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Pathirage, C. P., Amaratunga, Dilanthi and Haigh, Richard

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## **Knowledge Sharing in Disaster Risk Management Strategies: Sri Lankan Post-Tsunami Context**

Chaminda Pathirage, Dilanthi Amaratunga, Richard Haigh, and David Baldry

### **ABSTRACT**

Effective lesson learning should reduce the risk of future disasters through well-informed mitigation and preparedness planning. Ensuring the availability and accessibility of accurate and reliable disaster risk information when required entails an efficient system for knowledge sharing. In this regard, an efficient disaster risk management knowledge system is important. This paper highlights the importance of knowledge and good practice sharing in disaster mitigation strategies with particular reference to post-tsunami reconstruction in the Sri Lankan context. Further, a knowledge base infrastructure is introduced, developed as part of a research aimed at increasing the effectiveness of disaster management by facilitating the sharing of appropriate knowledge and good practices. This will provide the opportunity to explore the link between disaster and development to mitigate future devastations.

**Key words: Disaster Risk Management, Knowledge Sharing, Good Practices, Post-Tsunami Reconstruction.**

### **1. BACKGROUND**

Disasters cause a considerable amount of damage around the world each year (Ofori, 2002). The number of deaths apportioned to the Indian Ocean Tsunami is estimated to be in excess of 250,000, with at least 40,000 of those in Sri Lanka. Most of the affected countries have yet to recover from the devastation caused by the Indian Ocean Tsunami of December 2004 and Sri Lanka is no exception. Lack of awareness and preparedness has

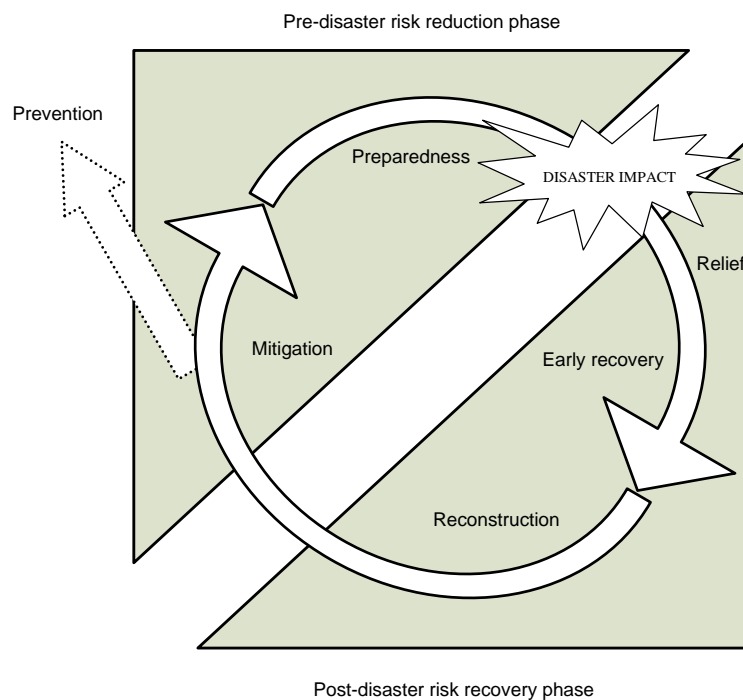
been identified as a major reason behind the huge loss of life. Indeed, the term "Tsunami" was heard by most of the ordinary Sri Lankans only after this devastation. Both awareness and mitigation measures are needed to prevent such huge loss of human life in future. It is clear that much work has been done and is ongoing, relating to disaster management and construction's role specifically. However, the link between disaster and development is poorly explored, particularly within developing countries due to lack of knowledge. Disaster management strategies need to recognize the importance of greater integration with development planning in order to alleviate the effects of future disasters and to build greater resilience into urban and rural communities. Programmes and activities on prevention, mitigation and preparedness comprise the development portion, while relief and recovery comprise the humanitarian assistance portion (de Guzman, 2001).

Therefore, the problem continues beyond the immediate relief and recovery into long term reconstruction and mitigation. The RICS (2006) highlight the inefficient management and coordination of permanent reconstruction, despite the huge improvements in the emergency response to natural disasters. Stable and secure post-disaster recovery is threatened by institutional constraints; gaps in communication, lack of access to or inappropriate use of professional skills and knowledge to support the local effort, and failures in management and planning. Despite its importance, knowledge appears fragmented (Mohanty *et al*, 2006), although there are undoubtedly many successful practices and lessons to be learned, most significantly from major disasters such as the 2004 Tsunami. It is important to guarantee that knowledge gained is knowledge applied to reduce the impact during future disasters. In this context, the paper aims to highlight the importance of knowledge and good practices sharing in disaster mitigation strategies with particular reference to post-tsunami reconstruction in Sri Lankan context.

## **2. DISASTER MANAGEMENT CYCLE**

Disasters, both natural and man-made, have been occurring with increasing frequency and effect in recent decades in many countries around the world. As such, 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 (Warfield, 2004). As shown in Figure 1, the process of disaster management is commonly visualised as a two-phase cycle, with a post-disaster recovery informing pre-disaster risk reduction and vice versa. As Warfield (2004) states, the disaster management cycle illustrates the ongoing process by which governments, businesses and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. The significance of this concept is in its ability to promote the holistic approach to disaster management as well as to demonstrate the

relationship of disasters and development (de Guzman, 2001). Recovery and reconstruction are commonly identified within the post-disaster phase, that is the period that immediately follows after the occurrence of the disaster. However, the terminology of disaster relief and recovery, rehabilitation and reconstruction is used without precise and commonly agreed definitions, although in practice, a distinction is drawn between the emergency relief phase and the subsequent non-emergency recovery (RICS, 2006). Once a disaster has taken place, the first concern is effective 'recovery' – helping all those affected to recover from the immediate effects of the disaster. 'Reconstruction' involves helping to restore the basic infrastructure and services which the people need so that they can return to the pattern of life which they had before the disaster (Davis, 2005). The importance of the 'transitional phase', linking immediate recovery and long-term reconstruction, is also stressed by a number of publications (de Guzman, 2001; RICS, 2006). With the recovery of social institutions, the economy and the main infrastructure, transition to the longer-term recovery and reconstruction process can be implemented.



**Figure 1.1** Disaster Management Cycle (adopted from RICS, 2006)

The pre-disaster phase of the disaster management cycle includes both mitigation and preparedness. As RICS (2006) defines, disaster mitigation refers to any structural and non-structural measures undertaken to limit the adverse impacts of natural hazards, environmental degradation and technological hazards. 'Mitigation' measures may eliminate or reduce the probability of disaster occurrence, or reduce the effects of unavoidable disasters. As such, these measures include building codes; vulnerability analyses updates; zoning and land use management; building use regulations and safety codes; preventive health care; and public education (Warfield, 2004). In the ideal case, mitigation eliminates the risk of future disasters by effective sharing of lessons learned through 'preparedness' planning. Hence, the attention for disaster mitigation and risk reduction, which comprises the development portion, is equally important as disaster recovery and reconstruction, and rehabilitation. Greater attention to pre-disaster planning and preparedness, and sharing the lessons from previous disasters, could considerably reduce the risk associated with disasters. Thereby, the mitigation phase, and indeed the whole disaster management cycle, includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle (Warfield, 2004).

Natural events however only become potential hazards when they threaten people or property (Davis, 2005). As de Guzman (2001) states, natural hazards themselves do not necessarily lead to disasters. Natural hazards like earthquakes, however intense, inevitable or unpredictable, translate to disasters only to the extent that the population is unprepared to respond, unable to cope, and consequently, severely affected. An earthquake will cause little damage if it takes place in an empty desert. It may also cause little damage if it takes place where people can afford to be well protected. Hence, a natural event only causes serious damage when it affects an area where the people are at risk and poorly protected. Disasters occur when these two factors are brought together (as shown in Figure 2):

- people living in unsafe conditions
- a natural hazard such as a flood, Tsunami, hurricane or earthquake



Figure 1.2 Components of a Disaster

Thereby, the threat from natural hazards can only be minimized through the elimination of unsafe conditions, as much as possible, in terms people, property and infrastructure. The role of the pre-disaster risk reduction phase, also referred as development portion, is considered to be vital in bringing unsafe conditions to controlled safe environment, through mitigation and preparedness.

### **3. TSUNAMI DISASTER - SRI LANKAN CONTEXT**

According to the World Disaster Report 2005, the number of reported disasters has increased steadily over the past century and risen very sharply during the past decade. An average of 354 disasters of natural origin occurred per year in the period 1991 to 1999. From 2000 to 2004, this rose to an average of 728 per year. The Asia-Pacific region has experienced the greatest loss of life in absolute terms and in proportion to the population, due to earthquakes, floods and tropical cyclones. In economic terms, the World Disaster Report 2002 assesses the average estimated damage due to natural disasters at US\$69 billion. Asia shows the highest reported losses but those in Europe are considerably greater than those in Africa. This reflects the high value of the infrastructure and assets at risk. The Asian region is highly prone to natural disasters. These bring about the loss of lives, property, employment, and damage to the physical infrastructure and the environment.

In Sri Lanka, the tsunami that struck on the morning of December 26, 2004 left behind widespread destruction, killed over 31,000 people, damaged natural ecosystems and coastal infrastructure. The 2004 tsunami is widely acknowledged as the largest, most devastating natural catastrophe in the history of Sri Lanka. According to the UNEP report 2005, the tsunami affected two-thirds of the coastline of Sri Lanka. It also resulted in the destruction of nearly 100,000 houses. The destruction of houses not only impacted on the existing housing stock, but also resulted in discontinuance of several livelihoods in the coastal areas such as fishing, farming and tourism related activities. The UNEP report 2005 highlights the context in which the current post tsunami rehabilitation is operating. Among the most important factors is the pre-existence of very high densities of unplanned settlements in Sri Lanka, with the majority of the construction not observing some of the critical building standards. To add to this, the post-tsunami rehabilitation operation has been affected due to weak local government institutions with poor response capacities to address the needs of such a magnitude as the Indian Ocean Tsunami. This is mainly because, before the tsunami, Sri Lanka was known to be a safe haven where outrages of nature scarcely occurred except for occasional floods and landslides during the rainy seasons. Vulnerable groups, such as poor fishermen living close to the shore in simple houses and shelters, have borne the brunt of the negative impacts (ADB, 2005). Therefore, a lack of awareness, preparedness and mitigation measures has resulted in widespread devastation in Sri Lanka due to 2004 Tsunami.

The recovery process is however making notable progress. The increase of natural and man-made disasters over the last two decades affecting Sri Lanka's economy, its people and the environment has compelled the government to introduce the Sri Lankan Disaster Management Bill. In addition to creating a council for disaster management, the bill also provides for the establishment of a natural and human disaster management centre, the appointment of technical advisory committees, the preparation of disaster management plans, the declaration of a state of disaster and the award of compensation to victims. Resulting from the formation of a task force known as the Task Force for Rebuilding the Nation (TAFREN), the Tsunami Housing Reconstruction Unit (THRU), The Ministry of Environment and Natural Resources (MENR), the Southern Provincial Council (SPC), the Central Environmental Authority (CEA) and the Coast Conservation Department (CCD) have initiated several important tasks and activities to meet the needs of the post-tsunami rehabilitation and reconstruction. However, within the recovery strategy for post-tsunami reconstruction, ADB (2005) stress the need for a coordinated approach to better manage the post-tsunami reconstruction efforts. A coordinated approach is critical to share knowledge and best practice, and to prevent duplication or overlap in activities. A suitable mechanism would need to be created at the local level for such coordination and dissemination of knowledge. The EU Sri Lanka cooperation has traditionally focused on poverty alleviation through rural development, irrigation and farming. This has now shifted towards economic cooperation as Sri Lanka's economy develops and in order to react to the Tsunami disaster. According to the United Nations' Sri Lanka report on Post-tsunami Recovery and Reconstruction (December 2004 – December 2006), the need to strengthen national capacities, for the recovery and reconstruction process, including disaster preparedness and long term disaster risk management, is one of the major strategic objectives. This can be achieved by developing the capacities and providing support for institutions, both governmental (national and local), non governmental (NGOs and CBOs, private sector and other civil society organisations), in the form of knowledge inputs, technical support, institutional building and systems development.

### **3.1 Disaster Mitigation Measures**

Prior to the tsunami disaster, the risks from natural hazards to Sri Lanka were considered low. Sri Lanka experiences mainly weather-related hazards, resulting in localised and seasonal floods, landslides, cyclones and droughts. Post-tsunami reconstruction is a major investment in rebuilding the country. The opportunity to protect this investment from future disasters Sri Lanka may face should not be missed. Lessons from the tsunami combined with findings from the rapid multi hazard risk assessment should be fed into reconstruction planning and future risks reduced through improved building standards and design considerations

(ADB, 2005). The importance of improving the construction industries of developing nations is widely recognized, highlighting a need to equip them to manage the post-disaster scenario. There is growing recognition that the engineering community has a valuable role to play in finding and promoting rational, balanced solutions to what remains an unbounded threat and that the construction industry has a much broader role to anticipate, assess, prevent, prepare, respond and recover from disruptive challenges. However, best practice improvements are likely to be required by the community in order to guarantee long-term sustainability of the reconstruction (Ofori, 2002) to ensure safe conditions for future disasters. Recognizing the challenges exposed by the recent tsunami, the Asian Development Bank (2005) stresses that Sri Lanka should develop a risk management approach, based on the principles that:

- The post-tsunami reconstruction programme, and in general, all development programmes, should be guided by multi hazard risk considerations;
- Improved institutional capacities are required for improved management of emergency response, particularly at the local level;
- Risk transfer mechanisms should be considered to mitigate the financial impact of disasters on the economy and future development activities.

A significant number of ordinances, acts and laws exist in Sri Lanka that relate to land use planning, human settlements, development and conservation of natural resources. Review of existing legislation and standards from a risk reduction perspective, simplification of procedures for their implementation and clarification of institutional arrangements for their enforcement should go hand in hand with reconstruction and development efforts (ADB, 2005). The lessons and experiences of the tsunami relief and recovery coordination should be distilled in developing an appropriate disaster management mechanism and an authority that reflects the risks faced by Sri Lanka. A National Disaster Management Plan would clarify roles, responsibilities and streamline coordination across administrative levels and various stakeholders. Mitigation will depend on incorporating appropriate measures in national and regional development planning. Its effectiveness will also depend on the availability of information and knowledge on hazards, emergency risks and the countermeasures to be taken. Hence, post-disaster housing reconstruction requires a variety of interventions that go beyond the construction of houses (Lizarralde, 2002). International exchange of best practice and knowledge sharing among practitioners, authorities and NGOs, particularly from the region, can significantly contribute to reconstruction at all levels. Further, the importance of training and education is well recognised. This need is all the more important in disaster situations (Yasemin, 1995). The scope of a training and education programme must include the identification of areas of vulnerability, mitigation measures (social, physical and organizational)



that can be employed to reduce vulnerability and awareness of plans developed to manage post-disaster risk reduction activities (Jigyasu, 2002).

#### **4. THE NEED TO SHARE KNOWLEDGE**

There is a conscious effort for disaster management at national, provincial and sub-provincial level. Despite this, knowledge appears fragmented, although there are undoubtedly many successful practices and lessons to be learned (Mohanty et al, 2006). Hence, there is a perceived gap in information coordination and sharing particularly relating to disaster mitigation. A lack of prior knowledge and proper point of reference have made most of the recovery plans guessing games, eventually failing without adding appropriate values to the recovery attempts (RICS, 2006). The lack of effective information and knowledge sharing, and dissemination on disaster mitigation measures can thereby be identified as one of the major reasons behind the unsatisfactory performance levels of current disaster management practices.

Knowledge can be differentiated between explicit, tacit and implicit forms of knowledge. Explicit knowledge is that which is stated in detail and leaves nothing merely implied. It is termed "codified" or "formal" knowledge because it can be recorded. Tacit knowledge is that which is understood, implied and exists without being stated, mainly grounded in individual. In an organizational context, knowledge management is about applying the collective knowledge of the entire workforce to achieve specific organizational goals and facilitating the process, by which knowledge is created, shared and utilized (Nonaka & Takeuchi, 1995). However, within the disaster management context, knowledge management is all about getting the right knowledge, in the right place, at the right time (Mohanty et al, 2006). As a strategic approach to achieve disaster management objectives, knowledge management will play a valuable role in leveraging existing knowledge and converting new knowledge into action through the knowledge management cycle. In essence, knowledge organization and human knowledge conversion processes can bring a comprehensive foundation to the common operating picture, interoperability, intelligence, training and acquisition (UNDP, 2005). In the light of this, it can be perceived that valuable knowledge on disaster mitigation is present at three different levels: institutional, group and individual, in the forms of both tacit and explicit knowledge.

Thousands of organizations and institutions have been supporting the efforts on disaster management over last few decades. The linkages among all agencies working on disaster management need to be strengthened in order to derive the regional best practice and coping mechanisms (RICS, 2006). In order to enhance the information sharing and management of the knowledge generated in institutions, it is essential to knit these organizations and institutions, and moreover groups and people working within these institutions (UNDP, 2005) more closely together.

There are many gaps that could be bridged by the appropriate use of professional skills, but access to these by the local organizations on the front line of the recovery effort is highly constrained by lack of recognition of their existence. Therefore, recognition needs to be given for the institutions and organizations operating not only at international and national level, but at the local level too. In addition, this local knowledge can reside among the groups operating within different communities; hence, the recognition can be extended to the existence of these formal and informal groups involved with disaster management process.

The knowledge and experiences of disaster practitioners remain mainly in the individual domain. Due to its large geography, the experiences, approaches and adopted modalities for disaster management is not codified and remains with individuals as a tacit knowledge (Mohanty et al, 2006). Acknowledging the need for a disaster knowledge networking platform to facilitate interaction and have simultaneous dialogue with all related expertise dealing with disaster management, the knowledge management initiative should be envisaged as a tool to store, retrieve, disseminate and manage information related to disaster management, particularly relating to disaster mitigation and preparedness.

## **5. ADDRESSING THE NEED – “ISLAND”**

In view of addressing the perceived need to share knowledge relating to disaster management strategies, the School of the Built Environment, at the University of Salford, undertook the research project 'ISLAND' (Inspiring Sri-Lankan reNewal and Development), funded by RICS. The research is aimed at increasing the effectiveness of disaster management by facilitating the sharing of appropriate knowledge and good practice in land, property and construction. Due to the broad scope of disaster management-related activities, this initial research focuses on creating a knowledge base on the post-Tsunami response, with specific reference to case material in Sri Lanka. The broad aim of the research will be addressed by:

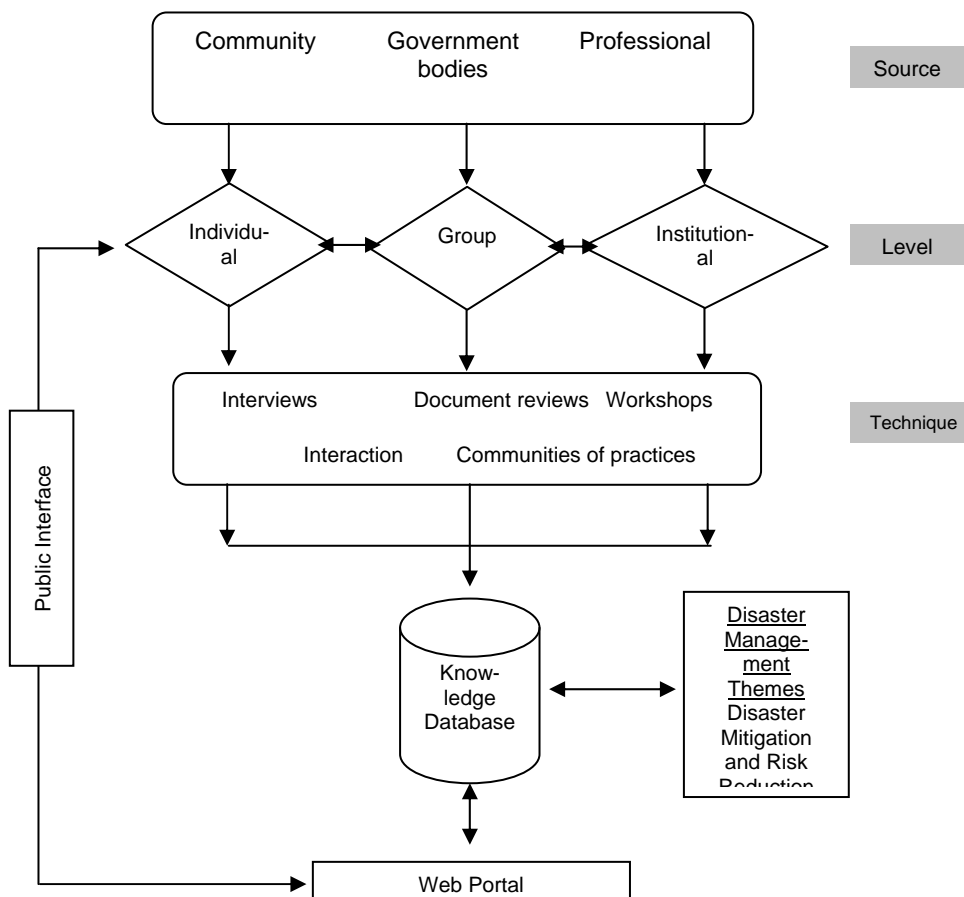
- Creating an infrastructure for developing, sharing and disseminating knowledge about disaster management, particularly mitigation measures, for land, property and construction;
- Developing a knowledge base on disaster management strategies arising from post-tsunami recovery efforts; and
- Developing case materials on post-tsunami response in Sri Lanka.

The Project's aim and objectives will be delivered in three Work Packages (WP's). WP1: Develop knowledge base infrastructure - aims at developing infrastructure for developing, sharing and disseminating knowledge about disaster management in land, property and construction; WP2: Populate knowledge base - aims at populating the knowledge base with a range of land, property and construction materials related to post-

tsunami recovery efforts; WP3: Disseminate research and identify future research directions - aims at disseminating the research outputs and identifying future research directions. The knowledge management initiative, undertaken as part of WP1, specifically concentrates on the pre-disaster risk reduction phase in view of catering for the need of sharing knowledge on measures which may be needed to reduce the extent or impact of damage during a similar tsunami disaster.

### 5.1 Knowledge base Infrastructure

Disaster management is seen as an active, on-going process of dynamic ventures and needs to be reviewed, modified, updated and tested on a regular basis. Hence, there is an urgent need of an organized common platform to capture, organize and share the knowledge on disaster mitigation and to create a versatile interface among government, professional bodies, research groups, funding bodies and local communities.



**Figure 1.3** Knowledge base infrastructure facilitating dissemination

The focus of knowledge base is at three levels i.e. institutional (government, ministries, departments, agencies, professional and funding); group (research, voluntarily); and individual (experts, community leaders). The initial capturing of the knowledge, relating to disaster mitigation, is done through knowledge management techniques such as, communities of practices, interviews, workshops, interactions and document review. Both the tacit and explicit knowledge on disaster management are captured, but the main emphasis would be on the tacit component of the knowledge. Captured knowledge is recorded and stored in a knowledge database according to disaster management themes:

- Disaster mitigation policies and plans
- Disaster mitigation strategies, their effectiveness and drawbacks
- Good practices in terms of disaster mitigation
- Information on reporting frameworks
- The role of professional institutions and experts
- The role and the level of community involvement

In addition to the knowledge database a dynamic network is created. The network will use various tools to connect the government, institutions, groups and people. The knowledge management initiative also involves the development of a web portal to facilitate the knowledge collaboration between the network members. The portal provides tools to capture or acquire and organize knowledge, through which the knowledge database will be kept up to date and live. Importantly, the portal facilitates in sharing and disseminating the disaster management knowledge among the network members and public at large. The portal will have a public interface once it is populated with relevant knowledge and will enable cross posting and interaction across the networks. The portal operates on an extranet and controlled by access levels. Users at the various networks could share their programme status and progress in the portal; the products of the programme such as disaster mitigation plans, various manuals, documents, reports and a trained human resources roster relating to identified themes within the knowledge database. Thereby, this infrastructure will provide the opportunity to share and disseminate appropriate knowledge, and good practices in land, property and construction relating to disaster mitigation strategies.

## **6. CONCLUSION**

Information and knowledge play an extremely important role in effective disaster reduction and response. Good communication and exchange of critical disaster risk information and knowledge could enhance coordination and integration of stakeholders' actions in disaster mitigation and response. This paper stressed the importance of sharing and disseminating knowledge relating to disaster mitigation strategies with particular reference to the Sri Lankan Tsunami reconstruction context. In facilitating such dissemination, this paper introduced the knowledge base infrastructure devised as part of the ISLAND project. This will provide the opportunity to explore the link between disaster and development to mitigate future devastations.

## 7. ACKNOWLEDGEMENT

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