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Exploring Good Practice Knowledge Transfer Related to Post-Tsunami Housing (Re-)Construction in Sri Lanka

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Abstract: Sri Lanka was badly affected by the tsunami that occurred on 26th December 2004. The tsunami destroyed about two-thirds of the Sri Lankan coastline and affected more than 1,000,000 people. It does not only affected the lives of the community, but also had a devastating effect on their housing and livelihoods. The overall loss of 100,000 or more houses due to the tsunami proved to be a major challenge to the emergency response teams and disaster planners. Although several major disasters of varying magnitudes have occurred in the world, the body of knowledge related to post-disaster housing reconstruction and rehabilitation appears fragmented and poorly integrated. This paper attempts to fill this theoretical gap by focusing on the extent to which good practice knowledge transfer helps in overcoming this problem for more effective and efficient delivery of post-tsunami housing in Sri Lanka. The paper applied knowledge transfer principles within the context of the two housing reconstruction strategies employed in post-tsunami housing reconstruction in Sri Lanka; namely donor-driven housing and owner driven housing. The results of this study reveal that the knowledge transfer within this context cannot be simply copied and inserted from one context without any localisation. Therefore, the paper proposes a high-level abstraction of the core principles of community engagement through participatory techniques associated with appropriate capacity and capability building techniques that will enable the various stakeholders to create a new application to suit the appropriate context of the transfer destination (post-tsunami context in Sri Lanka).

Keywords: Post-tsunami, Housing reconstruction, Knowledge transfer, Good practice

INTRODUCTION

The December 2004 Asian tsunami disaster affected many countries such as Indonesia, Sri Lanka, Thailand, India and a few other countries in the region. The tsunami has led to an unprecedented loss of life, reportedly more than 35,000 people were killed in Sri Lanka causing severe damage to built environment structures as well as the productive assets and livelihoods of people such as fishing, agriculture, farming and tourism related activities in 13 districts. It also resulted in the loss of more than 100,000 houses. For a country such as Sri Lanka whose natural rate of house building is as low as 4000–5000 per annum (Manatunga, 2005), the loss of 100,000 houses within a few hours proved a significant challenge for the

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process of post-disaster reconstruction and recovery. To add to this, the post-tsunami rehabilitation operation has been affected due to weak local government institutions whose response capacities to deal with a natural catastrophe such as a tsunami are very poor (UNEP, 2005). The Sri Lankan emergency response teams faced some unique problems and dilemmas in post-tsunami housing reconstruction. Firstly, there were extreme shortages of materials and labour for construction that fuelled inflationary increases in the whole of the construction sector. Secondly, there were too many external actors (international aid agencies and relief organisations) trying to expedite the reconstruction and rehabilitation process and thirdly, there were many settlements within the affected areas which did not adhere to planning and building regulations.

Although more than three years have passed since the tsunami, Sri Lanka is yet to fully recover from the effect of the tsunami and a number of people still live in temporary shelters. Despite the above mentioned unique challenges, the Sri Lankan disaster response teams appear to have confronted the challenge of the fragmented and poorly integrated nature of the body of knowledge related to post-disaster housing reconstruction and rehabilitation. Therefore, the main focus of the paper is to investigate whether potential sharing of good practice and knowledge across various post-disaster housing re-construction and rehabilitation schemes in various parts of the world could have led to more effective and efficient delivery of post-tsunami housing in Sri Lanka.

The paper raises the following specific research question for purposes of investigation.

> *To what extent would existing good practice knowledge (related to post-disaster housing construction) contribute towards effective and efficient delivery of post-tsunami housing reconstruction in Sri Lanka?*

We can divide this broad research question into the following two categories:

(i) Factors and the context prevailing within documented case histories; and
(ii) Evaluation of the existing post-tsunami housing construction strategies in Sri Lanka and the potential for facilitating good practice knowledge transfer.

The paper is organised as follows. First, a review of literature on impact of natural disasters on housing, post-disaster housing reconstruction process, various housing reconstruction strategies in use and good practice knowledge transfer in the context of post-disaster reconstruction is carried out. The next section sets out the main research question of the study. Then the paper sets out the methodology adopted

and discusses the previously documented case histories and survey results. Finally, the conclusions are drawn.

LITERATURE REVIEW

Impact of Natural Disasters on Housing and Overview for the Post-Disaster Housing Reconstruction Process

The World Bank estimates that, in 1998, various natural disasters killed over 50,000 people and destroyed $65 billion worth of property and infrastructure (Ofori, 2004). This number significantly increased in 2004 due to the tsunami. South Asia Disaster Report (2006) states that the 2004–2005 period was the "most appalling" period in the history of South Asia. The report suggests that in addition to the tsunami, nearly 75,000 people died due to the earthquake in the Himalayan region and rendered nearly 2.3 million people homeless in the Kashmir region. Natural disasters can impose drastic consequences both directly and indirectly on people's lives and their livelihoods. Ofori (2004) explains the significance of the problem particularly in developing countries by identifying how destruction of housing can affect the community. First, many houses in developing countries are used by families for income generating activities (livelihoods). Second, a house represents several times each person's annual income, and it might be impossible for the owner to replace it. Third, there are usually no suitable commercial insurance schemes to recover any financial losses. These factors indicate the severity of the problem as destruction of housing represents the greatest material loss (Johnson et al., 2006) to the people in many affected areas.

However, disasters are considered as open windows of opportunity for creating more resilient communities. Achieving resiliency in a disaster context means the ability to survive future natural disasters with minimum loss of life and property, as well as the ability to create a greater sense of place among residents; a stronger, more diverse economy; and a more economically integrated and diverse population (Vale and Campanella, 2005 cited in Berke and Campanella, 2006). Having identified such development opportunities, the reconstruction bodies begin the process of determining specific actions that can move it forward. One practical approach to developing the plan is to draft the plan based on a consensus view of its members regarding priority actions. Alternatively, they might consider convening groups of stakeholders associated with each specific issue (for example, groups of farmers and fishermen who lost their livelihood) to brainstorm on possible actions addressing that issue. Tapping into the knowledge of several stakeholder groups which are involved with the sector being considered enables more community members to participate in plan formulation and ensures that the broadest possible set of actions are identified

(EPC-India and TCG International-Washington, 2004). Thus, people who are affected by natural disasters are often strongly motivated to get back into the pre-disaster social networks by getting re-connected with the previous livelihoods so that they can carry on the economic activities (Olshansky et al., 2006) and get back to normalcy. Therefore, there is a natural tendency for both people affected as well as various other policy makers to jointly work towards reconstruction of housing and re-establish livelihoods, within the areas where the affected community lived prior to the disaster.

Set against this backdrop, the emergency response teams when faced with disasters, particularly in developing countries, quickly "swing into action" to provide quick fixes that are not necessarily resilient[1] to further disasters (Johnson et al., 2006; Cuny, 1983). Due to the urgency and scale of relief and reconstruction operations, the special needs of particularly vulnerable groups are often overlooked and participation in general can be minimal, in a context where considering the needs of differing groups is vital during planning and implementing relief and reconstruction activities (Gunasekara, 2006). These quick fixes are provided at the cost of formalising and implementing a gradual process of systematic decision-making and up-front planning through participatory approaches. While expedient response is critical to the well-being of the community, the longer-term effectiveness of well thought through processes cannot be discounted.

A review of literature reveals the existence of various disaster management plans and processes. Of interest to the subject of this paper are specific plans and models for post-disaster housing rehabilitation and reconstruction. Quarantelli (1995) for instance, defines four stages of reconstruction and recovery plans for housing targeting immediate relief, immediate shelter, temporary housing and permanent housing. What is important in this process is the timing of each of the stages. Johnson et al. (2006) who used the four-stage framework in the context of post-disaster housing construction after earthquakes in Western Turkey and Columbia found that the process did not work according to the specified method, and instead the authorities were forced to employ several ad hoc measures.

Figure 1 incorporates the four-stage process of housing recovery with the practical limitations associated with providing disaster resilient housing and infrastructure, and the

[1] Concept of resilience has a meaning that encompasses the whole community rather than the physical infrastructure (e.g., housing in the context of this paper). The definition of resilience has moved from being termed as the ability of the community to recover following the impact of a disaster (Fox, 2002) to a more emergent and proactive behaviour, which is improvised and adaptive based on the disaster situation (Dynex, 2003).

speed of providing the solution (adapted from Johnson et al., 2006). The first two phases address short-term solutions whereas the third and the fourth stages provide (ideally) medium to long-term orientated solutions. As Johnson et al. (2006) argues, post-disaster reconstruction is a process that is both comprehensive and involves cross-disciplinary contributions of a wide variety of stakeholders. As shown in Figure 1, the degree of resilience of the community affected increases with longer-term orientated solutions. However, the speed of providing the longer-term solution usually reduces due to various problems associated with availability of funding, social problems, economic problems and technological problems. The degree of funding allocated to each of the stages or solutions should be appropriately managed. Any mismanagement of any of the stages of housing provision will result in the community not being settled in permanent housing. Instead, some of the temporary housing might have to be converted to permanent housing as covered in Johnson et al. (2006). The model in Figure 1 will be used to study the transfer process of good practice knowledge from one context to another.

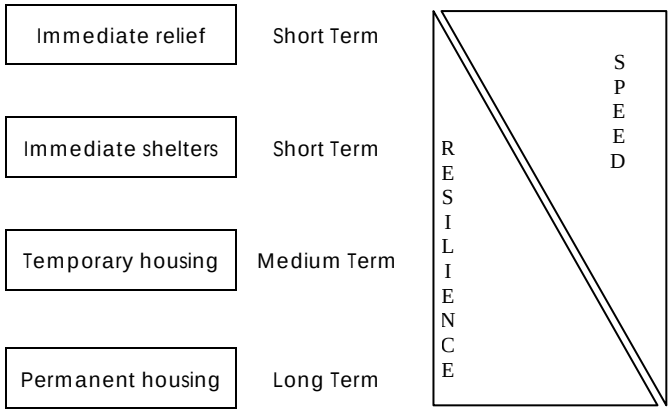

Figure 1. The Four-Stage Process of Housing Reconstruction and its Relationship with Resilience and Speed of Reconstruction (adapted from Johnson et al., 2006).

Reconstruction of Housing from a "Good Practice Knowledge Transfer" Perspective

Generally, during chaotic situations, the information flow is not reliable, and may be mostly rumour that circulates. Even the government officials may not have timely and accurate information. This is partly because governmental decision-making does not follow its usual procedure due to the urgency and pressure (Akçar 2001). Reconstruction following

a natural disaster is a complicated problem concerning social, economic and technological aspects. Therefore, rational decision-making is the key to accelerating the reconstruction process and to improving the human settlement environment (Yaoxian, 2002). Reconstruction projects include some decisions which need to be made such as the kind of post-disaster houses to provide (temporary or permanent or both), the financing method, the procurement method and the type of construction (Dikmen, 2006). Dikmen (2006) reports that in Turkey, post-disaster resettlement projects generally resulted in refusal of new settlements by the people. According to the investigation conducted in Turkey, it was reported that new settlements were refused due to such failures in post-disaster reconstruction projects. Quick decisions and lack of user participation in early decision-making process have been identified as two main cause. Therefore, beneficiaries should be involved in the early decision-making process of post-disaster reconstruction works. Discussions with the beneficiaries will help decision makers to understand their needs and preferences, and also users will understand the reasons for the decisions taken (Dikmen, 2006).

The parties involved in the post-tsunami reconstruction process vary from the affected community at large to the community leaders, local authorities, service providers, the government and external actors. The external actors consist of various local and foreign relief organisations. External assistance was given in the form of financial and technical assistance. A majority of these external actors have complex rules pertaining to their involvement in the reconstruction and recovery process (e.g., the timing of disbursement of funds). According to Thompson (1995), the major role of the external actors in the process of disaster recovery was to transfer their knowledge on areas such as conducting damage surveys, preparation of building codes for hazard-resistant construction, education of local construction experts, building trade workers and labourers, organisation and management of reconstruction programmes, and future contingency planning efforts.

These external actor roles are very much pertinent within the Sri Lankan context as well. In Sri Lanka, the various actors in the process of rehabilitation and reconstruction of housing while interacting closely with the local councils also realised the importance of engaging with the affected communities. As a result, they adopted various participatory techniques to engage with the communities and the community leaders in the process of knowledge transfer (Gopalakrishnan and Santoro, 2004). The key challenge of good practice knowledge transfer is how easily it is absorbed by the transferee. This depends on the absorptive capacity (Cohen and Levinthal, 1990) of the recipient and the appropriateness of the new context to receive the new knowledge. According to Lillrank (1995), the transfer process involves three variables.

They are the level of abstraction used in the process, the approach of actors involved in the process and the type of managerial content transferred.

As explained by Lillrank (1995), a low-level transfer provides low, abstraction amounting to copying or inserting a foreign practice without considering the appropriateness of context. A transfer process that involves high-level abstraction in contrast, transfers only the core abstract ideas and a new application is created to suit the appropriate context of the transfer destination. The level of abstraction is generally affected by the complexity of the system or idea to be transferred, and refers to arrangements that involve a high human component as a complex system that requires a very high level of abstraction.

Jeong et al. (2006) studied process improvement in the construction industry context and presented two opposing views of good practice transfer. One view is that borrowing something that has gained acceptance in other industries, rather than inventing a new solution, is easier to exploit (Towill, 2003). The other view is that good practices originated from other industries are bound to be rejected on the basis of being in appropriate to a particular industry (such as construction) whose characteristics are, arguably, perceived as "unique". Further, Goh (2002) citing Zulzanski (1996) focuses on transferee characteristics and points out that a recipient's lack of motivation, absorptive capacity and retentive capacity can result in poor transfer of knowledge.

In the light of the above theoretical aspects related to good practice knowledge transfer, the next section looks into the experience of post-tsunami reconstruction of housing within the context of Sri Lanka.

EXPERIENCE OF POST-TSUNAMI RECONSTRUCTION OF HOUSING IN SRI LANKA

This section presents the main strategies adopted in the reconstruction of permanent housing in Sri Lanka after the tsunami. The government devised two different strategies for permanent house building. The first strategy was known as the home-owner driven strategy, for those outside the buffer zone, all affected households that were able to demonstrate ownership to land were entitled to a grant by the state. Under this strategy, the government provided a cash grant of Rs.250,000 for a fully damaged house (in 4 instalments), and Rs.100,000 (in 2 instalments) for a partly damaged house. In addition, several NGOs provided additional payments or provided labour, materials and general technical assistance to support families rebuilding their own homes. This strategy was also termed as "assisted self-help" by Johnson et al. (2006).

The second strategy was known as the donor-driven strategy, which was mainly targeted at people living within the buffer zones attached to the coastal area who had to be relocated. Under this strategy, for those within the buffer zone, all affected families are entitled to a house built by a donor agency on land allocated by the state in accordance with Sri Lankan government standards. The donor provides each new settlement with an internal common infrastructure while the Sri Lankan government provides the services up to the relocation site. However, this buffer zone was changed in December 2005 and the reduction in the buffer zone allowed some of the communities to repair or rebuild their own homes under the first strategy. The rest of the people living in buffer zones were allowed the above incentive, provided they build their home outside the buffer zone, but within the same district. Therefore, the home-owner driven strategy contributed to a significant number of new houses built as part of post-tsunami reconstruction in Sri Lanka.

The policy makers and the emergency response teams at the forefront of the reconstruction process faced several challenges, which resulted in concentrating more on short term solutions rather than more long lasting solutions. The production capacity of traditional building materials manufacturers, who were over stretched in terms of their production capacity even prior to the tsunami, could not meet the new demand. Further, there were skills shortages particularly among the various building trade workers. These shortages fuelled price increases, which kick-started inflationary increases within the whole industry. Harris (2006), for instance, reports that the daily wage of a skilled mason or carpenter has risen from about Rupees 500 (£2.50) to about Rupees 1,000 (£5.00). These cost escalations affected some of the initial project feasibility studies carried out under owner-driven and donor-driven housing strategies.

The post-tsunami housing construction in Sri Lanka also created other problems that affected the balance of skills expertise of some of the construction companies. For example, Harris (2006:5) related how one organisation had been "robbed" of its operational capacity by the influx of international agencies. The company had been involved in the construction of transitional shelters and had both an extremely competent site planner and water/sanitation engineer on their staff. Within weeks of being awarded a project to construct hundreds of shelters, both of these staff members had been "poached" by international organisations, who were also involved in transitional shelter construction, but were offering salaries far greater than the other company could afford to match.

Further, some of the houses damaged and destroyed along the coastline as a result of the tsunami were occupied illegally prior to the tsunami. This resulted in difficulties in

establishing legal ownership of affected properties mainly due to the lack of documentation and illegal occupation. In addition, UNEP (2005) notes of pre-existing unplanned settlements in the southern part of the country, who had ignored the building standards. This was a major barrier in the reconstruction process. Houses belonging to some of the affected occupants, were ill-suited for less intense hazards such as strong winds or storms let alone tsunamis. These unique features prevalent within the context of post-tsunami housing reconstruction in Sri Lanka become strong determinants of good practice knowledge transfer. Some of these factors may have caused the process of reconstruction and rehabilitation of housing to slow down (lessening of the speed when moving from stage one to four as depicted in Figure 1).

Post-tsunami housing reconstruction (owner-driven and donor-driven housing) gathered momentum during its initial stages. This was mainly due to the motivation to provide immediate response to the affected community and the mobilisation of several relief organisations, whose internal policies and procedures forced expedient disbursement of funds to the government and affected community. However, after more than two years, the overall situation in the country in terms of reconstruction of housing does not paint a good picture. The current status pertaining to owner-driven and donor-driver housing construction is shown in Table 1.

Table 1. Housing Information (adapted from RADA, 2007).

	Temporary Shelters	**Owner-driven, Partially Damaged (onsite)**	**Owner-driven Fully Damaged (onsite)**	**Donor-driven Relocation**
Original figures (revised in 2006)	114,069	39,823	39,361	31,233
Current usage/ completed	14,960	34,988	11,543	12,207
Percentage usage/ completed	13%	88%	29%	39%

The above figures indicate that 13% of the people affected still live in temporary shelters two years after the tsunami (figures as in December 2006). The owner-driven strategy for partially damaged housing seems to have progressed well with 88% completion. But the owner-driven strategy for fully damaged housing and the donor-driven programmes (based on relocation of families) have not worked as anticipated. The donor-driven and owner driven housing construction strategies are well established schemes of post disaster housing construction, specifically within the context of developing countries. Previous work in this area

(Johnson et al., 2006; South Asia Disaster Report, 2006; Asian Disaster Management News, 2006) has evaluated the effectiveness of various housing construction projects and how they fit in with socio-economic variables. However, there is a gap in the literature that looks into post-disaster housing reconstruction from the point of view of "good practice knowledge transfer". This is confirmed by Mohanty et al. (2006) who drew upon knowledge management literature to argue that in disaster situations in practice, there are no processes currently available to get the appropriate knowledge at the right time. The purpose of this paper is to investigate this area within the developing country context (in Sri Lanka).

We propose the following methodology to conduct the above investigation.

RESEARCH METHODOLOGY

We adopted multiple approaches to investigate the stated research question. Due to the exploratory nature of the research, we first conducted a qualitative inquiry of previously documented case histories of post-disaster reconstruction of housing (after an earthquake). The objective of the first stage was to gain a deep understanding of its principles so that we can consider it as a candidate source for good practice knowledge transfer. Then, a questionnaire survey was carried out to gain an understanding of the effectiveness of post-tsunami housing reconstruction programmes in Sri Lanka. The two techniques enabled us to investigate the appropriateness of potential good practice knowledge transfer in the context of post-tsunami housing reconstruction. In the third stage, we combined the primary data with principles of good practice knowledge transfer and post-tsunami housing reconstruction found in literature to focus on the various benefits, barriers and comment on the stated research question. We adopted this mixed method approach to improve the robustness of the research design.

We considered previously documented post-earthquake housing construction case history data (Johnson et al., 2006) as a potential source of good practice knowledge transfer. The case-in-point in the documented case histories has been temporary housing, whereas in our study we considered temporary housing as a means to providing permanent housing and that temporary provision occupies an important place in the four-stage delivery of post-tsunami housing construction. Further, we took into consideration the unique opportunity of comparing the knowledge transfer aspects of post-disaster housing reconstruction during the aftermath of an earthquake with the aftermath of a tsunami. Although the types of disaster were unique in their own right, we were able to explore

various theoretical aspects of knowledge transfer related to post-disaster housing reconstruction. This qualitative inquiry also provided insights on the level of abstraction (whether high level or low level) of knowledge from one context to another based on Lillrank's (1995) study. The fact that the documented case histories and the intended field survey were from a developing country context (Columbia, Turkey and Sri Lanka) adds support to our chosen sample of documented case histories.

To gain an understanding of the applicability of some of the principles of post-disaster housing reconstruction, a questionnaire survey was conducted among the victims of the tsunami within Sri Lanka. In broad terms, the survey investigated the level of satisfaction of the victims on the ongoing housing reconstruction programme. This survey covered victims of the tsunami in general and concentrated on both the owner-driven and donor-driven housing as well as those living in transitional shelters and the homeless. The questionnaire was personally administered within the Galle district (a district in the southern province in Sri Lanka) among 226 victims of the tsunami, as shown in Table 2. The sample was selected from the data provided by the local provincial council on tsunami victims and their housing provision. Galle district was significantly affected due to the tsunami and the 226 victims in the sample represented a good cross section of the different types of permanent and temporary housing provisions. The victims also represented almost all the areas affected within the Galle district. The objective of this questionnaire survey was to investigate the perception of the victims of the tsunami disaster, based on criteria such as architecture/aesthetics, quality/strength and durability, functionality, space availability, agreeing to change the design as requested and degree of flexibility to make future changes.[2] We were able to link the results of the survey to address the initial research question raised in this research.

The survey sample was divided into victims who received donor-driven housing, owner-driven housing, transitional shelters and victims who received nothing as shown in Table 2. The sample consists of almost equivalent percentage of victims from houses built through main two categories; namely owner-driven houses and donor-driven houses. Three years after the disaster, 15% of victims still live in transitional shelters or have not received any shelter at all. The response was obtained in the form of the level of

[2] These criteria were included after a literature review covering user perspectives and levels of satisfaction expressed on various types of buildings.

satisfaction according to a scale of four levels of satisfaction (very dissatisfied to extremely satisfied) from victims who occupy donor-driven and owner-driven houses. The results are discussed in the next section in detail.

Table 2. Sample Selection of Tsunami victims Based on the Housing Programme

Type of Housing Programme	Number of Victims Surveyed	%
Houses built under donor-driven housing programme	96	42%
Houses built under owner-driven housing programme	97	43%
Transitional shelters	11	5%
No house or transitional shelters	22	10%
Total	226	100%

DISCUSSION

The discussion is based on the two parts of the research question raised in the literature review. The case history results together with the questionnaire survey results helped to gain a broader understanding of potential avenues for good practice transfer from one context to another. This section then comments on the broader research question set out in the study.

Factors and the Context Prevailing within Documented Case Histories and the Potential for Good Practice Knowledge Transfer

The documented case histories are related to two post-earthquake housing reconstructions in Turkey and Columbia. The main factor that distinguished the two housing provisions was the nature of decision-making by the policy makers (see Figure 2). Within the context of Turkey, the decision-making process was centralised, whereas in Columbia, it was more decentralised and several participatory approaches were devised to engage with the community that was affected by the earthquake disaster in arriving at the various housing solutions. Figure 2 maps out the two decision-making processes and their effects within the contexts of Turkey and Columbia.

In the case of Western Turkey, the post-disaster management process faced problems from the beginning, mainly due to the lack of engagement with the directly affected community (Johnson et al., 2006). The decision makers did not adopt any participatory approaches in generating the potential temporary housing solutions as depicted in Figure 2

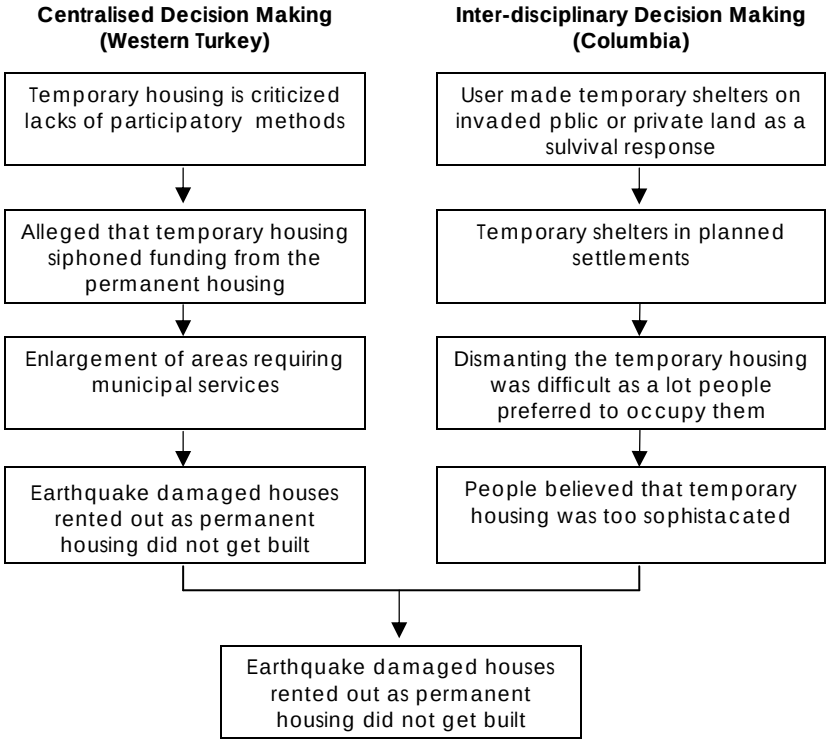

Figure 2. Comparison of Two Post-earthquake Housing Construction Scenarios (adapted from Johnson et al, 2006).

(Johnson *et* al., 2006). This may have created negative perceptions among the community on the delivery of temporary housing, which resulted in various disputes such as alleging that too much was spent on temporary housing. Lack of community engagement eventually resulted in the emergence of a lot of socio-economic problems within the community. In the case of Columbia, the process that followed was a participatory approach for decision-making. Although it was initially successful, the main problem was the investment allocated for temporary housing, which was out of proportion compared to the quality of temporary housing that was necessary under the circumstances. This resulted in temporary housing solution being pushed towards the more permanent housing category in Figure 1. In this instance, the community might have lacked the capability to understand the degree of sophistication required for the temporary houses. The policy makers and the rest of the stakeholders could have benefited some advice from the external actors on deciding the type and degree of sophistication of the temporary housing. Based on the four-stage model in Figure 1, the decision makers as a whole could have interacted with the experts in choosing of an appropriate temporary housing solution consistent with the duration (medium term nature of the solution). This would have reinforced the fourth stage permanent housing solution within the original plan and with the appropriate allocation of funds.

Three principles emerged from these case histories that can be abstracted as good practice knowledge to another context. They are: (a) the lack of community participation in post-disaster housing; (b) Lack of capacity and capability improvement of the community to understand the degree of sophistication in the four-stage housing reconstruction process (Figure 1). It is important to note that various techniques of participatory approaches could have enriched the decision-making process. The objective of participatory approaches is to gain some idea of the subtle dynamics of the community that is affected and gain a thorough knowledge of how the housing and people's livelihoods are closely related. Any disconnection between the housing need and the people's livelihoods would result in possible failure of the housing solution. A significant part of this knowledge is not available in explicit fashion (as documents). This knowledge exists mainly as tacit knowledge and is embedded and grounded within the individuals' and the communities' behaviours and actions. For example, Empson (1999) refers to explicit knowledge as the "tip of the iceberg," because a substantial part of the knowledge is tacit and hidden below the surface. Practical Action (2006) suggests various tools for participatory assessments as good practice information. Some of them are observation, semi-structured interviews, drama, role-play, diagrams and visual tools, mapping, and modelling of various scenarios. (For a full list of participatory tools – see Practical Action info pack, 2006).

Apart from principles (a) and (b) above, the documented case histories also demonstrate the need for upfront planning of investment during the four stages of housing reconstruction [principle (c)]. Expert knowledge on various financial and risk management models, and technical solutions for post-disaster housing could have contributed to more efficient financial and technical strategies being derived, so that the four-stage process (in Figure 1) could have resulted in appropriate permanent housing for the community. In both post-earthquake case histories, there seem to be inappropriate allocation of resources considering short to medium to long-term reconstruction of housing.

The next section evaluates the existing strategies adopted and the performance of post-tsunami reconstruction of housing in Sri Lanka.

Evaluation of the Existing Post-Tsunami Housing Construction Strategies in Sri Lanka

The questionnaire survey carried out in the Galle district identified the perspectives of the victims of the tsunami. These perspectives are compared with the three principles identified previously.

Lack of community participation in post-tsunami housing

Figure 3 indicates the comparison of their responses based on the donor-driven and owner-driven housing schemes (detailed statistics are included in the appendix). The four-level satisfaction scale (very dissatisfied to very satisfied) was combined into a two-level scale (satisfaction and dissatisfaction) in constructing Figure 3.

The comparison of respondents' satisfaction on the two housing strategies in Figure 3 shows that the occupants of donor-driven housing were significantly more satisfied than occupants of owner-driven houses in the areas of aesthetics of the building, quality, durability and the functionality. However, the survey results also show that owner-driven house occupants were generally more satisfied than the donor-driven housing occupants with respect to availability of space ability to influence design changes and affording flexibility to perform future expansion of the house. The main cause for this comparatively lesser satisfaction is that it falls short in meeting the communities' subtle demands related to dynamics of life and particularly understanding how their livelihoods are connected to the types and location of housing. In simple terms, lower satisfaction level tends to be an indication of lower community participation through which softer needs of the people do not seem to have been addressed. In owner-driven housing, owners have the opportunity of identifying their needs and engage in various community participatory schemes and indicate their preferences in relation to parameters such as space, design changes and flexibility for future expansion. Thus, Figure 3 provides insights into less community were engagement in donor-driven housing construction compared to owner-driven housing. For example, most of the male members of the affected community were engaged in fishing and it was found that several of these families had to disengage with their day-to-day employment due to the location of their new housing (donor-driven), which was too far away from the coast where their fishing boats and other equipment were located. Furthermore, South Asia Disaster Report (2006: 38) states that "coastal women in Sri Lanka traditionally engaged in... home based activities such as processing coir from coconut husks...and other craft based work." Some of these houses were not appropriate in meeting needs of the activities of these women. Therefore, as highlighted by Ofori (2004), houses and livelihoods have a strong interconnection, hence the poor satisfaction score related to space, current design and future flexibility of the donor-driven houses.

The community engagement and adoption of participatory approaches were not adopted within donor-driven strategy to the same extent as owner-driven strategy. An effective localised housing solution using a high level of

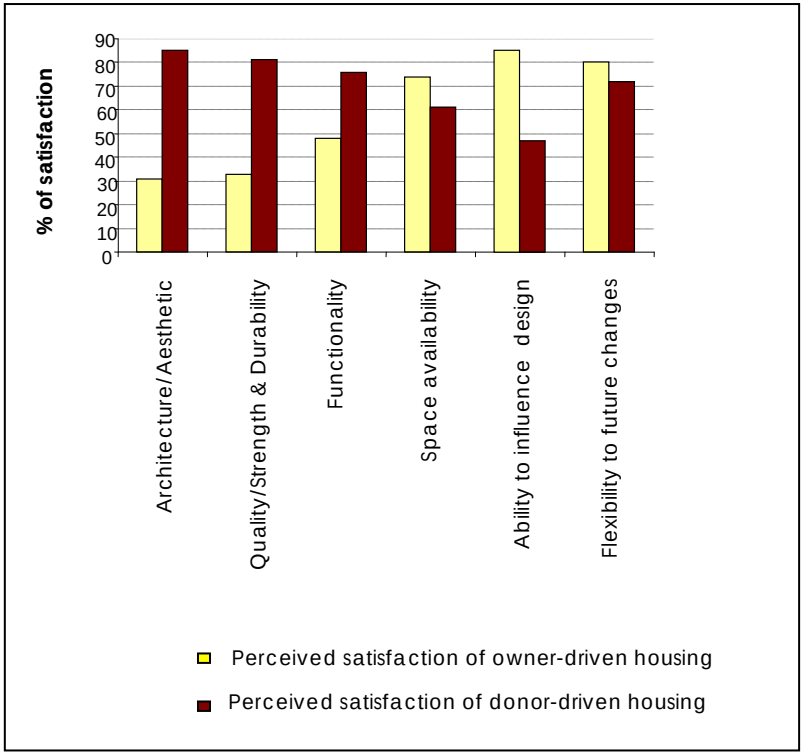

Figure 3. Comparison of the Level of Satisfaction of Owner-driven and Donor-driven Housing (Galle district, Sri Lanka).

durability and sustainability in accordance with the community needs did not seem to emerge from the donor-driven strategy (see Lillrank, 1995). The donor-driven housing was said to be a more sustainable solution compared to owner-driven housing. For instance, most donors specify environmental policy guidelines (e.g., the International Committee of the Red Cross – ICRC does not allow the use of asbestos and coconut rafters in buildings that receive their funding). The supervision of donor-driven housing construction was also very effective, resulting in cost control and timely completion.

Lack of capacity and capability improvement of the community to understand the degree of sophistication in the four-stage housing reconstruction process

Owner-driven houses proved better value for money as the affected community participated throughout the building process (there was also very little red-tape in the process as there was no tendering or selection of contractors). Furthermore, active engagement of families was seen as a positive developmental approach to reduce some of the dependency created by the tsunami. However, a major shortcoming related to the principle of good practice transfer in this housing strategy was that although the community requirements related to housing was well assessed and understood, their capacity to achieve the requirements was

not evaluated. As part of a process of empowering the affected community, funds were disbursed to the people to build their houses, which the people found very difficult to do, as they did not possess the requisite capability. For instance, according to Mugalan (2006), some professional and technical support was required at various stages of this housing strategy, as many families did not have individual capacities to rebuild their own houses. This process was not formalised to the extent it should have been, as the requisite expertise was in short supply. These were the causes of significant shortfall in the reconstruction of fully damaged housing through the owner-driven scheme compared to the partially damaged ones (see Table 1). The people whose capacity and capability to manage the reconstruction of partially damaged houses seem to have been at a satisfactory level, hence the achievement of 88% completion (see Table 1). Due to the duration of the construction of fully damaged houses, the disbursement of instalment payments was not managed properly. Some occupants chose to reduce the specified building components to save money. This is reflected in the satisfaction level statistics in Figure 3, as people believed that they have compromised aesthetics, quality, durability and functionality to achieve cost effectiveness, appropriate design and flexibility.

Lack of upfront planning across the four-stage housing reconstruction process

Both the owner-driven and donor-driven schemes were introduced as permanent solutions for post-tsunami reconstruction activities in Sri Lanka. Therefore, the degree of upfront planning exercised within the context of tsunami affected community in the Galle district was more comprehensive compared to the documented case histories. The housing provision in the documented case histories was geared towards temporary shelters as opposed to permanent housing. Thereby, the decision makers, both within the context of Turkey and Columbia were more interested in providing immediate relief to the victims, and hence the aim of upfront planning and financial provision across the four-stage reconstruction process was different to the context of the survey done in Sri Lanka.

Comment on the Research Question and Limitations of the Study

The analysis of documented case histories and survey results indicate that the two abstract principles related to post-disaster housing can be transferred from one context to another. The first principle of community engagement was seen as extremely critical to the success of the housing strategy, as the knowledge on the relationship between housing and livelihood is extremely subtle and context

dependent, and a significant proportion of this is tacit knowledge. Several examples in the post-tsunami housing construction indicated that, while reconstruction of housing in a manner that is resilient to various disasters is important (as proven by the donor-built strategy), it should not drastically affect the livelihoods of people (as indicated by the levels of satisfaction between the two strategies). The second principle of capacity and capability improvement for the community is also important so that the participatory approaches can be deployed not only to get back to normalcy, but also to produce more imaginative and creative solutions to "build back better" (South Asia Disaster Report, 2006). The third principle of upfront planning and finance across the four stages is important as it results in equitable allocation of resources during the life cycle of rehabilitation and reconstruction after a disaster. These three principles of good practice knowledge transfer are abstract ideas, which need to be localised depending on the particular context, in this case, post-tsunami housing re-construction in Sri Lanka.

According to the overall research design, multiple approaches were adopted to address the initial research question. The analysis of documented case histories was later compared and contrasted with the survey of tsunami victims on their level of satisfaction on various types of housing provisions, the degree of participation, capacity and capability and financial investment across the post-disaster housing provision. The field research of this study was confined to the survey of the tsunami victims within the Galle district, which is a limitation of this research. We anticipate conducting further research by extending the chosen sample to include multiple stakeholders such as various types of donors (NGOs and government institutions), community based organisations and other institutions that supply technology and services. We also anticipate covering a wider geographical area of Sri Lanka (as the Galle district was one of 13 districts that was affected due to the tsunami) to gain further insights into knowledge transfer.

CONCLUSION AND FURTHER RESEARCH

Post-disaster reconstruction is an area that is gaining increased attention by many governments, environmental campaigners, scientists and various other stakeholders, both in the developing and the developed world. Along with the loss of life resulting from various disasters, loss of housing marks a major impact due to the multiple effects of psychological, physiological and economic damage that it creates. The December 2004 tsunami destroyed more than 100,000 houses in Sri Lanka and, as yet, not managed to fully recover from this loss. Although disasters of similar magnitudes occur in many parts of the world, which impact on a country's housing stock, the knowledge relating to post-disaster housing seems to be fragmented and there seems to be a dearth of literature in

the area of transferring good practice knowledge on post-disaster housing reconstruction. This paper focused on how to transfer effective good practice knowledge from one context to another. The paper studied documented case histories in the context of post-earthquake housing reconstruction, and investigated the potential of emerging good practice knowledge that could be transferred towards effective and efficient delivery of post-tsunami housing reconstruction in Sri Lanka.

We initially learned lessons by evaluating two documented case histories that indicated the use of an effective model for housing reconstruction during the aftermath of a disaster. The essence of the framework (Figure 2) is the emphasis on high level abstraction of core principles and localising within the post-disaster context. Then, a survey was conducted among the victims of the tsunami disaster to investigate their level of satisfaction in their housing provision. The survey was limited to the tsunami victims in the Galle district of Sri Lanka. It was decided to limit the scope of the survey so that we were able to cover a wide range of reconstruction solutions from temporary shelters to more permanent housing, and investigate the levels of satisfaction from the perspective of the tsunami victims in more detail. The depth covered in the survey was extremely useful in focusing on the four-stage process of reconstruction (see Figure 1). Therefore, the overall lessons learned from this study can be applied to cover all three principles of knowledge transfer identified and discussed in the previous section. However, the possible limitation of the survey in not having adequate breadth will be addressed through future research. As further research, the authors recommend that this study to be widened to cover knowledge transfer perspectives of multiple stakeholders such as international donor perspectives of multiple stakeholders such as international donor organisations, non governmental organisations, community based organisations and other technology/knowledge suppliers linked to various post-disaster reconstruction and rehabilitation contexts. Such a study will enable us to gain insights on multiple knowledge flows between various stakeholders.

The results of this study supported the principle of high level abstraction of core principles of housing reconstruction and localising within the post-disaster context as evidenced by the higher level of satisfaction expressed by the victims of tsunami who were part of the owner-driven strategy (see Figure 3). The survey results indicated that in the case of the owner-driven strategy, the people engaged effectively in generating their needs in terms of parameters such as space, design and flexibility for future expansion. The ideal solution might have been a compromise between the needs of the people (the main stakeholders), functionality, sustainability, resilience and the budget available for reconstruction.

Therefore, the paper proposes the development of good practice knowledge on housing reconstruction (as high-level abstraction of the core principles of housing reconstruction) and localised community engagement as two important goals of knowledge transfer. The study does not only contributes to the body of knowledge within post-disaster reconstruction, but it also relocates literature residing in the general body of good practice knowledge transfer within the context of post-disaster reconstruction.

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APPENDIX

Level of satisfaction for post-tsunami housing (Donor-driven schemes)

Conditions	Donor-driven			
	% of Victims Very Satisfied	% of Victims Somewhat Satisfied	% of Victims Somewhat Dissatisfied	% of Victims Very Dissatisfied
Architecture/ aesthetic	49	49	5	10
Quality/strength and durabilit	50	31	11	8
Functionality	44	32	14	10
Space availability	34	27	20	19
Agreeing to change the design as requested	23	24	19	34
Flexibility to do the necessary changes in the future	46	265	18	10

Level of satisfaction for post-tsunami housing (Owner-driven schemes)

Conditions	Donor-driven			
	% of Victims Very Satisfied	% of Victims Somewhat Satisfied	% of Victims Somewhat Dissatisfied	% of Victims Very Dissatisfied
Architecture/ aesthetic	3	28	5	18
Quality/strength and durabilit	7	26	39	28
Functionality	10	38	44	8
Space availability	13	61	25	1
Agreeing to change the design as requested	24	58	18	-
Flexibility to do the necessary changes in the future	29	51	18	2