APPROACHES FOR CAPACITY BUILDING FOR DISASTER WASTE MANAGEMENT

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Abstract

Natural disasters such as Fukushima earthquake and tsunami in 2011, Haiti earthquake in 2010, Hurricane Katrina in 2005 and Indian Ocean tsunami in 2004 were evident for large volumes of waste generated overwhelming existing solid waste capacities, requiring special approaches. This was further aggravated by prevailing improper Municipal Solid Waste Management practices with inadequate management capacities, specifically in developing countries. These resulted in social, economical and health issues such as unpleasant odor, ground water contamination and epidemics. This is also applicable to Sri Lanka which was severely affected by Indian Ocean Tsunami in 2004 and prevailing dengue epidemic due to improper Municipal Solid Waste Management practices. In this context, this paper reveals approaches for capacity building over identified capacity gaps in disaster waste management in Sri Lanka.

Case study research approach was used and multiple cases were selected representing all stakeholders involved in disaster waste management. Data were gathered through fifteen semi structured interviews. Unavailability of a regulatory body, pre-planned frameworks and enforceable rules and regulations and capacity constraints are identified as major gaps in disaster waste management in Sri Lanka. Establishment of a regulatory body and enforceable rules and regulations with necessary levels of capacities can attain sustainable disaster waste management for future resilience in Sri Lanka.

Key words: Disaster Waste Management, Capacity gaps, Approaches, Sri Lanka

1. Introduction

Disasters are extreme events that can be adversely affected on human life, property and the way of lives. When a natural disaster attacks a community, whether it is a flood, fire, tornado, hurricane, tsunami or an earthquake, tremendous amounts of debris are produced. In some cases the equivalent of many years' worth of waste are generated in a single event often overwhelming existing solid waste management facilities and personnel (Brown et al., 2011). Example, the Great East Japan Earthquake, occurred near the northeast coast of the Tohoku region in Japan on March 2011 can be shown (Shibata et al., 2012). Accordingly, management of waste created by disasters has become an increasingly important issue to be addressed in responding to a disaster (Thummarukudy, 2012)

In Sri Lanka, Indian Ocean Tsunami 2004 is the disaster that reported as the biggest tragedy that experienced in recent past with large volume of debris which has not properly disposed, reused or managed with in the country (UNEP, 2005). Karunasena et al., (2009) shows that still there is no enforceable legislation, institutional framework, coordination and communication mechanism, district and divisional contingency plans and adequate resources including finance, equipment and labour to manage the waste generated from the disasters. Thus, these gaps emphasis the necessity of capacity building of disaster waste management in identified areas as communication and coordination, institutional arrangements including policy developments, investments in infrastructure etc. Therefore, this paper focuses on identified approaches for capacity building for disaster waste management for identified gaps in Sri Lanka. Next section of the paper presents compressive review on disaster waste management in Sri Lanka.

2. Literature findings

2.1. Disaster waste management in Sri Lanka

Asia remained the most affected continent with over 80% of natural disasters reported from 2000-2009 with the highest disaster-related deaths and economic damages, except in year 2010 when America became the continent with more disasters, victims and damages in year 2010 (Guha-Sapir *et al*, 2011). Statistical figures reveal that most disaster-related deaths occurred or were reported from the world's poor countries and communities (Guha-Sapir *et al*, 2011). According to Oxfam (2005), Indian Ocean tsunami in 2004 mainly affected the poorest people in each of the three worst hit countries and in Sri Lanka, nearly one-third of the population in affected areas were under the poverty line.

Sri Lanka is prone to natural disasters commonly caused by floods, cyclones, landslides, droughts and coastal erosion for generations with increasing losses of life and property (Jayawardane, 2006). Indian Ocean tsunami in 2004 is widely acknowledged as the largest and most devastating natural catastrophe in the history of Sri Lanka, being extremely hard-hit in terms of loss of life, infrastructure and economic assets (Joint report, 2005; UNDP, 2006).

Unlike in the case of floods and landslides where waste is managed by usual municipal waste management authorities, Indian Ocean tsunami in 2004 created significant quantity of disaster waste challenging national and local capacities (Joint UNEP/OCHA, 2005). United Nations Environment Protection Report (2005) revealed that in Sri Lanka about 100,000 houses was destroyed generating about 450,000 tons of waste. Basnayake *et al* (2005) stated that a cost of US$ 5-6 million approximately was incurred for management of debris in Sri Lanka, where waste was not properly disposed, reused or managed (UNEP, 2005). Uncontrolled open air dumping and open burning of waste caused significant negative public health and environmental impacts through contamination of soil and groundwater, increased vermin presence and negative odour and visual impacts (EC, 2006; Jayawardane, 2006; Basnayake *et al*, 2005; UNEP 2005). Disaster C&D waste is not recycled and reused at its optimum capacity in Sri Lanka, instead disposing them to landfill sites (UNEP 2005). Pasche and Kelly (2005) state that collected disaster waste having a considerable portion of C&D waste is often disposed at "unplanned landfills in environmentally sensitive sites". Risks to public and environment by prolonged exposure to disaster waste after the Indian Ocean tsunami in 2004 is highlighted by Srinivas and Nakagawa (2008).

Waste removal programs conducted at local levels in collaboration with NGOs do not consistently meet current best practices due to lack of guidance, practical procedures and resources (Shaw, 2003; Martin, 2007). Absence of enforceable national legislation on disaster waste management further aggravated issues related to waste removal these matters. In Sri Lanka, Disaster Management Act (Act No.13 of 2005) enacted after the Indian Ocean tsunami in 2004 does not contain any provisions on management of disaster waste although it provides a legal basis for disaster risk management. Disaster waste management challenges faced after the Indian Ocean tsunami in 2004 include exposed coastal dumping sites, waste burning, insufficient landfills, lack of coordination and environmental effects on ground water, further aggravated by lack of financial and intellectual capacities such as knowledge, expertise and training related to disaster waste management (Basnayake *et al*, 2005; Pilapitiya et al, 2006; Srinivas and Nakagawa, 2008). National Disaster Management Centre of Sri Lanka accepted that capacities of Sri Lankan institutions are inadequate for successful disaster management (DMC, 2009a). Importance of capacity building to mitigate damages cause by improper coordination and immature organisational processes of related organizations and communities during disasters is thus highlighted (Keraminiyage *et al*, 2008; Baycan and Petersen, 2002; Hettiarachchi, 2007, UNEP, 2005; Brown *et al*, 2011), together with the importance of enhancing capacities of local government authorities (UNESCO, 2005).

Study on post-disaster waste management strategies by Karunasena *et al*, (2012) revealed that gaps in Sri Lanka such as, lack of single responsible authority including a hierarchical structure for disaster waste management, lack of pre-planned framework of rules and regulations that are enforceable by statute and mandatory, capacity constraints such as technology know how, funds, physical resources etc, management constraints such as communication and coordination among involved parties, poor government encouragement and idling of resources, lack of awareness, applicability of continuity and sustainable approaches and less research and development. Thus, this paper focuses on presenting approaches for capacity building for

disaster waste management for areas having capacity gaps. Next section presents the research methodology adopted for the study.

3. Research Methodology

A comprehensive literature survey was carried out by referring books, journals, research articles and other publications to identify the gaps existing in disaster waste management in Sri Lanka.

Thereafter case study approach was selected as the most appropriate method to proceed with the data collection for verification of identified gaps and identification of approaches for capacity building. Three cases were selected under multiple case study design representing key stakeholders involved in disaster waste management, government, non government and other sectors as shown at table 1.

Table 1: Profile of the case interviews

Cases	*Type*	*No of interviews*
Case A	*Government*	*07*
Case B	*Non government*	*04*
Case C	*Others*	*04*

Fifteen semi-structured interviews were conducted (refer Table 1) within the case studies by covering "professionals" experienced in disaster waste management representing entities of government, non government and other sectors. In addition, documentary reviews were conducted for this study to further clarify data gathered through semi structured interviews at the case study stage. Details of previously conducted programmes and projects were specifically gathered through documents such as annual reports, year progress reports etc.

Code-based content analysis technique was used to analysis the each individual case based on the seven themes namely; skills and confidence building, organizational implementation, linkages and collaborations, continuity and sustainability, investments in infrastructure, research and development and communication and coordination. The content analysis is a method of analysis of large set of data in simplest way while it produces a uniform schema of categories, which facilitates the comparison of the different cases to which it is applied.

4. Case findings

Findings are presented on eight areas identified for capacity building having gaps as illustrated below.

Table 2: Capacity gaps with approaches for capacity building

Capacity gaps	*Approaches for capacity building*
Skills and confidence building ▪ *Fewer opportunities for personal development –training/workshops* ▪ *Unavailability of formal procedure for preparation, conducting, monitoring and evaluation of training and awareness programmes* ▪ *Unavailability of strategies to retain valuable human resource*	▪ *Provide more opportunities for career development - local and international exposure* ▪ *Establish formal procedures to prepare, conduct, monitor and evaluate local and foreign programmes* ▪ *Enhance capacities of the government sector to promote interactive working* ▪ *Promote holistic approach for capacity building with more focus on local and sustainable approaches* ▪ *Develop an expert knowledge database on disaster management*
Organizational implementation ▪ *Unavailability of provisions for disaster waste management in existing policies* ▪ *Unavailability of single point responsibility at national level for disaster waste management* ▪ *Inefficiency and ineffectiveness of prevailing peace time solid waste management practices, policies and responsible authorities* ▪ *Non-revision of existing waste management systems/ procedures*	▪ *Incorporate disaster waste mgt. into existing solid waste management practices, policies and authorities* ▪ *Restructure institutional practices allocating specific functions to each with single point responsibility* ▪ *Increase collection of recyclable items, provide incentives to recyclers* ▪ *Develop enforceable rules and regulations for prevailing solid waste management/ disaster waste* ▪ *Introduce cash paying programmes for waste management* ▪ *Change existing procedures to facilitate quick and easy payment of compensation to affected parties*
Linkages and collaborations ▪ *Unavailability of formal procedures to establish linkages and collaborations* ▪ *Availability of projects with complete proposals without implementation* ▪ *Reduced active participation of NGOs and INGOs*	▪ *Develop formal and transparent procedures to establish linkages* ▪ *Enhance capacities of government sector to promote interactive working , specifically at local levels* ▪ *Provide more opportunities for collaborative projects* ▪ *Promote diversification* ▪ *Enhance active participation of NGOs and INGOs*
Continuity and sustainability ▪ *Less consideration of incorporation of sustainable concepts into disaster waste management practices* ▪ *Loopholes in prevailing solid waste management practices, policies and with responsible authorities* ▪ *Unavailability of formal procedures for monitoring and evaluation of implemented projects*	▪ *Train general public and officials on sustainable techniques with special emphasis on environmentally friendly, culturally supported mechanisms* ▪ *Introduce procedures to obtain permission for projects on quality, operational, maintenance and environmental impacts to ensure continuity and sustainability* ▪ *Establish formal procedures for monitoring and evaluation of implemented projects*

	▪ *Promote holistic approaches for implementing waste projects*
Investments in infrastructure ▪ *Loopholes in government rules and regulations on fund raising and procurement* ▪ *Less consideration for environmental protection*	▪ *Enhance capacities of staff to obtain funds through project proposals* ▪ *Establish transparent and accountable formal procedures for project selection* ▪ *Provide incentives to recyclers and mobilization of peoples'*
Research and development ▪ *Reduced interest on research and development -government sector* ▪ *Inadequate opportunities for collaborative research programmes* ▪ *Inadequate transfer/ sharing of knowledge and technical know-how*	▪ *Establish resource centres with knowledge on new developments* ▪ *Organize open discussion forums for sharing research knowledge* ▪ *Provide opportunities and incentives for collaborative research* ▪ *Establish transparent systems in providing opportunities for career development*
Communication and coordination ▪ *Uniformity of prevailing centralised framework* ▪ *Inadequate efficiency and effectiveness of existing systems*	▪ *Decentralize the system within established rules and regulations* ▪ *Provide adequate resources for communication systems* ▪ *Appoint responsible persons at each level of the communication*
Others ▪ *Lesser diversification towards emerging areas* ▪ *Lack of awareness on disasters such as earthquakes* ▪ *Vacuum between relief and early rehabilitation* ▪ *Policy issues, such as enforceability, wider scope* *Lack of awareness on peoples' needs*	▪ *Prepare orders enforceable by law that clearly define responsibilities and functions of each institution* ▪ *Capacity building and needs identification from bottom to top* ▪ *Design framework for disaster waste management through District Coordinating Committees* ▪ *Provide provisions for disaster waste management when preparing urban development plans*

4.1. Skills and confidence building

Skills and confidence building is focus on training and educating human resources to improve abilities to perform functions related to disaster waste management.

As illustrated at table 2, provide more opportunities for career development of responsible persons, with local and international exposure through seminars, workshops and scholarships to enhance capacities of officials at national level is identified. Parallel to that provide opportunities for self training through field activities, specifically in disaster waste management is emphasised Provide incentives to attract and retain staff such as life insurance/ pension schemes and sufficient grants for career development, specially for government employees are proposed. To avoid repetition or duplication of programmes and unethical practices, establish formal procedures to prepare, conduct, monitor and evaluate local and foreign programmes.

Implement a national level project to build technical support, assigning DMC with responsibility of training and awareness. Additionally introduce monitoring and evaluation methods such as beneficiary evaluations, statistical and non-statistical measures and progress reports. Sharing and disseminating knowledge among respective parties can enhance personal interests. Also enhance capacities of the government sector to promote interactive working, such as collaborative projects. Enhancement of soft skills is proposed as an approach to eliminate traditional bureaucratic red tape. Alignment of capacity development at each level with existing policies for real time implementation, such as individual capacity building programmes with master plans is suggested. These will eventually align capacity development with economic development of the country. Promote holistic approach for training and development focussing on indigenous and sustainable approaches for skills and confidence building, giving consideration to new aspects as good governance, livelihood development and resilience. Development of an expert knowledge database consisting of experience of experts on typical disasters is also proposed as a propose approach for long term resilience.

4.2. Organizational implementation

This section presents analysis of existing capacities at national level entities in organisational implementation, exploring how organisational structures and processes improve disaster waste management.

Incorporate disaster waste management into existing peace time solid waste management practices and policies including environmental and wet land protection policies to improve disaster waste management, reinforced with disaster waste management guidelines prepared specifically for developing countries with little or no existing infrastructure and expertise by United Nations Joint Environmental Unit (UNEP/OCHA, 2010). Expansion of existing peace time solid waste management practices such as zoning and seven steps process is proposed to promote sharing of resources and collaborations among local authorities. Establishment of enforceable rules and regulations for peace time solid waste management as well as disaster waste is necessary for long term sustainability. Restructuring of institutional processes allocating specific functions with single point responsibility is also a key approach to improve institutional structures for better disaster waste management. This will overcome non-functioning of important and necessary committees on waste management. These changes need to be incorporated into activities of entities as modes of mitigation, adaptation and recovery. Continuation with awareness and training programmes for public and local authorities on native and sustainable approaches for waste management emphasising on environmental protection and conservation will reduce inefficiencies and ineffectiveness prevailing in existing solid waste management processes. Examples are conducting of awareness programmes for domestic solid waste management at urban areas and enhancing of capacities of local authorities on composting and bio gas generation. Parallely, increase collection of recyclable items, provide incentives to recyclers and mobilize peoples' support for recycling. Enhance existing procedures to facilitate quick and easy payment of compensation to affected parties from polluters, together with an effective spot fining system.

4.3. Linkages and collaborations

Linkages and collaborations focus on partnerships as a means of building capacities by exchange of skills, practice knowledge and resources.

Developing formal and transparent procedures to establish linkages and collaborations with local and international entities is an important approach to enhance capacities by exchange of skills and practical knowledge. An example is to produce reports on benefits gained through established linkages and collaborations. This will enhance transparency and accountability of linkages leading to commitment of parties. Enhance capacities of government entities to promote interactive working, specially at local levels to gain effective and efficient outcomes from partnerships. Also, promote diversification to build new relationships and collaborations among entities. Enhanced active participation of NGOs and INGOs in disaster management also create opportunities for collaborations.

4.4. Continuity and sustainability

Continuity and sustainability focus on how to maintain acquired skills and knowledge and continue implemented programmes and projects for the benefit of future generations.

As an approach to enhance continuity and sustainability, create awareness among general public and train officials on sustainable, environmentally friendly and culturally supportive techniques on disaster waste management. Create awareness on how to convert waste into profitable businesses. As an example, promote holistic approaches in initiating projects such as composting and recycling, together. Further, it is important to change rules and regulations to facilitate sustainability concepts in disaster waste management practices. Establish formal procedures for monitoring and evaluation of implemented projects to avoid duplication of work and illegal projects with increased government intervention at regular intervals. Introduce procedures to obtain prior permission for projects on such aspects as quality, operational maintenance and environmental impacts to ensure continuity and sustainability. Additionally, at the end of a project, a certificate can be issued on achievement of sustainability standards..

4.5. Investments in infrastructure

This section presents analysis of existing capacities in investments in infrastructure at national level entities. It focuses on avenues for investments in infrastructure to enable smooth and effective management of disaster waste such as recycling plants and dumping sites.

Establishment of formal, transparent and accountable procedures for project selection and evaluation is important to improve investments in infrastructure, increasing confidence among investors. An example is to share financial reports at the end of a project among all involved parties. Create awareness among investors on how to make waste a profitable business while providing incentives to investors. Enhancing capacities of staff to obtain funds through project

proposals and implementing policies, rules and regulations that facilitate self financing are important steps for the government sector.

4.6. Research and development

Research and development focuses on developing research capacity at personal and entity levels at national level.

Establishment of a transparent system to provide opportunities for career development, such as foreign training, workshops and scholarships is important to enhance research and development capacities. This is specially relevant to ignite and enhance interest on research and development within government entities. It can further be improved by allocation of sufficient funds for staff development and grant of promotions based on research performances, publications presented at recognised conferences, symposiums and papers published in academic journals. Further, it is necessary to provide opportunities and incentives for collaborative research work. Also, establish resource centres with data on new developments and adequate facilities. Conduct awareness programmes to develop a research culture in government entities, changing attitudes and traditional practices. Documentation of project outcomes for future reference and organisation of open discussion forums to share research interests at regular intervals will also enhance research and development.

4.7. Communication and coordination

This section analyse aspects of communication and coordination in disaster waste management at national level.

Appointment of responsible persons at each level of communication and coordination process is necessary to enhance transparency and accountability of existing systems. This can prevent lack of responsibility in the existing system. Provision of adequate resources and new technology, such as wireless and online communication facilities can improve effectiveness and efficiency of existing systems. Conduct awareness and training programmes for officials and general public on new technologies in communication and coordination at regular intervals. Decentralisation within existing rules and regulations can minimise adverse effects of inadequate implementational powers of DMC.

4.8. Others

In addition, there are other propose approaches that can be applied in general to further improve disaster waste management.

Preparation of lawfully enforceable provisions with clearly defined responsibilities and functions of each institution involved in disaster management is one such approach. It can minimise duplication of work and non-functioning of important committees and entities. Establishment of an institutional framework for disaster waste management with single point

responsibility and adequate implementational powers is an important aspect of such an approach. Experts propose designing of a framework for disaster waste management through district coordinating committees and adequate provisions for disaster waste management shall be made when preparing urban development plans. It is further proposed to enhance capacities related to certain specific disasters, such as earthquakes that generate large quantities of waste.

5. Conclusion

Disaster waste has become a crucial issue not only in Sri Lanka but also in worldwide due to the increase of number of disasters. Therefore, it is a challenge, which has to be faced by local governments in order to minimise or manage waste following a disaster. If there are proper disaster waste management plans to manage these waste it can be done quickly without wasting time and money and without disturbing the livelihood of community.

When it comes to Sri Lankan context, research findings revealed that contribution for disaster waste management is very less and identified a number of gaps which are prevailing in disaster waste management process which lead to an improper management of waste after a disaster. Hence, this paper presents probable approaches to mitigate the major gaps in disaster waste management in order to develop a proper disaster waste management system in Sri Lanka.

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