CIOB Bowen Jenkins Legacy Research Fund Research Report

Long-term Sustainability and Performance of Post-disaster Housing Projects

by

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Further information about the project and its activities are available at: http://www.post-disaster-reconstruction.info

Abstract

Disaster events, such as those induced by natural hazards, often cause widespread property damage and require extensive relief efforts. Beyond the initial response and temporary accommodation stages, the key challenge of organising permanent houses for the displaced emerges. The time leading up to moving into a permanent house is a period of great distress for those affected. Particularly in developing countries, those affected may not be able to either repair their homes or construct a new permanent home for themselves without external assistance. As such, housing projects are initiated to provide houses for the victims. Previous research, however, has shown that permanent reconstruction following a disaster event is often inefficiently managed, uncoordinated, slowly initiated and tends to overlook the long-term requirements of the affected community. Compared to the number of studies on how post-disaster housing initiatives have performed during the planning, construction and initial occupation stages, there is a dearth of research investigating how these projects have performed in the long term. As houses are a fixed asset, expected to deliver for decades, it can be argued that the post-disaster housing solutions provided need to perform as required beyond the initial stages of occupancy, and need to satisfy the requirements of the occupants for years to come. This study was conducted to investigate the long-term performance of post-disaster housing projects and to make recommendations for effective, sustainable post-disaster housing.

Post-disaster housing reconstruction in Sri Lanka was specifically used as a case study in this regard. Sri Lanka was especially selected because the country is frequently affected by various natural-hazard-induced disaster events, including floods, cyclones and landslides, which require such housing initiatives. To this end, primary data was collected from recipients of post-disaster housing as well as decision makers involved in post-disaster housing work. Three post-disaster projects in which the original recipients have occupied the houses for approximately ten years were selected in order to conduct a questionnaire survey of the housing recipients, and a focus group discussion was held with the decision makers involved. Findings from the questionnaire survey showed that the occupants were generally satisfied about their houses and the related facilities, albeit not to a great extent. The main issues they were not satisfied with were linked to their livelihoods and income generation. This clearly demonstrates the need to consider the socio-economic issues and, in particular, the livelihoods and the ability for occupants to use their homes for income generation, during the planning stages; not just the technical aspects of construction. Rather than simply providing a ‘house’ and expecting all other issues to be resolved, the focus should be to provide a ‘home’, systematically incorporating all other relevant service and infrastructure provisions, and livelihood and income generation opportunities, in addition to the necessary disaster resilience and preparedness strategies. Further longitudinal study is recommended in order to investigate how the views and satisfaction levels among the occupants change over time, and how the houses perform in the short and long term.

Keywords: Developing countries, Construction, Housing, Long-term, Performance, Post-disaster

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1 Introduction

1.1 Background

Countries and regions throughout the world are exposed to and are affected by various natural-hazard-induced disaster events on a regular basis. According to UNISDR (UNISDR, 2015a), 1.7 billion people were affected by such disaster events between 2005 and 2014, leading to 0.7 million fatalities and $1.4 trillion in damages. Providing further evidence relating to the devastating nature of such disaster events, 342 reported natural disasters caused 8,733 deaths, affected 569.4 million people, and caused US$154 billion damages in 2016 alone (Guha-Sapir, et al., 2017). Disaster events, such as those induced by natural hazards, often cause widespread property damage and require extensive reconstruction initiatives. In particular, during rapid-onset events, housing is usually the element that is most extensively damaged or lost, and often represents the greatest share of loss in the total impact of a disaster on the national economy (Iftekhar, 2011). For example, the Boxing Day tsunami in 2004 that affected many Asian countries wiped out more than 100,000 houses in Sri Lanka alone, requiring new houses to be built to accommodate those affected. In 2013, typhoon Haiyan destroyed 550,000 houses and an additional 580,000 houses were severely damaged in the Philippines (DEC, 2013). Beyond the initial response (emergency shelter) and temporary accommodation stages, the countries/regions affected are then faced with the challenge of providing permanent houses for the displaced.

Previous research has shown that permanent reconstruction following a disaster event is often inefficiently managed, is uncoordinated and is slowly initiated, and tends to overlook the long-term requirements of the affected community (Lloyd-Jones, 2006). Given that the hardest-hit communities would have lost their homes and properties or would have seen their properties being significantly damaged, the time leading up to receiving a permanent housing solution is a period subject to extreme trauma and stress for disaster victims. For housing providers, including local and central government, post-disaster housing is a politically sensitive issue that requires extensive funding. Under such extreme conditions, long-term performance and the satisfaction and requirements of occupants are issues that are often overlooked by policymakers, practitioners, funding bodies and the occupants themselves. For example, Ingirige, et al. (2008) discussed how the post-tsunami reconstruction work in Sri Lanka resulted in concentrating more on short-term solutions rather than on longer-term solutions due to the various challenges faced at the time. While criticism is often levelled at government institutions, previous research has demonstrated that property owners themselves tend to focus on immediate recovery and reinstatement, and overlook long-term requirements in their haste to reinstate properties as soon as possible (Wedawatta, et al., 2012). Although urgent action is a necessity during the aftermath of a disaster

event requiring reconstruction, adopting a long-term approach therein is key to providing sustainable permanent housing provisions.

While various studies have been undertaken to investigate how post-disaster housing initiatives have performed during the planning, construction and initial occupation stages, there is a dearth of research investigating how these projects have performed in the long term. Given that permanent housing is a long-term solution, it can be argued that the post-disaster housing solutions provided need to perform as required beyond the initial stages of occupancy and need to satisfy the requirements of the occupants. Revisiting post-disaster permanent housing schemes that have been occupied by the recipients beyond the short to medium term can suggest valuable lessons for future practice. Lessons to be learned can shape how such housing provisions are planned, delivered and maintained in the future. This research study was therefore undertaken to address this gap in knowledge and to make recommendations for future reconstruction initiatives following disaster events.

1.2 Aim and objectives

The overall aim of the project was to investigate the long-term performance of post-disaster housing reconstruction projects and make recommendations for effective, sustainable housing reconstruction following natural disasters. Post-disaster housing reconstruction works in Sri Lanka were specifically used as a case study in this regard. Sri Lanka was selected because the country is frequently affected by various natural-hazard-induced disaster events, including floods, cyclones and landslides. Following the Boxing Day tsunami in 2004, and various other disaster events, a large number of houses have been built to accommodate those affected and to resettle them. There is therefore a large housing stock that has been built following disaster events and that has been occupied by the recipients for a considerable period of time. Given that the country is constantly building new houses for those affected by regular disaster events, the lessons to be learned will be of particular relevance to post-disaster housing provision in the country. While the primary research is specifically focused on Sri Lanka, the findings and recommendations will also be of relevance to other similar situations where post-disaster housing construction work is required in order to avoid the pitfalls and deliver projects that perform as expected in the long term. In order to achieve this aim, several objectives were set, as follows:

- To review factors considered by decision makers and practitioners when deciding on post-disaster permanent housing provisions.
- To investigate the requirements and expectations of the occupants of post-disaster housing reconstruction projects.
- To explore how the post-disaster housing reconstruction projects have performed in the long term against the requirements of the occupants and housing providers.

- To make recommendations for future practice and policymaking on post-disaster housing reconstruction.

The study focuses on situations where the disaster-affected are provided with a new home, either via the donor-driven or owner-driven approach, within a post-disaster housing scheme.

1.3 Report layout

This chapter introduces the background to the research and the aim and objectives of the project. Chapter 2 includes a review of current knowledge with regard to post-disaster housing; in particular, the key performance indicators that can be used to assess the long-term performance of post-disaster housing and the Sri Lankan situation. The research method adopted is detailed in Chapter 3. Research findings and analysis are presented in Chapter 4, and conclusions are drawn and recommendations made in Chapter 5.

2 Post-disaster housing and its performance: a long-term perspective

2.1 Permanent housing construction following a disaster event

Quarantelli (1995) categorised post-disaster housing provisions under four ideal consequent stages, based on purpose of accommodation, for how long the disaster-affected are intended to stay in the accommodation and whether they will commence their usual household activities at that place or not. Johnson, et al. (2006) provided an explanation of how soon these housing provisions need to be provided. The categories are as follows:

- Emergency sheltering: quarters for short periods, for hours or overnight – provided within hours.
- Temporary sheltering: people's temporary displacement into other quarters, with an expected short stay – provided within a day or two.
- Temporary housing: resuming household responsibilities and activities in new quarters; arrangements that exceed a mere emergency or temporary basis, and extend for months, if not years – provided within weeks preferably.
- Permanent housing: returning either to their repaired or rebuilt original homes or moving into new permanent quarters – provided within a few years.

While the stages of emergency sheltering and temporary stages may overlap, there is a clear distinction between these two stages and those of temporary housing and permanent housing. In Sri Lanka, the emergency sheltering and temporary sheltering stages are often conjoined, with even the temporary housing stage conjoining at times. Accordingly, it is clear that the stage of moving the disaster-affected to a new permanent home may take a number of years. Therefore, it is likely to be a time period of significant distress and trauma to the disaster-affected, not knowing when they will be able to have a permanent roof over their heads. While, in developing countries, the provisions, such as property insurance, are likely to make this process more independent, disaster victims in developing countries tend to largely rely on external assistance (either national or international) in order to achieve the goal of moving into a permanent home.

Particularly in developing countries, the disaster-affected may not be able to either repair their homes or construct a new proper home for themselves without external assistance. For example, Mutton and Haque (2004) recognised that in Bangladesh poorer residents live closer to rivers, making them more vulnerable and often resulting in substantial flood damage. Wedawatta, et al. (2016) discussed how the lack of financial resources has significantly hindered their ability to better prepare, for example, either by moving out of highly vulnerable areas or by making their homes safe, despite their willingness to do so. As such, poorer and deprived communities are more likely to be in vulnerable places or live in houses not

fit for the level of risk. Such communities will essentially require financial and other assistance following damage to their homes, if they are to get a permanent home back. Also, assistance on the housing front is expected to allow disaster victims to focus on other issues, such as furthering their livelihoods and education, and take some of the stress and trauma away from them. Therefore, especially in developing countries like Sri Lanka, it is common practice to either provide a home built by a donor agency on land allocated by the state (donor-driven approach to post-disaster housing), and provide financial and technological assistance to enable them to have their homes reconstructed on either their own land or on allocated land (owner-driven approach).

However, providing permanent housing, especially following a major disaster event requiring a large number of houses to be built, is a monumental task in regions and countries where budgets are stretched and resources are constrained. Ophiyandri (2013) identified delays, cost overruns, poor quality and poor satisfaction as being some of the major problems associated with post-disaster housing projects. Ingirige, et al. (2008) discussed how post-tsunami reconstruction in Sri Lanka ran into difficulties due to the extreme shortages of materials and labour for construction that fuelled inflationary increases in the whole of the construction sector. Furthermore, it was noted that the involvement of too many external actors trying to expedite the reconstruction process, in addition to many settlements not adhering to planning and building regulations, made the reconstruction process problematic. Lyons (2009) alluded to post-disaster reconstruction often failing in its stated objectives relating to the centralised approaches taken with regard to reconstruction, linked to the political economy of post-disaster situations. While the above is not a comprehensive list of problems encountered in post-disaster reconstruction, it provides an indication of the extent of the problem.

Davidson, et al. (2007) noted that post-disaster reconstruction is quite similar to that of low-cost community housing projects in developing countries, but with added challenges. These added challenges identified were: i) the chaotic nature of the work involved, resources being in short supply, simultaneous projects being launched by numerous local and international organisations for housing and other aspects; ii) projects having to be completed as quickly as possible to foster recovery and to satisfy donors who want to see results; and iii) the post-disaster period being seen as a good opportunity to engage in activities that will increase the level of development and reduce vulnerability to future disasters. The first two challenges have been observed by Ingirige, et al. (2008). The last challenge identified implies that post-disaster projects need to be implemented with sustainability in mind. Furthermore, the reconstruction stage provides an opportunity to ‘build back better’; thereby incorporating the principles of making them less vulnerable to disasters and to strengthen their resilience. A key priority agreed as part of the Sendai Framework for Disaster Risk Reduction 2015–2030 was to build back better in recovery,

rehabilitation and reconstruction (UNISDR, 2015b). Previous research, however, has found that the opportunity to build back better is only effectively seized in limited instances (Wedawatta, et al., 2012).

2.2 The need for considering long-term performance of post-disaster housing

Post-disaster reconstruction, as discussed earlier, is often a challenging process and involves a multitude of pitfalls. Even if the projects are completed and delivered, the intended recipients may not be willing to move into their new homes or may require undertaking extensive alterations before moving in. For example, Audefroy (2010) noted several post-disaster contexts whereby permanent houses constructed were left uninhabited by the intended recipients for various reasons. In the haste to provide a speedy solution, the requirements of the recipients, their views and expectations, and socio-economic issues may not be well captured under chaotic conditions. Obviously, a speedy response is required in order to alleviate the plight of victims as soon as possible. As discussed by Patel and Hastak (2013), staying in a temporary shelter for a long period of time affects the victims both mentally and physically. However, there is also the need to deliver a solution that works for the recipients, not just in the short term but also in the long term. First, a house is a fixed asset that is expected to last and provide shelter for the intended recipients for a significant part of their lives. Second, a house requires a significant financial investment and there is the need to make the best use of financial assistance provided for post-disaster housing, given that many countries around the world are struggling to provide adequate housing provisions for their residents even without disaster impacts. Third, as discussed by Audefroy (2010), this can be used as a great opportunity to stimulate community empowerment, reduce vulnerability, enhance resilience, advance gender rights, and improve environmental protection and social justice; thereby deriving lasting benefits for the community settled in a post-disaster housing scheme.

A number of studies have investigated factors that can be effectively used to assess the success and performance of a post-disaster housing scheme following its delivery. For example, studies such as those reported by Ade Bilau and Witt (2016), ESSC (2014) and Jha, et al. (2010) can be cited, in addition to a relatively large amount of existing studies that investigate the success of post-disaster housing schemes during the planning, design and construction stages, as well as immediately after being delivered to the recipients. Comparatively, there is a lack of evidence on how well the post-disaster housing projects have performed in the long term, whether the intended objectives have been achieved and whether the recipients are satisfied with their dwelling unit and the surrounding issues. Studies on other sectors, such as the long-term recovery of small businesses following disaster events (Dasanayaka, et al., 2014; Webb, et al., 2002) suggest that valuable lessons can be learned by revisiting them sometime after the event.

2.3 Measuring long-term performance of post-disaster housing

Yilmaz, et al. (2013) identified an evaluation following the delivery of a post-disaster housing project as one which aims to ascertain the degree to which a project or programme has been successful, what the impacts on settlement and dwellers are, and what parts of the implementation can be improved, according to the beneficiaries. Accordingly, views of the housing recipients and aspects for improvement are central objectives behind measuring performance of such a housing scheme. Yimaz, et al. (2013) identified three stages where such an evaluation can be undertaken following project delivery: short term, mid term and long term. Mid term and long term were identified therein as a 'few years' and 'some years' after project closure, respectively. While the differentiation between mid term and long term is not clear-cut here, it is clear that these assessments happen after a number of years following project completion. Webb, et al. (2002), in their study of the long-term recovery of businesses following disasters, studied them after a period of six to eight years. In a recent article on the long-term evaluation of post-disaster reconstruction, Schwarz (2017) conducted a study ten years after the disaster event and this was revisited eight years later. Accordingly, 'long term' can be identified as after about six years following housing recipients moving into their new homes.

Yilmaz, et al. (2013) categorised the success factor under social, economic, physical and overall evaluation, and identified a total of 65 factors from previous literature. However, it has to be noted that these factors were identified for evaluation in the short, medium and long term collectively. Therefore, the factors applicable to the long-term context need to be distinguished. Furthermore, the list of factors relates to possible success factors, not critical success factors, which are more significant than others. Also, the context was post-earthquake construction in Turkey, and therefore the important factors that suit the local context need to be defined as well. However, the list of factors identified by Yilmaz, et al, (2013) provides a good starting point towards identifying measures that can be used to assess the long-term performance of post-disaster housing in Sri Lanka.

Table 1: Indicators for evaluating post-disaster reconstruction

(Source: Yilmaz, et al., 2013)

Social Evaluation	Economic Evaluation	Physical Evaluation	Overall Evaluation
• Training attendance • Fear of earthquakes • Trust in seismic resistance of the house • Temporary migration	• Financial help from the state • Completion level of house loan • Duration and amount of house loan • Preference of other payment options	• Plan layout • Size of house and room • Size of private lot • Size of windows • Quality of interior materials • Direction of entrance and terrace • Level of privacy • Ease of cleaning	• Overall satisfaction from the house • Comparison between old and new houses • Preference of structural system and material

• Decision making for migration • Knowing neighbours • Relationship with neighbours • Feeling of normalisation • Duration of disruption • Changes and difficulties in post-disaster life • Perception and aspiration of former and current environment	• Worthiness of the house received • Source of livelihood • Loss of animal stock and its recovery • Being unemployed • Comparison of income level (pre-and-post disaster) • Order of essential expenses • Type of heating • Expensiveness of heating • Affording essential expenses • Increase in expenses • Spending on alterations	• Heating and ventilating during winter • Location of dweller's house • Location of new settlement compared to former settlement • Distance to city centre and other services • Design of new settlement and outdoor facilities • Infrastructure and public services • Additional units owned • Receiving an additional unit from the state • Size and location of barn • Any alterations done • Type of alterations • Reasons for alterations and anticipated alterations in future	• Level of expectations • Anticipated years to live in the same house • Relationship with the officials • Trust in the state • Participation in decision making • Any issues to complain about

Following a review of the literature, Dias, et al. (2016) identified eleven success factors that can be used to measure the long-term satisfaction of communities. These are: maintenance of housing standards; housing design; provision of basic facilities at the same time that people are resettled; location of the relocation site; proper legal transfer; rehabilitation of livelihoods; provision of social infrastructure; materials used for housing; recreation of the neighbourhood; restoration of culture and cultural heritage; and empowerment of the community. This list is more applicable to the context of this study because the context is post-tsunami reconstruction in Sri Lanka, albeit from a qualitative point of view. The current study sought to undertake a quantitative assessment of long-term performance, particularly from the viewpoint of the housing recipients. Based on the literature, as discussed above, and other studies reported in Prasanna, et al. (2016), measures to assess the performance and occupant satisfaction were identified. These are introduced and discussed in Chapter 4.

2.4 Disaster situation in Sri Lanka

Sri Lanka is exposed to a range of hazards, such as floods, landslides, cyclones, droughts, high winds, lightning, thunderstorms, coastal erosion, subsidence, tidal waves and infrequent seismic events. A combined review by a number of international and national institutions following the 2004 tsunami recognised the vulnerability to hazards in Sri Lanka as being related to physical, environmental and legal institutional weaknesses (Asian Development Bank, et al., 2005). Land use patterns, including encroachment into flood plains and substandard construction on unstable slopes, human settlement developments and construction practices that are not sensitive to weather-related hazards were considered as being the most significant contributors to creating unsafe conditions (Asian Development Bank, et al., 2005).

A large number of houses are either destroyed or are significantly damaged due to various disaster events on a recurring basis in the country. According to the Disaster Information Management System in Sri Lanka (Disaster Management Centre, 2017), nearly 45,000 houses were either destroyed or substantially damaged due to disaster events in 2017 (see Figure 1). Compared to the period of 1970 to 2000, an increase can be observed in the number of houses damaged/destroyed as the result of disaster events since the year 2000. Apart from the Boxing Day tsunami in 2004, regular flooding and cyclones remain the main events that damage the housing stock of the country (see Figure 2). Overflowing rivers and flash flooding are common in Sri Lanka, especially during monsoon seasons when the country receives heavy rains. Subsidence and landslides have also emerged as being major hazards that cause damage to houses and residents requiring resettlement, particularly during the last decade. Out of the 65,000 square kilometres of land extent in Sri Lanka, an area of nearly 20,000 square kilometres encompassing ten districts is considered as being prone to landslides (Bandara, 2005).

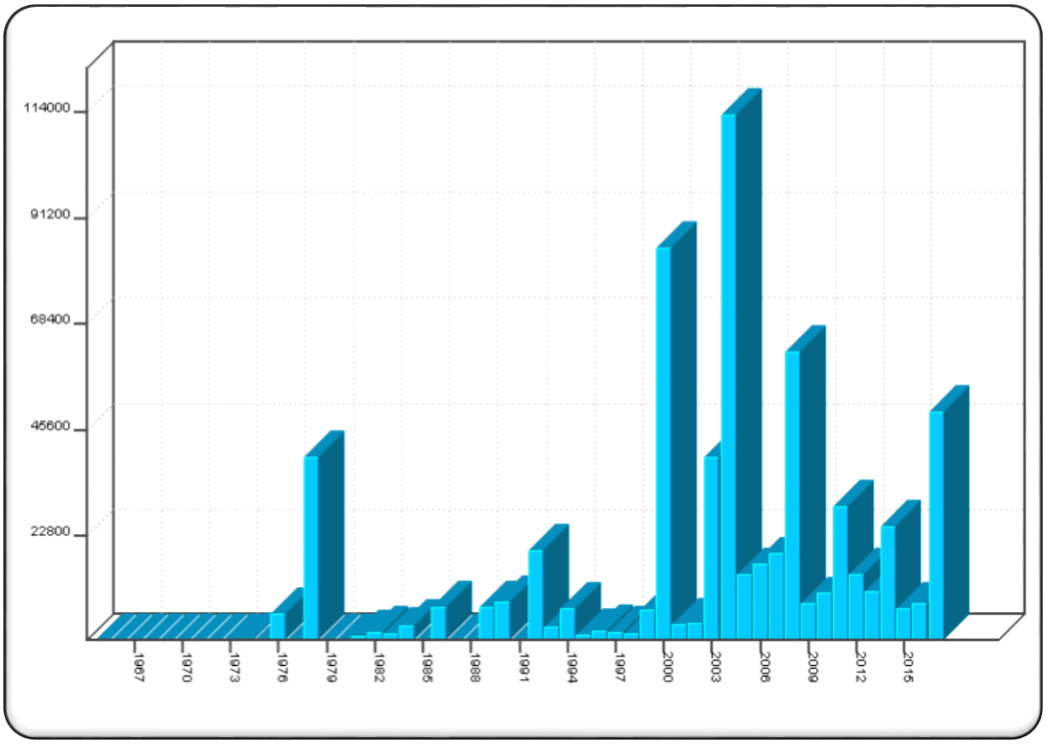


Figure 1: Number of houses destroyed or damaged by natural-hazard-induced disasters since 1974

(Source: DesInventar, 2017)

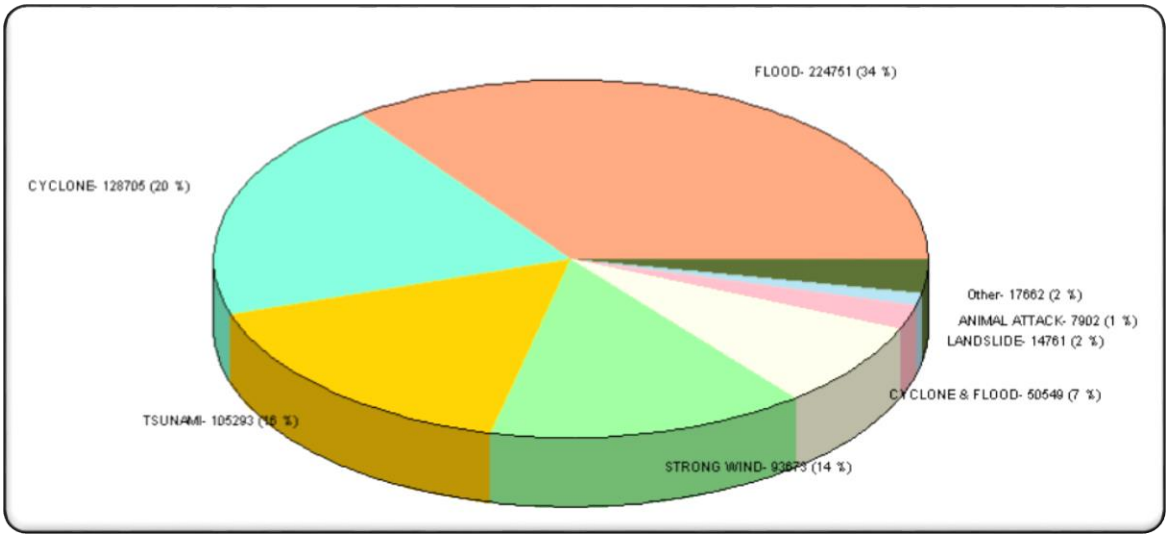


Figure 2: Total number of houses destroyed or damaged by different disaster types

(Source: DesInventar, 2017)

3 Research method

3.1 Data collection

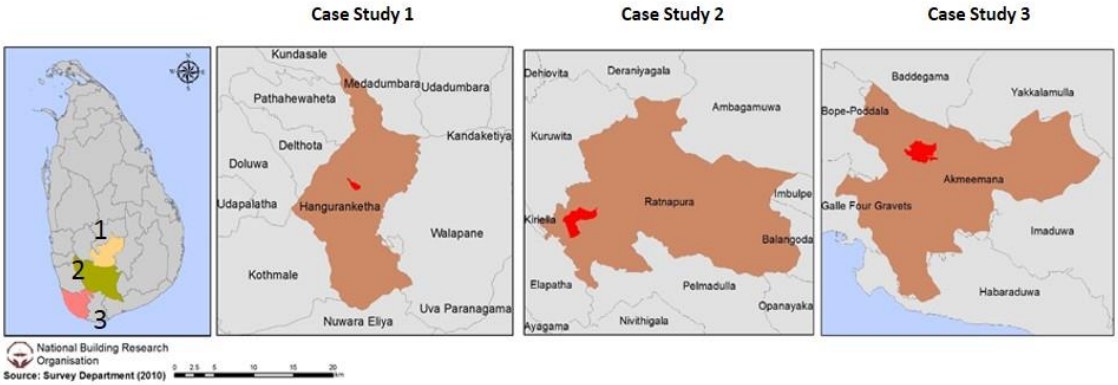
In order to achieve the objectives set for the research, primary data was collected from recipients of post-disaster housing as well as decision makers involved in post-disaster housing work. The information from the housing recipients was collected via a questionnaire survey, whereas the information from the decision makers was collected via a focus group discussion. First, a desk-based literature review was conducted to assess the existing knowledge on the issues. Based on this understanding and the research objectives, a template for the questionnaire survey targeting the housing recipients was developed. The questionnaire template was reviewed by a panel of selected experts in order to assess whether the structured questions and options provided reflected the context of Sri Lanka. Findings from the questionnaire survey informed the guidelines for the focus group discussion with the decision makers.

3.2 Case studies for questionnaire survey

In order to survey the views of the housing occupants, three post-disaster housing projects (case studies) were randomly selected. The main consideration therein was that the houses have been handed over to and have been occupied by the recipients for what is considered beyond the short and medium terms. Table 2 provides basic information relating to the three case studies. The houses in two of the case studies have been occupied for more than ten years, whereas they have been in use for more than eight years in the other case study. The selected case studies have been completed to house those affected by the 2004 Boxing Day tsunami, flooding in 2003 and landslides in 2006. The three case studies are located in the Galle, Nuwara Eliya and Rathnapura districts of Sri Lanka, as shown in Figure 3. In addition to the information collected from the survey recipients, further details about the case studies were obtained from the Divisional Secretariats (local administration offices), the grama niladhari (civil service administrative officer in each village), as required.

Table 2: Basic information relating to the three case studies

Description	Case Study 1	Case Study 2	Case Study 3
Disaster type	Landslide	Flood	Tsunami
District	Nuwara Eliya District	Rathnapura District	Galle District
Divisional Secretariat	Hanguranketha DSD	Rathnapura DSD	Akmeemana DSD
Funding approach	Owner-driven	Owner-driven	Donor-driven
Land area	20 perch	6/10 perch	10/15 perch
Target units	250	246	145
Time period	2007–2009	2003–2005	2005–2006
Number of survey participants	40	50	29



Key: 1 - Case Study 1 (Hanguranketha), 2 - Case Study 2 (Rathnapura), 3 - Case Study 3 (Akmeemana)

Figure 3: Locations of the three case studies

3.3 Questionnaire survey

The questionnaire survey was personally administered by the research team, including researchers from the National Building Research Organisation (NBRO) Sri Lanka, considering the socio-demographic profile of the occupants. A total number of 119 households were involved in the survey: 40 from Case Study 1; 50 from Case Study 2; and 29 from Case Study 3. While the households were randomly selected, whether the current occupants were the original recipients was considered. Only the households in which the original recipients have remained in occupancy were selected for the survey. This was to ensure that the views of the original recipients for whom the houses were planned and constructed are reflected in the study, rather than those who have subsequently bought them from the original recipients.

The head of household was the respondent in 85 (71%) instances, whereas the respondent was either the spouse or descendants in the other instances. The average age of the respondents was 51 years, with a standard deviation of 15 years. Apart from 3% of the respondents, the vast majority of the respondents have had a formal education: 54% below General Certificate of Education (GCE) O Level (below Grade 11); 32% GCE at O Level (Grade 11); and 11% at GCE Advanced Level (equal to GCE Advanced Level in the UK). Apart from 22.7%, the rest of the respondents were employed. However, many of the occupants were in low-paid manual labour or self-employment, earning well below the average household income for their respective districts.

Table 3: Average monthly income of the surveyed households

	Mean (in Sri Lankan Rupees [Rs])	**Std. Deviation (in Sri Lankan Rupees [Rs])**
Case Study 1: Hanguranketha	Rs 14,400.00	Rs 12,200.00
Case Study 2: Rathnapura	Rs 23,800.00	Rs 14,000.00

Case Study 3: Akmeemana	Rs 25,700.00	Rs 13,000.00
Overall	Rs 21,000.00	Rs 13,900.00

The level of satisfaction of the occupants with regard to different aspects of their homes was primarily obtained based on a 5-point Likert scale, as follows: 4: Highly Satisfied; 3: Satisfied; 2: Dissatisfied; 1: Highly Dissatisfied; and 0: Do not know/not sure.

3.4 Focus group discussion

Following the questionnaire survey, a selected group of experts was consulted in order to obtain the views of the decision makers involved in post-disaster reconstruction work in Sri Lanka. This discussion involved a total of twelve experts representing national housing authorities, NGOs and INGOs involved in post-disaster reconstruction work, consultants and advisors. All the participants were highly experienced in their respective fields and have been involved in post-disaster housing work extensively over the years in a decision making/advisory capacity. The focus group discussion, conducted as a half-day workshop, covered a range of topics, such as the current post-disaster housing policy in Sri Lanka, the challenges and shortcomings in post-disaster reconstruction, good practice case studies and lessons to be learned, and suggestions for improvement. Key findings from the questionnaire survey were fed to the focus group and these were reflected in the discussion.

Furthermore, two engagement and dissemination events held in Sri Lanka as part of the project were also used to capture the perspectives and opinions of the decision makers involved. Both these events were attended by more than fifty invited delegates, representing various government departments, private organisations, not-for-profit organisations and higher education institutions involved in post-disaster reconstruction work in Sri Lanka.

4 Findings and analysis

4.1 Current occupancy rates

Based on the information collected from the relevant local authorities, the percentage of original housing recipients still occupying their houses is 79%, 56% and 73% in Case Study projects 1, 2 and 3, respectively, as shown in Table 4.

Table 4: Percentage of original housing recipients remaining in their dwellings

	Case Study 1 Hanguranketha	Case Study 2 Rathnapura	Case Study 3 Akmeemana
Total number of houses	250	246	145
Original recipients remaining	198	137	106
Percentage of original recipients	**79%**	**53%**	**73%**

While the percentage of original recipients remaining is acceptable in Case Studies 1 and 3, this is quite low in Case Study 2. As noted by Da Silva, et al. (2010), the initial occupancy rate for post-disaster housing projects is a proxy for quality or acceptability to beneficiaries. Similarly, the rate of occupancy of original recipients can be a proxy for the long-term satisfaction of the recipients. While a certain level of transfer of ownership is to be expected, given the changes in circumstances, such as economic status and employment, a considerably higher rate could be an indication of the level of dissatisfaction or the property provided not meeting the requirements of the recipients. This seems to be the case particularly in Case Study 2. Launched to relocate flood victims in the Rathnapura District in 2003, Cast Study 2 is the oldest of the three projects surveyed and relates to the pre-tsunami period. Following the Boxing Day tsunami in 2004 and the significant housing projects that ensued to house those affected, both policy and practice on post-disaster housing have seen extensive transformation. A higher percentage of original occupants remaining in their houses in the two housing projects relating to the post-tsunami period could be an indication of the fact that the process has now become more occupant friendly, compared to the previous situation.

4.2 Legal transfer

As identified by Dias, et al. (2016), proper legal transfer is a success factor of post-disaster housing in the long term. However, information collected from the local authorities shows that the deeds have only been fully handed over to the occupants in Case Study 2. In the other two projects, deeds for only some of the houses have been handed over, as depicted in Table 5. The counter-argument from the authorities here is that delaying handing over the deeds will prevent the occupants from selling their houses and moving

on, sometimes to their original lands, which may be in a vulnerable area declared unsuitable for habitation, and making an economic gain. However, it can be argued that if the recipients are satisfied about their new homes the need to move on is likely to be limited. Furthermore, justifiable reasons, such as changes in employment and education, may even warrant a change of place. Therefore, speeding up the process of handing over the deeds to the new homes was identified as being a factor requiring improvement in Sri Lanka.

Table 5: Number of occupants still to receive deeds to their homes

	Case Study 1 Hanguranketha	Case Study 2 Rathnapura	Case Study 3 Akmeemana
Total number of houses	250	246	145
Situation regarding deeds	83 deeds distributed; others in progress	Yes, only for original recipients	80 households given deeds
Number of years in occupancy (~)	8	12	11

4.3 Satisfaction of occupants

Based on the review of literature reported in Chapter 2, section 2.3 above, factors to measure occupant satisfaction relating to the performance of their housing units were identified. These were then reviewed by a panel of experts to check the suitability relating to the Sri Lankan situation and for the purpose of measuring the long-term perspective. Accordingly, the long-term satisfaction of the occupants is discussed relating to three aspects: physical and technical; socio-economic; and infrastructure and services. Because the respondents' views on satisfaction were obtained on a 5-point Likert scale, as discussed in Chapter 3, section 3.3 above, a score of 2.5 can be taken as the cut-off point for satisfaction or dissatisfaction.

4.3.1 Long-term satisfaction with physical and technical performance of the houses

Table 6 shows the average satisfaction relating to physical and technical issues with regard to the occupants' houses. Although the level of satisfaction was positive in many aspects, it was not strong in the majority, for example, although the recipients were in general satisfied with plot size, provision for alterations, size of house and number of rooms, the level of satisfaction was minor when the Likert options were statistically analysed. The recipients were dissatisfied about the quality of building materials and the quality of workmanship in Case Study 3.

Table 6: Satisfaction with physical and technical issues

	Case Study 1Rathnapura (n = 50)		Case Study 2Hanguranketha (n = 41)		Case Study 3Akmeemana (n = 29)		Total (n = 120)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Plot size	2.50	.580	2.66	.693	2.72	.649	2.61	.639
Size of house	2.76	.591	2.73	.549	2.48	.574	2.68	.580
Number of rooms	2.68	.621	2.71	.559	2.48	.509	2.64	.577
Lighting and ventilation	2.74	.600	2.80	.401	2.72	.528	2.76	.518
Quality of building materials	2.56	.675	2.68	.567	2.03	.626	2.48	.673
Quality of workmanship	2.82	.482	2.80	.459	2.10	.673	2.64	.605
Orientation of the house	2.82	.523	2.90	.374	2.79	.726	2.84	.534
Level of privacy	2.54	.646	2.90	.374	2.97	.325	2.77	.530
Ease of cleaning/ maintenance	2.70	.647	3.00	.224	2.79	.559	2.83	.529
Provisions for alterations/ expansion	2.54	.613	2.68	.567	2.62	.677	2.61	.612
Sanitary facilities	2.70	.735	3.10	.300	2.90	.489	2.88	.582
Location of settlement compared to previous dwelling	3.14	.670	3.24	.624	2.90	.900	3.12	.724
Distance to city centre	3.02	.622	3.27	.501	2.79	.940	3.05	.696

Figure 4 represents the level of satisfaction when it is converted to a percentage. Although the percentages here should be treated with caution because they are based on converted Likert scale values, they still provide an indication of the strength of satisfaction/dissatisfaction expressed by the occupants. While the occupants were quite satisfied with the location and proximity to the city centre, satisfaction relating to other aspects was quite low.

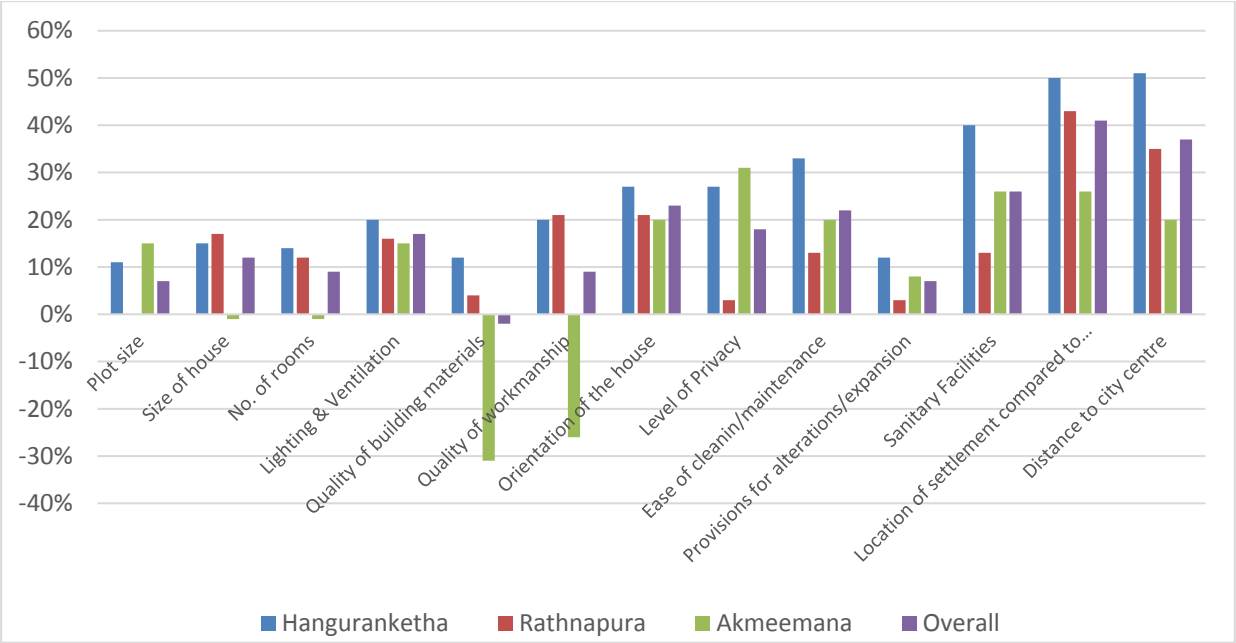


Figure 4: Level of satisfaction (as a percentage) relating to physical and technical issues

In addition to the quality of materials and workmanship, several other aspects, such as plot size, size of house, number of rooms and the ability to make alterations/expansions were particularly low. Given that the plot sizes in the three case studies were typically 20 perches, 6–10 perches and 10–15 perches, respectively, the plot size can be considered reasonable; except for the lower end of Case Study 2, with the low satisfaction here possibly linked to the size of the land previously lived on. A higher percentage of households have made alterations to their homes, especially in Case Study 1 (Rathnapura) and Case Study 3 (Akmeemana), as shown in Figure 5. The primary reason cited is the need for more space, followed by the need to upgrade quality and the need for privacy. Additional rooms, extensions to or a new kitchen, refurbishing the kitchen and refurbishing rooms are the primary alterations undertaken. This shows that many of the households tend to make changes to their homes in the long term. Therefore, considering the ability to do so in the house design stage seems to be a necessity.

When questioned about their level of engagement during the planning and design stages of their homes, only a very limited number of recipients stated that they were granted the opportunity to engage in the process or had been consulted. This means that recipients' requirements may not have been appropriately captured during the planning, design and construction phases of their houses. This may have resulted in the considerable number of houses having been vacated by the original recipients across the three case studies, and lower levels of satisfaction. Therefore, active community involvement in the process from the very beginning is a key requirement for future housing projects.

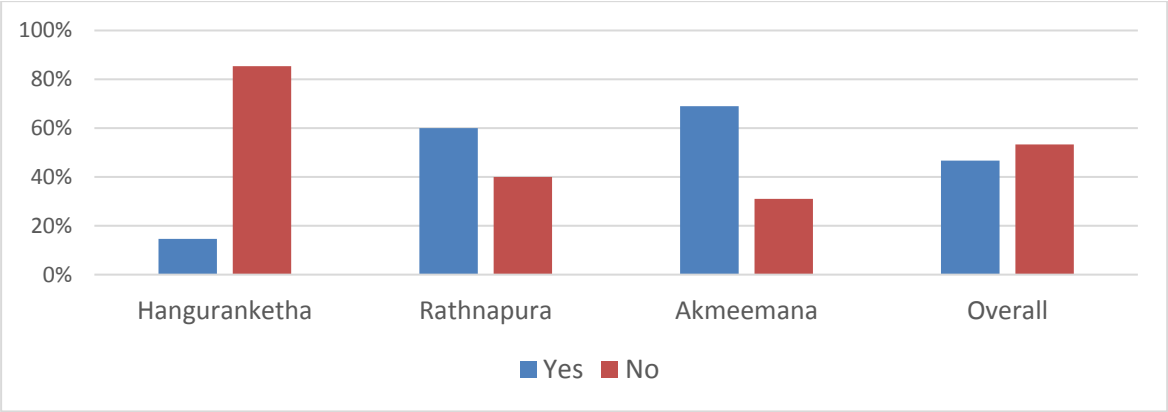


Figure 5: Percentage of occupants who have made alterations to their homes

However, the research team noticed varying levels of house completion in all three case studies (see Figure 6). While some houses were well completed, some of them have not been fully completed more than eight years after moving in. This is an issue that needs further investigation because some of the families seem to be living in less than desirable conditions on a permanent basis.

Figure 6: Varying levels of house completion

4.3.2 Long-term satisfaction with socio-economic issues

Figure 7 shows the level of satisfaction (as a percentage) relating to different socio-economic issues. The aspects that occupants were most dissatisfied with related to the issues regarding their economic status. The occupants expressed their dissatisfaction with the availability of space to carry out their livelihoods,

the ability to use their home for income generation, and the availability of employment and income generation opportunities (see Table 7).

Table 7: Satisfaction with socio-economic issues

	Case Study 1 Rathnapura (n = 50)		Case Study 2 Hanguranketha (n = 41)		Case Study 3 Akmeemana (n = 29)		Total (n = 120)	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**
Availability of space to carry out livelihood	2.20	0.857	2.17	0.946	2.38	0.820	2.23	0.877
Distance to livelihood/work	3.04	0.638	2.93	0.721	2.90	0.673	2.97	0.673
Ability to use home for income generation	2.00	0.000 (n = 2)	2.64	0.674 (n = 11)	2.33	0.500 (n = 9)	2.45	0.596 (n = 22)
Employment and income generation opportunities available in current location	2.50	0.647	2.32	0.820	2.28	0.702	2.38	0.724
Level of educational opportunities	3.16	0.510	3.32	0.471	3.34	0.484	3.26	0.494
Availability of religious places	3.30	0.463	3.17	0.543	3.28	0.455	3.25	0.489
Connectedness across community groups	2.70	1.093	3.10	0.539	2.97	0.680	2.90	0.854

Furthermore, out of the 120 surveyed, 22 households currently use their home for an income generation activity, and these occupants were particularly unsatisfied with the capability for using their homes for this purpose and for making alterations. This suggests that there is an urgent requirement to consider the livelihoods of housing recipients and employment opportunities in the region when planning post-disaster housing projects.

Adverse socio-economic changes, including reduced employment opportunities, income and the empowerment of women, have been noted as issues relating to post-disaster resettlement projects (Burnell, 2011). A number of respondents reported having significant land for cultivation before the disaster event and of having lost this land due to the event. Being farmers traditionally, they have now lost the ability to engage in their usual farming activities because the limited land area in the current settlement does not permit such activities. This can also be linked to the low satisfaction rates relating to plot size, as discussed earlier.

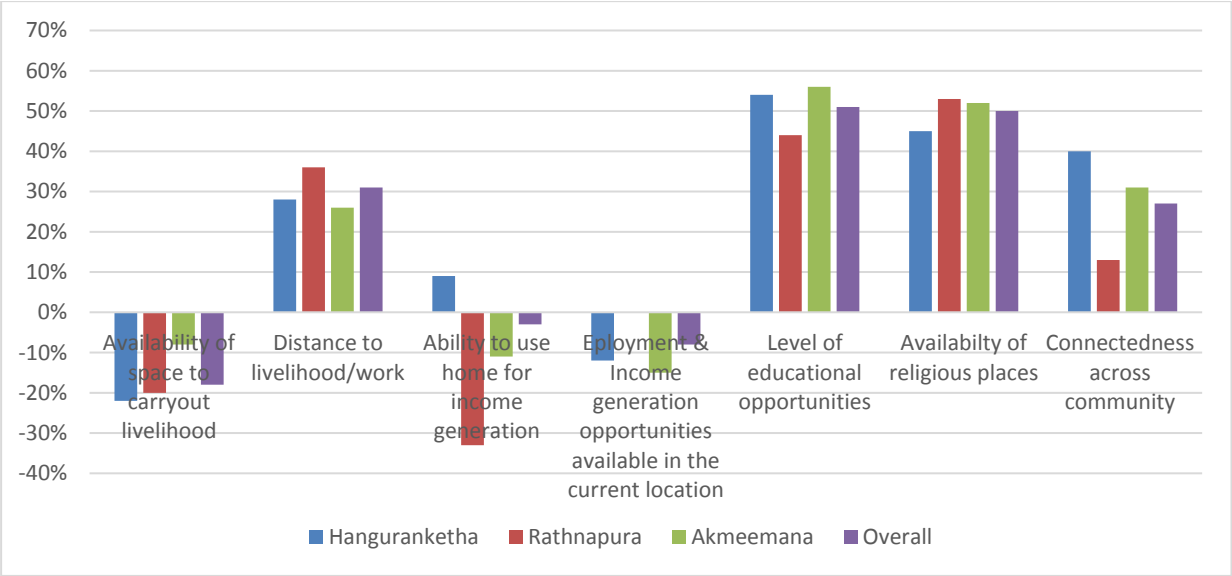


Figure 7: Level of satisfaction (as a percentage) relating to socio-economic issues

Table 8 shows how average household income in the three case studies compares with average household income in the respective districts, based on the Household Income and Expenditure Survey carried out by the Department of Census and Statistics (2017). Graphical representation in Table 8 clearly shows that household income in the post-disaster case studies is well below that of the average values in the respective districts.

Table 8: Comparison of household income of the case studies with that of the relevant districts

	Mean	Std. Deviation	District in which the settlement is situated	Average household income in the district
Case Study 1: Hanguranketha	Rs 14,400.00	Rs 12,200.00	Nuwara Eliya	Rs 46,517.00
Case Study 2: Rathnapura	Rs 23,800.00	Rs 14,000.00	Rathnapura	Rs 46,977.00
Case Study 3: Akmeemana	Rs 25,700.00	Rs 13,000.00	Galle	Rs 63,093.00
Overall	Rs 21,000.00	Rs 13,900.00	Sri Lanka	Rs 62,237.00

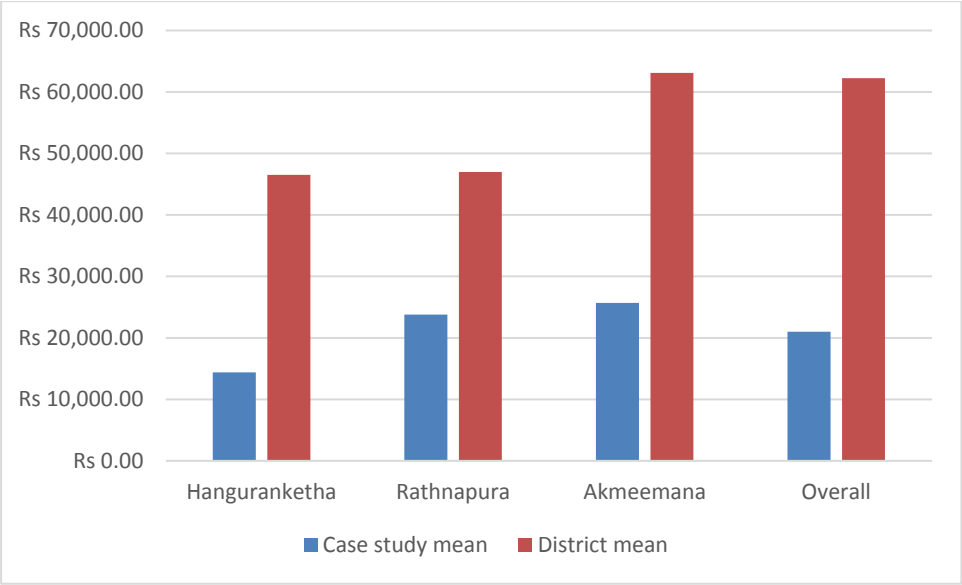


Figure 8: Household income compared to average income in the districts

Furthermore, as shown in Figure 9, the majority of the respondents seem to believe that their income has decreased compared to the pre-disaster situation. A total 65% of households depend on income generated by one household member in the survey sample. Comparatively, the number of income earners in a household in general in Sri Lanka is close to 2; 1.8 being the average value (Department of Census and Statistics, 2017). In addition, employment opportunities for women were noted as being particularly low. This is further evidence that additional employment opportunities for other household members are required in order to uplift the economic situation. If a strategy to provide vocational, self-employment training and support were to be integrated into the housing project, there is potential for these issues to be improved. Post-conflict reconstruction work facilitated by the United Nations Human Settlements Programme (UN-Habitat) in northern Sri Lanka, where the construction and repair of 17,945 houses has been completed, seems to be an instance where these issues have been considered and addressed (UN-Habitat, 2015).

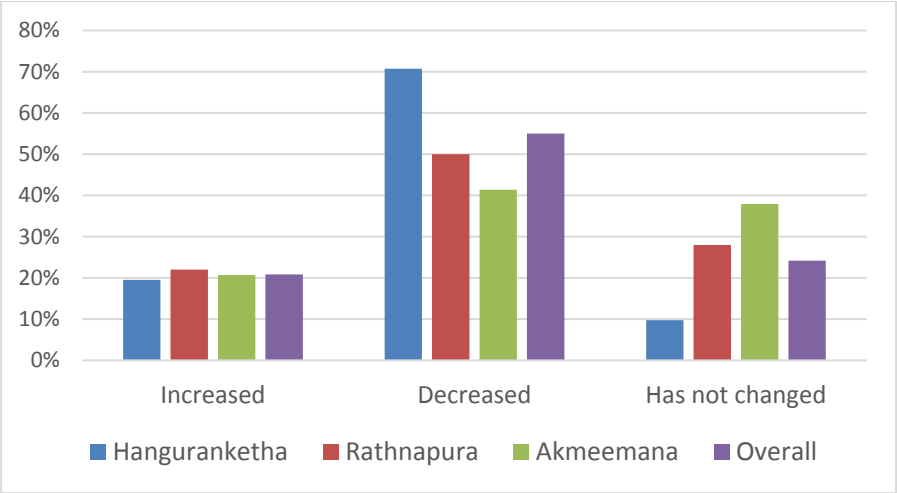


Figure 9: Views on how household income has changed compared to the pre-disaster situation

It is also clear from this study that a fundamental requirement is active community involvement from the very beginning, in order to identify occupation, how households should facilitate income generation, alternative income generation activities, and required training, etc. While extra work is required upfront, such an approach can improve the sustainability of the resettled communities and can reduce dependency on aid and government in the long term. Tafti and Tomlinson (2015) concluded that the two sectors central to the recovery of households – housing and livelihood – as disintegrated, often following a different sequence rather than complementing each other. Lower-income groups were found to be the hardest hit by this fragmentation. Furthermore, Burnell (2011), in her review, noted that the shelter sector lacks clear definition "with little progress being made to incorporate livelihoods and sustainability into its core principles". This also seems to have been the case with the surveyed case studies. When questioned about the respondents' relationships with neighbours, 50% stated that they are similar to how they were in their previous settlements.

4.3.3 Long-term satisfaction with infrastructure and service provision

As shown in Table 9 and Figure 10, the occupants were comparatively more satisfied with infrastructure provisions in the three case studies. The aspects that occupants were most satisfied with included the availability of educational opportunities, religious places, transport facilities and healthcare facilities. All the households had electricity and access to public water supply. However, only ten households had a home internet connection. Overall, the relevant infrastructure facilities seem to have been put in place adequately in all three case studies. The exceptions are the availability of recreational facilities and public safety/security, particularly in Case Studies 2 and 3. Adequate recreational facilities, such as parks and play areas, and measures to safeguard public safety, including adequate policing, seem to be aspects that require improvement in post-disaster housing projects. Residents in Case Study 2 (Rathnapura) were

particularly concerned about the illicit drugs trade and related social issues in their settlement, thereby resulting in a lack of public safety.

Comments from the survey participants suggested drainage and waste disposal as being aspects that require major improvement. These are in line with the general situation in Sri Lanka because waste disposal and drainage are issues that lack proper planning and consideration. Forming village committees in association with the relevant local authorities and first responders could be an effective way of providing a platform for local residents to raise and address these concerns. Occurrences where such committees have been particularly effective, both as a way of identifying and addressing community concerns and in responding to future disaster events, were noted in Bangladesh (Wedawatta, et al., 2016).

Table 9: Satisfaction with infrastructure and public services

	Case Study 1 Rathnapura (n = 50)		Case Study 2 Hanguranketha (n = 41)		Case Study 3 Akmeemana (n = 29)		Total (n = 120)	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**
Access to infrastructure facilities	3.16	0.510	2.98	0.651	3.07	0.530	3.08	0.568
Availability of transport facilities	3.20	0.571	3.12	0.640	3.41	0.501	3.23	0.586
Availability of healthcare facilities	3.08	0.488	3.34	0.480	3.24	0.511	3.21	0.500
Availability of public services	3.00	0.639	3.22	0.475	2.86	0.581	3.04	0.585
Availability of recreational facilities	2.34	0.745	2.85	0.654	2.45	0.686	2.54	0.732
Public safety/security	2.22	0.864	3.05	0.669	2.69	0.891	2.62	0.881

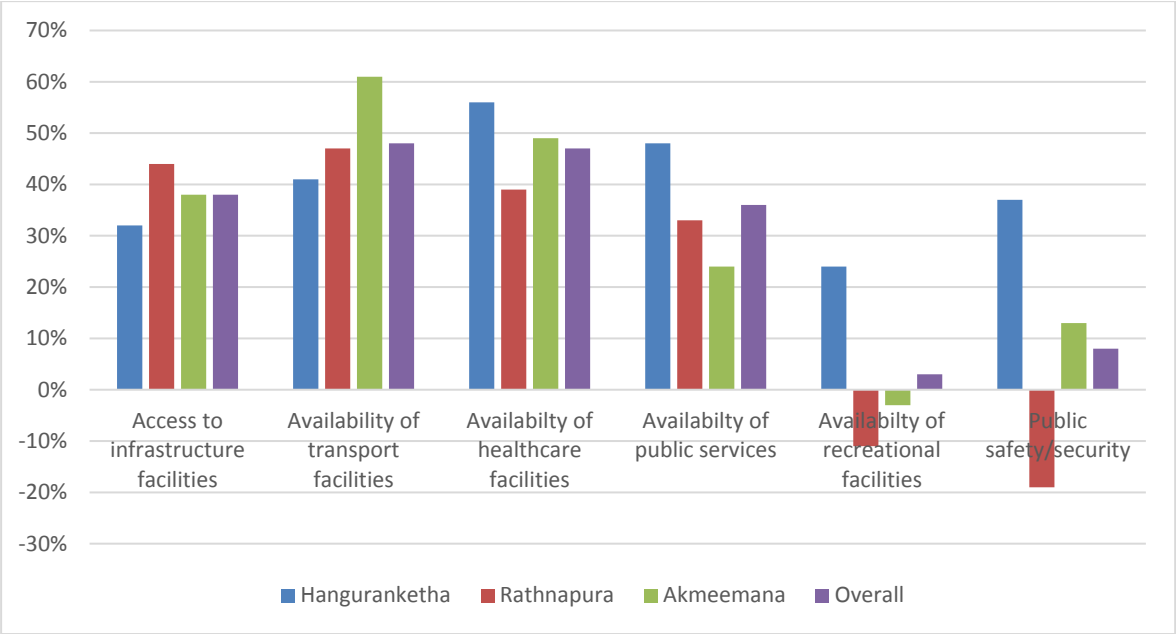


Figure 10: Level of satisfaction (as a percentage) relating to infrastructure and services issues

4.3.4 Overall satisfaction

When the respondents were asked to indicate their overall level of satisfaction, the responses in all three case studies were positive (see Table 10). The mean values were quite similar in all three case studies, despite variations with regard to individual factors. Furthermore, 43% considered that their living conditions had improved after moving into their new settlement, 31% considered that this has not changed and 26% considered that their living conditions had declined in the new settlement. This was primarily linked to loss of livelihood.

Table 10: Mean overall satisfaction

	Case Study 1 Rathnapura (n = 50)		Case Study 2 Hanguranketha (n = 41)		Case Study 3 Akmeemana (n = 29)		Total (n = 120)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Overall satisfaction	3.04	.755	2.93	.519	3.00	.655	2.99	.655

When correlation analysis was conducted relating to satisfaction regarding individual factors to that of overall satisfaction, the following factors were found to have a statistically significant correlation at 99% probability level:

- Ability to use home for income generation (Pearson correlation 0.545)
- Orientation and layout of house (0.284)
- Provision for alterations/expansions (0.243)

Furthermore, the following factors were found to have a statistically significant correlation to overall satisfaction at 95% probability level:

- Number of rooms (0.215)
- Lighting and ventilation (0.192)

This further highlights the previously discussed issues relating to income generation and the need and ability to make alterations (see Chapter 4, sections 4.3.1 and 4.3.2). Although only 22 households currently use their homes for income generation, the strong statistical correlation relating to satisfaction with this and overall satisfaction is evidence for the need to integrate this in future housing provision.

4.4 Integrating resilience

A total 12% of respondents considered their current home as being vulnerable to a disaster; either to landslides or high winds. A further 66% of respondents who considered their homes as being vulnerable were from Case Study 2 (Hanguranketha). This could be associated with the terrain there because the land slopes in places. Overall, the land areas selected for the case studies can be considered appropriate. However, given the terrain conditions in Case Study 2, mitigating works, such as retaining walls, could have been considered in order to avoid the risk of subsidence and small-scale local landslides. Four households have had these walls constructed under their own volition.

Compared to their previous home, 28% of the respondents believe that they are better prepared for a similar disaster situation. However, a majority (68%) believe that their level of preparedness has not changed compared to the previous location. A total 34% of respondents have participated in a disaster awareness programme. A further 58% of respondents acknowledged they are aware of where to find information relating to disaster vulnerability and preparedness. The Disaster Management Centre (DMC) of the Ministry of Disaster Management, the media and various NGOs were the main sources cited. A local disaster response committee was not available in any of the settlements studied. Furthermore, only one of the surveyed households had a property insurance policy. However, it has to be noted that Sri Lanka now has a blanket property insurance scheme. This scheme covers lives and properties of all households up to Rs 2.5 million each in respect of damages as a result of cyclones, storms, tempests, floods, landslides, hurricanes, earthquakes, tsunamis and any other similar natural occurrence.

4.5 Findings from the focus group discussion

The focus group discussion with decision makers and housing providers shed further light on the survey findings. In particular, observations were made by those decision makers and housing providers participating in the focus group discussions, as follows:

- Focus of post-disaster projects in Sri Lanka is often on technical issues, and social aspects, including the behaviours of people, are not afforded due consideration. Furthermore, the lack of consideration relating to people's livelihood activities in planning and development after post-disaster events, as well as social housing projects, was discussed. This can also be observed in the three case studies where the livelihoods of those relocated do not seem to have been adequately considered. Other issues discussed included people's socio-cultural differences and acceptability among the host community, in order to minimise negative impact on the community.
- The need to consider long-term requirements, such as family expansion and the ability to expand houses at a later stage. This was an issue identified in the three case studies, as previously discussed. It has to be noted that the NBRO has now developed a housing manual for hazard-resilient housing and sample plans for core housing units that offer the flexibility to be later expanded by occupants (NBRO, 2015).
- At the local level, houses are normally constructed by workmen who lack formal training and expertise. These workmen should be provided with the necessary technical knowledge because, currently, this issue is being largely ignored. This is especially the case for owner-driven projects. Therefore, the need for technical programmes to inform building tradesmen, particularly during the aftermath of a disaster, was raised.
- Lack of a masterplan in housing reconstruction. It was noted that Sri Lanka has a reactive response system rather than a pre-established strategy for post-disaster housing. The need for a coherent masterplan, including pre-identifying land for potential resettlement projects because post-disaster housing is required in the country on a continuous basis, was debated. It was noted that housing developments can then become part of a coherent development initiative rather than sporadic resettlement projects.
- Two contrasting views were put forward and discussed with regard to policy on post-disaster housing. While one view expressed that a national policy for post-disaster housing is required, another view affirmed that adequate policies are available at national level, and that it is the necessary regulations and enforcement strategies that are required to ensure implementation. While Sri Lanka has a detailed policy for housing with regard to involuntary settlement (Sri Lanka National Involuntary Resettlement Policy [NIRP]) and internally displaced people as the result of war (Resettlement Policy for Internally Displaced Persons [IDPs] and returnee refugees), the same level of detail with regard to housing is not provided in the National Policy on Disaster Management. Therefore, replicating the above policies for post-disaster housing is suggested. As a starting point, the NBRO has recently proposed a Resettlement Framework for the victims of the landslides and floods in 2017, which could also be expanded to include other post-disaster contexts.

- The need to continuously monitor the progress of housing projects, review completion reports, and further monitor post-occupancy performance by a central authority. This was in light of the fact that various issues, such as a number of housing projects having been left incomplete, houses having quickly deteriorated, and an adequate infrastructure not having been provided, have subjected disaster victims to further misery. Creating a central authority is a valid suggestion in order to improve compliance, and to assure completion and performance regarding post-disaster housing.

5 Conclusion and recommendations

Since the Boxing Day tsunami of 2004, after which more than 100,000 houses had to be rebuilt, both policy and practice relating to post-disaster housing has changed significantly in Sri Lanka. Over the past decade, this seems to have improved in many respects. This study investigated the long-term performance of post-disaster housing, particularly from the point of view of the housing recipients. While practices and policies have improved, the study identified issues that can be further improved in order to provide a 'home' that delivers long-term benefits to the recipients rather than a mere 'quick fix'. There is the risk that recipients may sell or abandon their houses and move back to their original, vulnerable, areas if further improvements are not made.

The questionnaire survey and focus group discussion captured a number of key issues with regard to the long-term performance of post-disaster housing. The three case studies surveyed reported occupancy rates of 79%, 53% and 73%, respectively, relating to the original housing recipients. However, previous studies have reported much lower occupancy rates (Fernando & Punchihewa, 2013). The identification of recipients' requirements, including socio-cultural concerns, plans for expansion, and livelihood patterns through engagement during the planning and design stages can be identified as being key in order to avoid delivering houses that do not satisfy their requirements. Transferring legal ownership at an early stage in order to create a sense of 'belonging' and security is also considered important, but this has not happened in some cases.

In general, respondents included in the survey expressed their satisfaction with a large number of aspects surveyed. The sample approached in the study included the original recipients, who had been the victims of a disaster event and had received a permanent house as part of the selected case study. There is obviously an element of bias here because the least satisfied recipients may have already left their houses. However, the survey provides a good account of the satisfaction levels of those who are still occupying their houses, thereby providing an indication of the level of performance of the housing project.

Although the level of satisfaction was positive in many aspects, it was not strong in the majority of aspects, for example, although the recipients were in general satisfied with plot size, provision for alterations, size of house and number of rooms, the level of satisfaction was minor when the Likert options were statistically analysed. When the factors included in the survey were categorised as 1. Physical and technical, 2. Socio-economic and 3. Infrastructure and services, the aforementioned particularly applied to the physical and technical aspects of the house. Overall, further improvements seem to be required in delivering a house that satisfies requirements in terms of the physical and technical aspects of the house.

Key recommendations that emerged from the study are as follows:

- True and active community involvement in the process from the very beginning. It is clear that recipients' requirements need to be clearly identified and addressed from the start, as opposed to just providing 'a house'. It is also worth remembering that most of the recipients have had permanent houses before and therefore have expectations, as opposed to social housing where the recipients may not have had a permanent shelter before. As such, housing needs to be planned as part of a coherent development strategy, rather than just providing houses and expecting everything else to 'work out'.
- Income restoration of housing recipients to be integrated within every housing project. A total 70% of survey participants had had their previous homes fully damaged, whereas the rest had suffered partial damage while suffering further economic damage. A total 55% of the participants stated that their economic situation is now worse than before, with only 21% stating that their economic status has improved. This is consistent with the dissatisfaction expressed (as discussed above) relating to income generation opportunities. Therefore, an assessment of occupation of the housing recipients, the facilities required to undertake their income generation activities, potential alternative employment, the vocational training required and financial assistance have to be integrated within the overall reconstruction programme. It is clear that these issues are unlikely to improve on their own, even in the long term, unless integrated within housing development from an early stage.
- Drainage and waste management was noted as being an issue in these housing projects. In future projects, sustainable waste management technologies need to be considered and implemented. Because Sri Lanka is lagging behind in terms of waste recycling and bio-fuels, etc., new, large-scale, housing projects will provide an opportunity to integrate these sustainable technologies.
- While the residents were generally satisfied with the infrastructure facilities in the case studies, this was not the case with regard to recreational facilities, such as parks and playgrounds. This suggests that there is a need to include such facilities within post-disaster projects.
- Development of a masterplan for post-disaster housing reconstruction integrating current best practices and lessons learned from previous projects. Rather than simply providing a 'house' and expect all other aspects to 'work out', the focus should be to provide a 'home' incorporating all other relevant service and infrastructure provisions, livelihood and income generation opportunities, and the necessary disaster resilience and preparedness strategies systematically.
- The need for a mechanism to coordinate post-disaster projects, monitor progress and completion, ensure compliance and regular monitoring beyond the handing over stage. Such a mechanism will: aid capturing requirements; provide the same level of service to all victims; and ensure that projects are delivered as planned/agreed. Post-occupancy evaluations at different intervals after moving in will allow the capture of household concerns and making improvements, thereby

avoiding occupants leaving their houses. The use of an exit survey could further help address occupant concerns, in the case of an original recipient leaving their home.

Sri Lanka is a developing country vulnerable to multiple hazards where post-disaster housing is required on a regular basis. As such, the situation is ideally suited to discuss longer-term performance of housing and, due to the multiple disasters facing the country, its individual elements can be effectively replicated within other developing countries. Therefore, the findings and recommendations listed above will be of special relevance to other developing countries affected by similar disaster events. Furthermore, Sri Lanka is currently engaged in building a large amount of houses for those displaced by war with the LTTE terrorist group. The findings are also applicable to this post-war housing situation because the focus therein should be to restore communities in order to deliver in future. The findings and recommendations of this study were fed back to and discussed with a high-level stakeholder group, including decision makers and housing providers, as part of engagement events relating to the study.

A further longitudinal study is recommended in order to investigate how the views and satisfaction levels among the occupants change over time, and how the houses perform in the short, medium and long term. Further research can be undertaken in order to better link the planning, design and construction stages, the decisions made and the actions taken during those stages, to that of long-term performance. The scope of the current study was primarily limited to that of the occupant view of long-term performance. Further research is recommended relating to technical performance, including building inspections and social aspects, including interactions between host and relocated communities.

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