

Managing Disaster knowledge: Identification of Knowledge Factors and challenges

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Abstract

The number of reported disasters has increased steadily over the past century and risen very sharply during the past decade. Consequently the loss of lives, property, employment and damage to the physical infrastructure and the environment is also on the rise. Knowledge management can play a vital role through ensuring the availability and accessibility of accurate and reliable disaster risk information when required and through effective lesson learning. In this context, identification of key disaster knowledge factors will be an enabler to manage disasters successfully. The paper presents key knowledge factors relating to disaster management cycle, and explores a few challenges relating to identified disaster knowledge factors. A list of disaster knowledge factors was first identified through a comprehensive literature review and later semi-structured interviews were conducted among few disaster management practitioners to explore the influence and challenges relating to identified knowledge factors. Technological, operational/ managerial, economic, social, legal and environmental factors seem to have direct influence over the disaster management cycle, while the influence of institutional and political factors seemed indirect and it is through other factors identified. Among key challenges, the lack of detection and warning systems, the need for effective education, training and awareness raising programmes, the need for regular updating of disaster related laws, lack of funds for economic planning measures, poor planning, poor communication, poor leadership, and poor institutional arrangement were highlighted.

Keywords: Disaster management, Knowledge management, Knowledge factors, Challenges

1. Introduction

Billions of people in more than 100 countries are periodically exposed to at least one natural disaster (Moe et al., 2007) and there are around 30 identified natural disasters worldwide (Deshmukh et al., 2008). There is evidence that the frequency and extent of natural disasters are increasing on a global scale (Warren, 2010). For instance, in the decade 1900-1909, natural disasters occurred 73 times, but in the period 2000-2005 the number of occurrences rose to 2,788 (Kusumasari et al., 2010). This increase is as a result of more frequent disasters; the growth of global populations located in increasingly vulnerable areas; and continued environmental degradation (Deshmukh et al., 2008). As communities worldwide have been facing an increasing frequency and variety of disasters which can cause direct and indirect effects, the urgent need to reduce disaster risk (Moe et al., 2007) and develop a resilient community capable of recovering from disasters (Rotimi et al., 2009) is of increasing concern in many countries. Disaster management efforts aim to reduce or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

Knowledge management can play a vital role through ensuring the availability and accessibility of accurate and reliable disaster related information when required and through effective lesson learning (Seneviratne et al., 2010). Despite this, knowledge on disaster management appears fragmented, emphasising a perceived gap in information coordination and sharing (Mohanty et al., 2006; Seneviratne et al., 2010). Mohanty et al. (2006) define knowledge as “the fact or condition of knowing something with a considerable degree of familiarity through experience, association or contact”. Two forms of knowledge could be identified: explicit and tacit. Explicit knowledge is codifiable knowledge inherent in non-human storehouses including organisational manuals, documents and databases. Tacit knowledge represents knowledge based on the experience of individuals, expressed in human actions in the form of evaluation, attitudes, points of view, commitments and motivation (Nonaka et al., 2000). The knowledge and experiences of disaster practitioners remain in the individual or institutional domain. As an example, a research (Koria, 2009) revealed that many organisations have not been able to capture, retain and/or re-use the learning from disaster management operations except through the tacit knowledge of individuals that have worked in various operations. Furthermore the UK Higher Education Disaster Relief Report (University of Gloucestershire, 2007) highlighted the lack of mechanisms at a national level in the UK to link expertise, skills and knowledge that reside in higher education, with that of the practitioners working in humanitarian agencies. Therefore the lack of effective knowledge sharing, and knowledge creation on disaster management can thereby be identified as one of the reasons behind the unsatisfactory performance levels of current disaster management practices. In this context, the paper aims to present and discuss key knowledge factors relating to disaster management cycle, and explore a few challenges relating to identified disaster knowledge factors.

2. Disaster management

Moe et al. (2007, pp 787) define a disaster as, “a situation which overwhelms local capacity, necessitating a request to the national and international level for external assistance, or is recognised by a multilateral agency or by at least two sources, such as national, regional or international assistance groups and the media”. Disaster management is an integrated process of planning, organising, coordinating and implementing measures that are needed for effectively dealing with its impact on people (Deshmukh et al., 2008). The disaster management cycle illustrates the ongoing process by which various stakeholders in a society plan for and reduces the impact of disasters, react during and immediately following a disaster, and take steps to recover from the impact (Clerveaux et al., 2010). Figure 1 shows the disaster management cycle which broadly classifies disaster management efforts into pre-disaster risk reduction and post disaster recovery.

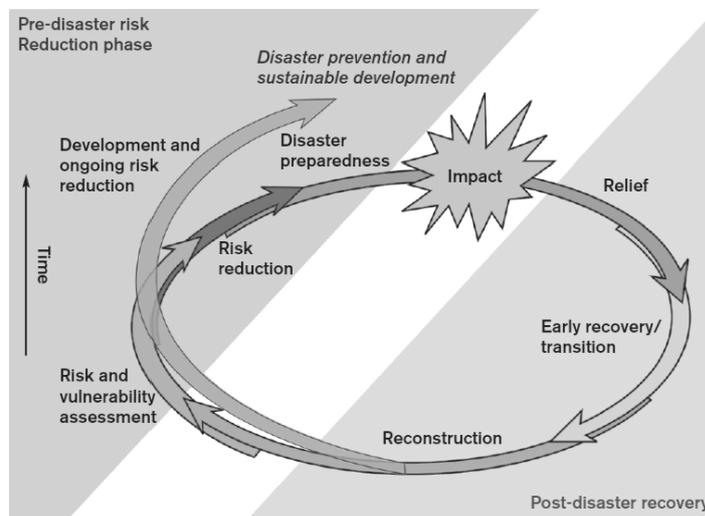


Figure 1: The disaster risk management and response cycle

Source: RICS, 2009

However, key phases of disaster management are identified as mitigation/preparedness, relief and long term reconstruction. Mitigation or risk reduction activities include structural and non-structural measures undertaken to limit the adverse impacts of natural hazards (Bosher et al., 2007; RICS et al., 2009). Preparedness deals with activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and temporary evacuation of people and property from threatened locations (Atmanand, 2003). Provision of assistance or intervention during or after a disaster to meet the life preservation and basic subsistence needs of those people affected is made during the relief phase (Moe et al., 2007). Reconstruction refers to the rebuilding of damaged living conditions of the stricken community with the aim of long term sustainability (Moe et al., 2007).

3. Disaster knowledge management

Knowledge management is a process by which knowledge is created, shared and utilized (Deshmukh et al., 2008). According to Tatham and Spens (2011), knowledge management is generally seen as a strategy to collect, store and retrieve knowledge in a systematic way, and then distribute the results to those who need it in a timely manner. In simple terms, knowledge management is all about providing the right knowledge, in the right place, at the right time. Though there is no way of neutralizing all negative impacts resulting from disasters, efforts can be made in order to reduce their consequences. Knowledge on disaster management strategies, together with good practices and lessons learned can undoubtedly support this effort through well-informed mitigative measures and preparedness planning. The RICS (2009) emphasises the feeding back of recovery experience to inform the disaster management process in order to reduce future risks and improve the resilience of vulnerable communities. According to Moe et al. (2007), it is essential for practitioners in the disaster management field to learn from lessons in order to adopt best practices throughout the disaster management cycle. Practitioners in disaster management should improve their skills and increase their level of knowledge, which requires investments in systems, databases and network structures so as to build a culture of learning from previous lessons and the adoption of best practices (Moe et al., 2007).

Despite the importance, knowledge on disaster management strategies appears fragmented, emphasising a perceived gap in information coordination and sharing (Seneviratne et al., 2010; Mohanty et al., 2006). Accordingly, the knowledge and experiences of disaster practitioners remain in individual or institutional domains. According to UNESCO (2005), while abundant knowledge about risk and vulnerability to hazards exists, its access and utilization at the community, national, regional and international levels, to empower or protect, is yet to reach its full potential. Kaklauskas et al. (2009) indicate that in the countries affected by Asian tsunami, the lack of knowledge management is apparent. This resulted in re-inventing the wheel in terms of setting up and managing construction programmes and projects within the tsunami recovery operation (Koria, 2009). According to Pourezat et al. (2010), disaster response is dynamic and therefore decision makers need to receive updated information on the current emergency situation. Disaster response is also time-sensitive, with little allowance for a delay in decision making and response operations. Therefore, any problem or delay in data collection, access, usage, and dissemination has a negative impact on the quality of decisions and hence, the quality of disaster response (Pourezat et al., 2010). All these highlight the importance of embracing knowledge management within the context of disaster management.

4. Methodology: ISLAND Project

In view of addressing the perceived need to capture and share disaster management knowledge, the School of the Built Environment, at the University of Salford, UK, undertook the research project titled 'ISLAND' (Inspiring Sri-LankAn reNewal and Development). ISLAND aimed at increasing the effectiveness of disaster management by facilitating the sharing of appropriate knowledge and good practices in land, property and construction. Due to the broad scope of disaster-management related activities, this initial study focused on creating a knowledgebase on the post-tsunami response, with specific reference to case materials in Sri Lanka. Research proposed through ISLAND-II aimed at

further extending the scope of ISLAND, by incorporating appropriate knowledge and good practices relating to the three key phases/stages of disaster management cycle, namely: mitigation/preparedness, relief/recovery and reconstruction/rehabilitation. Specifically it identified key disaster knowledge factors pertaining to disaster management cycle, evaluated the existing knowledgebase and expanded the knowledgebase to include good practice case studies associated with managing the different types of disasters. The research project was carried out according to four work packages (WPs) and this paper is based on WP 2, which aimed at identifying key disaster knowledge factors within the disaster management cycle.

A comprehensive literature survey and review is first carried out to identify the disaster knowledge factors which support successful disaster management and based on these findings semi-structured interviews were conducted with a few disaster management experts to identify the level and how these factors influence managing disasters successfully and any pertaining challenges. In total five experts were interviewed using a semi-structured interview guidelines. Their age ranged from 31 to 50, experiences dealing with disasters ranged between 4 and 7 years, and some had both industry and research experiences. Succeeding section provides a brief introduction to disaster knowledge factors identified through literature review and section after presents interview findings.

5. Disaster knowledge factors

Factors to be considered in managing disasters can be broadly classified into several categories as; Technological, Social, Environmental, Legal, Economical, Operational/ Managerial, Institutional and Political based on their characteristics. These factors are common for all types of disasters and across three phases/stages.

Technological factors include any tool, technique, product, process and method to benefit disaster management. Under this main category, three sub-categories are identified: warning systems, communication systems and structural measures. Disaster early warning systems, such as Tsunami, come under the first sub-category. Communication systems include emergency public sirens, satellite images, geographic information systems, remote sensing tools and broadcasts using radios, televisions and print media. These are used to distribute the information and make aware people on how to evacuate, locate and relocate (Olorunfoba, 2005). Structural measures include the effective application of science and engineering principles for the development of built environment. Physical preventive measures and construction of resilient buildings and structures come under structural measures (DFID, 2005).

Social factors include aspects relating to human society and its members in managing disasters: initiatives to increase the population's level of education, increase employment opportunity, reduce poverty, enhance the role and participation in decision making, including women that would support preparations for future disasters (Rodriguez et al., 2006). Natural environmental factors related to the disaster management are included under *Environmental factors*. Maintaining the protective features of the natural environment such as sand dunes, forests and vegetated areas are considered in this

category. Management of waste, like hazardous waste, vegetation, soil, sediment, demolition debris etc, created by natural hazards is also considered here.

Legal factors include issues relating to law, accepted rules, and regulations for managing disasters. Various regulations that apply to routine construction provide for the safe development of infrastructure, capital improvements and land use, ensuring preservation and environmental protection (Wilkinson et al., 2006). Long term economic planning measures and financial factors are included under *Economic factors*. Economic planning measures include aspects relating to production, distribution and consumption of goods and services in a society. Issues relating to money and management of monetary assets are covered under financial factors. Taking necessary measures to protect agricultural sector, industrial sector and infrastructure system (Bosher et al., 2007) against natural disasters are few examples on economic planning measures. Finance is an essential resource in disaster management and financial policies and procedures have an effect on disaster management process.

Operational/managerial factors include planning, coordination and management of disaster related activities. Skills and competencies needed to accomplish desired works are also included under this classification. Logistics management, information and communication management and leadership are some other aspects covered under this category. *Institutional factors* include aspects relating to an organisation founded and dedicated to disaster management and related activities. An effective institutional arrangement is essential for managing disasters successfully. Development of land use plans and regulations (Srinivas and Nakagawa, 2008), building codes (Bosher et al., 2007), and enhancing disaster related knowledge and competencies come under this category. *Political factors* include the aspect related to politics in related to disaster management.

6. Influence of knowledge factors on disaster cycle

This section presents a discussion on how disaster knowledge factors influence different phases of the disaster management cycle based on interview findings.

Influence of technological factors in different phases of the disaster management cycle

Most of respondents agreed that technology plays a major role in almost all phases of a disaster. But technologies that could be used during immediate relief stage are quite different from the technologies that could be used during long term recovery and the preparedness stages.

A technological focus in the immediate relief stage is very much on transport as a means to get to places very quickly and to recover people effectively and efficiently through ground vehicles to helicopters. In addition, sensing technology supports gathering of real time data on the scale of the disaster, what has being destroyed, and what is being left through satellite images. As this real time data supports much of the subsequent decision making on resource planning and allocation, it can have a big impact on the disaster management cycle. During long term recovery and preparedness, technology tends to be used to enhance the resilience of communities and safeguard existing

communities. Effective methods of reconstruction or product modelling play a major role during long term reconstruction. In addition, product modelling helps to analyse the strength of the buildings after a disaster and to remodel better. As perceived by respondents, the maximum impact of technology is likely seen during the preparedness stage as this stage allows maximum time to plan for technologies to improve the resilience of communities to face further disasters. Most of the measures that a country takes to avoid disasters in preparedness stage are technology based. However, the usefulness or ability to make an impact will depend on numerous factors, including the key parties in the disaster management cycle, who uses the technology, competencies that they have on the use of that technology, and the environment in which it is being used. Therefore, technological factors are integrated with operational/ managerial factors and social factors through institutions.

Influence of social factors in different phases of the disaster management cycle

One of the key success factors of disaster management is to what extent humans are part of disaster management or to what extent the disaster management is connected with the day to day lives and the operations of a society. Whether a society as a whole is well aware of the impending disaster but is also ready to take up and live with it, is considered as a key success factor. For example though Japan is a country which is prone to frequent earthquakes, it is considered as one of the world's most resilient countries because it is embedded into peoples' lives and people have a level of preparedness and resilience, despite recent tsunami devastation. Disaster related training, education and awareness raising are helpful to enhance the peoples' preparedness and resilience to disasters. When it comes to immediate relief and reconstruction, the extent of peoples' network can either help or hinder the operation. If it is a society that helps each other, it can tremendously improve the ability of the social network to withstand the effect of the disaster.

Influence of environmental factors in different phases of the disaster management cycle

As natural factors can sometimes prevent or promote disasters, the influence of natural factors on the disaster management cycle can be identified as follows.

When environmental factors have an effect in preventing disasters, measures should be taken to ameliorate and protect such natural factors. For example, planting trees may be used to prevent landslides, or planting of shelterbelts and mangroves along coastal areas may be used to minimise the effects from waves. On the other hand if there are already natural barriers in place, measures should be taken to protect them. For instance, if mangroves and vegetation are already present in coastal areas, necessary planning measures should be taken to avoid any interventions that damage those barriers. When natural factors promote disasters, careful consideration, through building and town planning, should be given as to whether people should be allowed to live in those areas. If people are allowed to live there, then the necessary man-made barriers should be used to minimise the possible effects. For example in the Netherlands, protective walls are built around the sea as the Netherlands lies below the sea level.

The influence of environmental factors can be clearly identified during the mitigation/ preparedness phase of the disaster management cycle. The interview findings suggest that natural environmental factors can promote or prevent disasters. Also it is clear from the findings that, when natural factors

promote disasters, the built environment has a big role to play in minimising any negative effects. In addition, institutions are responsible in developing necessary planning and regulations to enhance and protect the existing natural barriers and to minimise the damages to the structures and people when natural factors promote disasters.

Influence of the legal factors in different phases of the disaster management cycle

Most respondents felt that the highest impact of legal measures or legal factors will be at the prevention and mitigation stages. As disaster management policies have a high possibility of being very effective at the prevention and mitigation stages, there should be a legal backing to support these policies. In other words, the law can help to implement some of the disaster mitigation measures by incorporating them into codes, standards, and statutes. In addition, emergency regulations and laws related to civic duties might influence when responding to a disaster during the immediate relief. As an example, when hurricane Katrina hit New Orleans, a state of emergency was declared in that part of America. This was partly because of human unrest. The other reason was to give central government the power to use the resources of other states. Because America has very strong state governmental system, one state or even the federal government or central government cannot straight away intervene and use resources allocated to one state. But by declaring state of an emergency it gives central government the power to do that.

Influence of the economic factors in different phases of the disaster management cycle

As disasters can affect a country's wealth generation mechanism, economic planning measures are accepted as very important. The focus of economic planning measures in mitigation/ preparedness stages is on protecting the country's wealth generation mechanism and looking for alternatives during the reconstruction stage.

For example as Sri Lanka's paddy rice production is mainly based in Polonnaruwa, Anuradhapura and Kurunegala districts, a proper disaster risk assessment should be carried out in those areas to know the risks, mainly from floods, affecting the production and take actions to prevent them during the disaster mitigation stage. Similarly, risk assessments should be carried out to assess the risk to infrastructure facilities. During the disaster recovery/ reconstruction stage, actions should be taken to recover/ reconstruct damaged infrastructure and alternatives for such infrastructure can be identified. For instance, as Sri Lanka has only one international airport and seaport, any disruption on them due to a disaster could be crucial. With regard to financial factors, respondents highlighted the importance of financial management in the immediate relief stage as it may have filtered out the impact on other stages. However, a few emphasized the aspects of rigid policies and financial allocations throughout the disaster management cycle that may hinder efforts.

Influence of operational/managerial factors in different phases of the disaster management cycle

It was highlighted that most of operational/ managerial factors are interconnected and these factors remain important throughout the disaster management system. It was widely agreed that the management of technology is very important and therefore there is a strong link between and technological factors and managerial/ operational factors. In addition operational/ managerial factors

are linked with institutional factors as institutions are responsible for enhancing disaster related competencies and skills.

Influence of the institutional factors in different phases of the disaster management cycle

It was felt that the role of the institutional factors or the role of institutions remained the same throughout the disaster management cycle. One reason given was that institutions tend to safeguard the implementation of all the other factors. Therefore, institutions are looking at those factors at different times, yet dealing with the same issue.

Influence of the political factors in different phases of the disaster management cycle

As politics is an art of influencing others, factors like, legal, institutional, social and operational/ management have politics embedded in them. Politics have some implications not necessarily on disasters, but on the way institutions are formed, the way operations and things are managed, and the way the law is formed. Therefore, the level at which political factors affect disaster management will depend on how it affects the institutional arrangement, the legal framework and the operational/ managerial aspects. The implications of political factors on disaster management appeared to be indirect through institutional, legal, social and operational/ managerial aspects.

7. Challenges

Experts identified a number of challenges related to disaster knowledge factors. These challenges are described below. Challenges recognise those areas which are lacking and need to be improved further in order to deal future disasters successfully.

Technological factors

In relation to technological factors, the need for cost effective and proactive technologies is highlighted by the respondents. Respondents identified communication as one of the areas that needs technological support. As an example, they elaborated the experiences of the Kashmir earthquake, which highlighted the importance of speed of communication as many people had died by the time the government realised the scale of the disaster and started the relief operations. Also proper use of the technology and having the necessary skills was recognised as highly important by the respondents. Effective technology will not cause a positive impact unless the people who use them have the required competency and knowledge. Respondents stressed that the key issue related to this aspect is lack of training. Knowing the strengths and weaknesses of the technology was another factor identified during the interviews. In addition, respondents identified a gap in the implementation of technology. They indicated that political institutions or bureaucratic structures hamper the uptake of technology. The need to address the social, political, institutional and behavioural barriers in the implementation of the required technology was highlighted during the interviews. The effective use of technology to create networks among communities and across networks between the policy makers and the communities was noted by the respondents as an area that is lacking and that needs further improvement.

Social factors

Interviewees indicated that people need to be educated and trained properly to engage in overall disaster management cycle. Accordingly, people should be made aware of any potential disasters and their collective responsibility in preventing or minimising the effects of disasters. Respondents view that these will help to make preparedness part of their lives or enhance their culture of preparedness. As an example, they pointed out that even though vulnerability is increased in many third world countries due to unsafe power lines and closed running sewers and water lines, the aggravating effects of these are not known by many of the people of these countries. Respondents highlighted that the success of training depends on several factors, including the knowledge of the person who delivers the training, the environment in which the training is delivered, the level of resources needed to support the training and the absorptive capacity of the people who receive training. Therefore, a thorough understanding of the context was emphasized by them.

Issues related to people's attitudes and perceptions were the next challenge identified by the respondents. Respondents admitted that, as civilians of a country, people should know their strengths and weaknesses and anticipate certain disasters. Respondents were of the view that while some people believe disasters can be prevented, some people do not learn lessons from previous disasters as they struggle for life which takes their focus away. For example, one respondent stated that even after the 2005 earthquake in Kashmir, people have started constructing their houses in hilly places where there are massive power lines running above the land. According to the respondent, in some countries behavioural structure has taken over the legal structure through bribery and corruptions. Therefore, these socially embedded issues need to be addressed for successful implementation of laws. Respondents agreed that social factors should be given a thorough consideration throughout the disaster management cycle. However, social factors are less concerned during the long term reconstruction and preparedness/ mitigation phases and much more attention is paid during the relief stage. Accordingly, people's needs and requirements are not considered in long term reconstruction. As an example, they highlighted the fact that many resettlement programmes do not consider people's livelihood needs. In order to minimise these effects the detachment between policy makers and the affected community should be minimised. Building networks among people and between people and policy makers was viewed as vital if this challenge is to be addressed.

Environmental factors

It is reported that similar scale of hazards cause different effects in different countries due to different environmental factors, different population densities and different planning and building regulation standards. A thorough understanding of the environmental factors and their influence is needed by policy makers, professionals and communities. A broader understanding of the forces of nature and the forces of environment is proposed to be highly important by the respondents. It was acknowledged that Indian Ocean is the least studied Ocean which led to a huge devastation by 2004 tsunami. A possible reasoning for this might be that the countries around the Indian Ocean are less economically developed. Finally the respondents indicated that building regulations should be based on proper vulnerability analysis of the environment.

Legal factors

Implementation of the law was identified as a major shortcoming by most of the respondents. The laws which do not address the humanitarian aspect of disaster management have become unsuccessful and ineffective. For instance the 200m buffer zone which was regulated after the 2004 tsunami in Sri Lanka was unsuccessful as it was not taken into consideration the livelihood needs of the affected community. As a result, the fishing community re-constructed their houses within the buffer zone in order to safeguard their livelihood needs. Within a disaster context, it is highly unlikely that laws can be developed which cover the every aspect of disasters, as communities sometimes face new circumstances which they have not encountered before. It is also contended that disaster related laws should be updated regularly.

Economical factors

Economic planning measures: Risk assessment or vulnerability analysis of a country's wealth generation mechanism is accepted as a more prominent part of long term economic planning by the respondents. However, it was found that a lack of investment hampers this process. For example, though many developing countries' infrastructure facilities are instrumental to communities, governments do not invest enough in them. As a result the impact could be magnified if a disaster strikes. Therefore interviewees suggested that the vulnerability assessment of a country's wealth generation mechanism should be an integral part of the country's financial model. At the same time they argued that long term reconstruction should focus on both recovering the damaged infrastructure and looking for alternatives, rather than focusing only on repairing the existing facilities.

Financial aspect: As the relief stage attracts more funding, the management of finance during the relief stage was considered as vitally important by the respondents. Rigid policies in handling money hinder rapid decision making in the aftermath of disasters. Therefore, respondents highlighted the need for more flexible systems which allow fluid decision making. They also highlighted that the reconstruction and preparedness/ mitigation phases tend to attract less finance. One reason given by respondents was that disaster management does not get priority in the allocation of finance. However as proactive approaches to disaster management could bring much benefit, they felt investments in reconstruction and preparedness/ mitigation phases should be prioritised. Financial mismanagement is another issue experienced during reconstruction stage. Respondents indicated that the disconnection between investment or insurance companies and public sector has prevented public sector learning from insurance companies on how to manage finance effectively. As respondents stated, the accountability of post disaster reconstruction should be improved, yet not adhering to the conventional financial accounting systems, as conventional financing accounting systems are developed on the basis that there are very well defined requirements and outputs. Nonetheless, in a disaster situation things are not certain and it needs much more flexible accounting system.

Operational/managerial factors

Experts argued that improvement is needed in decision making process of disaster management. Parties to the decision making process, speed of the decision making and innovativeness of decisions are some of the areas considered by the respondents. Community participation in decision making process is highly promoted in disaster context as it helps to identify their real needs. Slow decision making is identified as a main reason for delay in reconstruction work. As an example, despite the

urgency, it is reported that most of government institutions still follow the traditional tendering system by giving priority to the lowest bid. As every disaster brings some uniqueness, the role of innovative decision making is highlighted.

As viewed by the respondents, reasons for some failures in disaster management were down to the quality of leadership. Choosing the correct leadership style is one aspect which needs more attention. Respondents described that participatory style of leadership may be appropriate for certain contexts while autocratic style may be convenient for certain contexts. Also the communication among affected communities and between the affected communities and policy makers should be enhanced. In order to avoid receiving inappropriate relief goods, the process of collecting goods should be driven by the requirements. For instance, the Disaster Emergency Committee (DEC) which operates in UK sends money in a disaster emergency instead of goods which may be not appropriate or useful. Moreover, providing the required training and necessary resources including financial, time and manpower were identified as essentials in managing the disasters successfully by the respondents. Though people have knowledge and know the best practices in managing disasters, transfer of knowledge to the right person at the right time is identified as lacking and training could facilitate this transfer of knowledge. A considerable gap exists between what is known and what is done in practice. Another area which needs attention is developing a common vocabulary that could bring together various disciplines in the disaster management field. As an example, terminologies used by engineers are different from GIS specialists or public officials and this may hamper the communication between them.

Institutional factors

Interviewees claimed that proper institutional formation and integration are vitally important in managing disasters successfully. Hence they indicated that the capacity of these institutions need be reviewed and empowered according to the needs. Particularly the disaster related knowledge and skills need to be improved. In addition a centralised institution which monitors and oversees all the other institutions need to be formed. For example once hurricane Katrina hit New Orleans, for a couple of weeks it was not known who should be responded, whether it is the state of Louisiana or the federal government.

Political factors

Studies on political expectations in context of disaster management are recommended to minimise the mismatches between political agendas and disaster management agendas. Most importantly it is highlighted that the long term perspectives of disaster management should not be dominated by the short term political perspectives.

8. Conclusion

This paper presented key knowledge factors within disaster management cycle and challenges relating to identified disaster knowledge factors. Technological, operational/ managerial, economic, social, legal and environmental factors seem to have direct influence over the disaster management cycle, while the influence of institutional and political factors seemed indirect and it is through other factors

identified. Further, mitigation/ preparedness phase seemed influenced by almost all the factors discussed. Among key challenges, the lack of detection and warning systems, the need for effective education, training and awareness raising programmes, the need for regular updating of disaster related laws, lack of funds for economic planning measures, poor planning, poor communication, poor leadership, and poor institutional arrangement were highlighted by most of the respondents. Most of these challenges are apparently related to the operational/managerial factors. In order to enhance the management of disasters, these challenges need to be addressed. Further, peoples' attitudes and perceptions hinder their involvement in disaster management. As an example some people believe that disasters are act of god which cannot be prevented, some are not involved due to their economic hardship. Also some people put the blame on others and refrain from contributing to manage disasters. Furthermore, bribery and corruptions have been taken over the legal structure. Hence, in order to manage disasters successfully it is important to overcome these attitudes and perceptions. Therefore, future research could be conducted to study how these attitudes and perceptions could be changed to manage disasters successfully.

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