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Karunasena, G. I., Amaratunga, Dilanthi and Haigh, Richard

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Capacity building towards disaster resilience: context of post disaster waste management

Gayani Karunasena,

Department of Building Economics, University of Moratuwa

gayani@becon.mrt.ac.lk

Dilanthi Amaratunga,

School of Built and Human Environment, University of Salford

r.d.g.amaratunga@salford.ac.uk

Richard Haigh,

School of Built and Human Environment, University of Salford

r.p.haigh@salford.ac.uk

Abstract

Capacity building provides an opportunity to understand strengths, weaknesses, threats and opportunities towards a resilient future through identification of broader issues around sustainable development of a particular program, project or process, including their unique cultural, social and ecological characteristics. Thus, concept of capacity building is an essential component in development theory and practice. In particular, in post disaster scenarios, focus has been placed upon local capacity building as a means of increasing resilience to natural hazards. In this context, this paper focuses on concept of capacity building and its role in post disaster waste management towards building future resilience. Case studies have been conducted to gather information on existing capacities of post disaster waste management in Sri Lanka. Semi-structured interviews were held as the main data collection method and content analysis was used to analyse collected data. Results of existing capacities and identified gaps of post disaster waste management are presented in key areas as skills and confidence building, links and collaborations, continuity and sustainability, research and development, communication and coordination, organisational implementations and investments in infrastructure. Finally, the paper concludes with proposed recommendations for enhancing capacities of post disaster waste management towards future resilience.

Keywords: Capacity building, Disaster waste management, Post disaster, Resilience

1. Introduction

Kennedy *et al*, (2008) highlighted the importance of integrating relief and development by introducing capacity building and development of local and national partners in post-disaster programmes for future resilience. It becomes dominant in disaster management policy and practice, specifically in developing communities more vulnerable to disasters in developing countries (Webb and Rogers, 2003). Hyogo Framework for Action 2005-2015 (UNISDR, 2005) also highlighted the importance of institutional capacity building to prevent, prepare and respond to disasters to enhance resilience of disaster-affected communities (World Disaster Report, 2004). This means building on existing resilience, which essentially makes an emphasis on enhancing capacity of affected communities to recover with little or no assistance following a disaster (UNISDR, 2005; Tadele and Siambabala, 2009; Haigh and Amaratunga, 2010).

This is equally applicable to post disaster waste management which places significant challenges in both national and local capacities, specifically on developing countries that are less able to deal with causes and impacts of disasters. Blakely (2007), highlighted that by focusing on long-term debris planning and setting measures for ecological and economic sustainability can improve region's resilience to future disasters. Furthermore, Deutz and Gibbs (2004) indicated that expansion of recycling capabilities and eco-industrial planning results in more job creation and promotes partnerships. However, building capacity is becoming a challenge with rapidly changing social, economic and technological drivers, policies and various players involved in disaster management. In this context, this paper discusses existing capacities, capacity gaps and proposed recommendations towards resilience in post-disaster waste management in Sri Lanka.

2. Capacity building in achieving disaster resilience

The concept of capacity building has evolved from a standard approach to a systematic and individualized method of analyzing a system's needs (Porter cited in Hernandez 2006, p.68). This has become an essential component in development theory and practice in recent years. Capacity building is the process by which individuals, groups, organizations, institutions and societies increase their ability to perform core functions, solve problems, define and achieve objectives and understand and deal with their development needs in a broad context and in sustainable manner (UNDP 1997). According to Global Development Research Center (2009) capacity building is identified as a starting point and a necessary ingredient for many global goals such as human security and development.

In this context, capacity building becomes dominant in disaster management policy and practice, specifically among communities more vulnerable to disasters in developing countries (Webb and Rogers 2003). Boyd and Juhola, (2009) indicated that capacity building provides an opportunity to understand strengths, weaknesses, threats and opportunities towards a *resilient* future through identification of broader issues around sustainable development of a particular

program, project or process, including their unique cultural, social, and ecological characteristics.

Concept of disaster resilience has gradually intervened into a wide range of disaster risk reduction activities during the recent decade. Manyena (2006) argued that definition of term resilience is a challenge as it varies based on the context it applied. However, author has indicated that most definitions view resilience as both a process and outcome. Adding to that author defines resilience as the *capacity of system, community or society to cope with, adopt or bounce back by resisting or changing in order to research and maintain an acceptable level of functioning and structure in the light of hazard stress or shock (pp.812)*. All these prove that building capacities to enable local communities to develop internally to face any future emergency ultimately establishes resilient communities. In this context, next section of the paper justifies importance of capacity building within context of post disaster waste management.

2.1 Capacity building in post disaster waste management

In a disaster, generation of waste is unavoidable. According to Californian regulation 17210.1(d) of title 14 disaster waste means “nonhazardous solid waste caused by or directly related to disaster”. Peterson (2004) indicated that disaster waste becomes critical as it differs from a normal situation that generates waste in more or less stable quantities and composition whereas in a post-disaster situation, it radically changes in type and quantity. Further, disaster waste may contain or be contaminated with certain toxic or hazardous constituents.

Thus waste management represents without any doubt a major environmental issue in any post-disaster scenario. Specifically, Construction and Demolition (C&D) debris when it is contaminated with toxic substances such as lead, asbestos, arsenic becomes hazardous, which leads to environmental degradation and health problems (Pelling 2002). Thus, measures aimed at controlling disaster waste generation such as building regulations and codes are needed at the mitigation phase of disaster management. Many researchers have emphasized on importance of designing early-stage strategies to be managed in a most environmentally sound manner possible, maximizing source reduction and recycling options and minimizing land disposal (Lauritzen, 1998; Baycan and Petersen, 2002; Brown *et al*, 2010).

However, a report on managing disaster debris by Luther (2008) indicated many challenges in managing disaster debris, such as issues associated with large volumes of waste, ensuring ability of property owners to return to an area and assist with cleanup, separating hazardous and non-hazardous waste and managing asbestos-contaminated waste. In addition, the literature revealed demolition, establishment of permanent recycling infrastructure and enhancement of eco-industrial networks through strategic planning as some key barriers in disaster waste management (Baycan and Petersen 2002; Zeilinga and Sanders 2004; Ardani *et al*, 2009). Ardani *et al* (2009) describe lack of funds to acquire required technology and equipment as a major barrier in most disasters. Other than capital required, most authors interpreted lack of

capacity of both local and national institutions as a key barrier for effective disaster waste management. Lack of vulnerability and risk assessment, lack of environmental baseline data, technology knowhow and lack of communication and coordination are some other areas highlighted (UNDP 2006, UNEP 2005).

This is equally applicable to Sri Lanka which was severely affected by Indian Ocean Tsunami in 2004 and three decades of civil war. United Nations Environment Protection Report (2005) stated that debris were not properly disposed of, reused or managed in Sri Lanka (Pilapitiya *et al*, 2006; UNEP 2005; Pasche and Kelly 2005; Karunasena *et al*, 2009). According to Europe Aid Co-operation Office (2006), C&D debris is not recycled and reused at its optimum capacity in Sri Lanka, which disposed them into landfill sites. Further, Pasche and Kelly (2005) stated that collected waste is often disposed to “*unplanned land fills in environmental sensitive sites*”. A paper titled “Utilization of Tsunami debris for reconstruction process in Sri Lanka” by Gunawardena and Rajakaruna (2005), pointed out that inadequate education material on how to recycle Tsunami debris, lack of awareness and training for technical people on standards and reuse of materials, poor waste management plans, legislation related to scope and lack of appropriate monitoring systems, minimal legislation related to landfill activities and standards, lack of experience on debris recycling, insufficient economic incentives for recyclers and high initial costs as key challenges in disaster waste management. All these literature findings are evidence for prevailing ineffective post-disaster waste management practices which laid the foundation for necessity of enhancing capacities in post disaster waste management for future resilience. The forthcoming section of this paper discusses methodology adopted for investigation of existing capacities of post disaster waste management strategies and challenges.

3. Research Methodology

Literature review and documentary survey were conducted on capacity building in various disciplines with special emphasise on post disaster waste management to identify capacity building principles, strategies, evaluation measures and challenges.

Primary data were collected through case study approach. Three case studies covering twelve agencies representing government (case A), non government (case B) and other sectors (case C) were selected for data collection. A detail of case study profile is illustrated at table 1.

Table 1: Profile of case study interviews

Case A	Case B	Case C
Disaster Management Centre (DMC)	Sarvodaya Shramadana Movement	United Nations' Development Programme (UNDP)
Disaster Management Centre (DMC)	Asian Disaster Preparedness Center (ADPC)	Sri Lanka Red Cross
Central Environmental Authority(CEA)	International Union for Conservation of Nature (ICUN)	International Federation of Red Cross (IFRC)
Cost Conservation Department (CCD)		
National Building Research Organisation (NBRO)		
Department of Irrigation		

Six numbers of government agencies, three numbers of non government agencies and three numbers representing other sectors were selected for data collection. At least one interviewee from each agency was selected from top or middle management involved in post disaster management processes having experience in waste management. Semi- structured interviews were conducted to gather data as it facilitated in depth analysis and gather different views and opinions of respondents within scope of study.

Content analysis was used in order to analyze collected data. Nvivo software was used for easier and speedy content analysis. Relevant coding structures were prepared using software and analysed in order to determine existing capacities of national organisations. Prepared coding structure mainly focuses on seven areas identified for capacity building as illustrated at figure 1.



Figure 1: Coding structure

Next section explains the findings of this study.

4. Findings

Findings revealed that in small scale disasters such as floods and landslides local authorities are capable of management of disaster waste whereas in large scale disasters, waste has been managed with collaboration of national level agencies. Roles and functions of an agency in disaster waste management varied based on type of a disaster. As a result, agencies not owning any responsibility over disaster waste made contributions at massive disasters in their own specialized areas. For example, while one organization cleaned roads, another cleared debris from the sea shore. Moreover, some organizations provided equipment and technical knowledge whereas some other organizations gave financial assistance. Following section briefly explains existing capacities of seven identified areas (refer figure 1).

4.1 Existing capacities

4.1.1 Skills and confidence building

This focuses on education and training of human resources targeting to improve ability to perform functions related to disaster management with special emphasis on disaster waste. This dimension focuses particularly on managerial and technical levels to extend their overall performance of a given task. Findings revealed that most programs were conducted targeting skills and confidence building at community level where agencies gain fewer opportunities. In addition, development of policies and position statements supporting concepts of career progression and opportunities to apply skills development are not visible at most agencies except in the government sector. As a result, attraction for public sector jobs and retention of individuals is a key issue visible in relation to disaster management. In addition, repetition or duplication of programs, cultural surroundings, attitudes towards disasters and inadequate physical resources affected skills development and confidence building. Incorporation of disaster management into education system, creation of awareness among public, stakeholders and professionals on various aspects of disaster management, participative decision making and program implementation and development of expert knowledge bases are suggested as remedial actions to overcome the aforementioned.

4.1.2 Organizational implementation

This focuses on improving organization structures and processes related to disaster waste management. This involves establishing goals, hierarchy for disaster waste management and formal and informal communications within an agency. Further emphasis is placed on existing capacities on assessment of types of waste generation, risk involvement, identification of cost effective material, monitoring and evaluation methods, incentives to people involved and rules and regulations on post disaster waste management. In this context, as revealed through pilot interviews none of the agencies do not take any responsibility over disaster waste and contribute in cases of massive disasters in their own specialized areas. As a result assessment of types of waste generated and risk factors are not available at national level. However, some

statistics and few statements on environmental impacts of disaster waste were recorded through risk assessments conducted after the Indian Ocean Tsunami in 2004 (UNEP 2005). Further, though national level policies on disaster management (refer Disaster Management Act, no 13 of 2005) and waste management (refer, National Environmental Act 1981) are available, it is noted that they contain no provision on disaster waste management. In addition, findings revealed that disaster waste is classified as solid waste as there are no regulations specifically dealing with disaster waste. Further, an in-depth review of National Disaster Management Plan and National Emergency Operation Plan which is in progress, being enforceable in near future, also disclosed lesser provisions for disaster waste management. However, in the post Tsunami period, TAFREN, CEA and MENR (Ministry of Environment and Natural Resources) jointly contributed to strengthening national policies on management of critical environmental issues such as disposal of debris and solid waste. Further, they emphasized on importance of developing mandatory guidelines to ensure uniform practices (MENR, 2005).

4.1.3 Linkages and collaborations

This area focuses on building partnerships and collaborations as a means of building capacities by which exchange skills and practice knowledge is affected. The linkages that exist for disaster waste management includes universities and practices, experienced researchers, different professional groups, policy makers, UN agencies, government and non government organizations, community groups and different countries. As mentioned, most linkages and collaborations catered for community development such as social, economic, physical and knowledge resilience except COWAM (Construction Waste Management), a project within EU-ASIA PRO ECO II B Post Tsunami Programme, initiated to manage C&D waste in Sri Lanka. The aim was to provide Galle area with practical solutions for implementing a sustainable C&D waste management programme and for it to become a model for all other local authorities in the country. This would involve preparation of guides for public on waste management, control illegal dumping, give legal support, select suitable places for gathering waste, supply human and physical resources, implement rules and regulations and reduce the use of virgin construction material. In addition, research on waste management, testing construction and recycled materials and sharing knowledge of professionals are also identified achievements of this project. Furthermore, Amapara and Hambanthaota districts initiated projects targeting recycling of plastic items and composting of degradable components. However, findings hardly revealed any collaboration established at national level agencies for disaster waste management except aforementioned collaborations.

4.1.4 Continuity and sustainability

This area focuses on continuously maintaining acquired skills and knowledge. Crisp *et al* (2000) suggested that capacity can be sustained by applying skills to practice. It further, can be enabled by providing opportunities to extend skills and experience which may be linked with a concept of career development. This is noted as the area having significant capacity gaps which need to be paid attention not only in the context of post disaster waste management but also on other sectors as well. Most projects and programs initiated during the Indian Ocean Tsunami in

2004 were abundant after few years time due to unavailability of strategies towards continuity and sustainability. Many responses emphasized that this is mainly due to unavailability of sustainable measures or policies in Sri Lanka.

4.1.5 Investments in infrastructure

This area focuses on investing in infrastructure to enable smooth and effective management of disaster waste. Inadequate funds for establishing recycle plants; obtaining necessary technical know-how and expertise knowledge are identified as critical issues related to capacity building. Further, identification of yards for temporary dumping and recycling plants became critical due to protests from temporary yard owners, public and relevant authorities during the Indian Ocean Tsunami in 2004. With reference to technical know how information on calls for funding, fellowships and conferences is proposed as the remedial actions.

4.1.6 Research and development

This area focuses on developing research capacity in post disaster waste management that is useful for practice. This will add new knowledge and inventions close to practices enhancing effectiveness and efficiency of post disaster waste management. The notion 'close to practice' means that research is highly relevant to practice or policy concerns. This involves creating opportunities for research such as scholarships, funds etc. Findings revealed that though Sri Lanka has been experiencing disasters for long such facilities were provided properly only after the Indian Ocean Tsunami in 2004. As a result research and development on disasters are rarely visible. Inadequate resources are a key barrier for research and development, as indicated by many respondents.

4.1.7 Communications and coordination

Final area focuses on enhancing communications and coordination capacities of post disaster waste management. These address issues encountered by non government organizations and volunteer groups in communications and coordination such as non existence of practical guides, transparency and accountability. Risk assessments conducted after Indian Ocean Tsunami in 2004 indicated that most disaster waste management programmes implemented at local levels with collaboration of NGOs do not consistently meet current best practices due to lack of readily available guidelines , practical procedures and resources (United Nations Development Programme 2005, United Nations Environmental Programme 2005). In 2007, National Disaster Management Committee of Sri Lanka also indicated that capacity of Sri Lankan institutions is inadequate for successful disaster management. However, findings revealed that properly established communication paths from national to local level have been established under the coordination of Disaster Management Centre (DMC) of Sri Lanka. Further, each level is equipped with necessary physical resources to streamline communication processes. However, few respondents stated that issues still prevail in relation to transparency and accountability factors. In addition, with respect to disaster waste management, there was no available formal path of communication except for the prevailing path for general solid waste management.

Local authorities such as municipal councils, urban councils and pradeshiya sabhas are responsible for management of general solid waste and laws of local governance, such as Municipal Council Ordinance (section 129,130,131), Urban Council Ordinance (section 118,119,120) and Pradeshiya Sabha Act No.15 of 1987, (section 93,94) were also applied for in management of disaster waste (Raufdeen, 2009). Authority is vested with such independent provincial and local authorities that tend to work in isolation. That situation is further aggravated by political mismatches visible among provincial and local authorities who may have been elected through different and opposing political parties. In any event, general solid waste management rules and regulations in Sri Lanka are not properly implemented due to absence of penalties or incentives. In this context, most respondents emphasized on importance of developing policies and strategic plans which are statutorily enforceable and creating easily referable information databases for disaster waste as well as normal solid waste management. The next section lists the capacity gaps identified through case study findings.

4.2 Capacity gaps

Investigation into existing post-disaster waste management strategies revealed following capacity gaps in Sri Lanka;

- Lack of a single point responsible authority including an institutional framework for disaster waste management.
- Lack of pre-planned framework of rules and regulations that are enforceable by statute and mandatory. Specifically, presence of an environmentally sound post-disaster waste management framework.
- Lack of awareness among different groups such as public, stakeholders and built environment professionals etc.
- Less consideration of continuity and sustainable approaches, measures in developing projects, programs etc.
- Less research and development.
- Inadequate resources including skilled persons, equipments, etc.
- Less technical and soft skills among key players involved in disaster waste management.

These gaps indicated that though government institutions encompass certain legal powers to carry out post-disaster waste management, it has not happened effectively and efficiently. Conversely, non-government organisations do not possess any legal power to implement their own projects, though most of them are willing to provide financial and other technical support

on managing disaster waste. Thus, the necessity for a sound framework to address above identified capacity gaps for effective and sustainable post disaster waste management for future resilience in Sri Lanka, is evident.

5. Conclusions

Disaster resilience is one concept that has recently entered into the disaster arena along with other concepts such as sustainability, capacity building and empowerment. This is evident in literature by such terms as “sustainable and resilient communities”, “capacity building towards resilient communities”, etc. Through out this paper, the author emphasised on importance of capacity building in the context of post disaster waste management. Further, the author revealed capacity gaps prevailing in post disaster waste management at national level agencies in Sri Lanka identified through case study interviews. It established the necessity of capacity enhancement of few areas such as skills and confidence building, development of enforceable legislation and institutional frameworks, research and development, establishment of sustainable measures, etc. In conclusion, though government institutions encompass certain legal powers to carry out post-disaster building waste management, it has not happened effectively due to aforesaid issues. Thus, the author recommends an institutional framework centred around local authorities as they are vested with authority in the prevailing set up, with the coordination of national agencies such as Disaster Management Centre and Central Environment Authority, which will also address aspects of skills development and research and development.

References

- Ardani K B; Reith C C, and Donlan C J (2009) “Harnessing Catastrophe to Promote Resource Recovery and Eco-industrial Development”, *Journal of Industrial Ecology* 13(4): 579-591
- Baycan F and Petersen M (2002) “Disaster waste management-C&D waste”, *Annual Conference of the International Solid Waste Association*, 8–12 July 2002 Turkey: Istanbul, 117-125
- Blakely E (2007) “Collaborating to build communities of opportunity”, *Roosevelt Institute Symposium*, 31 November 2007 Louisiana: New Orleans
- Boyd E and Juhola S (2009) “Stepping up to the climate change: opportunities in re-conceptualising development futures”, *Journal of international development* 21:792–804
- Brown C; Mike M and Seville E (2010) “Waste management as a “life line?” A New Zealand case study analysis”, *International Journal of Disaster Resilience in the Built Environment* 1(2): 192-206

Crisp B R, Swerissen H and Duckett S J (2000) “Four approaches to capacity building in health: consequences for measurement and accountability”, *Health promotion international*, 15(2):99-107

Deutz P and Gibbs D (2004) “Eco-industrial development and economic development: Industrial ecology or place promotion”, *Business Strategy and the Environment* 13(5):347–362

Europe Aid Co-operation Office (2006) *Construction waste management in Sri Lanka* (available online <http://www.cowam-project.org> [accessed on 22/9/2008])

Gunawardena D A and Rajakaruna A (2005) Utilization of Tsunami debris for reconstruction process in Sri Lanka,

Haigh R and Amaratunga D (2010) “An integrative review of the built environment discipline’s role in the development of society’s resilience to disasters”, *International Journal of Disaster Resilience in the Built Environment* 1(1): 11-24

Hernandez G Y (2006) *Assessing EL Salvador’s capacity for creating inclusive educational opportunities for students with disabilities using a capacity assessment framework* PhD Thesis, University of Maryland

Karunasena G; Amaratunga D; Haigh R and Lill I (2009) “Post-disaster Waste Management Strategies in Developing Countries: Case of Sri Lanka”, *International Journal of Strategic Property Management* 13(2): 173-191

Kennedy J , Ashmore J, Babister E and 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

Lauritzen E K (1998) “Emergency construction waste management” *Safety Science* 30: 45–53

Luther L (2008) *Managing Disaster Debris: Overview of Regulatory Requirements Agency Roles and Selected Challenges* (available online <http://wikileaks.org/wiki/CRS-RL34576> [Accessed on 29/8//2009])

Manyena S B (2006) “Rural local authorities and disaster resilience in Zimbabwe” *Disaster Prevention and management*, 15(5):810:820

Ministry of Environment and Natural Resources (MENR) (2005) *Post Tsunami Environmental Assessment in Sri Lanka: Recommendations for Environmental Recovery*, Ministry of Environment and Natural Resources, Colombo, Sri Lanka

Pasche A and Kelly C (2005) *Concept Summary: Improving the disposal of Tsunami generated waste*, UNDAC/Sri Lanka

Pelling M; Ozerdem A and Barakat S (2002) "The macro economic impact of disasters" *Progress in Development Studies* 2(4): 283–305

Petersen M (2004) "Restoring waste management following disasters" *International conference on post-disaster reconstruction*, 22-23 April, UK Coventry: IF Research group

Pilapitiya S; Vidanaarachchi C and Yuen S (2006) "Effects of the tsunami on waste management in Sri Lanka" *Waste Management* 26(2): 107–109

Raufdeen R (2009) *Construction Waste Management: Current status and challenges in Sri Lanka*, COWAM publication

Tadele F and Siambabala M A (2009) "Building disaster resilience through capacity building in Ethiopia" *Disaster Prevention and Management* 18(3):317-326

The Global Development Research Center (GDRC) (2009) *About the GDRC: Capacity building Policy* (available online from <http://www.gdrc.org> [Accessed on 2 November 2009])

United Nations Development Program (UNDP) (1997) *Capacity Development Technical Advisory Paper II* Geneva: Management development and Governance Division, United Nations Development Programme

United Nations Development Programme (UNDP) (2006) *Post-Tsunami Recovery and Reconstruction Strategy*, United Nations Development Programme:Colombo

United Nations Environment Programme (UNEP) (2005) *Sri Lanka post tsunami environmental assessment*, United Nation Environment Program (UNEP) Geneva: UNEP (DEP/0758/GE)

United Nations International Strategy for Disaster Reduction (UNISDR) (2005) "Building the resilience of nations and communities to disasters: Hyogo Framework for Action 2005-2015", *World Conference on Disaster Risk Reduction UNISDR*, January 2005

Webb P and Rogers B (2003) "Addressing In" in Food Insecurity Washington", DC: Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development (AED)

World Disaster Report (2004) *World Disaster Report Focus on Resilience*, International Federation of Red Cross and Red Crescent Societies, Geneva

Zeilinga de B J and Sanders D T (2004) *Earthquakes in Human History: The Far-reaching Effects of Seismic Disruptions*, Princeton University Press Princeton, NJ