, and enabling them to accelerate recovery. According to the interviewees, none of them received any notification warning them of the flood risk from any government or non-government sources. The data therefore suggest that social networks, supported by mainstream media and social media were the primary way for interviewees to obtain information during the response period.

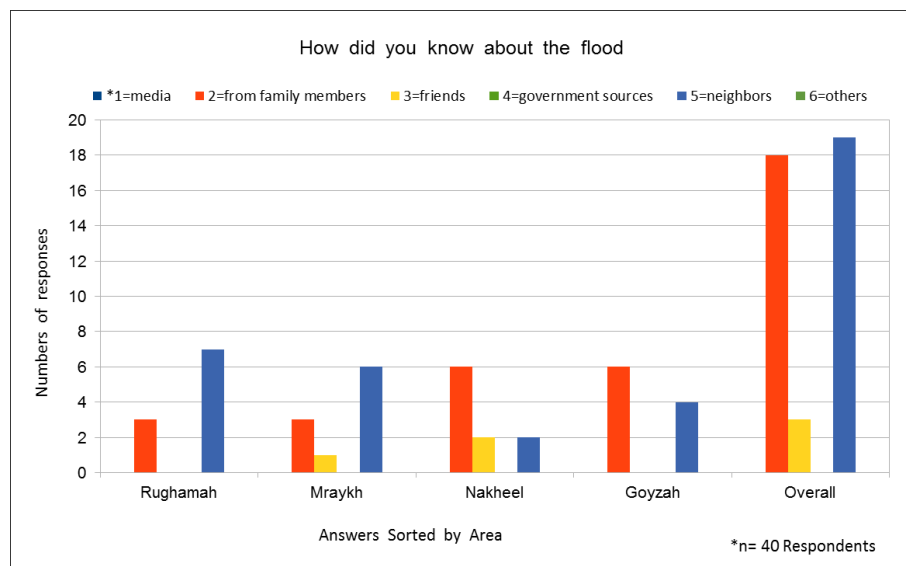


Figure 5.9: How Information about the Floods was obtained by the Interviewees

5.2 Organizational Capacity

Broadly defined as the ability of an organization to meet its goals. Organizational capacity has been a particular focus of scholars who seek to understand of the variables that impact the organizational performance of a community (Bryan, 2011). This topic has also been of interest to outside funders, such as charities, who have been increasing their efforts in building the effective capacity of communities, especially with respect to organizations that provide services to the general public.

5.2.1 Role of Government Organizations

With respect to organizational structure, the KSA is an absolute monarchy, with the central national government located in Riyadh, the capital of the country. Through a number of

ministerial departments, the national government supervises 13 provincial governments across the KSA. The ministerial departments exercise some local power, perform local functions, and also have representation in each of the provinces (Saudi Arabia Ministry of Interior, 2013). Part of the function of the ministerial departments in the province of Makkah is to direct the provincial government and supervise city municipalities across the province, such as the City of Jeddah.

In the oil-export-based KSA economy, the government previously provided substantial subsidies and bursaries to its citizens. However, due to the 2008 recession and recent drop in oil prices, the government has introduced numerous reforms and budget cuts. Unfortunately, especially for the 2009 flood, at that time the government also lacked a comprehensive and effective disaster-management framework. Accordingly, in the case of the City of Jeddah, some respondents mentioned that if they could have relied on assistance from government organizations and received necessary information in time, their resilience could have been significantly improved. Several participants pointed out that the recovery frameworks of government organizations should be transparent and widely disseminated to local citizens so that they can trust them and rely on them. They could then also be part of a post-disaster recovery plan, which would certainly enhance the resilience of the impacted communities. Faleh, a 65 year-old resident of Goyzah, said, “Government agencies were not expecting a disaster of this magnitude.” He also added that “government agencies [should] learn from this lesson and be more prepared for future events.”

5.2.2 Compliance with Building Regulations and Bylaws

According to the Ministry of Municipal and Rural Affairs (MMRA), a real estate developer must obtain building permits in accordance with the Master Zoning Plan of the City of Jeddah and related bylaws, which must comply with technical standards approved by the

MMRA. Any building permit must include proof of compliance with all planning, architectural, and engineering technical requirements and specifications, including design criteria, standards, and specifications; population density studies and expected number of units; estimated consumption of water, electricity, telephone lines, and sanitation; and number of parking spaces required (Municipality of Jeddah, 2010). These regulatory provisions are mandatory legal requirements for the approval of any building permits, development projects, subdivision planning, city growth, or economic development activities in the City of Jeddah. However, due to the absence of effective bylaw enforcement, regular building oversight auditing, and proper engineering supervision, builders neglect the regulatory requirements of the bylaws and other organizational policies when constructing new buildings (Jeddah Municipality, 2010). For example, as noted in the field observations, a multi-story building is being constructed to block a flood drainage channel, which is an explicit violation of the building bylaws and codes, as well as the ethics and values of the construction industry (Figure 5.10).



Figure 5.10: Housing Construction in a Flood-Prone Area (*Saudi Gazette*, 2009)

In such situations, there seems to be a combination of factors at play, including the absence of bylaw enforcement; the prevailing culture of ignoring building codes, professional ethics, and values; as well as lack of government oversight and implementation mechanisms. As a result, all of the communities affected are dramatically vulnerable to flooding, and the resilience capacity of city dwellers with respect to any future disasters is negatively impacted.

An additional perspective to consider is whether community development has been based on proper urban planning or on random development. Figure 5.11 clearly demonstrates the effect of planning: the difference between the housing at Site #1 (Rughamah, which was carefully planned) and that at Site #4 (Goyzah, which evolved haphazardly) is obvious. According to the field case-study results, Site #1 relief and rescue operations were more effective and faster than those at Site #4. Areas that developed without careful planning thus experienced generally greater difficulty in recovering than those that benefited from prior urban planning. Well-organized and -planned areas are accessible and aid can be delivered more easily and quickly, as well as repairing damaged infrastructure, which contributes to faster recovery.

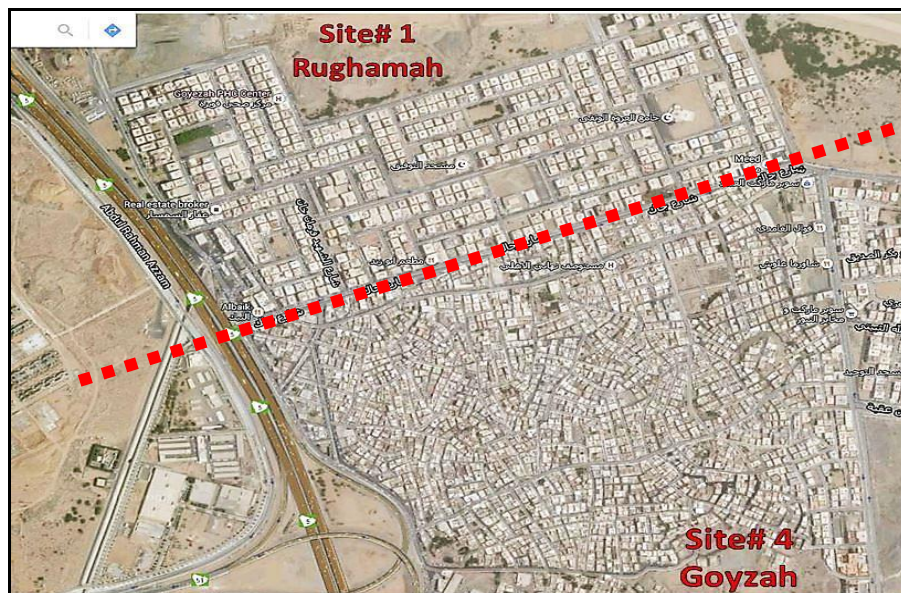


Figure 5.11: Evidence of Planning Discrepancies that can Affect Recovery (Google Earth)

Examples of these problems were noted in the statements of key informants and interviewees and were also observed by the researcher:

- Some houses were built on flood-prone areas either without permission from the municipality or with permission that was obtained via corruption or “favours.”
- In many apartment buildings vulnerable to flooding, the ground floor was used for residential purposes, whereas safety regulations stipulate that those areas should be for parking or open space.
- Electricity meter boards located close to street level were inundated by the floods, causing electrical hazards, which led to some casualties and deaths.
- Some home owners installed anti-theft steel guards on the windows, which hindered the effectiveness of rescue and evacuation operations.
- Due to poor sanitary infrastructure and a completely blocked system, flood water became polluted due to back-flooding from sewers and residential septic tanks.
- Habitation ratio limits were ignored. The number of residents living in some houses exceeded the maximum legal capacity of the dwelling unit, a violation that led to increased fatalities in the areas affected.

5.3 Disaster Management

The Municipality of the City of Jeddah is responsible for all local community affairs, including disaster planning and emergency response through the Regional Committee for Civil Defense (RCCD). In the event of a natural disaster, the RCCD implements the directives of the city council with respect to firefighting, search and rescue, and ambulance services. The RCCD has broad powers to instruct civil and military organizations, determine the use of public resources, and coordinate all disaster intervention and recovery operations as required. The RCCD therefore prepares local emergency response plans, directs all response teams, and

coordinates communication with all government and non-government organizations in order to provide efficient response and recovery activities. To meet its commitments, the RCCD is also responsible for sourcing and training appropriate teams, as well as implementing, enforcing, and overseeing all aspects related to occupational health and safety regulations (Saudi Arabia Ministry of Interior, 2013).

Based on the field case-study observations and interviews with key informants, some of the affected residents were located post-disaster in temporary shelters while others stayed with friends and relatives. As indicated in Figure 5.12, about 80 % of participants affected by the 2009 or 2011 flash floods took shelter in government-provided temporary housing, in some cases for as long as three months. The remaining 20 % were split between staying with relatives and being accommodated by friends.

Government response and recovery initiatives were praised by the interviewees at the three wealthier sites. Here, the government provided not only compensation but also shelter and necessary living supplies such as food, drinking water, blankets, beds, medicine, and non-perishable food supplies. However, in the Mraykh area, there were no government-provided shelter initiatives. The most likely reason for this discrepancy is that most of the residents were illegal immigrants. Residents of this site were therefore forced to live in their damaged houses and share them with other affected neighbours. Some of the impacted residents lived in their neighbours' homes for several weeks.

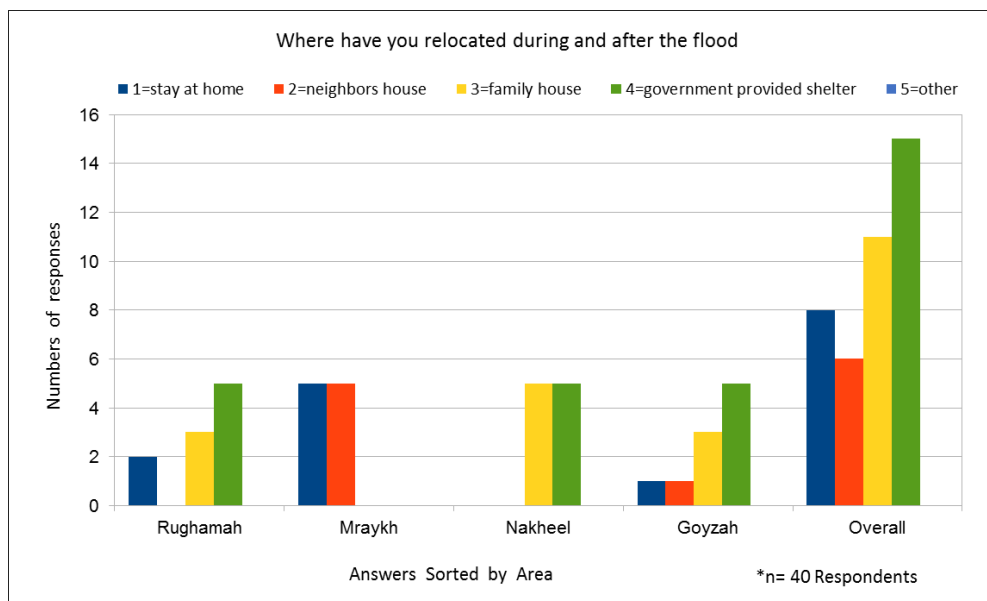


Figure 5.12: Accommodation of Affected People During and after the Flooding

Clear variations were also evident in interviewee responses regarding questions about sources of help and aid during the flood events and the importance of the role of government initiatives following the disaster. As indicated in Figure 5.13, government initiatives during the post-disaster recovery period for all sites except Mraykh were regarded as influential and generous. Half of the interviewees at the Rughamah, Nakheel, and Goyzah sites reported that government ministries responded quickly to distribute drinking water, necessary medicine, and temporary shelters, and to provide transportation services to hospitals and healthcare centres. In general, these interviewees believed that government initiatives were well organized with respect to their response to the disaster and during the post-disaster recovery period.

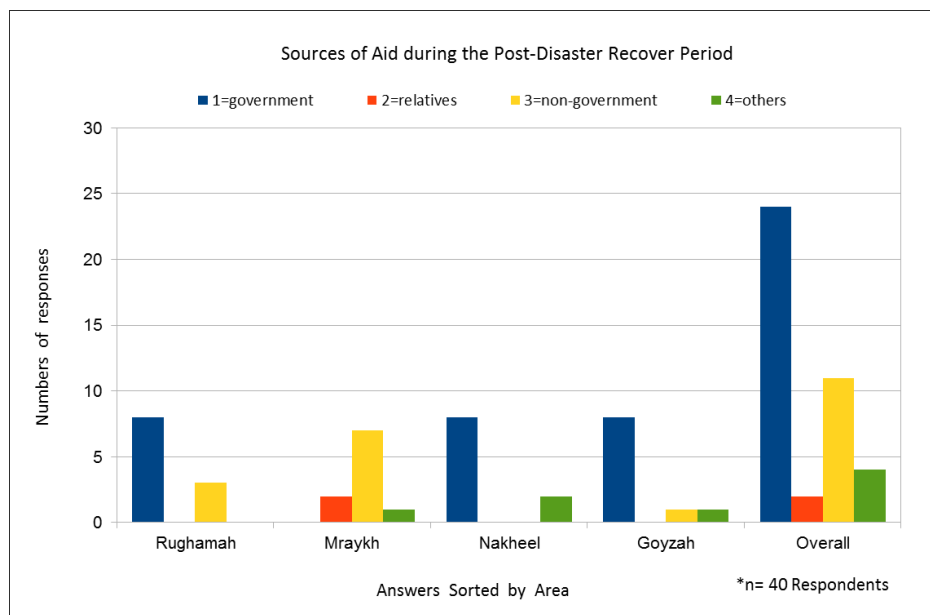


Figure 5.13: Government Initiatives



Figure 5.14: Government Compensation Applications in Progress (Sada News, 2011)

As well, for those who receiving government assistance, the local governments in the disaster areas played an important role by disbursing compensation to the people who had lost significant portions of their property. The amount of compensation given was based on the reported loss of wealth and assets. Thousands of people were compensated for their damaged properties, and families who lost relatives received SR1 million (approximately \$350K CDN) for each death, as shown in Figure 5.14 (Okaz, 2012). Although the compensation system was somewhat delayed

by bureaucratic inefficiency, the monetary amount was significant and important to note. Local governments also helped with the distribution of relief aid and were the first to respond, even with limited manpower. According to key informants, within 24 hours, volunteers were prompted to join the local government team to deliver relief such as drinking water, to find safe places for children, to transport the injured to health centres and hospitals, and to provide necessary first aid and medicine.

Two days after the disaster, local governments also set up reporting centres where people could report problems and emergency needs, and they established communication resources to facilitate contact with friends and relatives living elsewhere. Temporary shelters were organized for the affected communities before their residents were placed in other areas. A large number of volunteers, ranging in age from 20 to 55, helped local government officials and rescue teams to evacuate people from flood-hit areas.

However, all of this aid is in direct contrast to the Mraykh site. There were no government initiatives at this location because it was a community of illegal immigrants and government aid could not be provided according to government mandates. Most of the aid received at the Mraykh site came from NGOs and relatives or friends.

5.4 Additional non-Governmental Capacity: NGO, CBO and Emergent Organizations

Recent political and social reforms have provided an opportunity for the establishment and strengthening across the KSA of many social organizations which serve to supplement governmental DM capacity at both the local and national levels: interest-based youth, women's groups, organizations for people with disabilities, special needs groups, labor organizations, and others. The following are examples of these organizations, groups, and clubs in the City of Jeddah:

- Emdad-SA (Risk and Disaster Management Team): This non-profit organization was established in 2010 after the 2009 flash flood. Its main goal is to manage crises and disasters in Jeddah. Members are committed to their core values and principles of neutrality, humanity, impartiality, and independence in providing their services. They support the efforts of local communities to strengthen their capacities with respect to monitoring disasters and providing early warnings as well as counseling afterward in order to reduce the risk of natural disasters, increase preparedness, and enhance mitigation efforts. According to the case-study results, Emdad-SA was actively engaged in providing support during the 2011 Jeddah flash flood (Yahya, 2015).
- Civil Protection Volunteer Institution: This group is another youth team whose goal was to provide humanitarian services and rescue operations for communities affected during the 2009 and 2011 Jeddah flash floods. Mr. Tayseer Alhibshy, one of the key informants for this research, was head of the team and provided information about the role of his organization during the post-disaster recovery.
- Jeddah Islamic Education Foundation is a charitable cooperative under the supervision of the Ministry of Islamic Affairs, which aims to provide Islamic education in several languages to Muslims and non-Muslims communities.
- City of Jeddah Literary Club: Established in 1995, this group aims to strengthen the roles of cultural and national identity. It is one of the most important literary and cultural clubs in Jeddah and is open to all local intellectuals and scholars. The club runs a variety of programs and activities that encourage and nurture literary talents, help build networks, and maintain closer links with writers and intellectuals across the city and throughout the country.
- Literary Girls Book Club: This female-only book club meets once a month. It was started by a group of friends who wanted to nurture their passion for reading. The initiators were

motivated by the need to inspire and encourage women to read so that they could become more knowledgeable and strengthen their capacities and social skills. The club usually chooses a theme for each meeting, and members are then encouraged to explore a variety of books that fall within that theme. Although the meetings are casual, they are nonetheless informative and educational.

During the 2009 and 2011 flash floods, these organization and many more were actively involved in providing relief, aid, and assistance services. Other organizations included the World Assembly of Muslim Youth, Muwatana, and Friends of the City of Jeddah all of which provided extremely valuable help by conducting field surveys, distributing donations, cleaning homes, and dispensing information brochures, as portrayed in Figure 5.15 (Arab News, 2009). In addition, men, women, and teenage volunteers were very active in helping needy residents by handing out relief aid and other humanitarian assistance, as shown in Figure 5.16.



Figure 5.15: Volunteers from the City of Jeddah (*Asharq al-Awsat*, 2012)



Figure 5.16: Delivering Food and Medicine to Affected People in Shelters (Alriyadh, 2012)

The interviewees mentioned that they received different types of assistance from both government and non-government organizations. As shown in Figures 5.16 and 5.17, both government and non-government organizations distributed housing supplies and provided relief and other services, such as non-perishable food supplies, drinking water, blankets, beds, medicine, economic and mental support, monetary help, and shelters (Alriyadh, 2011).



Figure 5.16: Collection of Relief Supplies and Provision of Social Assistance (Alriyadh, 2011)



Figure 5.17: Aid Distribution (*Okaz*, 2010)

Based on the findings and interview results, it can be noted that in most of the areas, affected residents received substantial relief and recovery assistance from either government or non-government organizations. Indeed, NGOs and community-based organizations (CBOs) were active in Rughamah and Goyzah, providing basic needs to people affected by the floods. However, government aid was evident primarily in Nakheel, where the municipal officials resided, and access to government services was available immediately following the event. In contrast, due to the illegal status of the population in Mraykh, the main source of aid was from NGOs and CBOs with some help from neighbours. The perception of the participants from all sites was that the NGOs were very active and had an effective network for providing aid and assistance to the affected inhabitants. “I think they did everything possibly [sic] they [NGOs] could do,” said a wife of a head of household with three children whose Goyzah-area house was damaged by sewer water during the flood. “I’m not into blaming individuals; there is plenty of blame to go around. But that’s not the issue. Let’s make sure it never happens again,” she added.

Because of the cultural and religious background of Saudi society, local people were accustomed to forming a number of community organizations, either formal and registered or informal and unregistered. Registered community organizations include but are not limited to youth associations, daycare centres, clubs, and recreational and leisure-based organizations. Other registered local organizations that are usually outreach extensions of the masjid are orphan's associations, social dispute councils, Quran memorization centres, and others. In contrast, unregistered community organizations include groups of volunteers and gatherings of female household members who meet with the goal of improving housekeeping and other vocational skills.

In Saudi society, these community organizations help develop robust relationships that strengthen societal bonds and the sense of belonging among different classes of community members. These organizations usually keep some emergency reserves, which are offered to their members in emergency situations at both the individual and community levels. Therefore, the more people are involved in community organizations, the more the community will have access to emergency resources during both disasters and post-disaster recovery periods. The roles and responsibilities of these organizational resources become crucial, especially when recovery programs following massive disaster events are slow or impeded. Many participants mentioned that the contributions of the CBOs helped households maintain considerable resilience and strength so that they could recover psychologically from the disaster, as well as rehabilitate their communities.

CBOs were identified and classified by the KSA and the City of Jeddah, and this then provided a structure upon which the government could work with these organizations post-disaster. Their primary tasks were to provide a platform for the community to come together, analyze the causes of problems, work toward feasible solutions, communicate with decision-

makers, raise community awareness with respect to environmental and disaster issues, monitor relief and recovery operations, and provide contextual evaluations. Featured CBOs who participated in the Jeddah disaster recovery efforts included: (1) the Women's Charity Society, (2) the Faisaliah Charity Feminism Organization, (3) Neighborhood Society Centres, (4) the First Women's Charity, (5) Charity House, and (6) the Al-Ber Society. Based on the data collected, in general, Jeddah CBOs played a prominent and active role in providing humanitarian services to the affected households. They were able to provide cash and in-kind donations, organize and run fundraising events, and offer emotional support.

According to the case-study results, a number of CBOs focussed on different areas of interest, and actively participated in specific aspects of the recovery efforts. They were part of the team that assisted with the distribution of relief aid and the implementation of recovery help programs. The contribution of the CBOs clearly emphasizes the social capital that contributes to the resilience of their communities. Neighbourhood leaders spearheaded the collection of data and the distribution of aid in their areas, and women's organizations and female volunteer groups provided a significant contribution by helping impacted females and children, since social and religious custom generally restricts men from interacting with these groups. Women's associations provided many services to the affected communities, including maternal and child health, social care, and assistance with financial matters.

As observed during the field interviews, most CBOs worked closely with masjid and other religious organizations across Jeddah, because in most cases, members of the CBOs were also members in their local masjid. In the Muslim culture, the masjid, in addition to functioning as an empathy-promoting center, plays a role similar to an investment incubator, especially during emergencies, disasters, or social conflicts. This effect is attributable to Islamic teachings that encourage all people to take part in doing good deeds so that they will reap great rewards

from God. Residents therefore assumed responsibility for helping the needy in their community because of their religious beliefs.

On other occasions, emergent volunteer groups of young men provided towing services to those who were stranded by flooding, as can be seen in Figure 5.18. Their services included pulling cars from flooded streets and delivering food and medicine. Another group of volunteers drove a truck displaying a large photograph of a sport utility vehicle with two contact phone numbers to call, as well as a written statement: “If your car got stuck don’t hesitate to call the volunteers.” The group also continually urged owners of four-wheel-drive vehicles to come forward and help stranded citizens (Arab News, 2015).



Figure 5.18: Group of Young Men Providing Towing Services (*Arab News*, 2011)

Mr. Tariq Alabdullah, one of the volunteers, said that he asked several young drivers to use their 4x4 vehicles to help members of the community. He said that the group had assisted the elderly, people suffering from hypertension and diabetes, and others stranded in their homes or cars. Mr. Abdullah added that the group tried to recruit the owners of large vehicles across the city so that each person would be responsible for a specific area, and they provided contact numbers to the public. Hisham, a young volunteer, said that the group prioritized the elderly and sick, including

dialysis patients who could not be late for their appointments and motorists who were stranded with children inside their cars. Hisham added that they printed Google Maps identifying severely damaged areas, took photographs of closed or damaged roads, and warned people to avoid these locations (*Arab News*, 2015).

According to the results collected, more than 90 % of the household members interviewed strongly believed that the community volunteers accelerated the recovery process, and most residents expressed their gratitude to the volunteers for their immediate response. Salem, a grocery shop owner in the Goyzah area, said, "I think they tried everything [with] the [greatest possible] effort." Another respondent named Abdurahim added, "I'm surprised what progress has been made; I think volunteers have done a great job." When the interviewees were asked what values and norms the volunteers shared, Abdulaziz, a resident of the Nakheel area, suggested that "reciprocity and helpfulness were the most common values." Omar, a local masjid imam, told me that more than 40 people came to help clean the Rughamah Mosque after it was heavily damaged by 1.5 m of water. Residents of Goyzah and Mraykh spoke with great appreciation about the efforts of the volunteers in the aftermath of the floods. They praised the helpfulness of strangers and fellow citizens, since they had been unable to help out their neighbours personally because of facing similar conditions themselves.

Most of the key informants identified a crucial link that was completely lacking: a relief and recovery coordination center. They claimed that many people wanted to volunteer and offer their help, but did not know whom they should contact, and no information was available with respect to what exactly was needed to help the people in the disaster areas. Due to a lack of coordination and management between the local government and NGOs, on one hand, and the volunteer groups, on the other, most volunteers ended up going to the sites and standing around, not knowing what to do. Key informant Tayseer Alhibshy reported that these would-be

volunteers just documented, videotaped, and photographed the scenes with their cell phones. According to Mr. Alhibshy, due to a lack of professional rescue supplies, the volunteer SUV drivers, who were asked to help in the rescue efforts, were unable to drive because the water was so muddy and visibility was very limited.

5.5 Religious Institutions and Cultural Practices

In Saudi culture as religious institutions founded 14 centuries ago with the rise of Islam, the masjids and jawami (mosques) offer physical space for worship, host other collective religious activities and weekly congregational, e.g., Jumma prayer. In addition, Masjid and jawami buildings usually have multi-purpose spaces and rooms that can accommodate a wide range of social and religious activities and meetings. During emergencies and disasters, these spaces are convertible resources that can be used for storing and distributing aid supplies and for coordinating relief efforts. These spaces can also be utilized as meeting places where religious leaders and health professionals can offer emotional support and healing (IRIN, 2013).

As Joakim and White (2015) also found, media resources, such as loudspeakers, recorded speeches, open gatherings, and other audio systems were used as effective tools for providing important mass communication channels to the Jeddah public. As indicated by many participants, relief and directive information was disseminated from the mosques through loudspeakers and the imam's speeches in public areas. Masjid and jawami resources were used prior to the disasters as early warning systems, as well as afterwards with respect to organizing relief, rescue, aid, and recovery efforts. Saudi religious beliefs direct that others be helped regardless of their ethnicity, colour, gender, or any other characteristics or background, and respondents witnessed that the masjids and jawami played an active role in rebuilding and helping the community with respect to cultural and financial aspects, because the imams and members of these institutions took the lead in setting an example for the sake of God. Most

imams are regarded as very trustworthy individuals in their communities, so that residents tend to believe an imam's opinions, listen to their messages, and follow their instructions. These institutions thus offer effective opportunities for facilitating successful and sustainable relief and recovery efforts.

Culture includes a set of organized approaches, practices, and beliefs that support the functioning of different societies and many of the cultural attributes in Jeddah provided important post-disaster support. Local culture can be characterized by aspects such as shared religious beliefs, histories, heritage, values, knowledge, traditions, rituals, and ideologies (Daskon, 2010; Throsby, 1999; Joakim, 2013). KSA is a culture is underpinned by an Islamic belief system that involves respect for older people and decisions made by the head of the household, generally a male, since Saudi society is patriarchal. An ideal Muslim society is based on the fundamental belief that Islam is not only a worshipping practice but also a complete system of life and behaviour, a philosophy that the believer should constantly act upon. Therefore, local cultural organizations and groups that represent individuals with common interests, such as retirees, journalists, volunteers, or landlords, often reflect Islamic teachings within their area of expertise. For example, commonly featured programs would include the following:

- Reciting and memorizing the Holy Quran
- Evening clubs for exchanging views about religion and contemporary political and social concerns
- Cultural heritage preservation groups

According to the collected data and results, such groups meet frequently – once or twice in a month – particularly in the Goyzah community, which is known locally as having the most religious activities because a number of strong religious leaders reside there.

The field observations revealed that these social organizations were highly effective with

respect to providing services to community members during and after the floods and were therefore an important factor in increasing organizational capacity and resilience at the community level and for the City of Jeddah in general. For example, Civil Protection Volunteer Institution and Emdad have contributed significantly to the establishment of several courses and programs to educate the community in how to deal during and after disasters in order to increase resilience level.

5.6 Social Capital

In line with the claims of scholars such as Putnam (2000) and Aldrich (2012), in Saudi society, social capital includes various formal and informal social connections that exist within a single community and/or enable it to bridge to other communities. Based on shared cultural backgrounds and deeply rooted Islamic beliefs, Saudi social capital offers households and communities a concrete foundation of feelings of reciprocity, trust, and connections that fundamentally provide a basis for healthy and mutually beneficial social and economic interactions and activities. Unfortunately, due to recent immigration laws, illegal immigrants are not included. The case-study and related empirical analysis methodology entailed the exploration and evaluation of the following specific aspects of this topic.

5.6.1 Religious Leadership

Religious leaders played a significant role in alleviating psychological trauma while helping those affected by the disaster. They delivered speeches and lectures and offered spiritual recommendations to their community members in a variety of formats, such as media broadcasts, focused meetings, and weekly congregational services for Jumma prayers. According to the results and observations, the key informants appreciated the importance of the speeches, lectures, and messages delivered by the religious leaders because they felt that the leaders demonstrated a

sense of responsibility for rebuilding the spirit and motivation of the people in their communities. As Fahad from Nakheel stated,

The imam gave a comprehensive understanding of the flash flood and how people should perceive it in order to preserve their faith and their feelings, as well as how they should be more patient and react in a proactive way. In addition, religious leaders through their respected status, encourage people to be more optimistic and build on the trust in Allah and not be fearful, sad, or depressed as everything is written in their destinies by Allah.

Omar from Goyzah also claimed that “Our mosque religious leaders addressed a factual understanding of the flash flood and how to rescue the people and myself. So I learned how to prepare for the flood from the religious leader.”

Based on the field observations as well as on the knowledge acquired about the current social structure of the Jeddah communities, different clans and groups of people live in the same communities. This mix of residents sometime created conflicts with respect to the distribution of government development funds and other relief and recovery financial incentives. However, the religious leaders mediated between the parties, helping them by reflecting on, and reminding them, about the Islamic teaching of preserving good neighborly relations, which makes people more respectful and understanding of the critical aspects of a situation and enhances the sense of community. In many cases, government officials utilized a religious leader’s social status and mediation skills to achieve common understanding, fair compromises, and acceptable trade-offs. Some of the participants did not feel that this function falls within the mandate of a religious leader as opposed to government organizations. However, as Joakim and White (2015) pointed out, others believe that coordinated and unified messages and efforts from government, social, and religious institutions together strengthen acceptance and acknowledgement of the best approaches to relief and recovery for their communities. As a result, this can collectively help

reduce the risk of disaster and also improve the resilience and organizational capacities of the community.

5.6.2 Social Connections

As suggested by Joakim (2013) and as evident in the case-study results, during the recovery work after the 2009 and 2011 Jeddah floods, many respondents noted that connections between residents and external networks (i.e., bridging capital) constituted a primary method of accessing external assistance. In addition, communities that had higher levels of external connections were able to obtain more aid than those that did not. Examples of such external networks and social connections were ones with religious leaders, NGOs, and high-profile government officials, who were key resources with respect to obtaining further assistance and thus increasing the resilience of the community.

5.6.3 Access to Funds

As soon as a disaster occurs, the communities and people impacted need immediate access to cash (monetary help) for purchasing important items such as food, medicine, water, and baby supplies, as well as other forms of instant relief aid. However, during the 2009 and 2011 floods, it was observed that banks were closed and cash machines were disabled for security and safety reasons so that people were prohibited from retrieving their own savings. In most cases, people therefore asked for help from relatives or friends who could afford to offer cash quickly. The religious beliefs prevalent in a Saudi community mean that, in such situations, neighbours and relatives play a pivotal role in providing such help, based on their values of solidarity and duty. The feedback received during the field interviews demonstrated that people who had access to cash immediately following the disaster were more resilient than those who did not, especially in the lower-income communities such as Goyzah and Mraykh, where many residents were financially unprepared for such a sudden disaster and lacked emergency financial

resources. Immediate access to cash enabled them to rebuild their homes and recover faster than others.

5.6.4 Access to Help from Relatives, Friends, and Neighbours

As Kirschenbaum (2006) identified, family relationships, empathy, and neighbours are a critical social mechanism for increasing resilience to disasters, particularly during the post-disaster period, and also represent a resource for material and non-material support. This assessment is supported by the data collected and the results of the analysis. Almost all the people interviewed stated that they received immediate assistance from family members, blood relatives, and neighbours during the aftermath of the disaster. Assistance took a variety of forms of emergency support, including cash, food supplies, and household goods. Ali, a resident of the Nakheel district, said “My brother who lives in [the] northern part of the City of Jeddah, offered [that I could] stay in his house until I can rebuild my house.” In fact, when asked what gave them strength to recover from the disaster, the majority of interviewees stated that the assistance of family and neighbours was an important support mechanism. Tangible (cash money, appliances) and non-tangible (spirit and motivation) donations from friends and family members provided a number of households with more assistance than they needed, so the aid recipients would, in turn, share whatever they received with their neighbours and other community members in need. Some interviewees also mentioned that they received significant help from outsiders such as volunteers from other communities.

5.6.5 Access to Help from Formal Organizations

The results from the field case studies, observations, and discussions with the interviewees in each of the four communities revealed that all interviewees had reasonable levels of social capital, although some lacked bridging and linking social capital to enable them to communicate with and benefit from external communities. As mentioned, Mraykh was

dominated by illegal immigrants, thus making it impossible for them to connect with government officials. They also tended to refrain from any communication with NGOs or other organizations located outside their communities and networks.

A similar situation was evident in the Goyzah district, where the majority of the population was elderly and of lower middle class in terms of income level and education. These factors resulted in poor and very limited connections with outside resources and to those in authority because the residents were lacking bridging and linking capacities. As noted by Faleh, from the Goyzah district,

If we were sustainably connected with government authorities and officials, we would've been much better. The people who have some sort of connection with authorities received all kind[s] of assistance immediately. This is not fair. Our houses are still even without a sewage system.

On the other hand, communities like Nakheel and Rughamah successfully employed bridging social capital to connect with influential people in government and non-government organizations in order to obtain additional resources and other assistance from outside their area.

5.6.6 Trust and Sense of Togetherness in the Local Communities

During the field case study, it was observed that the spirit of giving, support, and solidarity that are grounded in Islamic beliefs and teachings contributed to feelings of togetherness within the communities at the four selected sites. Several household members mentioned that this was an essential source of social and spiritual support during and after the flash floods. About 90 % of the interviewees confirmed community solidarity as a factor in providing strength for effective recovery. Unexpectedly, many of the participants believed that the flash flood and recovery experiences brought their community closer together. Additionally, as stated by Dr. Malawi, a homeowner in Nakheel district, who had lived in the area for more

than 20 years, “Neighbours are not just neighbours; they are circles of friends, colleagues, and confidantes who often [in] time form our [greater] family.” Key informant Yahya, the founder of Emdad, a crisis- and disaster-management team, agreed, saying “Overall, there was a sense of community here ... the wider sense of community comes in [a] large part from the shared norms, values, and experiences.” According to Hassan and Badr from the Rughamah community, these shared values included reciprocity and helpfulness. Likewise Anwar, who lived in the Nakheel district, commented, “I feel that Nakheel is better after the flood; people learned from the disaster that togetherness is very important [– helping] each other. No one can live alone in this world. Our people and neighbours make us stronger.”

5.6.7 Willingness to Help One Another within the Community

Based on Saudi society norms and Islamic teachings related to voluntarily helping panicked and frightened people, as depicted in Figure 5.19, people who live in the same community will usually help one another during events such as disasters.

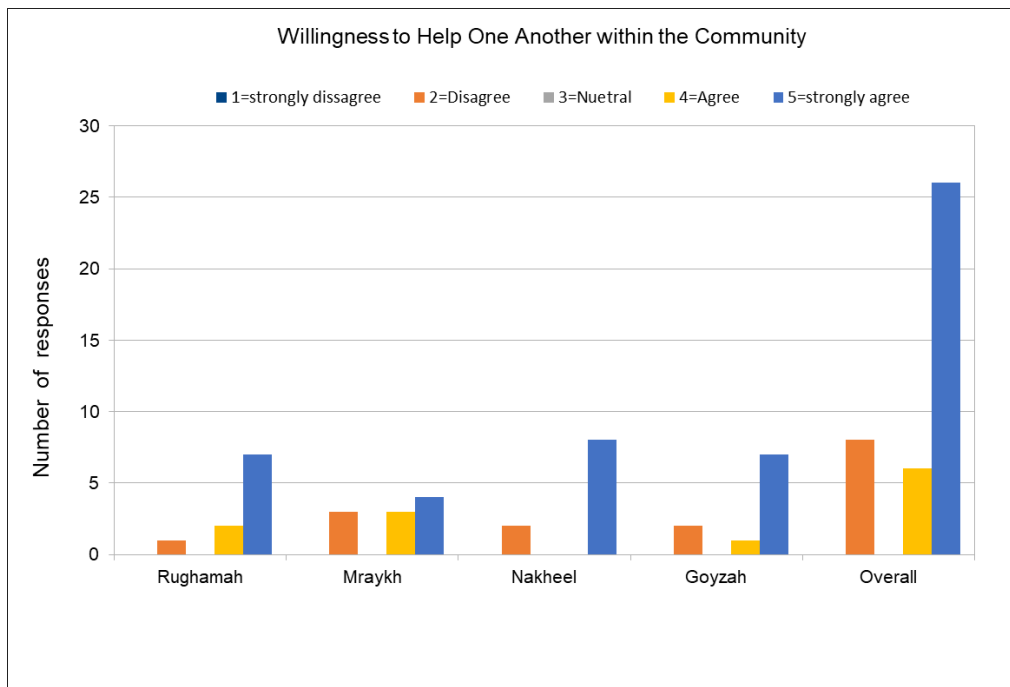


Figure 5.19: Levels of Neighbourhood Social Capital Connections

The behavior exhibited in impacted communities in the City of Jeddah conformed to the Saudi and Muslim expectation: people helped one another to some extent. However, poor coordination, lack of advance preparation, short response time, and limited capacities meant that people could not always help others living in the same community because the floodwater entered their houses very quickly, too, and rendered them helpless themselves. As can be seen from Figure 5.19, in all four study areas, the interviewees replied that they were ready to help neighbours and others inside their community during the floods. It was observed that people received support both from within their own community and from other communities unaffected by the floods (e.g., the northern districts of Jeddah). Relatively, there were more people who disagreed in Mraykh, compared to the other areas. From the field observations, this disagreement appeared to arise because the area includes illegal immigrants from different nationalities and races, and, therefore, lacks the harmony and mutual trust more evident in the other field sites. As depicted in Figure 5.20 and supported by the interview data, people gathered voluntarily to help anyone in need, regardless of who they were and what the situation was. Thus, the common understanding was that everyone would be willing to help restore the impacted communities. However, some people were unable to help their neighbors or friends or to ask for help for one or more of the following reasons:

1. They were themselves struggling to cope with the situation and did not receive any relief response from either the community or government entities. As a result, they were not in an ideal position to offer help to others.
2. They did not have enough relief aid to share with others.
3. They thought that other people were struggling with the same situation, so they felt that they could not ask others to offer what they already could not afford.



Figure 5.20: Neighbours helping others inside their community (Okaz, 2011)

5.7 Summary

This chapter has presented the investigation of a variety of aspects and levels of the three key dimensions of the assessment framework (household capacity, organizational capacity, and social capital). The results drawn from the field case studies, interviews with households, key informants, the researcher's observations, and secondary sources were organized according to the post-disaster recovery assessment framework. Where appropriate, the findings have been summarized into bar graphs in order to provide a visual presentation of the data collected and information gathered. Likewise, where possible, the data and related information were subdivided to represent the four selected areas in order to reveal a more nuanced picture for the creation of a resilient post-disaster recovery assessment framework.

Chapter 6: Discussion

6.1 Introduction

This chapter highlights the complex relationships among social capital, resilience, and post-disaster recovery that have been experienced in the City of Jeddah since 2009. First, this thesis outlined the literature review that was conducted with an interest on establishing the connections between household capacity, organizational capacity, and social capital and its role in flash flood disaster recovery. Second, the thesis described the data collection, analysis methods and case study locations as well as the initial resilient post-disaster recovery framework used to guide the research. Research results were laid out in chapter five, a chapter which makes connections between the City of Jeddah and flash flood data collected from the field and academic literature to provide both case-specific insights into resilient post-disaster recovery as well as insights for other jurisdictions and hazards. The chapter concludes by outlining the modifications to the conceptual framework. One of the goals of this study is to open new avenues for researchers to explore when assessing the post- disaster resilience of communities, based on evidence.

Starting with empirical contributions, the first section of this chapter provides an assessment of the long-term recovery efforts after the 2009 and 2011 Jeddah flash floods, which clearly links the evidence in chapter five to the concepts of household capacity, organizational capacity, and social capital outlined in chapter two (Literature Review chapter). This section also examines how the research provides further evidence to support and extend previous research. The second section of this chapter reviews the methodological contributions of using the resilient disaster recovery approach as a framework for assessing long- term recovery efforts. The RPDR-AF was developed to be able to connect post-disaster recovery to the key concepts in light of the

literature related to disasters and hazards. This section emphasizes the positives, as well as the difficulties associated with the research's conceptual framework. Presented at the end of the chapter, insights from the results section are utilized to modify the RPDR-AF model.

6.1 Post-Disaster Resilience

Many scholars refer to resilience as the resources and capacities that allow communities and societies to withstand a disaster event or to be restored following an event (Paton, 2006; Ronan & Johnston, 2005; Foster, 1995; Joakim, 2013). In Chapter Two, one of the key conceptualizations of resilience focused on three themes: recovery, resistance, and creativity. These themes emphasized the capacity of individuals, households and communities to absorb the effects of hazardous events, to recover rapidly after disasters, as well as to have the capability to learn, renovate, mitigate and adjust to future stresses and shocks (Adger, 2000). The following section explores resilience related to these three themes. Further discussion related to several of these ideas is explored in more detail throughout this chapter.

6.1.1 Recovery, Resistance, and Creativity

The role of religion in supporting the recovery efforts is a key finding of this research. During the interviews, the spirit of giving, support, and solidarity grounded in Islamic beliefs and teachings were consistently expressed, all of which contributed to feelings of togetherness within the communities at the four selected sites. Several household members mentioned that this was an essential source of social and spiritual support during and after the flash floods. About 90 % of the interviewees confirmed community solidarity, founded on religious teachings and encouraged by the imams, as a factor providing strength for effective recovery. Religious leaders also played a significant role in alleviating psychological trauma while helping those affected by the disaster.

Social capital relationships and organizational capacity was also a key during the recovery period. Almost all the people interviewed stated that they received immediate assistance from family members, blood relatives, and neighbours during the aftermath of the disaster that helped their recovery. In addition, more than 90 % of the household members interviewed strongly believed that community volunteers accelerated the recovery process. The field observations also revealed that social and religious organizations were highly effective with respect to providing services to community members during and after the floods, and were therefore an important factor in increasing organizational capacity and effective recovery to the community within the City of Jeddah.

At the three wealthier study sites, Rughamah, Nakheel, and Goyzah, the recovery processes were hindered due to the extended time and greater effort needed to rebuild the homes in those sites: many of these homes had not been originally built in compliance with local bylaws and building codes, and these wealthier communities had much more to lose and rebuild as compared to poorer communities. Thus, although these areas generally demonstrated higher levels of household capacities, their recovery processes were hindered due to the longer time and greater effort needed for rebuilding the homes in those sites compared to Mraykh, as well as the higher costs of returning to pre-disaster levels. As previously quoted (Section 5.1) by Ali Khan, one of the survey participants, some residents lost everything they had worked hard to build and acquire. Following the floods, this has prompted many residents in these areas to more carefully abide by the building codes as they rebuild, and to avoid building on the lands located in the likely path of future torrents and water aggregation locations. In this sense, the floods can be seen as a ‘window of opportunity’ where the household-level post-reconstruction actions have the potential to contribute to higher levels of future disaster resilience.

When comparing across the four study sites, it was clearly evident that the status of Mraykh as a community of illegal immigrants negatively impacted their household-level post-disaster recovery. Factors that led to increasing vulnerability, thereby reducing resiliency levels included: 1) the community's geographical location at the foot of the mountains, where watershed flood water gathered and rushed towards the city; 2) the semi-isolation of the area from the other neighborhoods of Jeddah city; this is a place where illegal immigrants have less visibility from government agencies responsible for prosecuting illegal immigrants; 3) the lack of government response and recovery support; 4) low education and literacy levels; and 5) decrepit houses and lack of infrastructure (see Figure 4.5).

Paradoxically, despite these vulnerabilities, the Mraykh community participants claimed that they recovered more quickly than any of the other three communities: almost 80 % faster. According to the interviewees, Mraykh's faster recovery rate not because of their high resiliency level, but due to the simple structures of their houses (e.g., brick walls and light wooden ceilings), which did not require a huge amount of time, effort, or money for repair or reconstruction, in addition to their skills in the construction work, as most of them are workers in the construction and maintenance jobs. Moreover, because most of the residents were illegal immigrants, they had comparatively less furniture; old models of low value vehicles, electronics, and appliances; and almost no collectibles (Section 5.1, Figure 5.7).

As indicated in the comments from Mraykh resident Ghulam, (Section 5.1), residents could not recover on their own so they needed the assistance of NGOs, while wealthier communities did not need outsiders help as much. That said, it should also be emphasized that this rapid recovery returned residents to their low pre-disaster resilience levels and that, restoring a community to such pre-disaster levels should not be considered sufficient; vulnerability to the risk of future disasters remains high. Since recovery operations and efforts in the aftermath of a

disaster event create critical conditions and windows of opportunity to increase resilience to future events (Wood et al., 2013), returning Mraykh residents to a vulnerable condition is counter-productive to long-term sustainability for the City of Jeddah.

Returning to the key dimensions of resilience, the capacity to absorb and withstand an initial impact is another essential element (Haines, 2009). Many studies have surveyed a wide range of hazardous events including technical and natural disasters, and several researchers indicate that addressing risk perception can be used either to reduce the risk or to improve resiliency (Ho, Shaw, Lin, Chiu, 2008; Martin, Martin, & Kent, 2009). In the case of the 2009 and 2011 Jeddah flash floods, the secondary data including the information from NGOs, humanitarian aid organizations, and news channels shows that the majority of residents of the four selected sites did not acknowledge living in a flood area. In addition, participants noted that they were unaware of the emergency procedures or did not know what to do in the event of a disaster, as a result of lack of awareness and training (e.g. some interviewees noted that training “does not exist” and others indicated that there is no disaster education programs in schools). It is argued that this lack of knowledge and awareness lowers the capacity of residents to absorb and withstand the initial impacts of disasters (Alshehri et al., 2013).

In order to increase the ability to absorb shocks, hazard awareness must be raised among the community through lectures, workshops and cooperative training courses, and through the publication and distribution of educational brochures and booklets on risk education (e.g., short disaster risk reduction videos distributed via social media). This program should entail close cooperation with community organizations, in particular local households. In addition, as Pelling and Dill (2010) and Minamoto (2010) observed in their studies, some participants believed that more effective coordinated efforts and unified messages from government, NGOs, CBOs, and religious leaders can effectively support and promote community acceptance of

initiatives aimed at reducing the risk of disasters. Therefore, it would also likely be important that any awareness and education initiatives for residents in Jeddah are undertaken with unified and coordinated messaging.

Following the floods, civil defense authorities have become cognizant of the need for such awareness-raising. Recently, they have introduced a program integrated with those of other relevant government departments and non-government entities, to raise and maintain public awareness through lectures, short workshops, and interactive training sessions and through the publishing and distribution of educational brochures and booklets about risk awareness. These programs will entail close cooperation with community-based organizations, in particular local households.

Another important approach to increasing resistance is through the implementation of flood-resistant building standards, appropriate land use, and a properly planned building drainage infrastructure system. Interviewees and field observations suggested that most of the damaged houses in all four sites appeared to have been constructed without adherence to building codes and in contravention of city bylaws. Thus, enforcement of current policies, especially during post-disaster reconstruction, should be a crucial first step towards increasing resilience. In the future, developing a building code that requires hazard resistant building practices would further avoid loss of wealth and lives, and strengthen resilience. For instance, as noted from the field observations, re-designating a building's ground floor for parking and storage from its pre-flood use as residential apartments might diminish flood losses.

The third theme identified with resilience, creativity, is related to the idea of increasing the functionality and resiliency of the community after a disaster event. In this sense, creativity is the process of mitigating and “adapting to new circumstances and learning from the disaster experience” to create communities that have achieved greater resiliency and functionality

through the recovery process (Maguire & Hagan, 2007, p.17; Adger, 2000). In terms of household and organizational capacity as well as social capital, creativity and resilience for Jeddah City during and after the flash flood of 2009 and 2011, several external and technical adaptive measures have been implemented. From the field research, it was observed that many households have begun to purchase four-wheel drive vehicles capable of handling some flood inundation instead of ordinary passenger cars. Based on several incidents, it should be noted that four-wheel drive vehicles cannot withstand the torrent in some sloping places characterized by rapid decline. In terms of homes, most of the home owners, especially those located near major flood pathways have begun to install water suction pumps inside their houses' yards which enable them to extract water from inside their houses in case of future floods, and to minimize losses and unwanted surprises.

Other indications of creativity and adaptability are also notable across the three dimensions of the RPDR-AF. These include the aforementioned upgrades to the homes in three of the areas and the emergence of several weather prediction sites (e.g., Arab weather, Jeddah weather, ask Jeddah, etc.), a topic that has become the daily concern of the community that did not exist in the past. In addition, the emergent growth of groups and organizations that can provide humanitarian assistance services and rescue operations for the community is another important development, e.g., Emdad-SA, Civil Protection Volunteer Institution, Jeddah Volunteer Club, Dallah Academy for Volunteerism, etc.

To summarize, the role of social capital and religion in supporting the recovery efforts is a key finding of this research. Social capital relationships and organizational capacity was also a key during the recovery period. Almost all the people interviewed stated that they received immediate assistance from family members, blood relatives, and neighbours during the aftermath of the disaster that helped their recovery. The field observations also revealed that social and

religious organizations were highly effective with respect to providing services to community members during and after the floods, and were therefore an important factor in increasing organizational capacity and effective recovery to the community within the City of Jeddah. On the other hand, it is argued that this lack of knowledge and awareness lowers the capacity of residents to absorb and withstand the initial impacts of disasters. Another important approach to increasing resilience is through the implementation of flood-resistant building standards, appropriate land use, and a properly planned building drainage infrastructure system. In terms of household and organizational capacity as well as social capital, creativity and resilience for Jeddah City, several external and technical adaptive measures have been implemented e.g., upgrades to the homes and the emergence of several weather prediction sites.

6.2 Integrating Religion into Household Capacity, Organizational Capacity, and Social Capital

As the research unfolded, it became increasingly clear that it was important to bring religion into the three dimensions of the model (household capacity, organizational capacity, and social capital). The contemporary literature outlines several prominent reasons for the damage caused by the floods in the City of Jeddah; much of which emphasizes the spatial and geographic physical features of the city area. For instance, Youssef et al. (2016) maintained that important factors include: (1) Geological setting of the city; (2) Abrupt rainfall and insufficient natural drainage in the existing watershed; (3) Topographic features; (4) Settlement in the vulnerable areas; (5) Less preparedness beforehand, and (6) Lack of citizen and authority awareness.

While all of these factors are clearly important, one of the key focus of this research has been on a missing link that is fundamental to understanding and assessing resilience within the context of KSA and the City of Jeddah; the role of religious influences and associated social capital, and its integration into all aspects of decision-making and disaster resilience. Hence this

work builds on studies by such researchers as Joakim and White (2015), Minamoto (2010), and Eriksson et al. (2009). This is in contrast to much of the available research in English, which has often been conducted in secular societies. In these studies, models of resilience tend to play down religion or include it as a minor category (e.g., Murphy, 2007; Al Saud, 2010).

The results from this research place the role of religion front and center and suggest that the integration of religious leaders and religious organizational structures into disaster management planning could help minimize the impacts of future flash floods or other disaster events.

It is important to note that one of the reasons religion has contributed substantially to disaster resistance during the floods is that this society in Saudi Arabia is almost homogeneous in terms of faith and Islamic religious beliefs, although there are a few non-Muslims residents. The literature has demonstrated that internal coherence increases social bonding and decreases disaster response and recovery complexity (Section 2.6.4.1). Thus, in many communities it was less complicated for the governing organizations, volunteers, non-profit organizations, and religious institutions to take quick actions; it might not be this easy and clear-cut for disaster recovery efforts in other socio-economic and geographic contexts. In KSA the civil chain of command was highly reliant on the support from religious leaders. Residents obeyed the decisions when these came from the religious leaders in their community, which might not be the case in other jurisdictions.

Given the ongoing importance of Islamic practices as playing a key role in Saudi daily life, one of the novel contributions of the RPDR-AF is the explicit inclusion of religion as one of the influential aspects in all dimensions of post-disaster recovery. Within households, religious beliefs are considered an important pillar of the integration and protection of family members, as well as a factor in the preservation of the coherence of the family through an authoritative

organizational structure, whereby the head of the household usually makes major decisions. The family meeting several times a day to perform prayers collectively also has a profound impact in increasing family cohesion. In addition, the Holy Quran is the supreme authority that governs the various facets of daily life, as well as social, political, and economic interactions. According to the educational curricula, religious studies are taught at all school levels as well as in colleges and universities (Alshehri et al., 2013). Study participants continually highlighted the importance of religion. For instance, in the aftermath of the flash floods, several participants noted that (1) they trusted in the imams and that following the instructions given by the clerics increased household capacity to facilitate reconstruction; (2) religious clerics gave religious tips quoted from the Holy Qur'an and the Prophet Hadith to local organizations and the younger people who took those teachings seriously were prompted to increase their flood response volunteer efforts; and (3) the community was grateful for the use of religious buildings and organizations to distribute aid and assist in reconstruction efforts.

Indeed, religious leaders have a very strong influence in the Saudi society. The results section of this study demonstrated that, due to the trustworthy characterization of the religious leaders in the community, they played a strong, pivotal, instrumental role in raising awareness about disaster resilience and disseminating information about how to prepare for disasters and recover from their impact. In the result section (5.6.1) of this study, it is interesting to note that in all of the four studied communities, almost 90% or more respondents agreed that they could easily rely on the religious imams for future guidelines for the rebuilding processes of the communities. These results are similar to Bagir (2012) who found that when communities need trusted figures for guidance and support, religious leaders may act as authority figures, particularly in situations involving a lack of trust between communities and government agencies.

As discussed in Chapter 2, at the organizational level, religious activities and spaces can provide a key contribution to disaster resilience (Clarke, 2006). In Islamic culture, Masjids and Jawami are not only buildings or places for static worship but also have a continual role in the teaching and memorization of the Quran, the encouragement of socializing among the community members, the hosting of a number of social and religious events and celebrations, and more. Likewise, in KSA society, people trust and are highly dependent on the messages and recommendations of the religious leaders during disasters and difficult times. In KSA, the Masjids and Jawami (mosques) can play a crucial role in delivering important messages to local residents, who usually come for prayer five times daily, as well as every Friday. It is important to note that Friday is one of the important days of Islamic culture when every Muslim is obliged to perform prayer at noon in the Masjid. So, if the authorities want to introduce disaster management plans, it is important to start working with the religious leaders to involve people during Friday prayer with some brief important messaging towards the community.

While the impact of religion was observed at all four field sites, the influence in the Goyzah community is particularly notable. The site is known locally as having the most religious activities due to the number of strong religious leaders residing there. The residents of Goyzah tend to be strongly committed to attending mosque for all five daily prayers, which participants felt contributed significantly to increasing their knowledge of religious teachings as well as deepening linkages between residents and between residents and local authorities. According to several interviewees, this contributed to increased social capital benefits including opportunities to exchange information on how to obtain the necessary assistance and compensation for better and faster reconstruction and recovery.

Despite views that would appear to suggest a negative impact from fatalism tied to religious beliefs, the majority of interviewees reported that their religious faith provided them

with a source of strong resilience and recovery mechanisms when the 2009 and 2011 flash floods occurred and also during the post-disaster periods. On the one hand, some pessimistic religious leaders may misconstrue the disaster as a punishment from God (Alshehri et al., 2013). Referring to the literature review of this research, such promotion could diminish disaster mitigation and hinder preparations because it denies human responsibility for creating low levels of resilience (e.g., choosing unsafe locations such as floodplains for buildings, employing poor construction materials and techniques, etc.)

On the other hand, in the case of the four field sites, the trust and belief of people in Allah (God) provided very strong motivation for residents to accept and acknowledge proactive participation and risk-mitigation processes. As Joakim and White (2015) also concluded, the field observations and survey results for all communities revealed that the Islamic religious faith and worship practices were important elements of response during the disaster events and post-disaster recovery processes following the flash floods. As mentioned in the literature review (Section 2.6.5), for many religions, the practice of praying during critical times and disasters is a spiritual link between the believers and the God who controls the world around them according to their Islamic beliefs. The majority of household members at the selected sites stated that their shared Islamic beliefs and reflections on the worldview and perspectives of the events increased their solidarity and accordingly strengthened their recovery. According to the imam's sermon, this event awakened the society from their ignorance of religion and worship and reminded them that on the Day of Resurrection everyone will return to God. In the wake of the floods, his words prompted residents to do more giving and good deeds that will be of benefit to them on the day of Day of Resurrection. In summary, the research demonstrated that any disaster-related negatives associated with religious fatalism were more than counteracted by the positives associated with

religiously-based social capital, organizational structures, and religious leaders, all of which could be tapped into during times of disaster.

The findings of this research are also similar to that of Chester and Duncan (2010) who explored some missing links related to disaster response and recovery that psychological trauma was not clearly identified within religious dimensions. Likewise, in this study many household members indicated that they had struggled with issues of psychological trauma, access to available resources, and lack of hazard awareness. The research demonstrated that religious leaders played a significant role in alleviating psychological trauma while helping those affected by the disaster. They delivered speeches and lectures and offered spiritual recommendations to their community members in a variety of formats, such as media broadcasts, focused meetings, and weekly congregational services for Jumma prayers.

In addition, the results of this research are also consistent with the work of Joakim and White (2015), who studied the influence of religious confidence, leadership, and networks on the response and recovery of disaster-affected populations affected by the 2006 earthquake in Yogyakarta. They concluded that religion provided an important source of resilience in the aftermath of the earthquake, particularly by providing spiritual and psychological strength, and that religious interpretations of disasters do not necessarily have to be seen as a source of vulnerability, but can be understood as alternative worldviews that provide opportunities to facilitate disaster risk reduction and preparedness for future events. They found that faith and religious reactions were important elements in post-disaster responses and the development of strategies for a resilient recovery. In the same way, many participants in this research expressed their appreciation for the role of prayers and sincere faith, as well as the desire to be a good person and to prepare psychologically for future disasters.

In agreement with the notion proposed by Putnam (2000), who suggested that religious participation is an important source of social capital, empirical analysis of the results of this research included an examination of the relationship between the participation of religious leaders in terms of providing emotional and psychological support that acted as spiritual healing for alleviating the trauma, and the various aspects of social capital, including volunteering, inter-organizational networking, provision of support for families, and involvement in support groups.

While it has been demonstrated that this research corroborates the findings of several existing studies, it is also important to point out how the current study extends the existent literature about the role of religion as a key element of resilience. As the research unfolded it became increasingly clear that it was important to bring religion into the three dimensions of the model (household capacity, organizational capacity, and social capital). Post-disaster recovery systems usually deal with economy, environment, society, and the rebuilding process of health and addresses trauma that were experienced by the communities (Olshansky & Johnson 2012). However, religion did not come up as a predominant theme in the majority of the literature. For instance, in this case of this research, it was experienced during the interview processes and informal and formal talks with the community members that they were highly motivated and influenced by religious decisions and directives instead of government initiatives alone. Therefore, it became increasingly clear that religion should be highlighted as a key component of all aspects of post-disaster recovery, rather than treating it as a separate category.

6.3 Household Capacity

According to Lindell (2013), the four main social entities involved in the recovery of a community after disaster events are government agencies, civil society organizations, local and national businesses, and household capacities (and this research argues that a fifth entity, religious organizations, is also important in some contexts). Businesses and households are

responsible mainly their own recovery, while government and civil society organizations share collective responsibility for post-disaster operations and the recovery of the overall community (Lindell, 2013).

The main consideration associated with post-disaster household recovery is the effectiveness and sustainability of household capacity, which, at minimum, refers to the ability of household members to return to their normal lifestyle after recovery. According to research studies, the capacity of households is affected by the number of people living in a given home, their levels of education, their access to community organizations, and their connection to local religious and social associations (Haviland, 2003). From a disaster risk reduction perspective, post-event, the ultimate goal would be to progress beyond current resilience levels and increase capacities to deal with future events.

As demonstrated in the results chapter, many factors contributed to household capacities in the City of Jeddah. At the broadest level, according to emergency-management experts and disaster planners, household emergency assistance and relief aid can sometimes be delayed. For that reason, they advise that individuals and families should be prepared to be self-sustainable and self-recoverable for at least the first 72 hours after a disaster, (Muttarak & Pothisiri, 2013). In the Jeddah research, many respondents were either unaware of emergency procedures and measures or unprepared through a lack of disaster drills and thus did not know what to do or how to act in the event of a disaster. For example, some participants stated that no disaster resistance or recovery training programs existed. Others indicated that there were no proactive practical training programs, such as fire and hazard drills in schools or other public buildings.

Significantly, it was observed in this research that some of the household aspects related to household composition seemed to have greater impact than others (e.g., age, education, and individual faith). Empirical analysis of the results (see 5.1 of the Results section) suggests that

people with higher education were more likely to be aware and had a better capacity for effective and efficient recovery in the study areas. For example, the Nakheel neighbourhood was inhabited mainly by people with higher educational qualifications (see 4.9 of characteristics of the case-study sites and Fig. 5.4). As explained during the interviews, they were able to access, understand, and promote information related to the disaster from a variety of sources, such as websites (Civil Defense, Presidency of Meteorology and Environment, and Saudi Geological Survey (SGS), social networking sites, and the media. As a result, they were considerably more likely to cope with disasters and thus reduce the burden on the government during disasters and pave the way for a rapid recovery after the disaster. For instance, a faculty staff member who was trapped inside the university building for several hours due to the submergence of all streets around the university used his cell phone to communicate with government agencies and friends to find the safest route and to determine the appropriate time to exit the building. As a result, he was able to get home faster than others who did not have access to information, enabling him to more quickly begin his recovery activities.

Since literacy rates are associated with a certain degree of formal education and linked to vulnerability reduction (Ivanov & Cvetkovi, 2014), this research supports the need to increase literacy rates for all its citizens. Based on the collected data, literacy rates among the older people were quite low (less than 15% as discussed in the Results section). Of the four sites, the lowest levels of education and associated reduced literacy rates were particularly observed during the field work at the Mraykh site where interviewed participants had greater difficulty understanding the questions posed to them by the researcher, as compared to the other three sites. In this regard, the research suggests benefiting from the services of the Jeddah Islamic Education Foundation, which aims to provide Islamic education in several languages to Muslims and non-Muslims communities by delivering booklets and organizing awareness seminars for the residents of these

communities. In addition the literacy rates among women are lower than for men, especially for elder women who are known to have the highest levels of illiteracy. In KSA women did not have the opportunity before 1960 to get an education; instead, they only received basic literacy and numeracy skills (AlMunajjed, 2009). While progress has been made in women's education, more needs to be done by the government to allow women equal opportunities in education this will contribute to raising the capacity for well-informed decision-making throughout Saudi society. (Al Munajjed, 2009). As a result of the higher level of education, women will be more likely to cope with disasters, thereby reducing vulnerability and increasing resiliency across KSA.

Older people are often overlooked in disasters and conflicts, and their concerns are seldom addressed by emergency programs or planners (Hutton, 2008). Until recently, the needs of older persons in situations of disaster and conflict were addressed only through broader health and humanitarian programs for adults. This has changed as many recent emergencies have highlighted the vulnerabilities of this population group (Hutton, 2008). In the literature, Ivanov and Cvetkovi (2014) stated that improved health and educational status helps to increase resilience and limit the loss of life during natural disasters. Furthermore, while community elders can provide wisdom based on their vast experience and historical knowledge of past events, seniors residing in a community might require higher-priority assistance from the community due to diminished physical abilities or health needs (Thomas, 2006). The results of this research confirm that, because they are highly respected in local communities, senior citizens played decisive roles during and after the flash floods, since younger people were generally accustomed to obeying their recommendations and advice (Section 5.1.1; Figure 5.1). Older study participants also clearly indicated that they relied on the younger generation volunteers during the disaster to provide evacuation and rescue services during the flash flood, reducing the death toll. Although younger age groups had the strength and stamina to undertake more

physically challenging work during response and recovery efforts, they also benefited from the sage advice from their elders.

Simultaneously, the results also show that, in many cases, young people can take on leadership roles, providing extensive assistance and offering volunteer support during and after the events. For example, Figure 5.16, 5.17 shows collection of relief supplies and provision of social assistance of younger community members. It was also evident that younger people had better access to information through the use of mobile phones and the Internet (see result section 5.4), enabling them to communicate with relief organizations to obtain available resources, which will contribute to higher resiliency level. Taken together, these factors have the potential to increase disaster resilience.

6.4 Organizational Capacity

As defined by Bryan (2011), organizational capacity is the ability of an organization to meet its goals. Organizational capacity has been a particular focus of scholars who seek to acquire an understanding of the variables that impact the organizational performance of a community (Bryan, 2011). Organizational capacity is a concept that has received increased attention from public and non-government organizations and has been the subject of studies published in the literature over the last several years (Bryan, 2011). The analysis of organizational capacity in this study identified problems associated with the limited cooperation, integration, and coordination among various stakeholders involved, including relevant governmental departments. Also highlighted was the negative impact of corruption and incompetence associated with some government agencies.

Over many decades prior to the 2009 floods (i.e., 50 to 75 years ago), the country had not experienced such devastating events. An earlier light flash flood in 2007 did offer the policy-makers significant opportunity to develop new policies and measures for building more disaster-

resistant and recovery-resilient communities; unfortunately, the opportunity was not utilized. The 2009 and 2011 flash floods provided additional momentum and valuable experience for the implementation of mitigation and resilience improvements (Abosuliman, 2014; Momani & Fadil, 2010).

Although emergency management plans for the City of Jeddah suggest the required resources were in place (Section 5.2), the reality was very different, and the flash floods of 2009/2011 exposed many weaknesses. However, these plans were not technically detailed with respect to specific forms of intervention, staff participation, or required logistics, nor were problems prioritized, response procedure scenarios prepared in advance, or flood training drills conducted. For example, while the mandate of the Ministry of Defense was to defend the country and maintain a strong chain of command, the Ministry of Planning and the Ministry of Interior had established as a priority the preparation of regional emergency master plans and their implementation through a regulatory framework, including in the City of Jeddah (Chapter 3). According to the research findings provided in Section 5.2, none of these organizations had, in fact, set any truly useful priorities for emergency or rescue responses as a disaster unfolded. People were also unaware of the tasks to be performed by the different government organizations during events such as flash floods. As a result, they were often confused with respect to which organization to turn to for help (see Section 3.7).

According to Momani and Fadil (2011), no comprehensive disaster warning system was in place. The Civil Defense Department was ill-prepared for tasks under its purview, such as retrieving human remains and addressing the inadequate and ill-maintained drainage system (Abosuliman, 2014) (Section 3.6.2; Table 3.2). In addition, lack of cooperation, integration, and coordination between the Civil Defense Department and other relevant government organizations, such as the Ministry of Health, the Ministry of Transportation, and the Ministry of Municipal

Affairs and Rural Areas, resulted in the lowered resilience and greater vulnerability of the impacted communities.

The field observations also revealed that social and religious organizations were highly effective with respect to providing services to community members during and after the floods and were therefore an important factor in increasing organizational capacity and effective recovery to the community within the City of Jeddah. As shown in Figures 5.15, 5.16 and 5.17 and corroborated by interviewees these organizations actively contributed in distributing housing supplies and providing relief and other services, such as non-perishable food supplies, drinking water, blankets, beds, babies' supplies, medicine, etc. Religious institutions were used as centers to receive and distribute aid to those affected people and since imams have extensive knowledge of the families in the neighborhood surrounding the mosque, their role was important in guiding social organizations and volunteers during the delivery of aid to families in need.

6.4.1 Post-Disaster Capacity Improvements

Based on the conclusions drawn from the interviews with citizens, residents, key informants, and major stakeholders who play a part in disaster-management decision-making processes, it was found that several awareness-building initiatives, which had been repeatedly neglected prior to the 2009 flood, were subsequently put in place by government authorities. Since 2009 the Saudi government has also carried out a number of major infrastructure projects in an effort to guard against such disasters (Arab News, 2012). These include the building of seven dams, the expansion of existing canals in Jeddah, and the construction of a new canal near to King Abdulaziz International Airport north of the city (The National, 2014).

According to one key informant, the Makkah Area Crisis and Disaster Management Center (CDMC) has been set up in Jeddah City, which will improve the capabilities of the Civil Defense and other government and non-government agencies to manage crises and disasters. It

will offer improved technologies for communication between the agencies to gather and disseminate information about the nature and extent of crises (ARUP, 2012). The Center also monitors the weather and weather conditions, as well as sensitizing citizens and residents to potential dangers through various media and social media through the Emirate website in the Mecca area. Recently, a training plan has been developed, including training courses and lectures for the Center's staff and visits to the government sectors to exchange experiences and work on self-development (Al-Zahrani, 2014).

Within the social sphere, recent political and social reforms have provided an opportunity for the establishment and strengthening across the KSA of many social organizations at both the local and national levels, interest-based youth groups, women groups, organizations for people with disabilities, special needs groups, labor organizations, and others (e.g., CBO, NGO, social and religion organizations). According to the case-study results, these organizations focused on different areas of interest, actively participating in the recovery efforts. They were part of the team that assisted with the distribution of relief aid and the implementation of recovery help programs. The contribution of the CBOs clearly emphasizes their growing importance to post-disaster recovery with the City of Jeddah and KSA. Neighbourhood leaders spearheaded the collection of data and the distribution of aid in their areas, and women's organizations and female volunteer groups provided a significant contribution by helping impacted women and children, since social and religious custom generally restricts men from interacting with these groups. Women's associations provided many services to the affected communities, including maternal and child health, social care, and assistance with financial matters. As observed during the field interviews, most CBOs worked closely with masjid and other religious organizations across Jeddah, because, in most cases, members of the CBOs are also members in their local masjid. In addition, many social organizations (e.g., World Assembly of Muslim Youth, Muwatana, and

Friends of the City of Jeddah), were actively involved in providing relief, aid, and assistance services. They also provided valuable help by conducting field surveys, distributing donations, cleaning homes, and dispensing information brochures.

6.4.2 Access to Help from Formal Organizations

As noted in the literature review and revealed by the research results, connections between the selected Jeddah communities and local, provincial, and federal government organizations were critical to effective disaster response, but very difficult to manage during the disasters. For example, there was no prior coordination or meetings between representatives of these organizations on how to deal and coordinate aid during disaster events.

Although the formal entity most responsible for helping their constituents during and after a disaster is the local government prior to 2009, senior government officials lacked expertise in disaster management, so they were unable to deal with the situation as effectively as needed (Abdullah & Othman, 2015). Nonetheless, the local government of Jeddah did respond after the 2009 and 2011 disasters by offering a number of forms of assistance to increase the resilience of the communities: monetary compensation, relief aid, the establishment of reporting centres and communication systems, the provision of temporary shelters, and organization of rescue teams.

Overall, according to the statements of the interviewees and the research findings, government initiatives during and after the 2009/2011 floods were generally praised by the majority of Jeddah residents. Access to government help was provided to many who were affected and included not only compensation but also shelter and necessary living supplies such as food, water, blankets, beds, and medicine.

Despite the generous help provided, the participants maintained that the government response tended to favour some groups over others, which was especially evident in the marginalized Mraykh community (Site 2). In the Mraykh area, there was no government-

provided shelter initiative. Most of the aid received at the Mraykh site came from NGOs and relatives or friends. Government authorities confirmed the fact that most of the populations of Mraykh were illegal immigrants, which translated into a lack of detailed information about their numbers and the type of assistance needed. Interestingly, despite this fact, imams and religious leaders continued to urge people to provide aid and assistance to affected people regardless of their ethnic and religion backgrounds, and reminded residents of these acts as mentioned in the holy Quran and by the Profit Hadith.

6.5 Household and Organizational Compliance with Regulations and Bylaws

Jeddah's urban and land-use planning bylaws and rules were professionally developed and documented by the councils of the municipality of the City of Jeddah. Yet, the research demonstrates that the lack of government enforcement of land-use planning regulations and building codes, as well as administrative corruption, were important factors that increased the scale of the disaster, the number of casualties, and the amount of physical damage and monetary loss. These findings are in line with the views of Wagner (2010, Table 3.2). As reported by *Arab News* (2011), King Abdullah ordered the prosecution of about 50 municipal directors and individuals for corruption resulting from improper land use and illegal construction projects. Corruption has also been blamed on how to allow homes to be built on flood plains. Although Saudi culture encourages strict moral behaviour, the historical context of nepotism (the practice among those with power or influence of favoring relatives or friends) has contributed to high levels of corruption in government and public spheres (The National, 2014), suggesting there are limits to the influence of Saudi culture on morality.

In addition, the research results confirmed that due to the absence of or poor building-inspection practices, bylaw enforcement, and routine sewer line inspections, homeowners also paid very little attention to respecting and obeying urban and land-use planning bylaws or

building codes and regulations (Section 5.2.2; Figure 5.9). According to the regulations governing building permits and living standards prescribed by the Municipality of the City of Jeddah, damaged buildings are deemed unsafe for habitation until they are returned to a livable condition and declared safe to reside in, as assessed by the municipality. Despite these regulations, as observed during the field work, some people had rebuilt their dwellings on unsafe land lots and continued to live inside their damaged houses. Some respondents reported that they had never heard of any building codes or construction licenses, nor had they ever seen any oversight or inspection bylaws enforcement officers. It is thus evident that the lack of enforcement of municipal legislation related to urban and land-use planning, building codes, and regulations represents a major contributing factor in increasing household vulnerability and decreasing community resilience.

6.6 Social Connections, Social Capital, and Recovery

Lin (1999, 2001) states that social capital consists of social connections and commitments between members of a group characterized by two major features: robust social networks and the availability of resources that can be shared via the network ties. It is generally understood that individuals who are networking successfully in their personal life are also considered to have better social connections with their immediate community network than those who do not. A number of scholars have described networking as an essential element of social capital (Bhuiyan, 2005; Burt, 2000; Putnam, 2007; Woolcock & Narayan, 2000). According to Sobel (2002), strong bonding, bridging and linkage relationships have proved to be a positive contribution to the overall recovery of the community. In line with the claims of scholars such as Putnam (2000) and Aldrich (2012), in Saudi society, social capital includes various formal and informal social bonding connections that exist within a single community and/or enable it to bridge and link to other communities.

Culturally, the Saudi people usually first trust and rely on those individuals and groups who are known and familiar, with broader organizational interventions becoming a factor only later on. Moreover, common feedback from most interviewees emphasized the importance of the role of cultural organizations and groups in providing relief and recovery assistance for impacted residents of different cultural and ethnic backgrounds, which could indicate a tempering of the common tendency to focus on providing aid to those from within one's own circle, rather than to outsiders. Moving forward, these social networks can be strengthened even further, for example, through the organization of social activities that engage community members on a regular basis. Such social events and gatherings would provide residents with the opportunity to get to know one another and develop a stronger sense of togetherness and inclusion.

The majority of the interviewees (both household members and key informants) placed considerable emphasis on the value of the bonding social capital they experienced during the recovery process. The generous relief aid and recovery help offered by household members and kinship networks were indicative of the close relationships among the residents of the four selected sites, which played an important role in their post-flood recovery. Likewise, when the interviewees were asked what gave them strength to recover from the disaster, the majority of respondents mentioned that relationships and social bonding within the community made their neighbours feel like part of their extended family, and that these relationships were regarded as an important support mechanism.

In regard to linking and bridging social capital, 80% of the key informants stated that these relationships were robust for all of the impacted areas, except for the Mraykh site, where the illegal status and location relatively far from the other three sites (see Figure 4.3), somewhat isolated them from any other neighbourhood areas. The lack of linking and bridging social

capital negatively impacted the amount of aid and recovery initiatives that were provided in this location, thereby reducing resilience levels.

Most interviewees strongly endorsed the importance of bridging social capital during the disasters. For instance, the interviewees reported that the residents of the affected sites used cell phones as a first means of communication to spread news about the flooding and ask for help. From Figure 5.8, it can be inferred that in all four areas of study, participants noted that the rapid communication of mobile phones enabled them to seek help from relatives and friends who live across the city who own trucks that can help them get their vehicles out of the flood, and provide them with the necessary assistance (e.g., food supplies, drinking water, blankets, medicine.. etc.). Continuous communication through cell phones and social media encouraged everybody to help so that reconstruction efforts could proceed efficiently and effectively.

As suggested by Joakim (2013) and as evident in the case-study results, during the recovery work after the 2009 and 2011 Jeddah floods, many respondents noted that connections between residents and external networks (i.e., bridging and linking social capital) constituted a primary method of accessing external assistance. Communities with higher levels of external links tend to be able to obtain the necessary support and resources. For instance, within Nakheel site, where a number of residents had external connections with religious leaders, cultural organizations, NGOs, and high-ranking government officials, these networks were key resources with respect to obtaining needed assistance. As a result, Nakheel residents have been able to recover efficiently and increase the resilience of the community.

6.6.1 Emergent Volunteer Support

As mentioned in the literature review, disaster-affected people often do not have immediate access to basic needs, especially if the disaster is very intense and continues for several days (Dynes, 2006; FEMA, 2004). However, in the case of the Jeddah flash floods, the

floodwaters abated relatively quickly so that, with the help of volunteers, impacted residents had relatively quick access to information and evacuation centres. In spite of the outstanding efforts of all stakeholders including volunteers, damaged roads dramatically hindered rescue operations, preventing ambulances from entering some parts of the study areas and delaying rescue and relief operations. According to the research findings, emergency and relief operators were often either not knowledgeable enough about the extent of the damage or were unable to deliver aid within a reasonable length of time. In the wake of this situation, phenomenal community volunteerism was one of the major success stories related to the 2009 and 2011 post-disaster activities. The research findings confirm that more than 90 % of the household members interviewed strongly believed that community volunteers definitely accelerated the process of post-disaster recovery. Residents expressed satisfaction with the immediate community response (Section 5.4; Figure 5.18).

Beyond the general community efforts, the floods also led to the development of new volunteer organizations. According to Tierney (1989) and Murphy (2007), emergent organizations are groups that evolve to meet the needs of those affected by disasters that are believed to have been unmet by other respondents. These groups show new functions and structures (e.g., ad hoc groups formed to provide search and rescue services, shelter victims, etc.). Emergent organizations are examples of the development of new social capital in the aftermath of the crisis (Dynes, 2002; Murphy, 2007). These organizations are often temporary; however some may convert into permanent organizations over time depending on the circumstances (Murphy, 2007; Drabek, 1987).

During the 2009/2011 floods, the growth and function of Emdad-SA, and the Civil Protection Volunteer Institution can be seen as two examples of social capital network development. Emdad-SA (Risk and Disaster Management Team) is a non-profit organization

established in 2010 after the 2009 flash flood. Its main goal is to manage crises and disasters in Jeddah. Members are committed to their core values and principles of neutrality, humanity, impartiality, and independence in providing their services. They support the efforts of local communities to strengthen their capacities with respect to monitoring disasters and providing early warnings (e.g., workshops, publish materials) as well as counseling afterward in order to reduce the risk of natural disasters, increase preparedness, and enhance mitigation efforts. According to the case-study results, Emdad-SA was actively engaged in providing support during the 2011 Jeddah flash flood.

Another emergent organization, the Civil Protection Volunteer Institution is also a youth team whose goal was to provide humanitarian services and rescue operations for communities affected during the 2009 and 2011 Jeddah flash floods. Other emergent organizations, such as Jeddah Volunteer Club, Jeddah friends, and Jeddah boys delivered flyers, collected donations and helped to meet the needs of vulnerable community members.

6.7 Modifications to the Initial RPDR-AF

The framework developed for this thesis was used to evaluate post-disaster recovery in Jeddah City, KSA. The developed framework provides a method for holistically evaluating whether recovery efforts have effectively increased the capacity of the city to withstand future events, and also addresses some of the causes of slow recovery and low resilience observed during previous events. The first version of the Resilient Post-Disaster Disaster Recovery Assessment Framework (RPDR-AF), whose structure is illustrated in Figure 4.1, depicts the foundations of the conceptual modeling framework used to guide the empirical research phase. Concepts of resilience and recovery that elaborate on the dimensions of households, organizational capacities, and social capital, were adopted in building the framework. This method was applied for the assessment of flash flood resilience in the local Jeddah community

because that city offered an opportunity for the critical analysis of resilient post-disaster recovery procedures and operations. The analysis afforded an opportunity to assess the strengths of these dimensions in the context of disaster recovery and to obtain insights with respect to the nature of the relationships among these dimensions in the context of the City of Jeddah. The final version of the RPDR-AF model presented in this dissertation, anchored by resilience thinking, the three concepts of household capacity, organizational capacity, and social capital, and the explicit incorporation of religion, has been developed through an iterative process of ongoing reflection of the extant literature relevant to the Saudi Arabia context and the collected empirical results. For example, at the family level (i.e., households), religious beliefs are considered as an important pillar of integrating family members, as the head of the household usually takes the major decisions. In the case of social capital, the religious affiliation of the community has a strong influence, empowering the people.

Resilience was a foundational concept in the model to guide understanding of the underlying processes impacting individual, household, and community ability to access and effectively utilize a variety of societal, personal, and organizational assets. The resilience perspective provides an understanding of the characteristics that contributed to the capacities to absorb, recuperate quickly, and transform after the flash floods. Through the RPDR-AF model, the research was able to highlight areas of low resilience that may have been missed in approaches focused on a more limited set of recovery dimensions. For example, many households indicated that they had struggled with issues of psychological trauma, access to available resources, and lack of knowledge on hazards. In the given framework, it has been demonstrated that there are interactive and compounding influences among household capacity, social capital, and organizational capacity resiliencies and vulnerabilities that contribute to the post-disaster recovery process. In contexts similar to the City of Jeddah, for instance, in

conservative Muslim countries, researchers may very well find similar empirical evidence. However, an important caveat is that the influence of these dimensions will likely vary in other socio-cultural systems and spatial locations.

Although other key authors have incorporated religion into their models, this model places the role of religion front and center. The role of religion and its influence on the society of the study area was one of the main factors that contributed to the modification of this model. The modified RPDR-AF suggests that the integration of religious leaders and organizational structures into disaster management planning could help minimize the impacts of future flash floods or other disaster events.

Building on these opportunities and experiences, the modified RPDR-AF can serve as a useful tool for facilitating an understanding of both the strengths and the challenges associated with increasing the resilience of post-disaster recovery and offered a new evaluative tool whereby recovery programming and outcomes were compared to an idealized conceptualization of resilient disaster recovery. This framework models both the key dimensions undertaken to assess post-disaster recovery as well as the study's evaluation process. It consists of 3 steps, assessment, analysis and processing and results (Figure 6.1).

The assessment of each affected community was focused on three main dimensions: household capacity, organizational capacity, and social capital. The assessment was based on the collected and analyzed data, which were obtained through interviews with local residents and other key stakeholders in the zones affected by the Jeddah floods. Municipal documents, inter-ministerial responses, and contingency plans that were reviewed as secondary sources of information, along with other sources such as media and NGO reports. The assessment process also incorporated input from decision-makers and implementers, those who were involved in ensuring sustainable development, and urban planners.

The final framework model was refined and modified based on the empirical analysis of the case study and the research results. Empirical analysis began with the development of a Likert scale assessment to undertake a review of the interview data and identify the pertinent sections of the interview recordings that needed translation from Arabic to English. Once the Likert scale data had been incorporated into a Microsoft Excel spreadsheet, descriptive statistics were generated. A visual representation of the data was provided through the use of graphs. For this research, drawing from the framework's key themes, Likert scale measures were used for quantifying household participant answers in a more systematic manner in order to facilitate the analysis and discussion of the results. The analysis afforded an opportunity to discover the advantages of these dimensions in the context of disaster recovery and to obtain insights with respect to the nature of the relationships among these dimensions in the context of the City of Jeddah.

Finally, the results drawn from the field case studies, interviews with households, key informants, the researcher's observations, and secondary sources were organized according to the post-disaster recovery assessment framework. Where appropriate, the findings have been summarized into bar graphs in order to provide a visual presentation of the data collected and information gathered. Likewise, where possible, the data and related information were subdivided to represent the four selected areas in order to reveal a more nuanced picture for the creation of a resilient post-disaster recovery assessment framework.

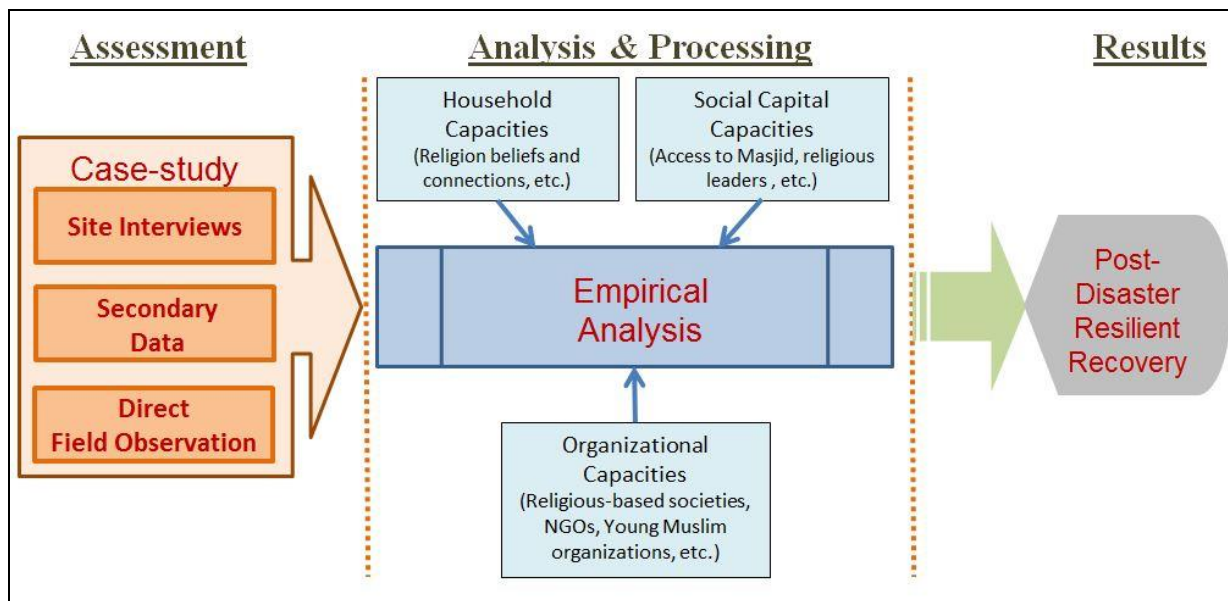


Figure 6.1: Refined Resilient Post-Disaster Recovery Assessment Framework

6.8 Research Challenges and Limitations

The conceptual RPDR-AF was used in this research for assessing the role of household capacity, organizational capacity, and social capital in resilient post-disaster recovery. However, in this research, as in any human-related studies, challenges and limitations were encountered during the assessment of the overall recovery effort:

1. Absence of baseline data or previous metrics due mainly to the lack of any previous detailed flash-flood research for the City of Jeddah: The researcher relied on as much limited data as was available to make meaningful comparisons and find connections between pre- and post-disaster conditions for a variety of stakeholders with a special focus on the three assessment dimensions. Most information regarding pre-disaster conditions was based on the information provided the interviewees and key informants.
2. Difficulties with the linkage between post-disaster conditions and recovery efforts using the RPDR-AF: The communities as a whole did receive relief aid and social assistance from several groups in the study area. However, some people did not receive the relief

and assistance as they were not able to receive any assistance nor did they seek help from any group.

3. The logistics of conducting the research was another challenge of the RDR-AF approach with regard to summarizing the information in a structured way so that a meaningful discussion could be undertaken and useful stakeholder recommendations provided. The wide range of information needed required a considerable amount of time and effort in terms of background information on a given disaster, a thorough understanding of contextual information, including language, culture, and customs, and opinions and perceptions from a variety of actors at various scales.
4. The terms and ideas associated with the RPDR-AF are virtually unknown in the Saudi Arabian context (e.g., lack of relevant Arabic literature, difficulties in translating the concept into local languages, lack of statements in official disaster preparedness documents, etc.).
5. Due to Saudi culture and traditions, I was not been able to interview women and obtain their perspectives.

6.9 Summary

The role of religion and its influence on the society of the study area was one of the main factors that contributed to the modification of the RPDR-AF. The results from this research places the role of religion front and center and suggests that the integration of religious leaders and organizational structures into disaster management planning could help minimize the impacts of future flash floods or other disaster events. The role of religion in supporting the recovery efforts is a key finding of this research.

The discussion in this chapter supports the assertion that prayers and worship practices were strong motivators in overall post-disaster response, and also delivered significant spiritual support for enhanced recovery and preparation for future disasters. Religious leaders also contributed to resilience through their perceived roles as trustworthy individuals who provided emotional and psychological support that acted as spiritual healing for alleviating the trauma of the disaster. It was also observed that due to some degree of political corruption, religious leaders held officials in authority accountable and responsible for working harder and more honestly to mitigate the impact of such disasters. In addition, religious buildings such as masjids and jawami have been shown to be an element of the social capital of a community. Along with their role in maintaining and raising morale and in increasing the level of faith, these facilities can also be used as relief and recovery hubs for activities such as collecting, distributing, and managing relief supplies, all of which can help ease the sadness and depression felt by the individuals affected.

This chapter has also highlighted the components of the refined framework, their empirical and methodological foundations, and the integration of three key dimensions. The framework suggests the need for an in-depth understanding of a variety of contextual and intervention programs at various scales at different locations to compare scenarios.

Also highlighted in this chapter were the conceptual contributions of the research. It was demonstrated that the empirical analysis and reflections on the research results contribute to a greater understanding and knowledge of post-disaster recovery, as well as the role of humanitarian relief organizations, religious institutions, and civil society organizations. For example, the research findings have shown that religious faith and worship practices were observed to be important influential support factors during the post-disaster response and the creation of recovery strategies.

Despite the current integration of government policies and decision-making systems with local, regional, and national disaster-management plans in the KSA, important key aspects remain excluded and could increase the resilience of Saudi communities. For example, organizational capacity was apparent in the three stages of emergency management planning: awareness, response, and recovery. However, this research recommends risk-reduction and disaster-resilience improvement programs for the consideration of disaster-management stakeholders with respect to the creation of more comprehensive and detailed scenarios so that the City of Jeddah can sustainably, efficiently, and effectively confront any future flash floods.

Chapter 7: Recommendations, Future Research, and Conclusions

This empirical research was conducted using a field case-study, divided into 4 sites, and a combination of qualitative and quantitative techniques. A research comprised semi-structured interviews and informal conversation, was developed in order to acquire an understanding of the ways in which people recovered after the flash floods that damaged their local infrastructure, undermined their social networks, and interrupted their regular lifestyles. This final chapter provides general and strategic recommendations to authorities for enhancing flood resilience and recovery in other Saudi communities at risk.

Based on the literature review conducted for this research, and building on the experience provided by the case study of the 2009 and 2011 flash floods that occurred in the City of Jeddah, KSA, the research identified current research gaps and emphasized the important roles of social capital, household capacity and organizational capacity in increasing community resilience for post-disaster recovery. A preliminary framework derived from the extant literature was modified following the analysis of actual experiences acquired from the 2009 and 2011 flash floods in the City of Jeddah. The RPDR-AF involves three key stages: 1) assessment, 2) analysis and processing, 3) results.

The objectives of this research were as follows: 1) Focusing on building resilience for post-disaster recovery in order to develop and test an evaluation framework that expressly incorporates religious dimensions, which have a significant impact on Saudi society; 2) Using the 2009 and 2011 flash flooding in Jeddah city as case study, to develop an assessment tool that incorporates factors and measures that contribute to evaluating the importance and the role of social capital to resilient post-disaster recovery, and to investigate how religion and religious leaders and institutions affected resilience and recovery during and after the two flash flood

events; and 3) Provide recommendations regarding the potential contribution of social capital and religion to the enhancement of Jeddah's capacity to be more resilient to future flash flooding.

To meet Objective 1, an extensive literature review was undertaken and a preliminary framework was developed. Following from the results of the empirical phase, the framework was then updated. In order to achieve Objective 2, household capacity, organizational capacity, and social capital were the three main assessment dimensions used to evaluate the importance and role of social capital in resilient post-disaster recovery, and to investigate how religion contributed to resilience and recovery during and after the two flash flood events. For Objective 3, based on the quantitative and qualitative analysis of the results, the field investigations and the secondary data, recommendations were outlined in Chapters 6 and 7 of this thesis. Due to the increased frequency of such flooding events, it is becoming clear that future natural disasters are very likely to occur. Given the results of this thesis, the incorporation of religion, religious leaders and institutions, and organizational capacities into effective disaster management is highly recommended.

The research results and findings support the effectiveness of the RPDR-AF. The framework allows for a comprehensive analysis in the evaluation of post-disaster recovery processes in Jeddah and other Saudi communities and places the role of religion front and center within the concepts of household capacity, organizational capacity, and social capital. Future work using the RPDR-AF model could include opportunities for researchers to further investigate the roles of government, community leadership, and religious affiliations with respect to building community resilience. Other potential topics for investigation by future researchers could involve the goal of incorporating the important contribution of NGOs and CBOs in building citizen awareness and early preparedness programs, which are currently neither comprehensive nor well initiated and managed by relevant KSA authorities.

7.1 General Recommendations

For effective post-disaster recovery and implementation of future disaster-management plans in social contexts where religion is deeply embedded into the fabric of the society, it is highly recommended that religious leaders be involved at every stage of the planning and policy-making process and that all developed processes and structures more fully incorporate religious leaders and organizational capacities into effective disaster management.

For the City of Jeddah, although some local offices had attempted to make earlier disaster-management plans, a lack of funding and of skilled human resources rendered these attempts ineffective. In fact, prior to the 2009 flood, no professionally pre-arranged disaster management mechanisms had been put in place either by the government or non-government organizations. Based on the findings and the analysis of the research results many deficiencies specific to the Saudi system of emergency management planning were demonstrated. Despite these challenges, it was observed that people did receive relief aid and recovery assistance from the government, non-government organizations, and private entities. The received aid was primarily undertaken by the central Saudi government launching generous recovery programs after the dramatic events of the 2011 flash flood. Accordingly, local governments were then asked to start preparing emergency and disaster-management plans to withstand future events.

In light of the research findings, observations, and the positive opinions of key informants, which all underscored the need for a resilient post-disaster recovery assessment framework, recommendations are suggested for rectifying the current situation. For example, local governments should start upgrading their emergency and disaster management plans so that they emphasize flash flood disaster management and resilient recovery. Likewise, all government levels and their various agencies in charge of emergency and disaster-management plans should learn from the best practices and proven experience of other local and international

cities so that they can develop comprehensive disaster-management plans and maintain chains of command. A similar recommendation is that governments put in place effective evacuation procedures and provision for temporary shelters. The shelters would need to respect religious beliefs, social customs, and constraints on inter-gender interactions, and they should also provide sufficient and secured access to information.

Municipalities should also enforce proper building codes and land-use plans that should be respected and implemented at the community level, and they should also adopt effective oversight audits and inspections for identifying and preventing any irregularities, violations, and misconduct. For example, an independent agency can be created which would have final approval authority for all proposed building and land use plans. Another important initiative is the adoption by the civil defense authorities of a program integrated with those of other relevant government departments and non-governmental entities in order to raise and maintain public awareness through lectures, short workshops, interactive training sessions and through the publishing and distribution of educational brochures and booklets about risk awareness, that include considerations with respect to the status and needs of illegal immigrants. Such a program should entail close collaboration with CBOs and, more particularly, local households.

The mapping of flash floods is another crucial aspect of prevention, rescue, and recovery. Civil Defense in cooperation with The Saudi Geological Survey (SGS) can accurately and clearly labeled directional evacuation maps should be made available to the community so that vulnerable individuals can confidently find their evacuation zones when necessary. Viable coordination and joint operations between volunteers and the search and rescue authorities should be clarified prior to the occurrence of events with respect to the roles, responsibilities, and jurisdiction of each party, so that emergency evacuations can be conducted according to plan through Makkah Area Crisis and Disaster Management Center (CDMC).

In addition, because the role of the NGOs, CBOs, and religious organizations was proven to be crucial and highly beneficial, such organizations should be included in any emergency and disaster-management plans. The inclusion of these organizations will promote a sense of confidence and trust that the recovery plan will work efficiently and effectively because it encourages the active participation of trustworthy local leaders and residents. With respect to learning about crucial practices, it is recommended that schools and universities be encouraged to teach the basics of disaster management as part of their curriculum. New funds can be provided to private educational institutions that can provide special training programs in how to deal with disasters, before, during, and after their occurrence. The courses should incorporate disaster relief, recovery techniques, and flood drills, which will give people in the community the opportunity to find out about appropriate responses and their duties before a disaster occurs. For those with less access to education, e.g., older men and women, knowledge can be spread through faith- and community-based organizations or women's groups as a means of increasing preparedness and resilience levels. CBOs and NGOs should also be formally empowered and supported by authorities with respect to training in emergency evacuation and recovery systems and techniques. Similarly, local residents should be afforded clear and simplified avenues for filing any complaints with the appropriate authorities. It is also highly recommended that local authorities provide special disaster and recovery training in advance so that senior citizens, in particular, will be able to respond according to prescribed procedures and rules governing disaster- and recovery-management plans. Due to their social status and community-wide belief in their trustworthiness, such trained seniors could be crucial consultative stakeholders during disasters.

7.1.1 Strategic Recommendations

The analyzed empirical data provide a valuable and feasible source for deriving additional subject-specific recommendations and suggestions for the development of further policies for post-disaster management. Decision-makers at different levels of authority and responsibility can use the results for building strategies and drawing up action plans according to their desired planning horizon, existing human resources, and available funds. The following are possible examples:

1. Define the most reliable sources of intervention and valuable support at local, regional, and national levels. This step could lead to the identification of the nature, capacity, strengths, weaknesses, and value of local support and sponsorship, etc., and could also assist with budget projections for future events.
2. Build a clear picture with respect to available local capacities, opportunities for improvement, and the development of strategies for more effective responses to future events. For example, consider upgrading building codes and land use bylaws to incorporate more robust consideration of likely future hazards and risk mitigation strategies. Resources might include government agencies, municipal authorities, local NGOs, and other civil society organizations.
3. Use the results from this thesis as guidelines for building more comprehensive remedial strategies that will cost-effectively and efficiently integrate and synchronize the capacities and resources of various players in the event of local flooding and other natural disasters for more resilient post-disaster recovery operations.
4. Explore best practices for employing smart technologies and other information communications technology (ICT) avenues for mitigating future risk and providing advanced alert systems for early preventive intervention (e.g., personal computers, digital

television, email, robots). This measure will help with the development of more sustainable preventive and risk-reduction systems and practices.

5. Develop ongoing community training hubs and promote the readiness of local volunteer and NGO groups through established organizations such as Scotts, the Red Crescent, and others. The training could include tools such as a series of short workshops, online self-learning courses, public campaigns, simulated drills, and informative and interactive sessions at educational and industrial institutions.
6. Taking an all hazards approach, build a detailed historical database of past emergency events, supplemented by robust projections of the impacts likely from climate change. This information could be utilized by government and local authorities for the prediction of a variety of disaster scenarios. Such a database would enable a determination of the best mitigation measures and remedial action, including a more practical expectation of the issues involved at various levels, the resources required, and the estimated budget allocations needed.
7. Consider how meteorological techniques and analysis, along with empirical modeling, can be employed for measuring the intensity of floods and for determining their paths. The modeling could be utilized for creating awareness and alerting vulnerable people and areas in advance. It would enable proactive preparation on the part of governments, communities, and other stakeholders, which would, in turn, increase resilience levels; mitigate casualties and damage; and enhance rescue, relief, restoration, and recovery operations.
8. Moving beyond the focus of the current project, explore ways that satellite images and geographic information systems can be used for establishing estimation algorithms that

incorporate consideration of spatial distribution and the monetary value of damage in impacted communities.

7.2 Future Research

Based on the empirical analysis of the research results, field observations, information collected from the interviewees (household members, government officials, community leaders, and participating NGOs and CBOs), and the reflections of the researcher, there are more aspects that need to be addressed and studied further. The study focused on improving the implementation of recovery planning and management strategies and increasing the knowledge and efficiency associated with the restoration, reconstruction, and rehabilitation of affected assets and areas. Suggestions are therefore made for further research that would comprehensively build on the accomplishments of this study can include:

1. Look at ways of using the contributions and experience of this research as a foundation for encouraging the continuous engagement and participation of local residents and community leaders for the enhanced management of future flash floods.
2. Establish initiatives that would persuade related authorities to work progressively to educate vulnerable people (especially household members) in order to increase awareness and ensure a clear perception of risk reduction techniques and mitigation measures.
3. Apply a multidisciplinary approach to integrating detailed aspects of policy development, technical tools and skills, social and economic dimensions, and other resilient post-disaster recovery assessment parameters.
4. Develop comprehensive quantitative damage- and cost-assessment tools and optimized decision-support systems for achieving better decisions related to flash flood warnings and dissemination systems: Such proposed systems could prove valuable for investigating and analyzing numerous hypothetical what-if pre- and post-disaster scenarios.

5. Future research could involve assessing the disaster resilience needs and perspectives of Saudi women.

7.3 Conclusion

The main empirical contributions of this thesis work are mainly contributed to the choice of Jeddah for this research which makes everything about the empirical results unique. There have not been any other post-disaster/resilience studies in Jeddah, the focus on the 2009/2011 Jeddah floods, and the selection of the four studied communities.

The main theoretical contribution is the explicit inclusion of religion as one of the influential aspects in all dimensions of the RPDR-AF as the research findings have shown that religious faith and worship practices were observed to be important influential support factors during the post-disaster response and the creation of recovery strategies. With regard to the methodological contributions, the research used standard social science research methods.

Like many countries, the KSA is now considered to be affected by recent challenges related to climate change, which include heavy rains that have the potential to cause flood disasters. This study recommends taking into consideration the effect of climate change in the region and making necessary precautions in anticipation of future disasters. Based on historical data and the increased frequency of such events, such flooding is likely to continue. For the City of Jeddah, this study contributes information about the socio-economic dimensions of flood risk that will be useful for flood risk analysis and water resources management decision-making. The two flash flood events during 2009 and 2011 in the City of Jeddah were the most serious natural disasters in the history of that city and had a considerable effect on the people, civilian areas, and infrastructure. In the wake of the 2011 floods, the region witnessed similar events in 2015 when floods hit the western and northern parts of the kingdom and the civil defense announced the deaths of 12 people. In November 2016 another 3 people have died as a result of severe floods

sweeping across the country. The fatalities included 2 people who were struck by lightning in Al Qunfudhah, Makkah province (Flood List, 2016). As a result, raising awareness of the risk of flash floods is urgently required. This study was therefore undertaken in order to emphasize the importance of the role of household capacity, organizational capacity, and social capital in enhancing the resilience of post-disaster recovery processes in the City of Jeddah.

Local Saudi community and neighbourhood residents should also understand the importance of helping city authorities with the creation, implementation, and maintenance of emergency-management planning. Communities should encourage one another to strictly follow and respect rules, building codes, land-use bylaws, and regulations so that future losses and damages can be minimized. Education about building regulations and bylaws has also been found to be an important measure that can encourage people to be aware of the regulations and to stop violating them by building their homes in flood-prone areas.

The research results also indicate the important psychological and spiritual contribution of religious beliefs, and the role of imams and community seniors, who are regarded as trustworthy figures, with respect to increasing community bonding and elevating the levels of resilience and recovery during disasters. This perspective offers evidence that faith-based interpretations of a disaster can provide spiritual resilience for the people affected. Therefore, strengthening the sense of inclusion in a community and the feeling of ownership of public resources such as masajid, community halls, community centres, and recreational facilities is a very practical means of promoting the growth of local social capital.

The significant benefits of the developed RPDR-AF model are the integration of the concepts and detailed aspects of household capacity, organizational capacity, and social capital into an applied assessment framework. Based on the research methodology, a wide range of issues and aspects that influence disaster management and the recovery processes were addressed

and analyzed. The results of the research indicate the critical importance of incorporating all three concepts in an assessment of post-disaster recovery and in the creation of a strategic plan for long-term recovery. The findings also reveal a strong correlation between the incorporation of the concepts in assessment and planning and the ability to ensure that the risk of potential future disasters can be reduced and their impact and damage mitigated. The RPDR-AF was designed as an evaluation tool that can provide practical help with respect to establishing a conceptual assessment of the influence of long-term recovery efforts and plans.

References

- Aakre, S., Banaszak, I., Mechler, R., Rubbelke, D., Wreford, A., & Kalirai, H. (2010),
Financial adaptation to disaster risk in the European Union. *Mitigation and
Adaption Strategies of Global Change*, 15, 721-736.
- Abdulaal, W.A. (2012). Large urban developments as the new driver for land development in
Jeddah. *Habitat International*, 36(1), 36-46.
- Abdulgani, K. (1993). Jeddah: A study of metropolitan change. *Cities*, 10(1), 50-59.
- Abdullah, M.A., & Al-Mazroui, M.A. (1998). Climatological study of the south-western region
of Saudi Arabia. *Clim Res J*, 9, 213–223.
- Abdullah, N.N., & Othman, M.B. (2015). Disaster Management: Empirical Study of 2009
Jeddah Flood. *Scholars Journal of Arts, Humanities and Social Sciences*, 3(5B), 1083-
1087.
- Abosuliman, S. (2014). A system dynamics & emergency logistics model for post-disaster relief
operations. Thesis submitted to RMIT University.
- Adeney-Risakotta, B. (2009). Globalization and Religion from an Indonesian Perspective. In
Heidi Hadsell and Christoph Stuckelberger (Eds.), *Overcoming Fundamentalism* (pp.89-
109). Geneva: Globethics.net International Secretariat.
- Adger, W.N. (2000). Social and Ecological Resilience: Are they Related? *Progress In Human
Geography*, 24, 347-364.
- Adler, K.F. (2015). *Natural Disasters as a Catalyst for Social Capital: A Study of the 500-year
Flood in Cedar Rapids, Iowa*. Rowman & Littlefield.

- Adler, P.S., & Kwon, S.W. (2002). Social capital: prospects for new concept. *Academy for Management Review*, 27(1), 17-40.
- Agence France-Press (2011). “Saudi Arabia: ten dead, three missing in Jeddah floods”. Retrieved from: <http://reliefweb.int/report/saudi-arabia/saudi-arabia-ten-dead-three-missing-jeddah-floods>
- Aguilera, J.F., Perrocheau, A., Meffre, C., Hahne, S., & Group, W.W. (2002). Outbreak of serogroup W135 meningococcal disease after the Hajj pilgrimage, Europe, 2000. *Emerg Infect Dis*, 8, 761-7.
- Al Harithy, A. (2010). “Civil Defense responded ‘professionally’ to floods”. Saudi Gazette. Retrieved from: <http://www.sauress.com/en/saudigazette/72093>
- Al Saud, M. (2010). Assessment of flood hazard of Jeddah area 2009, Saudi Arabia. *Journal of Water Resource and Protection*, 2, 839-847.
- Al Saud, M. (2015). *Flood Control Management for the City and Surroundings of Jeddah, Saudi Arabia*. Springer.
- Al Awai, I. (2012). “Civil Defense refuses to certify safety of 800 Jeddah schools”. Saudi Gazette. Retrieved from: <http://www.saudigazette.com.sa/index.cfm?method=home.regcon&contentid=20120901134621>
- Al-Dhibyani, F. (2011). “King OK’s Makkah disaster center”. Saudi Gazette. Retrieved from: <http://www.saudigazette.com.sa/index>
- Al-Mazroui, M.A. (2006). “The relationship between atmospheric circulation patterns and surface climatic elements in Saudi Arabia”. PhD thesis, University of East Anglia.
- Al-Mazroui, M.A. (2010). Calibration of TRMM rainfall climatology over Saudi Arabia during 1998–2009. *Atmos Res J.*, 99(3). doi:10.1016/j.atmosres.2010.11.006

- Al-Saggaf, Y. (2012). "Social media and political participation in Saudi Arabia: the case of the 2009 floods in Jeddah". Paper presented for M. Strano, H. Hrachovec, F. Sudweeks, and C. Ess (Eds.), *Proceedings of the 8th International Conference on Cultural Attitudes Towards Communication and Technology 2012*. Perth, WA: Murdoch University.
- Al-Sefry, S., & Şen, Z. (2006). Groundwater Rise Problem and Risk Evaluation in Major Cities of Arid Lands – Jeddah Case in Kingdom of Saudi Arabia. *Water Resources Management*, 20(1), 91-108.
- Al-Suwian, A. (2001). "Potential petrochemical hazards in Saudi Arabia". Saudi Arabia General Directorate of Civil Defense: Division of Planning and Training.
- Al-Tukhi, M. (1990). Road traffic accidents: statistics and data comparing the Gulf countries and the Ruyadh area. *Saudi Med J*, 11, 1-3.
- Alam, S.M.N. (1990). Perceptions of flood among Bangladeshi villagers. *Disasters*, 14(4), 354-357.
- Alamri, Y.A. (2010). Emergency management in Saudi Arabia: Past, present and future. *Un. Of Christchurch report, New Zealand*, 21.
- Albala-Bertrand, J.M. (1993). *Political Economy of Large Natural Disasters: With Special Reference to Developing Countries*. Oxford: Clarendon Press.
- Aldrich, D.P. (2010). Fixing recovery: social capital in post-crisis resilience. *Journal of Homeland Security*, 6, 1-10. Retrieved from: http://works.bepress.com/daniel_aldrich/7
- Aldrich, D.P. (2012). *Building resilience: Social capital in post-disaster recovery*. University of Chicago Press.
- Aldrich, D.P., & Meyer, M.A. (2014). Social Capital and Community Resilience. *American Behavioral Scientist*, 59(2), 254-269.

- Alehaideb, S. (1985). "Precipitation distribution in the southwest of Saudi Arabia". Dissertation, Arizona State University, Arizona, USA.
- Alesch, D.J. (2004). "Complex Urban Systems and Extreme Events: Towards a theory of disaster recovery". 1st International Conference of Urban Disaster Reduction. Kobe, Japan, 19 Jan 2004.
- Alexander, R. (2006). *Tsunami: Build Back Better: Mantra Aside, An Aid Gone Wrong Story? A Livelihood Sector Review*. Bangalore, India: Development Consultancy Group.
- Aljoufie, M. (2014). Toward integrated land use and transport planning in fast- growing cities: The case of Jeddah, Saudi Arabia. *Habitat International*, 41(0), 205-215.
- Almulla, A. (2008). "Major Hajj catastrophies over the past decades". Alwaqt Newspaper.
- AlMunajjed, Mona (2009). *Women's Education In Saudi Arabia*, p.2. USA: Booz & Company.
- Al-Rasheed, M. (2013). *Politics and Society in Saudi Arabia: The Crucial Years of Development 1960–1982: Sarah Yizraeli London, Hurst & Co., 2012. Pp. xxi+ 336, bibliography, index.*
- Alshehri, S., Rezgui, Y., & Li, H. (2013). Public perception of the risk of disasters in a developing economy: the case of Saudi Arabia. *Natural Hazards*, 65(3), 1813-1830.
- Altheide, D.L. & Johnson, J.M. (1998). Criteria for Assessing Interpretive Validity in Qualitative Research. In Denzin, N.K., and Lincoln, Y.S. (Eds.). *Collecting and Interpreting Qualitative Materials*, pp.283-312. London: Sage.
- Ammerman, N.T., & Farnsley, A.E. (1997). *Congregation and community*. Rutgers University Press.
- Arab News (2012). Editorial: "Jeddah's floods to be a thing of the past". Retrieved from: <http://www.arabnews.com/editorial-jeddah-flooding-be-thing-past>

- Ashby, J.A., Knapp, E.A., & Ravnborg, H.M. (1998) Involving local organisations in watershed management. In E. Lutz, H. Binswanger, P. Hazell, and A. McCalla (Eds.), *Agriculture and the Environment: Perspectives on Sustainable Rural Development*. The World Bank, Washington, DC.
- Assaf, H. (2010). Water resources and climate change. In M. El-Ashry, N. Saab, & B. Zeitoon (Eds.), *Arab environment: water: sustainable management of a scarce resource*. Retrieved from: <http://www.afedonline.org/Report2010/pdf/En/Chapter2.pdf>
- Aten, J.D., Bennet, P.R., Hill, P.C., Davis, D., & Hook, J.N. (2012). Predictors of God Concept and God Control after Hurricane Katrina. *Psychology of Religion and Spirituality*, 4, 182–92.
- Australian Psychological Society (APS) (2013). *Psychological Preparation for Natural Disasters*. Melbourne, Victoria: APS.
- Ivanov, A., & Cvetković, V. (2014). The role of education in natural disaster risk reduction. *Horiz Int Sci J Ser A Soc Sci Humanit*, 16, 115-130.
- Bagir, Z.A. (2012). Nidhal Guessoum's Reconciliation of Islam and Science: Practice and the Agenda of 'Islam and Science'. *Zygon*, 47, 354–66.
- Baker, C., & Smith, G. (2010). *Spiritual, religious and social capital—exploring their dimensions and their relationship with faith-based motivation and participation in UK civil society*. William Temple Foundation, Manchester.
- Baki, R. (2004). Gender-Segregated Education in Saudi Arabia: Its Impact on Social Norms and the Saudi Labor Market. *Education Policy Analysis Archives*, 12(28), n28.
- Banki, E.S. (1981). *Dictionary of Administration and Management*. Los Angeles: System Research Institute.

- BAPPENAS, the Provincial and Local Governments of D.I. Yogyakarta, the Provincial and Local Governments of Central Java, and International Partners (2006). Preliminary Damage and Loss Assessment: Yogyakarta and Central Java Natural Disaster. Jakarta: The 15th Meeting of The Consultative Group on Indonesia, 2006.
- Barton, A.H. (1969). *Communities in Disaster: A Sociological Analysis of Collective Stress Situations*. Garden City, New York: Doubleday & Company, Inc.
- Bassuk, E.L., Mickelson, K.D., Bissell, H.D., & Perloff, J.N. (2002). Role of kin and non-kin support in the mental health of low-income women. *American Journal of Orthopsychiatry*, 72(1), 39-49.
- Bates, F.L., & Peacock, W.G. (1992). Measuring disaster impact on household living conditions: the domestic assets approach. *International journal of mass emergencies and disasters*, 10(1), 133-160.
- Bayumi, T., Alyamani, M., Subyani, A., Al-Dakheel, A., & Al-Ahmadi, M. (2000). *Analytical study of flood problems and groundwater rise in the Jeddah District*. King Abdulaziz University.
- Beaudoin, C.E., & Tao, C.C. (2007). Benefiting from social capital in online support groups: An empirical study of cancer patients. *CyberPsychology & Behavior*, 10(4), 587-590.
- Becker, P.E., & Dhingra, P.H. (2001). Religious involvement and volunteering: Implications for civil society. *Sociology of Religion*, 62(3), 315-335.
- Scientific Research Council. Project No. 606/418. Final Report
- Becker, W.S., & Stauffer, R. (1994). *Rebuilding for the future: A guide to sustainable redevelopment for disaster-affected communities*. Golden, CO: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Center of Excellence for Sustainable Development.

- Belshaw, C.S. (1951). Social consequences of the Mount Lamington eruption. *Oceania*, 21(4), 241-252.
- Benthall, J. (2008). Have Islamic Aid Agencies a Privileged Relationship in Majority Muslim Areas? The Case of Post-tsunami Reconstruction in Aceh. *The Journal of Humanitarian Assistance*, 26, 1-10.
- Berger, P., & Hefner, R. (2003). "Spiritual capital in comparative perspective". Paper prepared for the Spiritual Capital Planning Meeting 2003. Retrieved from: www.metanexus.net/spiritual_capital/pdf/Berger.pdf
- Berke, P., Kartez, J., & Wenger, D. (1993) Recovery after disaster: Achieving sustainable development, mitigation, and equity. *Disasters*, 17, 93-109.
- Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: lessons from resilience thinking. *Natural Hazards*, 41, 283-295.
- Bhuiyan, S.H. (2005). *Benefits of social capital urban solid waste management in Bangladesh*. Zugl: Bonn, Transaction Publishers.
- Birkmann, J. (2007). Risk and Vulnerability Indicators at Different Scales: Applicability, Usefulness and Policy Implications. *Environmental Hazards*, 7, 20–31.
- Birkmann, J., Buckle, P., Jaeger, J., Pelling, M., Setiadi, N., Garschagen, M., . . . Kropp, J. (2010). Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters. *Natural Hazards*, 55(3), 637-655.
- Birkmann, J., & Nishara, F. (2008). Measuring revealed and emergent vulnerabilities of coastal communities to tsunami in Sri Lanka. *Disasters*, 32(1), 82-105.
- Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (1994). *At Risk: Natural Hazards, People's Vulnerability and Disasters*. London: Routledge.

- Boin, A., & Hart, P., (2003). Public leadership in times of crisis: mission impossible. *Public Administration Review*, 63, 544-553.
- Bolin, R.C., & Stanford, L., (1991). Shelters, housing and recovery: a comparison of U.S. disasters. *Disasters*, 45, 25–34.
- Bolin, R., & Trainer, P. A., 1978. Modes of family recovery following disaster: a cross-national study. In Quarantelli, E. L. (Ed.), *Disasters: Theory and Research* (pp.233-247). Beverly Hills, CA: Sage.
- Bourdieu, P. (1985). The Forms of Capital. In J. G. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education* (pp.241-258). New York City: Greenwood.
- Bourdieu, P. (1987). Legitimation and Structured Interests in Weber's Sociology of Religion. In Whimster, S. and S. Lash (Eds.), *Max Weber: Rationality and Modernity*. London: A & U.
- Bourdieu, P., & Wacquant, L. (1992). *An Invitation to Reflexive Sociology*. Chicago and London: University of Chicago Press.
- Bowling, A. (1997). *Research Methods in Health*. Buckingham: Open University Press.
- Boyte, H.C. (1989). *CommonWealth: A Return to Citizen Politics*. New York: The Free Press.
- Brenkert, G. (1998). Trust, business and business ethics: an introduction. *Business Ethics Quarterly*, 8(2), 195-203.
- Brody, S.D. (2003b). Examining the effects of biodiversity on the ability of local plans to manage ecological systems. *J Environ Plan Manag*, 46(6), 733-754.
- Brody, S.D. (2008). *Ecosystem planning in Florida: solving regional problems through local decision making*. Ashgate Press, Aldershot.
- Brown, D., Saito, K., Spence, R., & Chenvidyakarn, T. (2008). “ Indicators for Measuring, Monitoring and Evaluating Post-Disaster Recovery”. 6th International Workshop on

- Remote Sensing for Disaster Applications. Retrieved from:
http://tlc.unipv.it/6_RSDMA/Finals/4.3%20-%20Brown.pdf
- Brown, G.F., Schmidt, D.L., & Huffan Jr, A.C. (1989). "Geology of the Arabian Peninsula, Shield area of western Saudi Arabia". U.S. Geological survey professional paper, 560-A.
- Brown, O., & Crawford, A. (2006). "Addressing Land Ownership after Natural Disasters". International Institute for Sustainable Development, Winnipeg, Manitoba.
- Bryan, T.K. (2011). "Exploring the dimensions of organizational capacity for local social service delivery organizations using a multi-method approach" (Doctoral dissertation, Virginia Polytechnic Institute and State University).
- Bryant, W.K., Jeon-Slaughter, H., Kang, H., & Tax, A. (2003). Participation in philanthropic activities: Donating money and time. *Journal of Consumer Policy*, 26, 43-73.
- Bucks, B.K., Kennickell, A.B., Mach, T.L., & Moore, K.B. (2009). Changes in US family finances from 2004 to 2007: Evidence from the Survey of Consumer Finances. *Fed. Res. Bull. A1*(95).
- Bullard, R., & Wright, B. (2007) Black New Orleans: Before and after Hurricane Katrina. In R. Bullard (Ed.), *The Black Metropolis in the Twenty-First Century: Race, Power and Politics of Places*. Lanham, Maryland. Rowman and Littlefield Publishers, Inc.
- Burby R.J., & May, P.J. (1998). Intergovernmental environmental planning: addressing the commitment conundrum. *J Environ Plan Manage*, 41(1), 95-110.
- Burns, N., & Grove, S.K. (1997). *The Practice of Nursing Research Conduct, Critique, & Utilization*. Philadelphia: W.B. Saunders and Co.
- Burt, R.S. (1997). The contingent value of social capital. *Administrative Science Quarterly*, 42, 339-365.

- Campanella, T.J. (2006). Urban resilience and the recovery of New Orleans. *Journal of the American Planning Association*, 72(2), 141-146.
- Caputo, M. (2010). "New Orleans is recovering, and offering lessons for Haiti". February 21, Miami Herald.
- Cardona, O.D. (2004). The Need for Rethinking the Concepts of Vulnerability and Risk from a Holistic Perspective: A necessary review and criticism for effective risk management. In G. Bankoff, G. Frerks, and D. Hilhorst (Eds.), *Mapping Vulnerability: Disasters, development and people* (pp.37-51). Sterling, VA: Earthscan.
- Carpenter, S., Walker, B., Anderies, J.M., & Abel, N. (2001). From metaphor to measurement: resilience of what to what? *Ecosystems*, 4(8), 765-781.
- Castiglione, D., van Deth, J.W., & Wolleb, G., (Eds.) (2008). *The Handbook of Social Capital*. New York: Oxford University Press.
- Chenoweth, E., & Stephan, M. (2011). *Why Civil Resistance Works: The Strategic Logic of Nonviolent Conflict*. New York: Columbia University Press.
- Chester, D.K., Duncan, A.M., & Dibben, C.J.L., (2008). The importance of religion in shaping volcanic risk perception in Italy, with special reference to Vesuvius and Etna. *Journal of Volcanology and Geothermal Research*, 172(3-4), 216–228.
- Chester, D.K., Duncan, A.M., & Dibben, C.J.L. (2008). The Importance of Religion in Shaping Volcanic Risk Perception in Italy, with Special Reference to Vesuvius and Etna. *Journal of Volcanology and Geothermal Research*, 172, 216–28.
- Chester, D.K., & Duncan, A.M. (2010). Responding to Disasters within the Christian Tradition, with Reference to Volcanic Eruptions and Earthquakes. *Religion*, 40, 85–95.
- Christensen, R.K., & Gazley, B. (2008). Capacity For Public Administration:

- Analysis Of Meaning And Measurement. *Public Administration and Development*, 28(4), 265-279.
- Christopolos, I. (2006). “The elusive 'window of opportunity' for risk reduction in post-disaster recovery”. Session 3 Discussion Paper: ProVention Consortium Forum 2006: Strengthening Global Collaboration in Disaster Risk Reduction, Bangkok, February 2-3, 2006.
- Cisneros, H.G. (Ed.) 1993. *Interwoven Destinies: Cities and the Nation*. New York: W.W. Norton and Company.
- Clarke, G. (2006). Faith Matters: Faith-based Organisations, Civil Society and International Development. *Journal of International Development*, 18, 835–48.
- Clarke, G., & Jennings, M. (2008). Introduction. In Gerard Clarke, and Michael Jennings (Eds.), *Development, Civil Society and Faith-based Organizations* (pp.1–16). New York, NY: Palgrave Macmillan.
- Clarke, L. (2007). Postscript: Considering Katrina. In D. Brunnsma, D. Overfelt, and J. Picou (Eds.), *The Sociology of Katrina: Perspectives on a modern catastrophe* (pp.235-241). Lanham, MD: Rowman and Littlefield.
- Clinton, W. (2006). “Lessons Learned from Tsunami Recovery: Key Propositions for Building Back Better”. A Report by the United Nations Secretary-General’s Special Envoy for Tsunami Recovery. New York: Office of the UN Secretary-General’s Special Envoy for Tsunami Recovery.
- Cohen, J., & Arato, A. (1992). *Civil Society and Political Theory*. Cambridge, MA: MIT Press.
- Cohen, D., & Prusak, L. (2001). *In Good Company: How social capital makes organizations work*. Boston: Harvard Business School Press.

- Cole, P.M. (2003). *An Empirical Examination of the Housing Recovery Process Following Disaster*. College Station, TX: Texas A&M University.
- Coleman, J.S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95-S120.
- Coleman, J.S. (1990). *Foundation of social theory*. Cambridge, Mass: Harvard University Press.
- Comfort, L., Oh, N., & Ertan, G. (2009). The dynamics of disaster recovery: Resilience and entropy in hurricane response systems 2005–2008. *Public Organization Review*, 9(4), 309-323. doi:10.1007/s11115-009-0098-3
- Coppola, D.P. (2007). *Introduction to International Disaster Management*. Burlington, MA: Elsevier, Inc.
- Costa D.L., & Kahn, M.E. (2003). Civic engagement and community heterogeneity: an economist's perspective, *Perspective on Politics*, 1(1), 103-111.
- Council of Australian Governments (COAG) (2009). "National Strategy for Disaster Resilience: Building our nation's resilience to disasters". Australia: Council of Australian Governments.
- Cuny, F. (1983). *Disasters and Development*. New York: Oxford University Press.
- Cutter, S.L. (1996). Vulnerability to Environmental Hazards. *Progress in Human Geography*, 20(4), 529-539.
- 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), 598-606.
- Cutter, S.L., Burton, C.G., & Emrich, C.T. (2010). Disaster resilience indicators for benchmarking baseline conditions. *Journal of Homeland Security and Emergency Management*, 7(1).

- Dacy, D., & Kunreuther, H. (1969). *The Economics of Natural Disasters: Implications for Federal Policy*. New York: The Free Press.
- Daniere, A., NaRanong, A., & Takahashi, L. (2002). Social capital, networks, and community environments in Bangkok, Thailand. *Growth and Change*, 33(4), 453-484.
- Daskon, C.D. (2010). Are Cultural Traditions Real "Assets" For Rural People? An Analysis from A Livelihood Perspective. *Global Journal of Human Social Science*, 10(3), 13-24.
- Dawes, J. (2008). Do Data Characteristics Change According to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International Journal of Market Research*, 50(1), 61-77.
- Long, David E. (2003) "The Role of the Extended Family in Saudi Arabia."
- Deneulin, S., & Rakodi, C. (2010). Revisiting Religion: Development Studies Thirty Years On. *World Development*, 39, 45-54.
- Dhaffar, K., Sindy, A., Gazzaz, Z., Shabaz, J., & Saudi Red Crescent Society (2005). Evaluation of an emergency service attempted by the Saudi Red Crescent Society. *Saudi Medical Journal*, 26, 357-9.
- Domínguez, S., & Watkins, C. (2003). Creating Networks for Survival and Mobility: Social Capital among African-American and Latin-American Low-Income Mothers. *Social Problems* 50(1), 111-135.
- Drabek, T.E., & Key, W.H. (1984). *Conquering disaster: Family recovery and long-term consequences*. Irvington Publishers.
- Drabek, T.E. (1987) Emergent structures. In: Dynes, R.R. et al. (Eds.) *Sociology of disasters: contribution of sociology to disaster research*. Franco Angeli: Libri s.r.l., Milano, Italy, pp.259-290.

- Dunn, K. (2010). 'Doing' Qualitative Research in Human Geography. In I. Hay (Ed.), *Qualitative Research Methods in Human Geography* (3rd ed., pp.99-138). Oxford: Oxford University Press.
- Durkin, E., Deutsch, A., & Heinemann, A. (2010). Inpatient rehabilitation facilities: variation in organizational practice in response to prospective payment, *Medical Care Research and Review*, 67(2), 149-172.
- Dynes, R.R. (2006). Social capital: dealing with community emergencies. *Homeland Security Affairs*, 2(2), 1-26.
- Dyson, M.E. (2006). *Come Hell or High Water: Hurricane Katrina and the Color of Disaster*. New York, Basic Civitas Books.
- Eadie, C., Emmer, R.E., Esnard, A.M., Michaels, S., Monday, J., & Philipsborn, C. (2001). "Holistic disaster recovery: Ideas for building local sustainability after a natural disaster". Natural Hazards Research and Applications Information Center, University of Colorado, Boulder, CO.
- Edgington, D.W. (2010). *Reconstructing Kobe: The Geography of Crisis and Opportunity*. Vancouver: UBC Press.
- Edin, K., & Lein, L. (1997). *Making Ends Meet: How Single Mothers Survive in Welfare and Low-Wage Work*. New York, Russell Sage Foundation.
- Eisenman, D.P., Cordasco, K.M., Asch, S., Golden, J.F., & Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: lessons from Hurricane Katrina. *American Journal of Public Health*, 97(S1), 109-115.
- Eisinger, P. (2002). Organizational capacity and organizational effectiveness among street-level food assistance programs. *Nonprofit and Voluntary Sector Quarterly*, 31(1), 115-130.
- El-Katiri, L. (2014). "A Roadmap for Renewable Energy in the Middle East and North Africa".

- Oxford Institute for Energy Studies (pp.1-52).
- El Ouargui, N. (2012). Cultural Creativity: Catalyst for Social Development. Retrieved from:
<http://www.mei.edu/content/cultural-creativity-catalyst-social-development>
- Emergency Management Australia. (2004). Emergency Management in Australia – concepts and principles. Retrieved from: <http://www.em.gov.au/Documents/Manual01>
- Environment Canada (2011). Emergency Management Basics. Retrieved from:
<http://www.ec.gc.ca/ouragans-hurricanes/default.asp?lang=En&n=31DADDF5-1>
- Eriksson, C.B., Bjorck, J.P., Larson, L.C., Walling, S.M., Trice, G.A., Fawcett, J., . . . Foy, D.W. (2009). Social support, organisational support, and religious support in relation to burnout in expatriate humanitarian aid workers. *Mental Health, Religion and Culture*, 12(7), 671-686.
- Evans-Cowley, J.S., & Gough, M.Z. (2008). Design and Disaster: Higher education responds to Hurricane Katrina. *Cityscape*, 10(3), 21-37.
- Facey, W. (2005). Queen of the India trade. *Saudi Aramco World*, 56, 10-16 (Aramco Services Company, Houston, Texas, USA).
- Falk, M.L. (2010). Recovery and Buddhist Practices in the Aftermath of the Tsunami in Southern Thailand. *Religion*, 40, 96–103.
- Falk, I., & Kilpatrick, S. (2000). What is social capital? A study of interaction in a rural community. *Sociologia Ruralis*, 40(1), 87-110.
- Federal Emergency Management Agency (FEMA) (2004). Federal response plan. Washington DC: Department of Homeland Security.
- Federal Emergency Management Agency (1986). *Making Mitigation Work: A Handbook for State Officials*. Washington, DC: Author.
- Fengler, W., Ishan, A., & Kaiser, K. (2008). “Management Post-Disaster Reconstruction

- Finance: International Experience in Public Financial Management". The World Bank - Policy Research Working Paper No. 4475.
- Fiddian-Qasmiyeh, E., & Ager, A. (Eds.) (2013). "Local faith communities and the promotion of resilience in humanitarian situations". Joint Learning Initiative on Faith and Local Communities and RSC Working Paper, Oxford, 2013.
- Fielding, N., & Thomas, H. (2008). "Qualitative Interviewing". In Gilbert, N. (Ed.), *Researching Social Life* (3rd edition), pp.245-265. London: Sage.
- Fisher, A.L. (1985). Voluntary labor, Utah, the L.D.S. Church, and the floods of 1983: a case study. *International Journal of Mass Emergencies and Disasters*, 33(3), 53-74.
- Folke, C., Colding, J., & Berkes, F. (2003). Building resilience and adaptive capacity in social-ecological systems. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating social-ecological systems* (pp.352-387). Cambridge, UK: Cambridge University Press.
- Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T., & Rockstrom, J. (2010). Resilience Thinking: Integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4).
- Foster, H. (1995). "Disaster Mitigation: The Role of Resilience". In: Proceedings of a Tri-Lateral Workshop on Natural Hazards. Merrickville, Canada.
- Fountain, P.M., Kindon, S.L., & Murray, W.E. (2004). Christianity, calamity, and culture: the involvement of Christian churches in the 1998 Aitape tsunami disaster relief. *The Contemporary Pacific*, 16(2), 321-355.
- Freeman, P.K., Keen, M., & Mani, M. (2003). Being Prepared: Natural disasters are becoming more frequent, more destructive, and deadlier, and poor countries are being hit the hardest. *Finance and Development*, 40(9).
- Friesma, H. P., Caporaso, J., Goldstein, G., Linberry, R., & McCleary, R. (1979). *Aftermath:*

- Communities after Natural Disasters*. Beverly Hills, CA: Sage.
- Fukuyama, F. (1995). *Trust: the social values and the creation of prosperity*. New York: Free Press.
- Fukuyama, F. (2001). Social capital, civil society and development. *Third world quarterly*, 22(1), 7-20.
- Gaillard, J.C., & Texier, P. (2010). Religions, natural hazards, and disasters: An introduction. *Religion*, 40(2), 81-84. doi:10.1016/j.religion.2009.12.001
- Gambetta, D. (Ed.) (1988). *Trust: making and breaking cooperative relations*. Oxford: Blackwell.
- Ganesan, S. (1994). Determinants of long-term orientation in buyer-seller relationships, *Journal of Marketing*, 58, 1-19.
- Geipel, R. (1982). *Disaster and Reconstruction: The Friuli (Italy) earthquakes of 1976*. London: George Allen & Unwin Publishers, Ltd.
- Ghafory-Ashtiany, M. (2009). View of Islam on Earthquakes, Human Vitality and Disaster. *Disaster Prevention and Management*, 18, 218-32.
- Gitell, R.V., & Vidal, A. (1998). *Community Organizing: Building Social Capital as a Development Strategy*. Newbury Park, Sage Publications.
- Glanville, J.L., & Bienenstock, E.J. (2009). A typology for understanding the connections among different forms of social capital. *American Behavioral Scientist*, 52(1), 1507-1530.
- Goddard, R.D. (2003). Relational Networks, Social Trust, and Norms: A Social Capital Perspective on Students' Chances of Academic Success. *Educational Evaluation and Policy Analysis*, 25(1), 59-74.
- Grandjean, D., Rendu, A.C., MacNamee, T., & Scherer, K.R. (2008). The Wrath of the Gods: Appraising the Meaning of Disaster. *Social Science Information*, 47, 187-204.

- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360-1380.
- Grant, E. (2001). Social capital and community strategies: neighbourhood development in Guatemala City. *Development and Change*, 32(5), 975-995.
- Grindle, M.S., & Hilderbrand, M.E. (1995). Building sustainable capacity in the public sector: what can be done? *Public Adm Dev*, 15, 441-463.
- Grootaert, C. (1998). "Social capital: the missing link?" The World Bank, Working paper No.3.
- Guha-Sapir, D., Vos, F., Below, R., & Ponserre, S. (2011). Annual Disaster Statistical Review 2010: The numbers and trends. Retrieved from: http://www.cred.be/sites/default/files/ADSR_2010.pdf
- Haas, J.E., Kates, R.W., & Bowden, M.J. (1977). *Reconstruction Following Disaster*. Cambridge, MA: MIT Press.
- Haines, Y.Y. (2009). On the definition of resilience in systems. *Risk Analysis*, 29(4), 498-501.
- Haggag, M., & El-Badry, H. (2013). Mesoscale numerical study of quasi-stationary convective system over Jeddah in November 2009. *Atmospheric and Climate Sciences*, 3(1), 73-76.
- Hamdan, A. (2005). Women and Education in Saudi Arabia: Challenges and Achievements. *International Education Journal*, 6(1), 42-64.
- Handmer, J. (1996). Policy design and local attributes for flood hazard management. *J Conting Crisis Manag*, 4(4), 189-197.
- Hanna, K.S., Dale, A., & Ling, C. (2009). Social capital and quality of place: reflection on growth and change in a small town, *Local Environment*, 14(1), 31-44.
- Hartig, J.H., Law, N.L., Epstein, D., Fuller, K., Letterhos, J., & Krantzberg, G. (1995). Capacity building for restoring degraded areas in the Great Lakes. *Int J Sustain Dev World*, 2, 1-

10.

Hartvelt F., & Okun, D.A. (1991) Capacity building for water resources management. *Water Int*, 16, 176-183.

Hartman, C., & Squires, G. (2006). *There Is No Such Thing as a Natural Disaster: Race, Class and Katrina*. New York, Routledge.

Hawkins, R.L., & Maurer K. (2010). Bonding, bridging and linking: how social capital operated in New Orleans following Hurricane Katrina. *British Journal of Social Work*, 40(6), 1777-1793.

Hay, I. (Ed.) (2010). *Qualitative Research Methods in Human Geography*. Oxford: Oxford University Press.

Hays, R.A., & Kogl, A.M. (2007). Neighborhood attachment, social capital building, and political participation: a case study of low and moderate income residents of Waterloo, Iowa. *Journal of Urban Affairs*, 29(2), 181-205.

Helen Chapin Metz, ed. Saudi Arabia: A Country Study. Washington: GPO for the Library of Congress, 1992.

Henstra, D., & McBean, G. (2005). Canadian Disaster Management Policy: Moving Toward a Paradigm Shift? *Canadian Public Policy - Analyse De Politiques*, 31(3).

Hewitt, K. (1997). *Regions of Risk*. Harlow, Essex: Addison Wesley Longman.

Ho M-C, Shaw D, Lin S, Chiu Y-C. (2008) How do disaster characteristics influence risk perception? *Risk Anal*, 28(3), 635–643. doi:10.1111/j.1539-6924.2008.01040.x

Hodgkinson, V. (1995). Key factors influencing caring, involvement, and community. In P. Schervish, V. Hodgkinson, M. Gates, and Associates (Eds.), *Care and community in modern society* (pp.21-50). San Francisco: Jossey-Bass.

Holling, C. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology*

- and Systematics*, 4, 1-23.
- Honadle, B.W. (1981). A Capacity-Building Framework - A Search For Concept And Purpose. *Public Administration Review*, 41(5), 575-580.
- Hooghe, M. (2008). Voluntary Associations and Socialization. In Castiglione, D., J.W. van Deth, and G. Wolleb (Eds.), *The Handbook of Social Capital*. Oxford: Oxford University Press, pp. 568-593.
- Hossain, M.A. (2012). Community Participation in Disaster Management: Role of Social Work to Enhance Participation. *Sociology*, 159, 171.
- Howard, P., & Hussain, M. (2010). "Opening closed regimes: civil society, information infrastructure, and political Islam". In A. Campbell & L. Martin (Eds.), Proceedings of the American Political Science Association's 2010 Annual Meeting. Washington, DC: APSA.
- Howe, P.D. (2011). Hurricane preparedness as anticipatory adaptation: A case study of community businesses. *Global Environmental Change*, 21(2), 711-720.
- Howitt, R., & Stevens, S. (2010). Cross-Cultural Research: Ethics, Methods, and Relationships. In I. Hay (Ed.), *Qualitative Research Methods in Human Geography* (3rd ed., pp.40-68). Oxford: Oxford University.
- Humphrey, J., & Schmitz, H. (1998). Trust and interfirm relations in developing and transition economies. *The Journal of Development Studies*, 34(4), 32-61.
- Hurlbert, J.S., Haines, V.A., & Beggs, J.J. (2000). Core networks and tie activation: What kinds of routine networks allocate resources in nonroutine situations? *American Sociological Review*, 65, 598-618.
- Hutchinson, J. (2004). "Social capital and community building in the inner city". In Hutchinson, J., & A. Vidal (Eds.), Symposium on using social capital to help integrate planning

- theory, research, and practice. *Journal of the American Planning Association*, 70(2), 168-175.
- Hutchinson, J., & Vidal, A.C. (2004). Using social capital to help integrate planning theory, research and practice. *Journal of the American Planning Association*, 70(2), 142-192.
- Hutton, D., & World Health Organization (2008). Older people in emergencies: considerations for action and policy development. Retrieved from:
http://www.who.int/ageing/publications/Hutton_report_small.pdf
- Ingraham, P.W., Joyce P.G., & Donahue, A.K. (2003). *Governance Performance: Why Management Matters*. Baltimore, MD, The John Hopkins University Press.
- Innes, J. (1996). Planning through consensus building: a new view of the comprehensive planning ideal. *J Am Plan Assoc*, 62, 460-472.
- Ivey, J.L., Loe, R.C., & Kreutzwiser, R.D. (2002). Groundwater management by watershed agencies: an evaluation of the capacity of Ontario's conservation authorities. *J Environ Manag*, 64, 311-331.
- Ivanov, A., & Cvetković, V. (2014). The role of education in natural disaster risk reduction. *Horiz Int Sci J Ser A Soc Sci Humanit*, 16, 115-130.
- Jackson, E., & Mukerjee, T. (1974). Human adjustment to the earthquake hazard in San Francisco, California. In White, G.F. (Ed.), *Natural hazards: Local, national, global* (pp.160-166). Oxford University Press, New York.
- Jazairy, I., Alamgir, M., & Panuccia, T. (Eds.) (1992). *The State of the World Rural Poverty*. IT Publications/IFAD, London, UK.
- Jeddah Chamber of Commerce and Industry (2013), "About Jeddah". Retrieved from:
<http://www.jcci.org.sa/JCCI/EN/About+Jeddah/Introduction>
- Jeddah Municipality <https://www.jeddah.gov.sa/English/>

- Joakim, E. (2008). "Assessing the 'Hazards of Place' Model of Vulnerability: A case study of Waterloo Region" (Master's Dissertation). Waterloo, ON, Canada: Wilfrid Laurier University.
- Joakim, E. (2013). "Resilient Disaster Recovery: A Critical Assessment of the 2006 Yogyakarta, Indonesia Earthquake using a Vulnerability, Resilience and Sustainable Livelihoods Framework" (Doctoral Dissertation). University of Waterloo, Canada.
- Joakim, E.P., & White, R.S. (2015). Exploring the Impact of Religious Beliefs, Leadership, and Networks on Response and Recovery of Disaster-affected Populations: A Case Study from Indonesia. *Journal of Contemporary Religion*, 30(2), 193-212.
- Kaniasty, K., & Norris, F.H. (1993). A Test of the Social Support Deterioration Model in the Context of Natural Disaster. *Journal of Personality and Social Psychology*, 64(3), 395-408.
- Karatani, Y., Hayashi, H., & Kawata, Y. (2000). Development of socioeconomic rehabilitation index based on Kobe statistics for the Great-Hanshin-Awaji earthquake disaster. *Journal of Social Safety Science*, 2, 213-222.
- Karatani, Y. et al. (2000). "Seikatsu saiken shihyo kara mita Hanshin-Awaji Daishinsai go no Kobeshi no seikatsusaiken katei [The process of recovery in Kobe City after the Hanshin-Awaji Earthquake as analyzed through a "recovery index"]. Paper presented at the 55th annual Academic Conference of Japan Society of Civil Engineers.
- Kartez, J., & Wenger, D. (1993). Recovery after Disaster: Achieving sustainable development, mitigation and equity. *Disasters*, 17(2), 93-109.
- Kates, R., & Pijawka, D. (1977). From Rubble to Monument: The Pace of Reconstruction. In J. Eugene Haas, Robert Kates, and Martyn Bowden (Eds.), *Reconstruction Following Disasters* (pp. 1-23). Cambridge MA: MIT Press.

- Kawachi, I., Kennedy, B.P., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality, and mortality. *American journal of public health, 87*(9), 1491-1498.
- Kennedy, J., Ashmore, J., Babister, E., & Kelman, I. (2008). The Meaning of ‘Build Back Better’: Evidence From Post-Tsunami Aceh and Sri Lanka. *Journal of Contingencies and Crisis Management, 16*(1), 24-36.
- Klein, R., Nicholls, R., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Environmental Hazards, 5*, 35-45.
- Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics, 112*(4), 1251-1288.
- Kong, L. (2010). Global Shifts, Theoretical Shifts: Changing Geographies of Religion. *Progress in Human Geography, 34*, 755–76.
- Krishna, A., & Shrader, E. (1999). “Social capital assessment tool”. In: Conference on social capital and poverty reduction, World Bank, Washington, DC (Vol. 22, p. 24).
- Kuhlicke, C. (2013). Resilience: a capacity and a myth: findings from an in-depth case study in disaster management research. *Disaster Management Research, 67*, 1.
- Kulig, J. (2000). Community resilience: The potential for community health nursing theory development. *Public Health Nursing, 17*(5), 374-385.
- Kulig, J. C., Pujadas Botey, A., Townshend, I., Awosoga, O., Shepard, B., Edge, D., . . . Lightfoot, N. (2012). *Families and children: responses to wildfires--links to community resiliency*. University of Lethbridge.
- Labadie, J.R. (2008). Auditing of post-disaster recovery and reconstruction activities. *Disaster Prevention and Management, 17*(5), 575-586.
- Lassa, J.A. (2011). “Japan’s Resilience to Tsunamis and the Lessons for Japan and the World: An Early Observation”. Ash Center, Harvard Kennedy School.

- Laurian, L., Day, M., Backhurst, M., Berke, P., Ericksen, N., Crawford, J., . . . Chapman, S. (2004). What drives plan implementation? Plans, planning agencies and developers. *J Environ Plan Manag*, 47(4), 555-577.
- Lelieveldt, H. (2004). Helping citizens help themselves neighborhood improvement programs and the impact of social networks, trust, and norms on neighborhood-oriented forms of participation. *Urban Affairs Review*, 39(5), 531-551.
- Lerner, E.B., O'Connor, R.E., Schwartz, R., Brinsfield, K., Ashkenazi, I., Degutis, L.C., . . . Sattin, R.W. (2007). Blast-related injuries from terrorism: an international perspective. *Prehosp Emerg Care*, 11, 137-53.
- Lewis, J. (1999). *Development in Disaster-prone Places: Studies of vulnerability*. London: IT Publications.
- Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 140, 1-55.
- Lim, M.B.B., Lim Jr, H.R., Piantanakulchai, M., & Uy, F.A. (2016). A household-level flood evacuation decision model in Quezon City, Philippines. *Natural Hazards*, 80(3), 1539-1561.
- Lin, N. (2001). *Social Capital: A Theory of Social Structure and Action*. New York, Cambridge University Press.
- Lindell, M.K. (2013). Recovery and reconstruction after disaster. In: *Encyclopedia of natural hazards* (pp.812-824). Springer Netherlands.
- Lindell, M.K., Prater, C.S., & Perry, R.W. (2006). *Fundamentals of Emergency Management*. Emmitsburg, MD: Federal Emergency Management Agency Emergency Management Institute. Retrieved from: archone.tamu.edu/hrrc/Publications/books/index.html

- Liu, A., Fellowes, M., & Mabanta, M. (2006). *A One-Year Review of Key Indicators of Recovery in Post-storm New Orleans*. Washington, DC: Brookings Institution.
- Lloyd-Jones, T. (2006). "Mind the Gap! Post-disaster reconstruction and the transition from humanitarian relief". Summary report for RICS by the Max Lock Centre at the University of Westminster.
- Lunn, J. (2009). The Role of Religion, Spirituality and Faith in Development: A Critical Theory Approach. *Third World Quarterly*, 30, 937–51.
- MacAbbey, E. (2008). Constructive regulation of nongovernment organizations. *The Quarterly Review of Economics and Finance*, 48, 370-376.
- Maghrabi, K. (2012). Impact of flood disaster on the mental health of residents in the eastern region of Jeddah Governorate, 2010: A study in medical geography. *Life Science Journal*, 9(1), 95-110.
- Magram, S.F. (2009). A Review on the Environmental Issues in Jeddah, Saudi Arabia with Special Focus on Water Pollution. *Journal of Environmental Science and Technology*, 2(3), 120-132.
- Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society and Natural Resources*, 23(5), 401-416.
- Maguire, B., & Hagan, P. (2007). Disasters and communities: understanding social resilience. *Australian Journal of Emergency Management*, 22, 16-20.
- Marsh, G. (2009). *Disaster Management and the Role of Community in a Post-Modern Age*. Melbourne: The School of Social Science and Planning, RMIT University.
- Martin, W.E., Martin, I.M., & Kent, B. (2009). The role of risk perceptions in the risk mitigation process: the case of wildfire in high risk communities. *J Environ Manag*, 91(2), 489–498.
doi:10.1016/j.jenvman.2009.09.007

- Masten, A., & Obradovic, J. (2008). Disaster Preparation and Recovery: Lessons from research on resilience in human development. *Ecology and Society*, 13(1), 9-16.
- May, P.J. (1985). *Recovering from catastrophes: Federal disaster relief policy and politics*. Greenwood Press, Westport, CT.
- May, P.J., & Williams, W. (1986). *Disaster policy implementation: Managing programs under shared governance*. Plenum Press, New York and London.
- Mayunga, J. (2007). "Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach". Draft of summary paper for the Summer Academy for Social Vulnerability and Resilience Building, 22-28 July, Munich, Germany.
- McAllister, D.J. (1995). Affect-and cognition-based trust as foundations for interpersonal cooperation in organizations, *Academy of Management Journal*, 38(1), 24-59.
- McBride, A.M., Sherraden, M., & Pritzker, S. (2006). Civic engagement among low-income and low-wealth families: in their words, *Family Relations*, 55, 152-162.
- McCreight, R. (2010). Resilience as a Goal and Standard in Emergency Management. *Journal of Homeland Security and Emergency Management*, 7(1), 1-7.
- McEntire, D. (1999). Correspondence. *Disasters*, 24(1), 78-79.
- McEntire, D., Fuller, C., Johnston, C.W., & Weber, R. (2002). A Comparison of Disaster Paradigms: The Search for a Holistic Policy Guide. *Public Administrative Review*, 62(3), 267-280.
- McGregor, A. (2010). Geographies of Religion and Development: Rebuilding Sacred Spaces in Aceh, Indonesia, after the Tsunami. *Environment and Planning*, A42, 729-46.
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27(1), 415 - 44.

- Meredith, J. (1998). Building operations management theory through case and field research. *Journal of Operations Management*, 16, 441-454.
- Merli, C. (2005). Religious interpretations of tsunami in Satun province, Southern Thailand. *Svensk Religionhistorisk Årsskrift*, 14, 154-181.
- Merli, C. (2010). Context-bound Islamic Theodicies: The Tsunami as Supernatural Retribution vs. Natural Catastrophe in Southern Thailand. *Religion*, 40, 104-111.
- Middleton, A., Murie, A., & Groves, R. (2005). Social Capital and Neighbourhoods that Work. *Urban Studies*, 42(10), 1711-1738.
- Mileti, D. (1999). *Disasters by Design: A reassessment of natural hazards in the United States*. Washington, D.C.: Joseph Henry Press.
- Miller, J., & Glassner, B. (2004). The "inside" and the "outside": Finding realities in interviews. In Momani, N.M., and A.S. Fadil (2010), *Changing Public Policy Due to Saudi City of Jeddah Flood Disaster*. *J. Soc. Sci.*, 6, 424-428.
- Mitchell, J.T. (2003). Prayer in disaster: case study of Christian clergy. *Natural hazards review*, 4(1), 20-26.
- Morrow, B.H. (1997). Stretching the bonds: the families of Andrew. In Peacock, W.G., B.H. Morrow, and H. Gladwin (Eds.), *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disaster* (pp.141-170). London: Routledge,
- Moser, C.D.N. (1998). The asset vulnerability framework: reassessing urban poverty reduction strategies. *World Development*, 26(1), 1-19.
- Mouw, T. (2006). Estimating the causal effect of social capital: A review of recent research. *Annual Review of Sociology*, 32, 79-102. doi:10.1146/annurev.soc.32.061604.123150
- Murphy, B. (2007). Locating social capital in resilience community-level emergency management. *Natural Hazards*, 41(2), 297-315.

- Murphy, J.T. (2002). Networks, trust, and innovation in Tanzania's manufacturing sector. *World Development*, 30(4), 591-619.
- Musick, M.A., & Wilson, J. (2008). *Volunteers: A social profile*. Bloomington: Indiana University Press.
- Muttarak, R., & Pothisiri, W. (2013). The role of education on disaster preparedness: case study of 2012 Indian Ocean earthquakes on Thailand's Andaman Coast. *Ecology and Society*, 18(4).
- Nakagawa, Y., & Shaw, R. (2004). Social capital: A missing link to disaster recovery. *International Journal of Mass Emergencies and Disasters*, 22(1), 5-34.
- Narayan, D., & Cassidy, M.F. (2001). A dimensional approach to measuring social capital: Development and validation of a social capital inventory. *Current Sociology*, 49(2), 59-102.
- National Flood Insurance Program (2007). Policy & claim statistics for flood insurance. Retrieved from: <https://www.fema.gov/policy-claim-statistics-flood-insurance>
- Norris, F., Stevens, S., Pfefferbaum, B., Wyche, K., & Pfefferbaum, R. (2008). Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness. *American Journal of Community Psychology*, 41, 127-150.
- Ofei-Aboagye, E.O. (1998). "Women Groups and Associations as Partners in Small Enterprises Development in Ghana". National Board for Small Scale Enterprises/ Frederich Ebert Stiftung, Accra, Ghana.
- O'Sullivan, D., MacGill, J., & Yu, C. (2003). Agent-based residential segregation: a hierarchically structured spatial model. In: *Proceedings of agent 2003 conference on challenges in social simulation* (pp. 493-507). Chicago, IL: The University of Chicago.

- Olsen, S. (2011). *Increasing National Resilience to Hazards and Disasters: The perspective from the Gulf of Louisiana and Mississippi: summary of a workshop*. Washington, D.C: National Academies Press.
- Olshansky, R.B, & Kartez, J.D. (1998). Managing land use to build resilience. In Burby, R. (Ed.), *Cooperating with nature: confronting natural hazards with land use planning for sustainable communities*. Joseph Henry Press, Washington.
- Olshansky, R.B., Hopkins, L.D., & Johnson, L.A. (2012). Disaster and recovery: Processes compressed in time. *Natural Hazards Review*, 13(3), 173-178.
- Oliver-Smith, A. (1999). What is a Disaster?: Anthropological perspectives on a persistent question. In Oliver-Smith, S. and S. Hoffman (Eds.), *The Angry Earth: Disaster in anthropological perspective*. New York, NY: Routledge.
- Olson, R.S. (2000). Toward a politics of disaster: Losses, values, agendas, and blame. *International Journal of Mass Emergencies and Disasters*, 18, 265-287.
- Olson, R.S., & Olson, R.A. (1993). The rubble's standing up in Oroville, California: The politics of building safety. *International Journal of Mass Emergencies and Disasters*, 11, 163-188.
- Organisation for Economic Co-operation and Development (OECD) (2001). *The Well-Being of Nations: The role of human and social capital*. Paris: Organisation for Economic Co-operation and Development.
- Paik, A., & Navarre-Jackson, L. (2011). Social networks, recruitment, and volunteering: Are social capital effects conditional on recruitment? *Nonprofit and Voluntary Sector Quarterly*, 40, 476-96.

- Paradise, T.R. (2005). Perception of earthquake risk in Agadir, Morocco: A case study from a Muslim community. *Global Environmental Change Part B: Environmental Hazards*, 6(3), 167-180.
- Pargal, S., Hug, M., & Gilligan, D. (1999). "Social Capital in Solid Waste Management: Evidence From Dhaka, Bangladesh". Working Paper No. 6, The World Bank.
- Park, J.Z., & Smith, C. (2000). 'To Whom Much Has Been Given...': Religious Capital and Community Voluntarism Among Churchgoing Protestants. *Journal for the Scientific Study of Religion*, 39(3), 272-286.
- Paton, D. (2006). Disaster Resilience: Building Capacity to Co-Exist with Natural Hazards and their Consequences. In Paton, Douglas and David Johnston (Eds.), *Disaster Resilience: An Integrated Approach*. Springfield, Illinois: Charles C. Thomas Publisher Ltd.
- Patterson, O., Weil, F., & Patel, K. (2010). The role of community in disaster response: conceptual models. *Population Research and Policy Review*, 29(2), 127-141.
- Patto, M.Q. (1980). *Qualitative evaluation*. Beverly Hills, CA: Sage.
- Paxton, P.M. (1999). Is social capital declining in the United States? a multiple indicator assessment. *American Journal of Sociology*, 105, 88-127.
- Paxton, P. (2007). Not all association memberships increase trust: a model of generalized trust in 31 countries. *Social Forces*, 86, 47-76.
- Peacock, W.G., Dash, N., & Zhang, Y. (2006). Sheltering and housing recovery following disaster. In Rodríguez, H., E.L. Quarantelli, and R.R. Dynes (Eds.), *Handbook of Disaster Research* (pp.258-274). New York: Springer.
- Peacock, W.G., Morrow, B.H., & Gladwin, H., (Eds.) (1997). *Hurricane Andrew: Ethnicity, gender and the sociology of disaster*. Routledge, London.
- Peel, M.C., Finlayson B.L., & McMahon, T.A. (2007). Updated world map of the Köppen–

- Geiger climate classification. *Hydrol Earth Syst Sci*, 1, 1633–1644
- Peirce, N., & Steinbach, C. (1987). *Corrective Capitalism: The Rise of American Community Development Corporations*. New York: Ford Foundation.
- Pelling, M., & High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change*, 15(4), 308-319.
- Pelling, M., & Dill, K. (2010). Disaster politics: tipping points for change in the adaptation of sociopolitical regimes. *Progress in Human Geography*, 34(1), 21-37.
- Pesce, A. (1977). *Jiddah: portrait of an Arabian city*. Falcon Press (sl), London.
- Pettigrew, A.M. (1990). Longitudinal field research on change: theory and practice. *Organization Science*, 1(3), 267-292.
- Phillips, B.D. (2009). *Disaster Recovery*. Boca Raton, FL: Taylor & Francis Group.
- Plumer, B. (2012). "Why Saudi Arabia is losing its power to calm the oil markets". The Washington Post, Washington, USA. Retrieved from:
http://www.washingtonpost.com/blogs/wonkblog/post/why-saudi-arabia-is-losing-its-power-to-calm-the-oil-markets/2012/04/04/gIQABRklvS_blog.html
- Pohl, S., Steyer, R., & Kraus, K. (2008). Modelling method effects as individual causal effects. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 171(1), 41-63.
- Portes, A. (1998). Social capital: its origins and application in modern sociology, *Annual Review of Sociology*, 24, 1-24.
- Poteyeva, M., Denver, M., Barsky, L.E., & Aguirre, B.E. (2007). Search and Rescue Activities in Disasters. In Rodríguez, H., E.L. Quarantelli, and R.R. Dynes (Eds.), *Handbook of Disaster Research* (pp.200-216). New York, NY: Springer.
- Pretty, J., & Ward, H. (2001). Social capital and the environments, *World Development*, 29(2),

209-227.

- Procopio, C. H., & Procopio, S. T. (2007). Do you know what it means to miss New Orleans? Internet communication, geographic community, and social capital in crisis. *Journal of Applied Communication Research*, 35(1), 67-87.
- Purdue, D. (2001). Neighbourhood governance: leadership, trust and social capital. *Urban Studies*, 38(12), 2224-2001.
- Putnam, R.D. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.
- Putnam, R.D. (1993). The prosperous community social capital and public life. *The American Prospect*, 4(13), 1-11.
- Putnam, R.D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy*, 6(1), 65-78.
- Putnam, R.D. (1996). The strange disappearance of civic America. *The American Prospect*, (Winter), 35-49.
- Putnam, R.D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.
- Qari, M.H. (2009). Geomorphology of Jeddah Governate, with emphasis on drainage systems. *JKAU; Earth Sci.*, 20(1), 93-116.
- Quarantelli, E.L. (1982). *Sheltering and housing after major community disasters*. Columbus, OH: Ohio State University Disaster Research Center.
- Quarantelli, E. (1999). "The Disaster Recovery Process: What we Know and do not know from Research". University of Delaware Disaster Research Center, Preliminary Paper No. 286.
- Rahn, W.M., Kwang, S.Y., Garet, M., Lipson, S., & Loflin, K. (2009). Geographies of trust. *American Behavioral Scientist*, 52(12), 1646-1663.

Ramsay, T., Manderson, L., & Smith, W. (2010). Changing a Mountain into a Mustard Seed: Spiritual Practices and Responses to Disaster among New York Brahma Kumaris.

Journal of Contemporary Religion, 25, 89–105.

Reale, A. (2010). Acts of God(s): The Role of Religion in Disaster Risk Reduction.

Humanitarian Exchange Magazine, 48. Retrieved from:

<http://www.odihpn.org/humanitarian-exchangemagazine/>

issue-48/acts-of-gods-the-role-of-religion-in-disaster-risk-reduction

Rice, G. (2004). Doing business in Saudi Arabia, *Thunderbird International Business Review*, 46(1), 59-84.

Rodriguez, H., Trainor, J., & Quarantelli, E. L. (2006). Rising to the challenges of a catastrophe:

the emergent and prosocial behavior following Hurricane Katrina. *The Annals of the*

American Academy of Political and Social Science, 604(1), 82-101.

Rodríguez-Pose, A., & Storper, M. (2006). Better rules or stronger communities? On the social

foundations of institutional change and its economic effects. *Economic geography*,

82(1), 1-25.

Ronan, K.R., & Johnston, D.M. (2005). *Promoting Community Resilience in Disasters: The*

Role for Schools, Youth and Families. New York: Springer Science+Business Media,

Inc.

Rose, A. (2006). Economic resilience to disasters: Towards a consistent and comprehensive

formula. In Paton, D., and D. Johnston (Eds.), *Disaster Resilience: An Integrated*

Approach (pp. 226-248). Springfield, Illinois: Charles C. Thomas Publisher Ltd.

Rothstein, B., & Uslaner, M. (2005). All for all equality, corruption, and social trust. *World*

Politics, 58, 41-72.

Royal Embassy of Saudi Arabia (2013). About Saudi Arabia. Retrieved from:

<http://www.saudiembassy.net/about/country-information/government/>

Rubin, C.B., Saperstein, M.D., & Barbee, D.G. (1985). "Community Recovery from a Major Natural Disaster". Monograph No. 41. Boulder: University of Colorado, Institute of Behavioral Science.

Rydin, Y., & Holman, N. (2004). Re-evaluating the contribution of social capital in achieving sustainable development. *Local Environment*, 9(2), 117-133.

Sadeka, S., Mohd, S.M., Reza, M.I.H., Manap, J., & Sarkar, M.S.K. (2015). Social Capital And Disaster Preparedness: Conceptual Framework And Linkage. *e-Journal of the Social Science*

Researches, 3. Retrieved from:

<https://worldconferences.net/journals/icssr/vol3/IC%20061%20SOCIAL%20CAPITAL%20AND%20DISASTER%20PREPAREDNESS%20-%20SUMAIYA.pdf>

Samad, M. (2002). *Participation of the Rural Poor in Government and NGO Programs*. Dhaka: Mowla Brothers.

Sapsford, R., & Abbott, P. (1996). Ethics, Politics and Research. In Sapsford, R. and V. Jupp (Eds.), *Data Collection and Analysis* (pp.317-342). London: Sage.

Saudi Arabia Central Department of Statistics and Information (2010). Key Indicators of the 2010 Census. Retrieved from: <http://www.cdsi.gov.sa/english/>

Saudi Arabia Centre of Statistics and Information (2014). Population Statistics. Retrieved from: <http://www.cdsi.gov.sa/english/index.php>

Saudi Arabia Ministry of Agriculture and Water, Riyadh (1984). Water Atlas of Saudi Arabia, pp.2-19. Retrieved from:

https://www.researchgate.net/researcher/21731051_Riyadh_Saudi_Arabia_Water_Resources_Development_Dept_Ministry_of_Agriculture_and_Water

- Saudi Arabia Ministry of the Interior (2013). General Directorate of Civil Defense. Retrieved from: <http://www.998.gov.sa/English/CDIntroduction/Pages/conceptofCD.aspx>
- Saudi Ports Authority (2014). Ports Statistics Annual Report for 2007 to 2009. Retrieved from: <http://www.ports.gov.sa/default.cfm>
- Saudi Arabia Presidency of Meteorology and Environment (2014). Retrieved from: <http://www.pme.gov.sa>
- Sastry, K.R. (2001). “Improving Community Participation and People’s Awareness in Disaster Reduction”. Paper prepared for contribution to the first edition of the Global Blueprints of Change and for use in conjunction with the International Workshop on Disaster Reduction, 19-22 August 2001 in Reston, VA.
- Schellong, A.R.M. (2007). “Increasing Social Capital for Disaster Response through Social Networking Services (SNS)”. In: Japanese Local Governments, National Center for Digital Government (NCDG) Working Paper No. 07-005. Tokyo: University of Tokyo.
- Schlehe, J. (2010). Anthropology of Religion: Disasters and the Representations of Tradition and Modernity. *Religion*, 40, 112–20.
- Schmuck, H. (2000). An act of Allah: Religious explanations for floods in Bangladesh as survival strategy. *Int. J. Mass Emergencies Disasters*, 18(1), 85–95.
- Schuller, T., Baron, S., & Field, J. (2000). Social capital: a review and critique. In S. Baron (Ed.), *Social capital: Critical perspectives* (pp.1e38). New York, NY: Oxford Press.
- Scott, M., White, I., Kuhlicke, C., Steinführer, A., Sultana, P., Thompson, P., . . . Russell, E. (2013). Living with flood risk/The more we know, the more we know we don't know: Reflections on a decade of planning, flood risk management and false precision/Searching for resilience or building social capacities for flood risks?/Participatory floodplain management: Lessons from Bangladesh/Planning and

- retrofitting for floods: Insights from Australia/Neighbourhood design considerations in flood risk management/Flood risk management–Challenges to the effective implementation of a paradigm shift. *Planning Theory & Practice*, 14(1), 103-140.
- Silverman, D. (Ed.) (2004). *Qualitative Research: Theory, Method and Practice* (2nd ed., pp.125-139). London: Sage Publications.
- Schwab, J. (1998). “Planning for Post-Disaster Recovery and Reconstruction”. Planning Advisory Service Report No. 483/484: American Planning Association.
- Semenza, J.C., Rubin, C.H., Falter, K.H., Selanikio, J.D., Flanders, W.D., Howe, H.L., & Wilhelm, J.L. (1996). Heat-related deaths during the July 1995 heat wave in Chicago. *New England Journal of Medicine*, 335(2), 84-90.
- Sen, A. (1981). *Poverty and Famine: An Essay on Entitlement and Deprivation*. Oxford: Clarendon Press.
- Sen, A. (1999). *Development as Freedom*. New York: Alfred A. Knopf.
- Sen, Z. (1983). “Hydrology of Saudi Arabia”. Symposium on Water Resources in Saudi Arabia. Riyadh. A68-A94.
- Sen, Z., As-Sefry, S. & Al-Harithy, S. *Environ Earth Sci* (2017) 76: 5.
<https://doi.org/10.1007/s12665-016-6312-z>
- Sharif, M. *Arab J Geosci* (2015) 8: 8795. <https://doi.org/10.1007/s12517-015-1810-y>
- Shiell, A., & Hawe, P. (1996). Health promotion community development and the tyranny of individualism. *Health Economics*, 5(3), 241-247.
- Sibley, C.G., & Bulbulia, J. (2012). Faith after an Earthquake: A Longitudinal Study of Religion and Perceived Health before and after the 2011 Christchurch New Zealand Earthquake. *PLoS ONE*, 7(12), 1-10.

- Smith, H., & Boruff, B. (2011). "Recovery from the storm: resilience and the role of community capital in long-term disaster recovery in regional Western Australia". In: Proceedings of the State of Australian Cities National Conference November 2011, Melbourne, Australia.
- Smith, K., & Petley, D.N. (2009). *Environmental Hazards: Assessing risk and reducing disaster* (5th edition). London: Routledge.
- Smith, M.H. (1978). American religious organizations in disaster: a study of congregational response to disaster. *Mass Emergencies*, 3, 133–142.
- Sobel, J. (2002). Can we trust social capital? *Journal of Economic Literature*, 40(1), 139-154.
- Sokolove, M. (2008). "The Transformation". The New York Times. Page WK.I (New York edition), 9 November 2009.
- Son, J., & Lin, N. (2008). Social capital and civic action: a network-based approach, *Social Science Research*, 37, 330-349.
- Spitzberg, B., Tsou, M.L., An, L., Gupta, D., & Gawron, J. (2012). "The map is not which territory?: Speculating on the geo-spatial diffusion of ideas in the Arab Spring of 2011". Paper presented at the International Communication Association Conference, Phoenix, AZ.
- Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stephens, N.M., Fryberg, S.A., Markus, H.R., & Hamedani, M.G. (2012). Who Explains Hurricane Katrina and the Chilean Earthquake as an Act of God? The Experience of Extreme Hardship Predicts Religious Meaning-making. *Journal of Cross-Cultural Psychology*, 44, 606–19.

- Stewart, K., Glanville, J.L., & Bennett, D.A. (2014). Exploring spatiotemporal and social network factors in community response to a major flood disaster. *The Professional Geographer*, 66(3), 421-435.
- Stolle, D., & Rochon, T.R. (1998). Are all associations alike? Member diversity, associational type, and the creation of social capital. *American Behavioral Scientist*, 42(1), 47-65.
- Subyani, A.M., & Al-Dakheel, A.M. (2009). Multivariate geostatistical methods of mean annual and seasonal rainfall in southwest Saudi Arabia. *Arabian Journal of Geosciences*, 2(1), 19-27.
- Subyani, A.M., Qari, M.H., Matsah, M.E., Al-Modayan, A.A., & Al-Ahmadi, F.S. (2009). "Utilizing remote sensing and GIS techniques to evaluate and reduce hydrological and environmental hazards in some wadis, Western Saudi Arabia". King Abdulaziz City for Sciences and Technology, Project No. APR 25/101. Final Report.
- Subyani, A.M., & Al-Modayan, A.A. (2011). Groundwater Vulnerability Risk Maps Using GIS and DRASTIC Index Method for Jeddah City, Western Saudi Arabia, *JAKU:Earth Sci.*, 23(2), 93-116.
- Suter, L., Birkland, T., & Larter, R. (2009). Disaster research and social network analysis: Examples of the scientific understanding of human dynamics at the National Science Foundation. *Population Research and Policy Review*, 28, 1-10.
- Swiss Reinsurance (2012). Sigma 2/12: Natural disasters and man-made catastrophes in 2011: Historic losses surface from record earthquakes and floods. Retrieved from: http://direito.folha.uol.com.br/uploads/2/9/6/2/2962839/natural_catastrophes_and_man_made_disasters_2011.pdf

- Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology*, 33(4), 650-667.
- Tafti, M.T. (2015). Housing assistance distribution after disasters: does it enable affected households to recover? *Environmental Hazards*, 14(4), 361-377.
- Taher, S., & Alshaikh, A. (1998) Spatial analysis of rainfall in Southwest of Saudi Arabia using GIS. *Nordic Hydrol J*, 29(2), 91-104.
- Talyer, C., & Ghazi, S. (1994). Jeddah Environmental Study (Meteorology and Environmental Protection Administration (MEPA), Jeddah).
- Tangui, J.K. (2014). "The role of community based organizations in the conservation of the environment in Kenya. A case of Kapcherop division, Elgeyo Marakwet County" (Doctoral dissertation, University of Nairobi).
- Taylor, R. (1962). Fatalism. *The Philosophical Review*, 71: 56–66.
- Thompson, D., Brown, S., Mallonee, S., & Sunshine, D. (2004). Fatal and non-fatal injuries among U.S. Air Force personnel resulting from the terrorist bombing of the Khobar Towers. *J Trauma*, 57, 208-15.
- Throsby, D. (1999). Cultural capital. *Journal of Cultural Economics*, 23, 3-12.
- Tierney, K.J. (1989). The social and community contexts of disaster. In: Gist, R. and Lubin, B. (Eds.), *Psychosocial aspects of disaster* (pp.11-39). John Wiley and Sons, Inc., Toronto, Canada,
- Tierney, K. (2007). From the Margins to the Mainstream? Disaster Research at the Cross-roads. *Annual Review of Sociology*, 33, 503-525.

- Timmerman, P. (1981). *Vulnerability resilience and collapse of society. A Review of Models and Possible Climatic Applications*. Toronto, Canada. Institute for Environmental Studies, University of Toronto.
- Tobin, G. (1999). Sustainability and community resilience. The holy grail of hazards planning? *Environmental Hazards*, 1, 13-25.
- Tolsma, L., & Zevallos, Z. (2009). "Enhancing Community Development in Adelaide by Building on the Social Capital of South Australian Muslims". Institute for Social Research, University of Adelaide.
- Tsuda, M., & Tamaki, M. (2001) *Shizensaigai to Kokusai Kyoryoku* (In Japanese). Tokyo: Shinhyoron.
- United Nations International Strategy for Disaster Reduction (UNISDR) (2002). "Natural Disasters and Sustainable Development: Understanding the Links between Development, Environment and Natural Disasters". Background Paper No. 5. Prepared for the World Summit on Sustainable Development, Johannesburg, September, 2002.
- United Nations International Strategy for Disaster Reduction (UNISDR) (2009). UNISDR Terminology on Disaster Risk Reduction. Geneva: UN/ISDR.
- United Press International (2011). "At least 10 dead in Saudi Arabia flooding". Retrieved from: http://www.upi.com/Top_News/World-News/2011/01/29/At-least-10-dead-in-Saudi-Arabia-flooding/UPI-44541296324045
- U.S. Energy Information Administration (2013). Saudi Arabia Analysis Brief Overview. Retrieved from: <https://www.eia.gov/beta/international/?fips=SA>
- Vale, L., & Campanella, T. (Eds.) (2005). *The Resilient City: How Modern Cities Recover from Disaster*. New York: Oxford University Press.

- Varda, D., Forgette, R., Banks, D., & Contractor, N. (2009). Social Network Methodology in the Study of Disasters: Issues and Insights Prompted by Post-Katrina Research. *Population Research and Policy Review*, 28(1), 11-29.
- Vidal, A.C. (1992). *Rebuilding Communities: A National Study of Urban Community Development Corporations*. New York: Community Development Research Center, New School for Social Research.
- Vincent, P. (2003). Jeddah's Environmental Problems. *Geographical Review*, 93(3), 394-412.
- Wagner, R. (2011). "After the flood: rising Saudi anger getting response". MidEastPosts.com. Retrieved from: <http://mideastposts.com/2011/01/after-the-flood-rising-saudi-anger-getting-response/>
- Wahab, S. (2012). "The Role of Social Capital in Community-Based Urban Solid Waste Management: Case Studies From Ibadan Metropolis, Nigeria". University of Waterloo.
- Walkup, J. (2003). Concepts of social capital. *The British Journal of Psychiatry*, 182(5), 458-458.
- Warren, C.A., & Karner, T.X. (2010). *Discovering Qualitative Methods: Field Research, Interviews, and Analysis* (2nd ed.). Oxford: Oxford University Press.
- Weatherspark (2013). Average weather for Jeddah, Saudi Arabia. Retrieved from: <http://weatherspark.com/averages/32766/Jeddah-Makkah-Saudi-Arabia>
- Weinberger, K., & Jutting, J. (2001). Women's participation in local organisations: conditions and constraints. *World Development*, 29(8), 1391-1408.
- White, G. (1945). "Human Adjustment to Floods". Research Papers No. 29. Chicago, IL: U of Chicago, Department of Geography.
- Wilson, J., & Musick, M. (1998). The contribution of social resources to volunteering. *Social Science Quarterly*, 79, 799-814.

- Wilson, J., & Musick, M. (1999). The effects of volunteering in the volunteer. *Law & Contemporary Problems*, 62(4), 141-168.
- Wisner, B. (2010). Untapped Potential of the World's Religious Communities for Disaster Reduction in an Age of Accelerated Climate Change: An Epilogue and Prologue. *Religion*, 40, 128-31.
- Wisner, B., & Luce, H. R. (1993). Disaster Vulnerability: Scale, power and daily life. *GeoJournal*, 30(2), 127-140.
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At Risk: Natural Hazards, People's Vulnerability, and Disasters* (2nd ed.). Routledge, London.
- Wondolleck, J.M., & Yaffee, S.L. (2000). *Making collaboration work: lessons from innovation in natural resource management*. Island Press, Washington
- Wong, S. (2008). Building social capital in Hong Kong by institutionalizing participation: potential and limitation. *Urban Studies*, 45(7), 1413-1437.
- Wood, L.J., Boruff, B.J., & Smith, H.M. (2013). When Disaster Strikes... How Communities Cope And Adapt: A Social Capital Perspective. *Change*, 11, 12.
- Woolcock, M.M. (2001). The place of social capital in understanding social and economic outcomes. *Isuma: Canadian Journal of Policy Research*, 2(1), 11-17.
- Woolcock, M., & Narayan, D. (2000). Social capital: implications for development theory, research and policy. *The World Bank Research Observer*, 15(2), 225-49.
- WorldAtlas (2011). Saudi Arabia's maps. Retrieved from:
<http://www.worldatlas.com/webimage/countrys/asia/sa.htm#maps>
- Wuthnow, R. (2002). Religious involvement and status-bridging social capital. *Journal for the scientific study of religion*, 41(4), 669-684.

- Yelvington, K.A. (1997). Coping in a temporary way: the tent cities. In Peacock, W.G., B.H. Morrow, and H. Gladwin (Eds.), *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disaster* (pp.92-115). London: Routledge.
- Yin, R.K. (1994). *Case study research design and method. Applied social research methods series, Volume 5*. Thousand Oaks, Sage Publication.
- Young, F.W., & Young, R.C. (1961). Key informant reliability in rural Mexican village. *Human Organization*, 20, 141-148.
- Youssef, A.M., Sefry, S.A., Pradhan, B., & Alfadail, E.A. (2016). Analysis on causes of flash flood in Jeddah city (Kingdom of Saudi Arabia) of 2009 and 2011 using multi-sensor remote sensing data and GIS. *Geomatics, Natural Hazards and Risk*, 7(3), 1018-1042.
- Youssef, A.M., Pradhan, B. & Sefry, S.A. *Nat Hazards* (2015) 75: 1465.
<https://doi.org/10.1007/s11069-014-1383-1>
- Van Breda, A.D. (2001). Resilience theory: A literature review. *Pretoria, South Africa: South African Military Health Service*. Zak, P. J., & Knack, S. (2001). Trust and growth. *The Economic Journal*, 111, 295-321.
- van Diemen, R. (2012). Saudi Arabia–Does the State Control Religion or Does Religion Control the State? Retrieved from: <https://socratichive.wordpress.com/politics-and-religion/van-diemen-renee-2012-saudi-arabia-does-the-state-control-religion-or-does-religion-control-the-state/>
- Zerbonia, R., Zadari, T., Al Fawaz, A., & Daggag, A. (1986). Jeddah Air Quality Report (Meteorology and Environmental Protection Administration (MEPA), Jeddah), 1-80.
- Zhao, Y. (2011). The Role of Social Network in Disaster Governance: An Example of Wenchuan Earthquake. *China Soft Science*, 8, 56-64.

Zhou, H., Wan, J., & Jia, H. (2010). Resilience to natural hazards: a geographic perspective. *Natural Hazards*, 53(1), 21-41.

www.frascanada.ca

<http://www.alyaum.com/article/1204469>

<http://www.alriyadh.com/771147>

<http://gulfnews.com/news/gulf/saudi-arabia/flash-floods-turn-deadly-in-jeddah-1.1621189>.

<https://www.jeddah.gov.sa/English/index.php>

<https://www.moi.gov.sa/wps/portal/Home/Home>

<http://www.techtarget.com/contributor/Margaret-Rouse>

<http://www.thenational.ae/world/middle-east/saudi-court-jails-45-people-over-deadly-jeddah-flooding>

APPENDIX 1 – Household Interview Question Guide

Date _____ Location _____

Oral Consent Obtained (Time): _____

Introduction Questions

- Can you tell us a little bit about yourself (age, education level, occupation?)
- Can you tell us a little bit about your household (i.e. other family members, who is head of family, education levels of other members)

- How long have you lived in your house?
- Do you own or rent the house?

Specific questions to 2009-2011 flash flood recovery

Can you describe your experience during and after the 2009-2011 flash floods?

- How did you know about the flash flood (media, family members, and friends)?
- What was your experience during and right after the flash flood? What did you do?
- Where did you live in the weeks/months following the disaster?
- Where did you receive the assistance from?
- Were most people in this neighborhood are willing to help if you need it?
- How did you recover? Who helped your recovery?
- How long did it take you to rebuild your house?
- Did you wait for government funding before rebuilding your house or did you start rebuilding with your own money/savings?
- Did you ask for help to rebuild your house?
- What inspired you or gave you strength to recover after the flash flood disaster?
- Do you feel that you have fully recovered from the event? If yes, at what point would you say that the recovery effort was finished? If not, what aspects of recovery are you continuing to work on?
- Have you undertaken any preparations or made any changes to your home to be ready for another flood?

APPENDIX 2 – Key Informant Interview Question Guide

Date _____ Location _____

Oral Consent Obtained (Time): _____

- 1) Do you belong to any social/community organizations? Can you talk a little bit about those organizations?
- 2) Tell me about the people you helped in, do they were will connected?
- 3) Thinking of the 2009 and 2011 recovery effort, would you describe it as successful? Why or why not?
- 4) What do you think could have been done to make the recovery effort more successful?

- 5) Within the community, do you feel the aid was distributed fairly?
- 6) Based on your experience with the response and recovery from the floods, what additional services or support do you think could be put into place to help the community better deal with any future events?