
Final Report

Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region

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1.0 EXECUTIVE SUMMARY

BACKGROUND

- This document is the final report, the last deliverable out of three deliverables of the project *Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region* commissioned by the Shelter Reference Group (SRG) and undertaken by the Humanitarian Architecture Research Bureau (HARB), RMIT University, Melbourne. The project was supported by Caritas-Australia with funding from AusAID under the Humanitarian Partnership Agreement.
- The first deliverable, a literature review, highlighted, a) The importance of understanding disaster resilience in permanent shelter given the limited literature on the subject in the Asia-Pacific; b) The need for an evaluation tool that is positioned within a sustainable shelter systems framework encompassing a range of physical and social dimensions; c) An evaluation framework adapted from the most relevant evaluation approaches; and d) The need for the literature review to serve as a background document to a shelter evaluation tool.
- The second deliverable, a draft evaluation tool for assessing disaster resilience in shelter projects, consisted of three main stages – Pre-Assessment, Assessment and Consolidation – with each stage including a set of guided activities. To understand its utility, the tool was tested in actual shelter projects, where it was found that the Key Informant Interviews was one of the most significant activities.

FIELDWORK

- To test and refine the draft evaluation tool developed in this study, two case study countries in the Asia-Pacific region – The Cook Islands and Sri Lanka - were selected in consultation with SRG member agencies. Within each country, respectively two and three shelter projects were selected, through which the evaluation tool was tested via extensive in-country fieldwork.
- An Analytical Framework consisting of five main factors – Inputs, Output, Result, Impacts & Effects, and External Factors – established through the literature review, was followed in the evaluation tool and utilised during the test assessments in the field.
- The following key findings relating to disaster resilience were evident in the shelter projects in the two case study countries where the evaluation tool was tested:

Aitutaki, Cook Islands (SRG agency: Emergency Architects):

- Quality of construction and building materials were of high standard, and the houses incorporated resilience features to resist cyclones, the main hazard there.
- Houses being small required extensions for large households, often built without professional support. It is uncertain if such extensions would be as resilient as the original house, in which case the occupants and household belongings would be vulnerable to future cyclones.

Mangaia, Cook Islands (SRG agencies: Red Cross, Partner Housing Australasia):

- The system of roof anchoring introduced in the project provided better resilience to cyclones, addressing a key vulnerable part of the house.

- Although the whole structure was not strengthened and only a part of the roof was made secure, it still improved the resilience of houses to some extent.
- Reliance on imported materials might affect sustainability and long-term resilience.

Galle, Sri Lanka (SRG agency: Habitat for Humanity):

- Although the project area still suffered from flooding, on the whole the situation of the community was much improved by the project and the community's vulnerability had been reduced.
- External factors such as uncoordinated road construction and lack of drainage by local authorities undermined the efforts of HfH and increased the community's vulnerability.

Galle, Sri Lanka (SRG agency: Caritas):

- Inland location, adequate site preparation, construction of good quality houses and provision of drainage had led to a resilient community.
- This project represented a gradual process of consolidation of community resilience.

Kirinda, Sri Lanka (SRG agency: World Vision)

- Elevated inland location and construction of good quality houses had led to a resilient community.
- An integrated community development approach including a DRR community training component had contributed towards long-term resilience.
- External factors such as inadequate public services provision by local authorities undermined the resilience-building efforts of World Vision.

CONCLUSION

- All the five shelter projects were found to have reduced disaster risk to varying levels, and had contributed to beneficiaries' resilience and improved living conditions.
- Nonetheless a broader range of problematic issue became evident in terms of the factors Result (meeting user needs) and External Factors (particularly support from the government).
- A brief overview of other projects in Sri Lanka indicated the significance of an integrated community development approach and long-term engagement towards contributing to resilience and sustainability.
- The field tests allowed reviewing the evaluation tool pointing to, a) The need for experience and skill; b) Application of Hazard Mapping & Ranking principally in multi-hazard contexts; c) Centrality of Key Informant Interviews; d) Importance of the Pre-Assessment Stage; and e) Importance of Documentation.
- Some of the key recommendations include, a) Need to adapt the tool to specific contexts and using it as a standard procedure; b) Its use in a variety of shelter project types; c) Need for training for proper utilisation of the tool; and d) The tool should be supplemented by good documentation practice.

background

2.0 INTRODUCTION

This project entitled *Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region* was carried out in response to the interest of the Shelter Reference Group (SRG), Australia, to obtain an understanding of leading practice in the provision of disaster resilient shelter in the Asia-Pacific region, as per the Terms of Reference (ToR) provided by SRG. It was carried out by a team from the Humanitarian Architecture Research Bureau (HARB), RMIT University, Melbourne, Australia. Funding for the project was allocated by Caritas-Australia from funds received from AusAID under the Humanitarian Partnership Agreement, a component of which related specifically to disaster risk reduction and management.

There are three main deliverables of the project:

- i. Literature Review on disaster resilient shelter and leading practices;
- ii. Draft Evaluation Tool to assess disaster resilience in shelter projects;
- iii. Final Report including analysis of testing the evaluation tool.

The first two deliverables have been completed and this document is the last deliverable, that is, the Final Report.

The key aim of the study was to develop a resource (that is, Evaluation Tool) for agencies and their country partners, which can support the implementation and assessment of disaster resilient/risk reduction focused shelter that takes into account:

- Sustainability and livelihood;
- Strength and durability of buildings and infrastructure in the face of future disasters;
- Long-term reductions in disaster vulnerability and consequently increased resilience.

A draft evaluation tool was developed through a literature review and consultation with SRG member agencies, and then tested in the context of shelter projects of some of these agencies in two countries in the Asia-Pacific region – the Cook Islands and Sri Lanka. Extensive consultation was done with a range of stakeholders in the project including the Australian Red Cross, Caritas-Australia, Emergency Architects Australia, Habitat for Humanity-Australia, Partner Housing Australasia, and their in-country counterparts and partner agencies. This report presents the findings of the tests in the two case study countries, based on which of the utility of the evaluation tool and future recommendations are discussed.

3.0 SUMMARY OF LITERATURE REVIEW

A review was carried out of literature on the broad theme of shelter and disasters, followed by literature offering lessons from past projects, and finally key shelter evaluation frameworks were reviewed with a view to informing the development of an evaluation tool. The websites of regular SRG member agencies were also reviewed to gain an understanding of their shelter projects (the literature review is appended at the end of this report; see Appendix 1).

Shelter in the Asia-Pacific region is often most visibly damaged in disasters, so building disaster resilient shelter is extremely important. Multi-hazard contexts, climate change and urbanisation present challenges to building resilient shelter. Post-disaster reconstruction offers an opportunity for building shelter to a better standard to resist future disasters, and such projects also allow assessing and gaining a better understanding of disaster resilience. When evaluating shelter projects it is important to have a long-term framework that examines both physical and social aspects.

Most of the literature dealt with temporary or transitional shelter, and there was limited literature on permanent housing. Most significant permanent shelter construction was done after the 2004 Indian Ocean Tsunami, and therefore Sri Lanka was chosen as a case study country as several SRG member agencies had implemented projects there. The Cook Islands was selected as the other case study country to represent the Pacific region, where also several SRG member agencies had been active (refer to section 5.1 for more details).

An evaluation framework for assessing post-disaster reconstruction, derived from the log frame approach, offered potential for adapting for this study. The literature pointed out that as shelter includes intrinsic design and technical factors in relation to resilience, they should be incorporated into the evaluation framework for this study. Also, as several sources highlighted the link between shelter and livelihood, this was considered for inclusion as a key element in the evaluation tool.

The literature review concluded by highlighting, a) The importance of understanding disaster resilience in permanent shelter given the limited literature on the subject in the Asia-Pacific; b) The need for an evaluation tool that is positioned within a sustainable shelter systems framework encompassing a range of physical and social dimensions; c) An evaluation framework adapted from the most relevant evaluation approaches; and d) The need for the literature review to serve as a background document to the evaluation tool.

4.0 METHODOLOGY OF EVALUATION TOOL

A draft evaluation tool followed from the literature review on disaster resilient shelter (see section 3.0), which served as a resource to assess the outcomes of shelter projects, specifically with regards to disaster resilience. The evaluation tool showing details of its processes is included in Appendix 2. The tool was designed to be used primarily by SRG member agencies to assess the effectiveness of disaster resilience options incorporated into their shelter projects. It can also be used by other organisations working in the shelter field, as well as communities themselves. To be used effectively, it would require training, particularly on basic technical concepts of shelter construction.

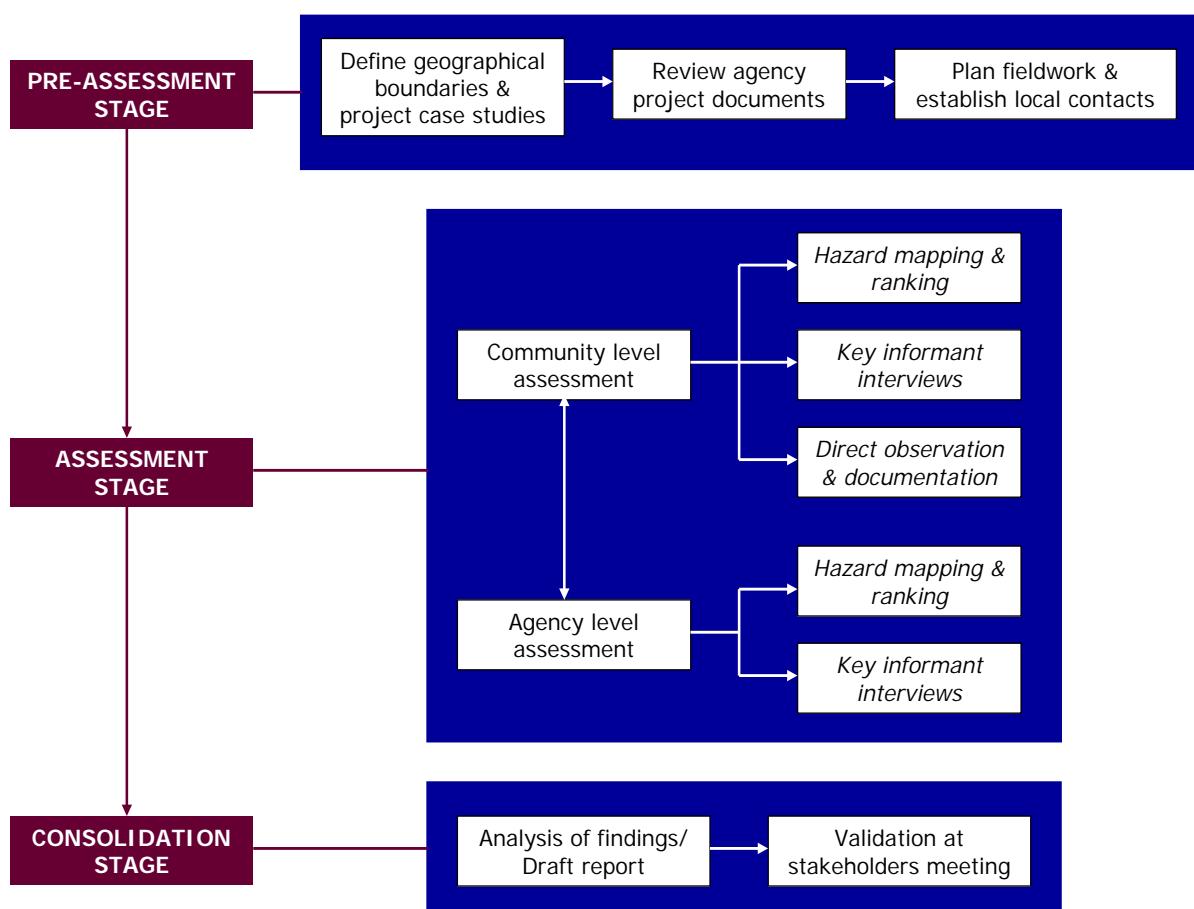


Fig. 1: Key aspects of the assessment process

The tool comprised three main stages of the assessment process consisting of the key activities of the evaluation (see Fig. 1), which was the basis of testing it in two case study countries. These three stages were followed thus in this study:

- i. Pre-Assessment Stage: This stage included selection of case studies, review of relevant secondary/project documents and preparation for field work.

- ii. Assessment Stage: This was the central stage where test assessments were carried out in the context of shelter projects at two levels: (a) Beneficiary community level; (b) Implementing agency level.
- iii. Consolidation Stage: At the last stage, findings from the assessment stage were analysed to produce a draft report. This was shared with the SRG member agencies and presented at a workshop. Based on feedback from the workshop, this final report was produced.

The principal activities carried out during the test assessments in this study were the Key Informant Interviews in particular (see Appendix 3 for a list of interview respondents) and Direct Observation & Documentation. During fieldwork for this particular study, circumstances were not opportune or appropriate to carry out the Hazard Mapping & Ranking activities as all the case study projects were in response to specific hazards. However it is advised that agencies using this evaluation tool should conduct the mapping and ranking activities especially if the shelter project being evaluated is in a complex or multi-hazard context.

fieldwork

5.0 CASE STUDIES

5.1 Background

To test and refine the draft evaluation tool developed in this study (see section 4.0), two case study countries in the Asia-Pacific region – The Cook Islands and Sri Lanka - were selected in consultation with SRG member agencies. Within each country, respectively two and three shelter projects were selected, through which the evaluation tool was tested via extensive in-country fieldwork.

Two countries in Asia where agencies have been active in the shelter sector to the greatest extent in recent times are Indonesia and Sri Lanka after the 2004 Indian Ocean Tsunami. Because Indonesia shares some of the characteristics of Pacific countries, Sri Lanka was chosen to represent Asia. Initially the Solomon Islands were considered as a possible case study country in the Pacific to test the evaluation tool on shelter projects built after the 2010 Earthquake & Tsunami. However it was not possible to source suitable shelter projects to study, and then in consultation with several SRG agencies (Emergency Architects, Australian Red Cross and Partner Housing Australasia), it was decided that the Cook Islands would be a suitable case study country.

SRG agencies were asked to nominate shelter projects in the two case study countries based on a list of criteria in the form of a matrix, as shown below in the example in Table 1.

Agency: Emergency Architects	Cook Islands	Sri Lanka
▪ Shelter project wholly or largely complete	Yes	
▪ Built within the last 8 years	Yes	
▪ DRR elements explicitly incorporated	Yes	
▪ Documentation available (drawings, project documents, etc)	Yes	
▪ In location exposed to natural hazards	Yes (cyclone)	
▪ Accessible without too much difficulty	Yes, but may require time	
▪ Type of key built environment professionals	Architects	
▪ Local contact person available preferably from agency	Yes	
▪ Intentional skills transfer approach included in the project	Yes	

Table 1: Example of a criteria matrix for selection of project case studies

5.2 Case Studies Summary

Table 2 below summarises the main aspects of the shelter projects in the two case study countries where the evaluation tool was tested.

COUNTRY	LOCATION	LEAD AGENCY	NO. OF HOUSES	KEY RESILIENCE FEATURES
Cook Islands	Aitutaki	Emergency Architects	66	<ul style="list-style-type: none"> ▪ Cyclone-resistant design ▪ Robust construction
Cook Islands	Mangaia	Partner Housing; Red Cross	30	<ul style="list-style-type: none"> ▪ Anchoring of roof to resist cyclones
Sri Lanka	Galle	Habitat for Humanity	22	<ul style="list-style-type: none"> ▪ Inland location to avoid coastal hazards ▪ Elevated land to avoid flooding ▪ Durable building materials
Sri Lanka	Galle	Caritas	76	<ul style="list-style-type: none"> ▪ Inland location to avoid coastal hazards ▪ Elevated land to avoid flooding ▪ Durable building materials
Sri Lanka	Kirinda	World Vision	68	<ul style="list-style-type: none"> ▪ Inland elevated location to avoid coastal hazards and flooding ▪ Durable building materials ▪ Integrated program including DRR training and EWS

Table 2: Main Aspects of the Case Studies

5.3 Analytical Framework

The analysis of the shelter projects in the case study countries presented below is based on the Evaluation Framework derived from the literature review (see Table 3), which was also the basis of the two main activities conducted in the field including Key Informant Interviews and Observation & Documentation as discussed above in section 4.0. As this Evaluation Framework explicitly contributed to the Interview Checklist (see Appendix 2) particularly, and guided the field observations, the analysis is directly linked to that framework as per its five main factors: (1) Inputs; (2) Output; (3) Result; (4) Impacts & Effects; and (5) External Factors. Table 2 below shows these factors, their definitions, aspects and key related questions.

FACTORS	DEFINITION	ASPECTS	KEY QUESTIONS
a) Inputs	Human, material and financial resources required to incorporate resilience in shelter	Efficiency	<ul style="list-style-type: none"> ▪ Were the local and external resources optimised (cost-effectiveness)? ▪ Was the community specifically engaged in design/construction? ▪ Was there a dedicated skills transfer/training component?
b) Output	Articulation of resilience options before applying it	Results	<ul style="list-style-type: none"> ▪ Were the resilience options realised?
		Timing	<ul style="list-style-type: none"> ▪ Were they available at the right time?
		Quality	<ul style="list-style-type: none"> ▪ Are the resilience options 'good' in the local context?
c) Result	Direct consequence for the beneficiary of applying the resilience options	Pertinence	<ul style="list-style-type: none"> ▪ Were the resilience options available to the most vulnerable people?
		Acceptability	<ul style="list-style-type: none"> ▪ Did the local community use the resilience options? ▪ Were they pre-determined/required, or optional? ▪ Were they replicated outside the project? ▪ Are they easy to maintain?
d) Impacts and Effects	Indirect or later consequences for the beneficiary of using resilience options (or the situation originating from the project)	Strategy	<ul style="list-style-type: none"> ▪ Did the resilience options correspond to the needs of the community?
		Scope	<ul style="list-style-type: none"> ▪ What proportion of vulnerable people was covered?
		Ultimate objective	<ul style="list-style-type: none"> ▪ Did the project reduce the disaster risks of the community? ▪ Do the community/ households feel a greater sense of security?
e) External Factors	Factors beyond the control of the implementing agency.	External aspects	<ul style="list-style-type: none"> ▪ How did the context and environment affect the results of the project?

Table 3: Evaluation Tool Framework (adapted from Lizarralde 2002)

It should be noted that the findings of the test evaluations are presented in some detail in the following sub-sections to demonstrate the nature of results that are obtainable by using the evaluation tool. However the focus of this scoping study is not these findings per se, but the development, testing and refinement of the tool.

5.4 Country Case Study # 1: Cook Islands (August 2012)

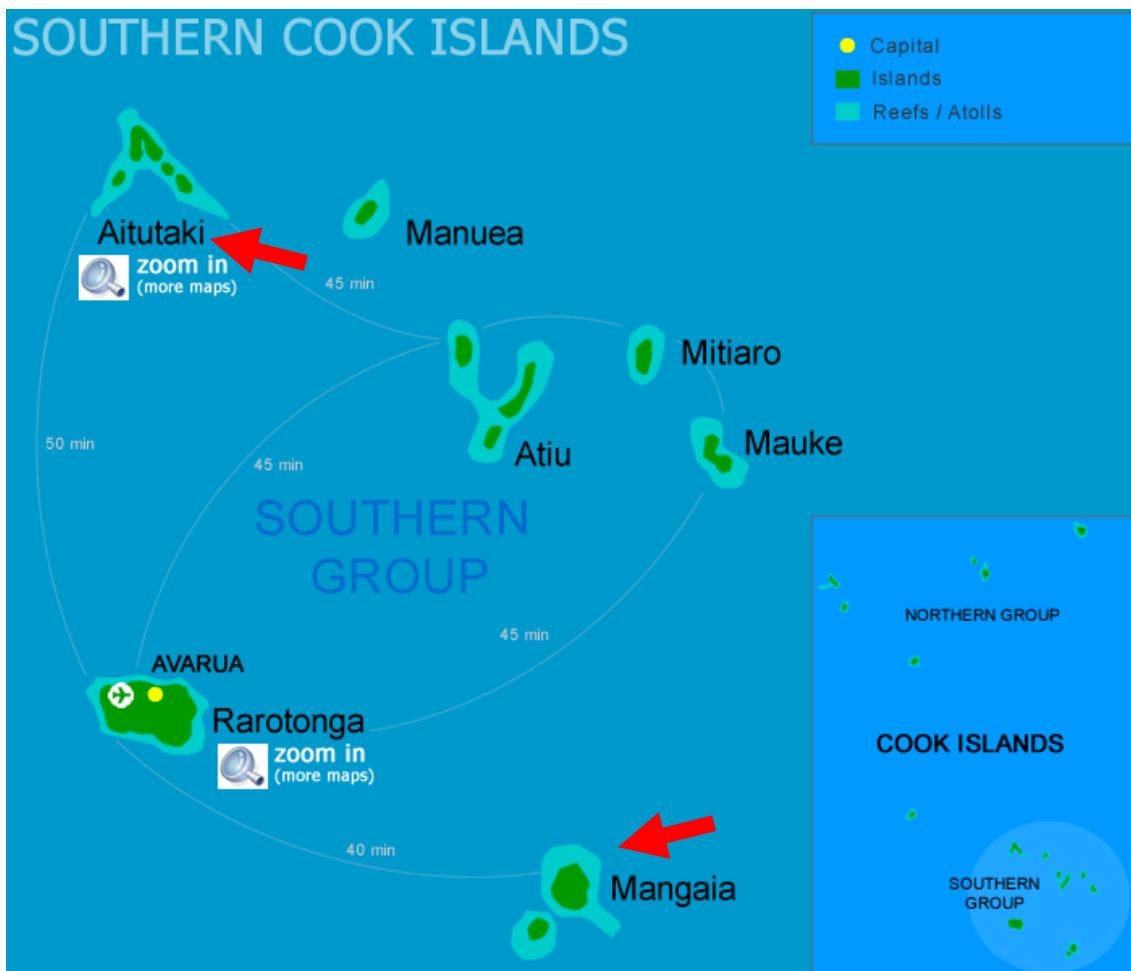


Fig. 2 Map of the Cook Islands showing the locations of the shelter projects studied (source: tourismcookislands.com, accessed November 2012)

Objectives:

- To test the evaluation tool developed in this scoping study and to thereby gain first-hand knowledge on shelter and disaster resilience in the Cook Islands.
- To examine the resilience of shelter specifically to cyclones, which is the main hazard in the Cook Islands, and also a significant hazard globally linked to climate change.



Fig. 3: The extensive coastlines of the Cook Islands are exposed to tropical cyclones

5.4.1 Country Case Study Background

As this study is concerned with shelter and disaster risk reduction in the Asia-Pacific region, it was agreed by the SRG members that shelter projects where the evaluation tool would be tested should be from one country in Asia and another country in the Pacific to represent the region. It was also agreed that these projects should be from those implemented by SRG member agencies. Although the Pacific region is subject to loss of land and habitat due to sea level rise, presenting tremendous challenges to the shelter sector, particularly when compounded by coastal disasters such as cyclones and tsunamis (see World Bank and SOPAC 2009), there were limited examples of shelter projects there by SRG member agencies.

Through an extensive consultation process with the SRG network, it was decided that the Cook Islands would be an appropriate case study country as three SRG member agencies had shelter projects there with explicit disaster resilience features addressing coastal cyclone risk. Additionally it allowed getting in-country logistical support to facilitate the fieldwork process and gain access to beneficiary communities and local stakeholders. One of the shelter projects, in Aitutaki, was a post-cyclone reconstruction project and the other project, in Mangaia, was a cyclone preparedness project to reduce the risk of future cyclone impact (see Fig. 2). Thus the projects represented different aspects of disaster resilience and were therefore considered worthy of study, offering a variety of insights. The fieldwork was carried out in August 2012 by a researcher from HARB and supported by key local stakeholders.

5.4.2 Agency Stakeholders Consulted

Australia: Emergency Architects Australia, Sydney; Partner Housing Australasia, Sydney; Australian Red Cross, Melbourne.

Cook Islands: New Zealand Aid, Rarotonga; Cook Islands Ministry of Infrastructure & Planning, Rarotonga; Aitutaki City Council; Cook Islands Red Cross, Rarotonga; Cook Islands Red Cross, Mangaia chapter.

5.4.3 Overview: Shelter Project, Aitutaki

Context

Cyclone Pat hit Aitutaki Island in February 2010 with a wind speed of nearly 200 kilometres per hour and caused extensive devastation. Although nobody died and there were only a few serious injuries, out of 762 buildings on the island, 388 were damaged or destroyed (57%), and 90% of housing were impacted. Most of the damage to buildings was evident in the roof structure (MOIP 2010) (see Fig. 4).



Fig. 4: A house destroyed by Cyclone Pat. Note that main damage was to the roof structure.

Stakeholders

- **Donor:** New Zealand government through NZAid.
- **Implementation:** Damage & needs assessment, and implementation of shelter reconstruction program were done by the Ministry of Infrastructure & Planning (MOIP), Rarotonga in partnership with the Aitutaki Island Council. Key decision making and guidance was provided by the Recovery Committee consisting of key government agencies in Rarotonga.
- **Design:** Emergency Architects Australia (EAA).

Important Shelter Features

- There were four categories in the post-cyclone shelter reconstruction program. Cat 1 and Cat 2 consisted of repairing minor structural and other damages, Cat 3 involved building a new roof over houses that had lost their roofs but were otherwise undamaged, and Cat 4 consisted of constructing new houses to replace completely destroyed houses. The study focused largely on Cat 4 housing. Firstly Cat 1 and 2 were implemented, followed by Cat 3 and finally Cat 4 over one year (July 2010 – July 2011).
- Two shelter designs were implemented: 1-bedroom type for households with less than 5 residents and 2-bedroom type for larger households (see Fig. 5). 66 houses were built, out of which 33 were of the 1-bedroom type and 33 of the 2-bedroom type. The cost of the 1-bedroom type was NZ\$26,000 and the 2-bedroom type NZ\$34,000 including labour costs.



Fig. 5: 1-bedroom type (left) and 2-bedroom type (right) shelters of the reconstruction project in Aitutaki

5.4.4 Key Findings: Aitutaki¹

Inputs

- Beneficiary selection was based on assessment by MOIP, with support from the Island Council. The Rarotonga-based Recovery Committee ruled that only households that were living in the houses during the cyclone would be eligible for reconstruction support, even if they were tenants; thus absentee landlords were not compensated. Households that were poor and vulnerable, but whose houses were not damaged or destroyed did not receive reconstruction support. This led to various grievances.
- There was minimal or no consultation with beneficiaries. After the designs were done, they were shown to the affected communities and most of them accepted the designs in order to be able to get free houses. During construction, some households made changes, for which they had to bear any extra costs incurred.
- The houses were expected to be painted and floor finishes (tiles, linoleum, etc) to be provided later by the beneficiaries, which some of them had done or were doing with their own funds.

Output

- The Cat 4 houses were built to resist future cyclones. Some of the main resilience features included: strong foundations with heavily reinforced footings (6 rebars of 20mm diameter), reinforced concrete block posts (4 rebars of 16mm diameter with stirrups of 10mm @ 300mm spacing), double wall plates (6"x2" each), strong timber rafters (8"x2" instead of the commonly used 4"x2" or 6"x2"), purlins (4"x2" instead of the usual 3"x2") and wall studs (6"x2"), metal straps to connect roof framing members, thick corrugated iron (CI) roofing sheets (0.45mm) screwed onto the frame to prevent lift-off in wind and a roof pitch more than 30°. The main focus was on building a strong roof, which was the element most affected by the cyclone.
- The wet areas – bathroom and kitchen - had external walls of concrete block to prevent quick deterioration and requiring less maintenance, adding to the resilience of the house.
- All interview respondents agreed that the houses were strong and would withstand future cyclones. Indeed some of them mentioned that they were “over-designed”.
- Most respondents agreed that the construction quality and building materials were good, and adequate supervision was provided by the implementers. However in some houses finishing was reported deficient with gaps in the ceiling, window louvres not matching in colour and other such shortcomings.

¹ Note that the analysis of findings for all the case studies in the Cook Islands and Sri Lanka follows the five thematic factors of the evaluation tool (Inputs, Output, Result, Impacts & Effects, External Factors), based on which the interviews and on-site observations were conducted (for details, refer to section 5.2 on the Analytical Framework).

- All the sites were compacted to prevent settlement of the houses and adequate infrastructure and services were provided.
- Although flooding was generally not common, localised water-logging due to low elevation of the sites was possible. In such instances, some households paid the extra cost of increasing the plinth height by one layer of concrete block during the construction process.

Result

- It was not clear to what extent the resilience features included in the project were being replicated locally. In one house where an extension had been added, it was found that some features such as connecting straps were used (see Fig. 6), largely because one of the household members was a construction worker and involved in the shelter reconstruction. On the other hand, in a new house being built, it was reported that there were hardly any resilience features. Houses more than 15 square metres required a building permit from Rarotonga and required following wind-resistant building codes. However the codes had not been upgraded to the wind speed level of Cyclone Pat, and also enforcement in implementation by an Island Council building inspector was found to be lacking.



Fig. 6: Straps to connect rafters and purlins were used in an extension (left) to the original house (right)

- In general, most commodities in the Cook Islands were imported from New Zealand, as was the building materials and products used in the reconstruction program. This made the commodities expensive and there was also an embodied energy cost due to

transport. Therefore any repair, maintenance or extension of the houses would require using imported and hence expensive materials, not possible to be procured locally.

- There were unanimous reports that the houses were too small. The 1-bedroom house type had a small bedroom of 2.65 x 2.85 metres and the bedrooms in the 2-bedroom house had smaller bedrooms of 2.65 x 2.65 metres (see Fig. 4). Extended households were common and people had to make alternative arrangements such as sleeping outside in makeshift structures, or in the living room.
- Nonetheless the houses were designed for ease of extension, having exposed rafters under the eaves to which new roof frames can be attached. Many households were found to have built extensions or planning to do so. However it was uncertain if the extensions would be as resilient to cyclones as the original house; only a shallow roof pitch could be maintained in the extended parts, and also it seemed unlikely that most households would be willing to spend money on and have access to products and skilled workers to apply resilient building techniques.
- A number of households mentioned that they did not prefer having the bathroom inside the house, especially next to the kitchen. Some of them had arranged during construction to avoid building the bathroom inside, some had moved the kitchen to an extended structure at the back and most were planning to build extensions and move the bathroom and kitchen. Firstly, this pertained to the local culture. Secondly, because of the small house sizes, not having a bathroom and/or kitchen inside allowed more space inside the house; for example, one household with 11 members was found to have converted the area originally allocated for a kitchen into a small bedroom (see Fig. 7).



Fig. 7: Original kitchen moved outside and the space converted into a small bedroom

Impacts & Effects

- In the earlier stages (Cat 1 and 2) building teams were brought in from Rarotonga, but subsequently 18 local builder teams were engaged and many local construction workers were employed and trained on the job. Even workers who built their own house were paid, hence contributing to the local economy. It was not clear to what extent local builders and workers were trained in building resilient houses, though there was some evidence of that, for example in the new extension to a house mentioned above, where some resilience features were applied.
- The new houses had given a sense of security to the beneficiaries and they felt that they were better protected from future cyclones. Even in Cat 1, 2 and 3 repairs and roof replacements were reported to be of high standard and had therefore contributed to the disaster resilience of the wider community on the island.

External Factors

- Because the project was managed and implemented largely by MOIP from Rarotonga, although in partnership with the Aitutaki Island Council, the local people did not feel entirely empowered. The design of houses and decision-making process was external and the locals felt left out. The Island Council office did not even have a set of the design drawings. In this sense, the project was somewhat top-down.
- The Mayor of Aitutaki at that time was unpopular in his own village (Amuri) and it was alleged that he intentionally overlooked people who deserved a new house, some of them needy and vulnerable.

Summary of Key Findings on Shelter Resilience: Aitutaki

- Quality of construction and building materials were of high standard, and the houses incorporated resilience features to resist cyclones, the main hazard there.
- Houses being small required extensions for large households, often built without professional support. It is uncertain if such extensions would be as resilient as the original house, in which case the occupants and household belongings would be vulnerable to future cyclones.

5.4.5 Overview: Shelter Project, Mangaia

Context

As throughout the Cook Islands, Mangaia Island was also exposed to tropical cyclones. A number of cyclones battered the island in 2005, including the most devastating Cyclone Meena. The prevailing wind direction caused the north and northwest side of the island to be at high risk, but the southern part was relatively sheltered. Islanders were aware of the risk and have a local practice of tying down metal sheet roofs during the cyclone season (January-April).

Stakeholders

- **Donor and Design:** Partner Housing Australasia.
- **Implementation:** Australian Red Cross in partnership with the Cook Islands Red Cross, particularly the Mangaia Red Cross chapter.

Important Shelter Features

- Recognition of the existing risk to cyclones, due to the devastation caused by Cyclone Pat in 2010 in Aitutaki Island, led to the recognition for the need to develop this DRR project.
- Based on the local practice of tying down metal sheet roofs, a more systematic approach to roof anchoring was being implemented.
- Through the project, households were provided good quality nylon (polypropylene) ropes (12mm diameter) to tie down roofs to anchor points on the ground (see Figs. 8 and 9). The terrain being rocky, where strong and deeply embedded rocks were available on site, the anchors consisted of galvanised iron ‘eyebolts’ (with a threaded end 25mm long) fixed into the rocks. A hole was first drilled into the rock and the pointed and threaded end of the eyebolt then placed in the hole, which was then filled with fast-setting adhesive cement. The ‘eye’ or ring protruding from the rock could be used for tying the rope holding the roofing sheet in place (see Fig. 10).
- Where suitable rocks were not present on site, a reinforced concrete footing having a base of 450 x 450 x 400mm with a cylindrical shaft (100mm diameter, 600mm high) was used as the anchor. A 12mm diameter steel rebar was curved and attached to the base reinforcement, acting as reinforcement for the shaft and the curved end protruding from the top of the shaft to serve as a ring to tie rope (see Fig. 11).
- This ongoing project started in July 2012 in one of the three villages – Tamarua – in Mangaia Island. All of the 30 occupied houses in the village were planned to be strengthened, and there were plans to subsequently extend the project to the other two villages in the island (Oneroa and Ivirua), thereby building resilience throughout the island.



Fig. 8: House with the roof anchoring system.

5.4.6 Key Findings: Mangaia

Inputs

- There was a lot of migration of young people from Mangaia to Rarotonga and New Zealand for employment opportunities. Tamarua village was found particularly vulnerable in a Vulnerability & Capacity Assessment (VCA) in 2011 by the Red Cross because of the high prevalence of elderly headed households and small number of able-bodied persons. Only 30 houses were occupied in the village and the owners of many houses had migrated. The village was also somewhat isolated from the main part of the island. Therefore it was chosen to begin a DRR roof anchoring pilot project here.
- A representative from Red Cross, Rarotonga visited the village together with Island Councillors, and community meetings were held in a local church. The project was introduced to the community and reportedly all of them agreed that it was a good idea.
- The cost of roof anchoring for each house was roughly NZ\$200 including labour. Some of the beneficiaries helped the construction workers, or treated them to lunch or snacks, and in some cases provided materials such as old chains or shackles as an alternative to the eyebolts or curved rebars.
- An engineer from Partner Housing Australasia trained a local builder and his supporting construction worker. After gaining experience from this pilot stage, the trained builder was expected to train and supervise workers in subsequent stages of the project when implemented in the other villages.

1.5 tonne Capacity Permanent Remote Concrete Anchor Points

1. Excavate 450 x 450 x 1,000 deep hole.
2. Bend N12 reinforcement anchor.
3. Prepare a mold out of a 100 dia x 700 mm pipe, split down one side and hold together by two rings.



4. Place the anchor and install N20 concrete. Install the mold around the anchor.

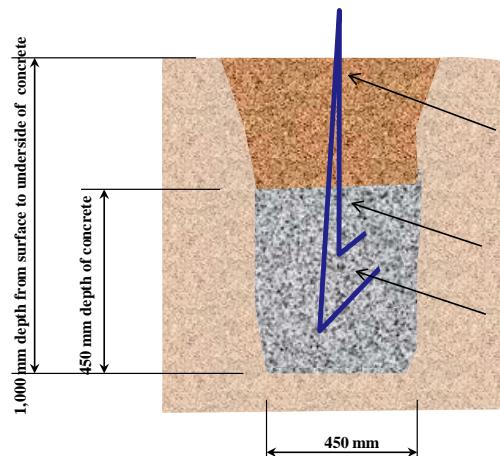


5. Remove the mold.



6. Expose the anchor.

7. Backfill and compact soil leaving anchor point exposed.



Copyright: Quasar Management Services Pty Ltd

Fig. 9: Details of RC anchor



Fig. 10: Eyebolt fixed into a rock



Fig. 11: RC anchor footing with curved rebar

Output

- This was the first time this type of resilience feature was applied on this island. Although there was a tradition of tying down roofs, the ends of ropes were tied to trees or nearby heavy objects. In the event of a tree being uprooted in a storm, it could fall on the house and damage it, while the roofing sheet may lift off. Therefore the system of roof anchoring introduced in the project would allow better resilience.
- The pilot project was planned to be completed before the next cyclone season and was therefore timely.
- The materials provided through the project and the construction was reported of good quality. However only two workers were carrying out the work, resulting in slow progress. Additionally not having good transport affected their work as the village was somewhat remote and about 40 minutes drive from the main village; there was no public transport in the island and roads were not paved, making transport of materials a critical issue.

Result

- Nylon (polypropylene) ropes being used in the project were more durable than ropes made of organic materials. However if left on the roof, they would deteriorate in the sun within a few years. Therefore households had been instructed to use them only in the cyclone season and store them inside the house during the rest of the years.
- However fixing and tying the ropes is a laborious task and it was not clear how household without able-bodied persons would be able to carry out the task. Nonetheless there was a tradition of mutual help within the island communities and the elderly people would possibly be able to get help from other community members.
- The galvanised eyebolts were weather-resistant, but the curved steel rebars will rust and weaken by corrosion in the salty atmosphere. There was no provision in the project for coating them with corrosion-resistant paint or a greasy substance.
- The roof anchoring was expected to resist up to category 3 cyclones (118-159 kilometres/hour wind speed) evidence of which can only be found after an actual cyclone.

Impacts & Effects

- This project was of a small scale and hence only a couple of local construction workers were trained. Nonetheless over the long-term this could be expected to build further capacity with the support of these trained workers.
- As typical of the Cook Islands, all the building materials had to be brought from New Zealand or elsewhere. This might be a barrier to extensive replication and long term maintenance.
- The project addressed a key vulnerable part of the house. Although the whole structure was not strengthened and only a part of the roof was made secure, it still improved the

resilience of houses to some extent. As one interview respondent commented: "It's better than nothing."

External Factors

- Reliance on imported building materials and outside suppliers might lead to uncertainty. For example, it proved difficult to get timely delivery of the eyebolts causing delay to the project. Subsequently the anchor design was modified, replacing the originally planned eyebolts with the curved rebar design. Materials such as steel rebars and cement were imported, but more easily available in local markets, especially in Rarotonga, compared to more unusual products such as eyebolts.

Summary of Key Findings on Shelter Resilience: Mangaia

- The system of roof anchoring introduced in the project provided better resilience to cyclones, addressing a key vulnerable part of the house.
- Although the whole structure was not strengthened and only a part of the roof was made secure, it still improved the resilience of houses to some extent.
- Reliance on imported materials might affect sustainability and long-term resilience.

5.5 Country Case Study # 2: Sri Lanka (October 2012)



Fig. 12 Map of Sri Lanka showing the locations of the shelter projects studied (source: Lonely Planet, accessed November 2012)

Objectives:

- To test the evaluation tool developed in this scoping study and to thereby gain first-hand knowledge on shelter and disaster resilience in Sri Lanka.
- To examine resilience of shelter built after the 2004 Indian Ocean Tsunami as many shelter projects were implemented following this most massive recent disaster in Sri Lanka.



Fig. 13: Coast of Hambantota in southern Sri Lanka was devastated in the 2004 Tsunami (source: J. Shaw 2005)

5.5.1 Country Case Study Background

As discussed above in section 5.3.1 on the country case study background for the Cook Islands, in the consultations with SRG member organisations it was agreed that one country case study should be in Asia (the other in the Pacific) and the evaluation tool should be tested on shelter projects implemented by SRG member agencies. Sri Lanka was decided as a good case study country because of the large number of shelter projects implemented there after the massive 2004 Indian Ocean Tsunami, including those by several SRG member agencies. The shelter projects were selected through extensive consultation with SRG member agencies, particularly where they were able to provide in-country logistical support, as well as ease of accessibility of the projects. The large scale intervention by many agencies also allowed visiting projects implemented by agencies other than SRG members, enabling a broader insight.

Sri Lanka also faced other hazards such as floods and cyclones (as well as the challenges of rebuilding a country after 30 years of civil war) making it particularly appropriate to examine shelter and disaster resilience in the country. Two case studies were located in Galle district in southern Sri Lanka and another one in Kirinda, Hambantota district. All the case studies consisted of permanent shelter in resettlement projects built after the Indian Ocean Tsunami of 2004 where the risk of future tsunamis was addressed by resettling away from the coast. Nonetheless they also addressed local hazards, particularly the two projects in Galle where flooding/water-logging was a key hazard. Thus the projects allowed gaining

insights on various aspects of disaster resilience. The fieldwork was carried out in October 2012 by a researcher from HARB and supported by key local stakeholders.

5.5.2 Agency Stakeholders Consulted

Australia: Habitat for Humanity – Australia, Sydney; Caritas-Australia, Melbourne; World Vision – Australia, Melbourne.

Sri Lanka: Habitat for Humanity – Sri Lanka, Galle; Caritas – Sri Lanka; Caritas - SED (Social and Economic Development Centre – Catholic Diocese of Galle), Galle; World Vision – Sri Lanka, Colombo.

5.5.3 Overview: Shelter Project, Habitat for Humanity, Galle

Context

In addition to massive destruction on the Galle coast, water from the 2004 Indian Ocean Tsunami travelled 3-4 kilometres inland through rivers and canals, causing further devastation. The settlement of Samagiwatte, located about a kilometre from the coast, was inundated by water flowing through an adjacent canal (see Fig. 14) and connected channels. This was largely a low-income settlement where most houses had earthen floors and rough timber walls, and hence damage to shelter here was extensive.



Fig. 14: Canal adjacent to Samagiwatte through which water from the tsunami flooded the settlement

Stakeholders

- **Funding, Design and Implementation:** Habitat for Humanity – Sri Lanka (HfH-SL).
- **Key supporting agencies:** Galle Municipal Council; Urban Development Authority (UDA); Reconstruction and Development Authority (RADA); National Water Supply and Drainage Board (NWSDB); Ceylon Electricity Board (CEB).

Important Shelter Features

- 22 damaged houses were rebuilt on existing sites during 2006-07.
- Each single-storey house was about 350 sft (32.5 sqm) with 2 bedrooms, a living room, kitchen and bathroom (see Fig. 15).
- The cost of each house was Sri Lankan Rupees 350,000 (about \$3,000).
- HfH-SL provided masons and skilled construction workers and beneficiaries provided sweat equity by helping the workers.
- Because the area was low-lying marshy land, each beneficiary household had to fill its site at their own cost by bringing soil from outside and raising the level of the land before the houses were built.
- Houses were built on pad foundations for structural stability on the soft soil.
- Because the area was low-lying, flooding/water-logging was the main hazard. Thus the key resilience feature involved raising the land. Additionally by replacing the previously flimsy wooden houses with houses built of durable materials, vulnerability was addressed.

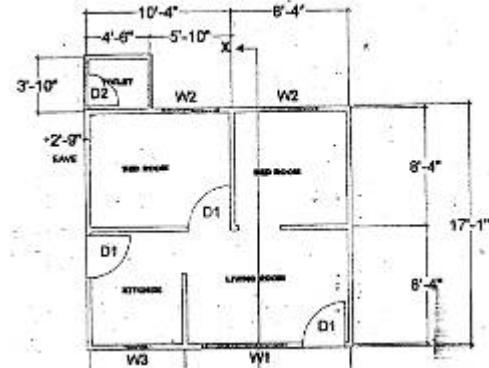


Fig. 15: HfH-SL house in Galle

5.4.4 Key Findings, Habitat for Humanity, Galle

Inputs

- A list of potential beneficiaries was prepared after the tsunami by the office of the Divisional Secretary of Galle and HfH-SL screened it to make the final selection of beneficiaries.
- Beneficiaries were living without tenure on government land before the tsunami. Before the reconstruction project was implemented, HfH-SL assisted the beneficiaries to secure land tenure by obtaining land titles and ownership. Each beneficiary paid SL Rs 10,000

(about \$900) as fees to the Municipal Council for a plot of land of 5 perches (1 perch = 25 sqm).

- The process of acquisition of land ownership involved extensive engagement and support from HfH-SL, and consultation with beneficiaries. Although there was some consultation on positioning of the house on the site, there was hardly any consultation on developing the house design, which was designed by HfH-SL based on the Urban Development Authority's (UDA) guidelines.
- There were no specific inputs for livelihoods or DRR; some limited support for home-gardening was provided.

Output

- Key resilience features include raised land elevation to avoid flooding, pad foundation for structural stability on soft soil, about 30cm high plinth and durable building materials (concrete floor instead of former earthen floor; brick walls instead of rough timber; clay tiles instead of CI sheet prone to lifting in strong wind).
- The land was filled and the soil was compacted to prevent settlement of structures.
- Municipal water supply and electricity was formalised from previous illegal connections.
- Septic tanks were built by HfH-SL to ensure sanitation.

Result

- Overall, most people who benefited from the project were poor and vulnerable. Previously they lived in flimsy houses in a low-lying area that was often flooded and water-logged (see Fig. 16).
- The quality of construction and building materials was generally good. However laminated plywood doors at the rear of houses that were exposed to the outside had deteriorated and generally were not of good quality.
- Standard design guidelines of the Urban Development Authority (UDA) were followed. However the UDA guidelines suggested a house of minimum 500 sft (46.5 sqm), but the HfH-SL houses were 350 sft (32.5 sqm). This was done for cost-effectiveness and to support more beneficiaries, but for large households it presented space constraints. In general, the bedrooms were rather small.
- However the houses had a high roof with the roof slope more than 30° to prevent damage by strong wind. Thus, inside, the houses felt spacious and cool. From the outside, the houses seemed large and gave their owners a sense of pride. The roofs were well-built and provided protection from rain adequately.
- Although a kitchen was provided inside the house, most households had converted it for other functions (small bedroom, store, dining, pantry, etc) and built an extension at the

rear to serve as a kitchen (see Fig. 17). Gas fuel was unaffordable for most of them, and using wood fuel in the indoor kitchen would have made the whole house smoky.



Fig. 16: Flimsy houses such as this was typical in the area before the tsunami. Note in the background the much better type of house built by HfH-SL.



Fig. 17: Kitchen built by beneficiary as an extension to the HfH-SL house

Impacts & Effects

- Despite raising the land by 1-1.5 metres, because of the very low original elevation, flooding/water-logging persisted. Particularly in the area close to the canal, regular flooding, sometimes up to 1 metre height, was experienced. However houses further

away from the canal experienced less flooding and here water did not enter into the houses.

- Although the area still suffered from flooding, on the whole the community was in a better and improved situation than before and the efforts of HfH-SL had succeeded in reducing the overall vulnerability of the community.
- Most beneficiaries were generally satisfied with the quality and durability of the houses, and mentioned that it was a great improvement over the type of house they had before. One beneficiary commented, “Previously we lived like animals in a shed, now it’s so much better – we are thankful.”
- Particularly because tenure security had been organised, beneficiaries felt more secure. As one beneficiary mentioned, “I can now sleep better.”
- No contractors were employed; rather head masons were appointed who organised their worker teams. This allowed local workers from Galle to obtain employment.

External Factors

- Building roadside drains is the responsibility of the Municipal Council and during the visit in October 2012, more than 5 years after the houses had been built, it was observed that no drains had been built. Open unpaved drains throughout the settlement presented a health hazard (see Fig. 18); in addition to overflowing during floods, in places where water was stagnant mosquitoes bred and added to the health hazard.
- Similarly, the Municipal Council built roads several years after the houses had been built and the roads were built on a high elevation to avoid water-logging. Thus although the roads remained free from water, because they were higher than adjacent house plots, water flowed from the road into the plots, aggravating the flood problem.



Fig. 18: Unpaved open drains posed a health hazard in the settlement

Summary of Key Findings on Shelter Resilience: HfH, Galle

- Although the area still suffered from flooding, on the whole the situation of the community was much improved by the project and the community's vulnerability had been reduced.
- External factors such as uncoordinated road construction and lack of drainage by local authorities undermined the efforts of HfH and increased the community's vulnerability.

5.5.5 Overview: Shelter Project, Caritas, Galle

Context

This project was implemented in line with the Sri Lankan government's buffer zone policy of resettling victims of the 2004 Indian Ocean Tsunami away from the coast. Low-lying vacant land in an area called Waluwatta about half a kilometre inland from the coast was provided by the government to establish this settlement of 76 houses with a community centre and playground.

Stakeholders

- **Funding and Implementation:** Caritas SED Galle (Social and Economic Development Centre – Catholic Diocese of Galle).
- **Design:** Avant Garde Urban Design Partnership, Colombo
- **Key supporting agencies:** Galle Municipal Council; Urban Development Authority (UDA); Reconstruction and Development Authority (RADA); National Water Supply and Drainage Board (NWSDB); Ceylon Electricity Board (CEB).

Important Shelter Features

- 76 two-storey houses were built on reclaimed marshy land in 2006. In each case, two house units were attached as a duplex.
- Each house was about 600 sft (55.8 sqm) with a living-dining area, kitchen and bathroom on the ground floor and two bedrooms with a balcony on the first floor (see Fig. 19).
- Each duplex was built on 5 perches (1 perch = 25 sqm) of land of which ownership was transferred to the beneficiaries.
- The cost of each duplex was Sri Lankan Rupees 1,400,000 (about \$10,800).
- The houses were built by contractors selected through an open tender system.

- Because the area was low-lying marshy land, Caritas had to raise the elevation by landfill, prepare the site for construction and build special foundations.
 - Community facilities including a community centre, pre-school, children's playground and shopping centre were incorporated into the settlement plan.
 - By raising and improving the land, and building drains, the risk of flooding/water-logging was overcome. Additionally as the area was located away from the coast, the risk of coastal hazards such as tsunamis and cyclones was reduced.

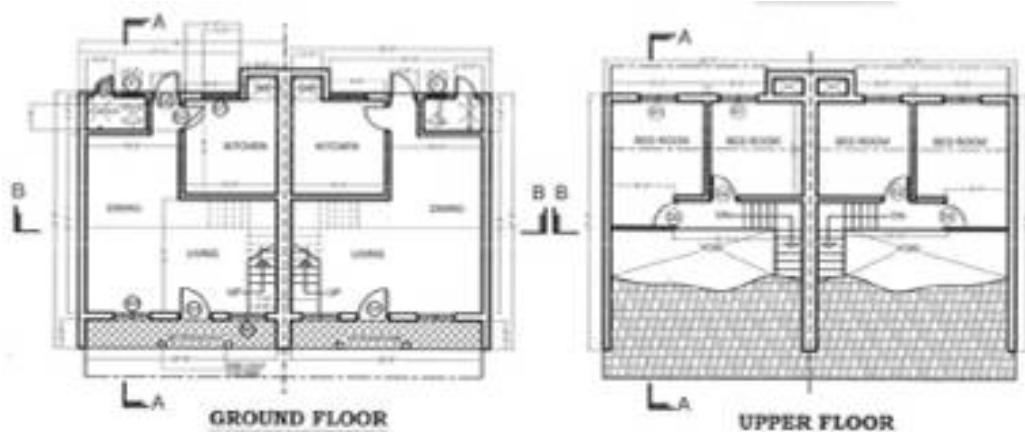


Fig. 19: Caritas-SL houses in Galle

5.5.6 Key Finding, Caritas, Galle

Inputs

- A list of potential beneficiaries was prepared after the tsunami by the office of the Divisional Secretary of Galle and HfH-SL screened it to make the final selection.
- Houses were designed by a consulting firm in Colombo, built by contractors and then allocated to beneficiaries by lottery. There was no beneficiary consultation or participation.
- There were no specific direct inputs for livelihoods. Because of the inland location, beneficiaries found it difficult to pursue their previous coastal livelihoods. Nonetheless compressed soil-cement blocks were used for wall construction, produced through a labour-intensive process that created job opportunities during project implementation (see Fig. 20).
- During the early stage after beneficiaries had moved into the houses, some DRR awareness-building activities were conducted with the support of the governmental Disaster Management Centre (DMC) focusing on first aid and search-and-rescue. However this was not part of a long-term program on sustained DRR.



Fig. 20: Production of compressed soil-cement blocks for building walls in Caritas shelter projects created livelihood opportunities (source: I. Anda 2006)

Output

- Key resilience features included site improvement and raised land elevation to avoid flooding, drainage to prevent water-logging (drains from back of houses connected to a main drain) (see Fig. 21), deep foundations for structural stability (foundation trench filled

with 1.5-2m sand with 1.5-2m deep foundations resting on the sand-filling), 30cm high plinth and durable building materials (concrete floor and RC frame; soil-cement block walls; roofing of clay tiles on good quality timber frame instead of CI sheet prone to lifting in strong wind).

- The land was filled and the soil was compacted to prevent settlement of structures.
- The area although inland was still close to the coast and experienced cyclones. There was a cyclone in early 2012, but there was no damage to the houses, demonstrating their sturdy construction.
- Municipal water supply and electricity was provided after 3 months and internal roads built about 4 months after beneficiaries moved into the houses. In the interim they experienced walking through muddy roads with many potholes and using candles/lanterns at night. Overhead water tanks were provided by Caritas.
- Septic tanks were built by Caritas-SL to ensure sanitation. However drains were built about a year after beneficiaries moved in, and in the interim there was water-logging and overflow from septic tanks. Because of strong complaints by the beneficiaries, the drainage system was provided. However no drains were provided to the last four houses built on the edge of the settlement.
- This project represented a gradual process of consolidating the resilience of the beneficiary community.



Fig. 21: Drainage to avoid water-logging was a key resilience feature in the Caritas project

Result

- The beneficiaries were all tsunami victims who lost their houses, although they were of varying social and economic backgrounds. It was reported that in this community a mix of people from different ethnic backgrounds lived in harmony.
- The quality of construction and building materials was generally good. However laminated plywood doors at the rear of houses that were exposed to the outside had deteriorated and generally were not of good quality.
- The living-dining space in the houses had a double height at one end and hence felt spacious and cool (see Fig. 22). However households with elderly members faced a problem of climbing the stairs to go to the bedrooms above and hence were compelled to sleep on the ground floor in the living-dining area. This led to a privacy problem, especially when guests were received inside and also during the regular activities of the household.



Fig. 22: The double height space in the Caritas house provided spaciousness and coolness, but the two-storey layout with bedrooms above was a problem for elderly people

- Most beneficiaries used the indoor kitchen as it had a chimney and so smoke from wood fuel could escape. Building two units on 5 perches land resulted in very little open space on the plot and therefore little scope for extension, though some beneficiaries would have preferred to build an outdoor kitchen in keeping with local tradition. Some large

households were planning to build such a kitchen so as to get more space inside the house.

- Because there was no eave on the gable ends, there was water penetration from the side during heavy rainfall. Thus dampness resulted in the gable wall. In some cases, tiles were not laid properly and allowed rainwater to enter, and beneficiaries had to repair and replace defective tiles.
- Nonetheless, overall beneficiaries reported the houses and building materials to be of good quality contributing to their resilience. Some of them mentioned that the Caritas houses were better than the houses built by other organisations in the area, and also much bigger. One beneficiary said, “This house is luxurious compared to other [agency] houses. The tsunami was actually a blessing for us to be able to get this house.”

Impacts & Effects

- Despite some initial problems the community is now more secure and resilient.
- Most beneficiaries were generally satisfied with the quality, size and durability of the houses, and mentioned that they were happy to receive such a house.

External Factors

- The government created pressure on Caritas to build the houses quickly so as to move the tsunami victims out of the transitional camps. There were various problems of coordination between different stakeholders and thus Caritas had to implement the project under very trying circumstances.
- The prices of building materials had increased after the tsunami because of the great demand created by the large number of reconstruction projects; it was also difficult to find skilled construction workers – many had died in the tsunami - and thus there was great demand for them. This impacted on the project implementation and created many challenges for Caritas.

Summary of Key Findings on Shelter Resilience: Caritas, Galle

- Inland location, adequate site preparation, construction of good quality houses and provision of drainage had led to a resilient community.
- This project represented a gradual process of consolidation of community resilience.

5.5.7 Overview: Shelter Project, World Vision, Kirinda

Context

This project was implemented in line with the Sri Lankan government's buffer zone policy of resettling victims of the 2004 Indian Ocean Tsunami away from the coast. Vacant land in Kirinda town of higher elevation than the coast, about half a kilometre inland was provided by the government to establish this settlement of 68 houses. The area was previously marginal land for seasonal agriculture (groundnut, chilli, maize, etc) and had very little vegetation and therefore building infrastructure and landscaping were important concerns alongside shelter provision.



Fig. 23: Tsunami victims in Kirinda were resettled on elevated land away from the coast

Stakeholders

- **Funding, Design and Implementation:** World Vision – Sri Lanka (WV-SL).
- **Key supporting agencies:** Kirinda Municipal Council; Urban Development Authority (UDA); Reconstruction and Development Authority (RADA); National Water Supply and Drainage Board (NWSDB); Ceylon Electricity Board (CEB).

Important Shelter Features

- 68 single-storey houses were built on elevated land half a kilometre away from the coast in 2005-06.
- Each house was about 550 sft (51.0 sqm) with 2 bedrooms, a living-dining room, kitchen and bathroom (see Fig. 24), built on plots of 15-20 perches (1 perch = 25 sqm)

- The cost of each house was Sri Lankan Rupees 600,000 (about \$4,600).
- WV-SL appointed a contractor from Colombo to build the houses. Beneficiaries supervised the construction of their own houses and provided a helping hand as required.
- Because the land was previously agricultural, WV-SL built internal roads and drains, and arranged services (street lights, water supply and electricity) from local authorities.
- Houses were built on pad foundations for structural stability on the soft soil.
- The key resilience feature was the avoidance of future tsunami risk by building the settlement inland on elevated land. Additionally, good quality construction was ensured so that houses withstood other hazards (such as cyclones).

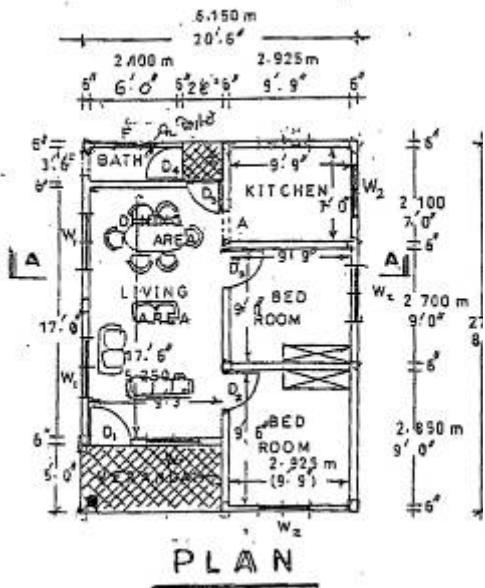


Fig. 24: WV-SL house in Kirinda

5.5.8 Key Findings, World Vision, Kirinda

Inputs

- A list of potential beneficiaries was prepared after the tsunami by the office of the Divisional Secretary of Hambantota and HfH-SL screened it to make the final selection.
- The house design was done by an architect in Colombo and built by a contractor also from Colombo. A sample house was built by WV-SL and prospective beneficiaries were invited to inspect it before deciding to accept such a house.
- There was some consultation with beneficiaries and the design was adjusted: initially the layout included a detached toilet, but being a predominantly Muslim community, for reasons of privacy of women, the toilet was attached to the house.

- The escalation of the prices of buildings materials and labour costs after the tsunami resulted in a high house cost (Rs 600,000).
- Various forms of livelihood support were provided. Each household was assessed for livelihood options and then provided loans as per needs and capacity.
- A significant amount of community training was provided on quality control of building materials, understanding construction measurements and construction supervision so that beneficiaries were able to supervise the construction of their own houses. Training was also provided on leadership and governance, and a community-based ‘Society’ was formed.
- Training specifically on DRR continued to be provided by WV-SL with the support of the governmental Disaster Management Centre (DMC). The main focus was on tsunami hazard though other hazards were also covered. Training aspects include hazard identification, preparedness, evacuation, child safety, etc and also included annual mock drills. A tsunami early warning tower with siren has been built in a nearby school and the community trained how to respond if there was a warning (see Fig. 25).



Fig. 25: Tsunami early warning tower in nearby school

Output

- Key resilience features included settlement away from the coast to reduce the risk of coastal hazards (tsunami, cyclones, etc) and a tsunami early warning system. The house roofs were designed to be wind-resistant with a strong framing structure and 30° slope. A structural frame with 13 RC columns and concrete block walls contributed to a robust house.

- The choice of an elevated location allowed avoiding floods and water-logging.
- The project was a “complete package”, as one WV-SL staff member mentioned. Internal roads were built instead of waiting for the local government authorities to build them later, as in many other post-tsunami projects. Cash-for-Work and Food-for-Work programs for building the roads provided economic support to the community at the same time.
- Other services provided by WV-SL included drainage and septic tanks, ensuring prevention of water-logging and sanitation; water supply and electricity was organised from local government authorities. As this was a semi-arid region, rainwater harvesting tanks were provided (see Fig. 26).
- This was the only shelter project studied where the implementing agency had provided support for landscaping through tree-plantation and home-gardening. As the site previously lacked vegetation, landscaping was considered necessary to make the area habitable. During fieldwork, very good examples of home gardens were found (see Fig. 27).



Fig. 26: Rainwater tanks were provided by WV-SL in this semi-arid region. Note on the right the extension for kitchen built by the beneficiary household.

Result

- The beneficiaries were all tsunami victims and WV-SL made special efforts to revise the government’s beneficiary list to include people with disability, suffering from

malnutrition, widowed, etc. In some houses, the design was modified for the disabled such as including a ramp instead of steps.

- The quality of construction and building materials was good. WV-SL ensured that Class-I materials were used (such as roof tiles and timber framing). One beneficiary narrated that she inspected the construction right from the outset. “The walls are very strong, hard to drive a nail into them”, she said.
- Because of the good quality, others who were building new houses in the area were copying the WV-SL house (see Fig. 28).
- WV-SL provided a retention period of 1 year during which any necessary repairs were done. It was reported by beneficiaries and also observed that after almost 7 years, there had been very little need for repair as the construction quality was good.
- The houses had been built with a foundation to support another floor so that future extensions if required could be made. So far no beneficiary had made such an extension, but at least the provision was there.



Fig. 27: With WV-SL's support, beneficiaries have extensively landscaped their houses

- As in the HfH-SL project, although a kitchen was provided inside the house, many households had converted it for other functions (small bedroom, store, dining, pantry, etc) and built an extension at the rear to serve as a kitchen (see Fig. 26). Gas fuel was unaffordable for most of them, and using wood fuel in the indoor kitchen would have made the whole house smoky.

Impacts & Effects

- The community felt secure because of the good quality of house construction, the elevated and inland location, and the early warning system. As one beneficiary said, “I have no fear about this house. Even if a cyclone comes, it would be fine.”
- Although the contractor was from Colombo, some local workers were recruited, thus creating job opportunities. Most of the materials were procured from other places in Sri Lanka due to constraints on local availability after the tsunami; nonetheless some of the materials, such as sand, were procured locally.
- Most beneficiaries were generally satisfied with the quality and durability of the houses, and mentioned that it was a great improvement over the type of house they had before.

External Factors

- As in many other post-tsunami projects, there was a strong pressure from the government to build houses quickly, which was amplified by the media. On the other hand, the approval process at the Urban Development Authority was slow. These external factors impacted the project.
- Although WV-SL built the internal roads and drains, building and maintaining such civic infrastructure is actually the responsibility of local government authorities. It was found that in some places the roads and drains were not in good condition due to lack of maintenance (see Fig. 25). Similarly the street lights were not all working. It was reported that the previous local government was more diligent, but the neglect had ensued since a change to a recently elected local government.



Fig. 25: Roads deteriorating and drains getting blocked due to lack of maintenance

Summary of Key Findings on Shelter Resilience: World Vision, Kirinda

- Elevated inland location and construction of good quality houses had led to a resilient community.
- An integrated community development approach including a DRR community training component had contributed towards long-term resilience.
- External factors such as inadequate public services provision by local authorities undermined the resilience-building efforts of World Vision.

conclusion

6.0 SUMMARY OF CASE STUDY FINDINGS

6.1 Background

The previous section presented the findings of the test assessments in five different shelter projects in two different countries to demonstrate the use of the evaluation tool in a variety of contexts. The findings were presented in some detail to indicate how the tool is able to obtain a range of findings relating to disaster resilience in shelter. Additionally, this has been done so that SRG member agencies are able to benefit from the review of their projects. However the key purpose of this report is not only to present the findings of the case studies, but to show how the tool can be used for getting insights into the performance of shelter projects vis-à-vis disaster resilience.

6.2 Overview

Notwithstanding the above, a brief overview below of the case study findings allows highlighting the key insights that the evaluation tool captured. These include:

- a) All the five shelter projects were found to have reduced disaster risk to varying levels, and had contributed to beneficiaries' resilience;
- b) All the projects represented a marked improvement to previous living conditions and vulnerability.

6.2.1 Result

Despite the overall positive findings various problematic issues became evident in the test assessments, especially with regard to the **Result** factor concerning shelter design issues. A key example: the one-size-fits-all approach followed in all the projects (except in Mangaia, where the scope was different) resulted in the obvious lack of space for large households and too much space for small ones.

6.2.2 External Factors

Despite the good intentions and efforts of the implementing agencies, **External Factors** also played a significant role in undermining the sustainability of beneficiary communities. In the Cook Islands, due to lack of local production, heavy reliance on outside commodities acted as a serious constraint to resilience and sustainability. In Sri Lanka, varying levels of service provision by NGOs and the government affected resilience; while communities were sheltered in well-built disaster resilient houses built by NGOs, lack of public service provision (drainage, roads, etc) contributed to vulnerability, undoing the efforts of NGOs.

6.3 Insights from Other Projects

In Sri Lanka, it was possible to visit a number of other post-tsunami shelter projects: Projects by the Foundation of Goodness (FoG) in Seenigama, near Galle; and Projects by Colliers International and UN-Habitat (and partners) in Kirinda and Tissamaharama. Although

the evaluation tool was not tested on these projects, broad discussions with agency staff and beneficiaries and field observations pointed to similar findings as above.

Two key findings were confirmed, particularly by the FoG projects:

- a) Projects that provided a wider set of **Inputs** integrated with shelter contributed to better community resilience; to some extent, the World Vision project in Kirinda demonstrated this.
- b) Agencies that engaged with communities over a long term and did not fold up their operations in the beneficiary community soon after project completion were able to assist contributing to the typically gradual process of consolidation of community resilience.

7.0 REVIEW OF EVALUATION TOOL

7.1 Overview

The evaluation tool has been designed to capture a wide range of issues relating to shelter and disaster resilience. Because it is comprehensive, it allows examining different types of projects. Not all the issues included in it would be relevant for all projects, and some issues might be more important according to specific projects. To prove relevant to agencies, it would need to be adapted to the particular context and project while adhering to its structure and processes.

The advantage of being comprehensive, as found in the field, is that it provided a menu of issues that allowed focusing on those most relevant to the project being studied.

- For example, other than in Mangaia, in all the four shelter projects because complete houses were built through the project, there was a lot to explore in terms of **Outputs** and **Result**. On the other hand, in Mangaia, because the project focused on resilience of one part of the house, many of the issues were not relevant and the researcher had to select and focus on the most relevant issues.
- Even within the other four projects, judgements and decisions had to be made on which of the factors were important in each case, and indeed even so at the level of individual respondent beneficiaries.

7.2 Need for Experience

The above observations indicate that the persons using the evaluation tool need to be adequately experienced so that they can make the judgement according to the project about which issues are more relevant and thereby conduct the assessment accordingly. The disadvantage is that if used by less experienced people, there might be a tendency to follow the tool mechanically and seek answers to all the issues, which might be unnecessarily time-consuming and lead to irrelevant data collection and information overload.

7.3 Hazard Mapping & Ranking

In the case of the Cook Islands, from a review of secondary literature in the Pre-Assessment Stage, and confirmed subsequently during fieldwork in the Assessment Stage, the main (and perhaps only significant) hazard was cyclones. Therefore there was no significant need to carry out the Hazard Mapping and Hazard Ranking exercises (see section 4.1 of the Evaluation Tool).

The Hazard Mapping & Ranking activities are relevant for multi-hazard areas where there are varying levels of exposure and sensitivity to hazards. Both Aitutaki and Mangaia being small islands, there was not much variation in that sense. However, a basic mapping in Mangaia allowed understanding that the northern part of the island was more at risk to cyclones and more sensitive as it was more populated there and had all the critical facilities. The pilot project was being implemented in the southern part, which was at less risk, but on the other hand vulnerable because of its remoteness and predominantly elderly population.

Similarly, in Sri Lanka all the shelter projects were built in response to the 2004 Indian Ocean Tsunami. Nonetheless in this case other hazards were also present, such as floods/water-logging and cyclones. However the multi-hazard contexts were not sufficiently complex to warrant the Hazard Mapping & Ranking activities.

In Sri Lanka, two of the projects (Caritas, Galle and World Vision, Kirinda) had eliminated risk and exposure by locating the settlements in hazard-free land. This is a different form of risk reduction compared to an approach as in the Cook Islands projects where exposure to hazards remain, but houses are built to withstand them.

Because the Hazard Mapping & Ranking activities require organising and running community and agency level workshops, advance planning is necessary, as is a larger research team (at least two or more researchers) and strong involvement of local counterparts of agencies commissioning the evaluation. It was beyond the scope of this pilot-level assessment to organise such workshops, nor was it found particularly necessary. However for evaluations in complex and multi-hazard environments, these activities would allow obtaining a comprehensive set of findings.

Given the circumstances of the fieldwork in both the countries, it would have been difficult to arrange community meetings for these exercises. Therefore, once again, a judgement had to be made on which elements of the tool to use.

7.4 Centrality of Key Informant Interviews

The Key Informant Interviews, of both community members and agency representatives (see Appendix 3), was found the most relevant element and was therefore used extensively, complemented by Direct Observation and Documentation.

It should be emphasised that the Key Informant interviews of agency staff and beneficiaries should be done independently. Particularly when implementing agency staff members are present during beneficiary interviews, responses can be influenced. In the field

this can often be hard to achieve. In this particular instance, because the researcher had to rely on agency staff to provide introductions to the beneficiary communities, it was very difficult to conduct independent interviews. Nonetheless in most cases, it was possible to achieve a degree of independence through tact, again indicating the need of experience for conducting such evaluations tactfully.

7.5 Importance of the Pre-Assessment Stage

The importance of the Pre-Assessment Stage, particularly to Plan Fieldwork & Establish Local Contacts, became very clear in this instance. This can often prove to be very difficult, and at times frustrating, because of varying levels of communication technologies and cultures in developing countries. Strong support is required from the outset from agencies commissioning the evaluation so that in-country support and involvement is ensured.

The Assessment Stage is concerned with engagement at the beneficiary community level and in-country implementing agency level. In some cases, agency staff who worked on the project and hence adequately knowledgeable to be key informants may not be based permanently near the project site and may leave after project completion. In the Aitutaki project, this was the case as the main implementing agency was MOIP, based in Rarotonga. Therefore a separate visit to Rarotonga had to be arranged to interview a key agency staff member.

In the case of Sri Lanka, the projects studied were built 6-7 years ago after the 2004 Tsunami, often involving expatriate staff. Thus during the field visit in October 2012, it was difficult to always find the staff who were directly involved in the projects. Nevertheless, it was eventually possible to find agency staff there who were adequately knowledgeable about the projects.

Although, ideally, such details should be sorted out at the Pre-Assessment Stage, in reality it can prove difficult. The experience in the Cook Islands suggests not to make a very tight field visit program and to instead have a bit of flexibility and some extra time to cover for unforeseen activities. This was followed in the subsequent visit to Sri Lanka where arrangements were made adequately beforehand and a sufficient margin of time was kept, allowing more effective fieldwork.

The key point to drive home here is that the Pre-Assessment Stage is very important as it has an impact on how the subsequent Assessment Stage will unfold.

7.6 Importance of Documentation

Extensive documentation during the activities in the Assessment Stage is most important for recall after completion of fieldwork. Digital photography and audio recording, with appropriate permissions, complements the evaluation tool and should form an intrinsic part of the assessment process. This was strongly confirmed during the test assessments in the Cook Islands and Sri Lanka, and subsequent report preparation.

8.0 FUTURE RECOMMENDATIONS

Developing and testing the shelter and resilience evaluation tool has allowed gaining insights for suggesting some future recommendations for SRG agencies and others that intend to use it, as listed below:

- The evaluation tool has been found productive in a variety of contexts and projects and therefore would serve as a useful resource for local agencies interested in evaluating whether and how disaster resilience has been achieved in their shelter projects. It is being recommended that such evaluations using the tool should be a standard procedure.
- The tool should be used after project completion, a few years after houses have been inhabited, and if possible, after one or more disaster events. In areas subject to annual flooding, this can be done easily.
- Although in this study most of the shelter projects studied were reconstruction projects, the utility of the tool is not only to evaluate reconstruction projects, as the DRR project studied in Mangaia demonstrated. It is a tool to assess any shelter project where it has been attempted to achieve disaster resilience, whether after a disaster or part of regular practice in hazardous areas.
- Being comprehensive, the tool offers flexibility for adapting to the purpose of individual agencies. Agencies are recommended to review the tool in the context of their shelter projects and then decide which of its elements to focus on.
- Agencies are reminded that although this tool focuses on disaster resilience of shelter, resilience should not be interpreted in a narrow sense of only DRR through design and construction, but should also be understood in the light of the range of issues that contribute to resilience or exacerbates vulnerability. The comprehensive framework of the tool reflects this concern.
- A key recommendation is the need for training for proper utilisation of the tool, particularly where organisational capacity and experience is limited. In addition to using the tool, training on basic technical aspects of shelter construction would need to be provided, particularly for those who do not have a built environment background. Those SRG agencies directly associated with the process of development of the tool would be in a position to provide training on the tool to their partners in the Asia-Pacific region. However back-stopping and technical support from HARB or other technical organisations should be considered.
- Promoting a culture of good documentation practice is embedded in the tool. Techniques of audio and visual documentation, and storage and retrieval of data should be followed, and again, should be part of any training on the tool. In any case, agencies should ensure that all stages of implementation of a shelter project is

adequately documented (design and construction drawings; photographs) so that they can serve as supplementary resources during the evaluation.

appendices

APPENDIX 1:

Literature Review: Disaster Resilient Shelter and Leading Practices

Literature Review: Disaster Resilient Shelter and Leading Practices

Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region

20 July 2012



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1.0 EXECUTIVE SUMMARY

The purpose of this literature review was to examine and synthesise literature on shelter and disaster resilience in the Asia-Pacific region. It is part of the Stage 1 initial activities of the *Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region* undertaken for the Shelter Reference Group (SRG).

A review was done of literature on the broad theme of shelter and disasters, followed by literature offering lessons from past projects and finally key shelter evaluation frameworks were reviewed with a view to informing the development of an evaluation tool for this study. The websites of regular SRG members were also reviewed to gain an understanding of their shelter projects.

1.1 A literature review on the broad theme of shelter and disaster risk reduction indicated the following points:

- Shelter, commonly the most important asset for people, is often most visibly damaged in disasters. It is important to reduce people's vulnerability through shelter that is resilient to disasters. The impacts of disasters in Asia, a continent with many developing countries, are acute and often affect shelter most severely.
- Often after disasters, maximum resources are allocated for shelter reconstruction and most initiatives on disaster resilient shelter have arisen after disasters. Post-disaster reconstruction offers an opportunity for building shelter to a better standard to resist future disasters.
- It is common to build resilient shelter according to the hazard that affects an area, such as stronger roofing in cyclonic areas, sturdy walls in earthquake-prone places or durable foundations in areas affected by floods. However a complex set of challenges confront shelter, particularly in a multi-hazard context where several hazards can impact at the same time or in succession. Climate change and urbanisation pose additional challenges.

1.2 The review also pointed to the following implications for this study:

- Importance of a long-term framework when evaluating shelter projects.
- Necessity of exploring the link between shelter and livelihoods when reviewing the outcomes of a shelter project.
- Need for looking at both physical and social aspects of shelter within a sustainable shelter systems framework.
- Looking at shelter reconstruction projects to assess disaster resilience as it is most likely to have been incorporated in such projects.

1.3 A review of key recent literature on shelter that offers lessons from past projects indicated:

- There is limited literature on permanent housing and most literature on shelter and disasters deals with temporary or transitional shelter. This was found in publications by IFRC and UN-Habitat that assemble a number of shelter projects, yet there are very few on permanent housing in Asia, and hardly any in the Pacific.
- The book *Beyond Shelter* assembles a number of leading shelter practices, where one example in Asia stands out – the work of Development Workshop France (DWF) for promoting typhoon-resistant shelter in Vietnam.

- Given the very limited literature on shelter and disaster resilience in the Pacific, the work of Emergency Architects in the Solomon Islands presented in the book is noteworthy, as well as the beneficiary-driven shelter projects there of the Australian Red Cross.

1.4 Based on the literature, a pathway for this study was identified along the following lines:

- Two countries in Asia where agencies have been active in the shelter sector to the greatest extent in recent times are Indonesia and Sri Lanka after the 2004 Indian Ocean Tsunami. Because Indonesia shares some of the characteristics of Pacific countries, Sri Lanka could possibly be a country for conducting fieldwork for this study, representing Asia within the scope of this study.
- The literature points to the work in Sri Lanka of Caritas, an SRG member agency, as an example of good practice in disaster resilient shelter.
- To operationalise this study, it was chosen to focus on the work of SRG member agencies. A review of their websites indicated that the larger organisations (Red Cross, Caritas and World Vision) implement shelter among other projects, whereas Habitat for Humanity Australia (HFHA) specialises primarily on shelter, thus offering potential case study projects for this study.

1.5 A review of evaluation frameworks within the scope of this study pointed to the following direction:

- Disaster risk reduction (DRR) evaluation frameworks offer a holistic perspective and offer potential for adapting to the evaluation of disaster-resilient shelter.
- The log frame approach is most widely used in the development field, but it allows conducting evaluations only within the framework of a project of an ongoing project.
- An approach derived from the log frame for evaluating post-disaster reconstruction offers potential for adapting for this study. The proposed adapted framework is in alignment with other key approaches.
- As shelter includes intrinsic design and technical factors in relation to resilience, they should be incorporated into the evaluation framework for this study.
- The link of shelter to livelihood has been highlighted in various sources and will need to be a key element in the evaluation tool to be developed in this study.

1.6 The literature review concludes by suggesting:

- The importance of understanding disaster resilience in permanent shelter, given the limited literature on the subject in the Asia-Pacific.
- The need for an evaluation tool that is positioned within a sustainable shelter systems framework to relate to a wide range of physical and social dimensions of shelter.
- An evaluation framework adapted from the most relevant evaluation approaches.
- This literature review to serve as a background document to the evaluation tool to be developed in this study.

2.0 INTRODUCTION

In order to initiate the Stage 1 activities of the *Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region* undertaken for the Shelter Reference Group (SRG) and to understand the key issues relating to the investigation for this study, this literature review was carried out to examine and synthesise literature on shelter and disaster resilience in the Asia-Pacific region.

Firstly, to serve as an introductory background, literature on the broad theme of shelter and disaster risk reduction was reviewed. This allowed highlighting the challenges and gaps, and typical entry points for agencies for incorporating resilience into shelter, and how that might inform this study. Secondly, zooming in from the broad overview, key literature offering lessons from past projects, as well as the shelter projects of regular SRG members, was reviewed, which allowed defining a pathway for the subsequent activities of this study. Finally, literature on evaluation frameworks that relate to shelter and resilience was reviewed, which allowed developing a framework for the evaluation tool for this study.

Some of the most relevant literature reviewed include:

Shelter and disaster risk reduction:

- ADRC (2012) *Natural Disaster Data Book 2010: An Analytical Overview*. Kobe, Asian Disaster Reduction Center (ADRC).
- Lyons, M. et al (eds) (2010) *Building Back Better: Delivering People-Centred Housing Reconstruction at Scale*. Rugby (UK), Practical Action Publishing.

Lessons from past projects:

- Aquilino, M.J. (2011) *Beyond Shelter: Architecture and Human Dignity*. New York, Metropolis Books.
- UN-Habitat and IFRC (2009, 2010 and 2012) *Shelter Projects*. Fukuoka and Geneva, UN-Habitat and the International Federation of Red Cross & Red Crescent Societies (IFRC).

Evaluation frameworks:

- AusAID (2005) AusAID (2005) *AusGuideline: The Logical Framework Approach*. Canberra, AusAID.
- Twigg, J. (2007) “Evaluating Disaster Risk Reduction Initiatives” in Benson, C. and Twigg, J. (2007) *Tools for Mainstreaming Disaster Risk Reduction: Guidance Notes for Development Organisations*. Geneva, International Federation of Red Cross and Crescent Societies and ProVention Consortium.
- Lizarralde, G. (2002) “Organizational Design, Performance and Evaluation of Post-Disaster Reconstruction Projects”. *Conference proceedings, Improving Post-Disaster Reconstruction in Developing Countries*. Montreal, Université de Montréal.

3.0 SHELTER AND DISASTER RISK REDUCTION

This section reviews literature on the broad theme of shelter and disaster risk reduction, providing an introduction and overview of key issues that have implications for this scoping study.

3.1 Disaster Impacts on Shelter

Shelter is often the most valuable asset for many people and its primary function is to provide protection from the elements of nature. In disasters, not only rapid onset events such as earthquakes and storms, where shelter is usually the most visible component that is damaged or lost, but also in slow onset disasters such as floods and bushfires, people are often forced to abandon their homes. Displacement or loss of shelter makes people vulnerable to possible aftershocks, as well as to the climate – rain, snow, heat, etc – thus compounding the effects of the disaster, and hence significantly impacts household and community health; therefore it is important to safeguard people from these disaster risks through adequate and resilient shelter. This has been emphasised in a number of disasters and shelter related publications (see for example ADPC 2002; Coburn et al 1995; HFHA undated (a); IFRC 2011; Seraj and Ahmed 2004; UNNATI 2006).

3.2 Disaster Impacts in Developing Countries

Developing countries tend to bear the brunt of disaster impacts, with the poor there often being the most severely affected (Schilderman 2004). Asia, the continent with the highest population and where the majority are developing countries, experienced the greatest disaster impacts in terms of number of disasters, economic damage and numbers of people killed and affected during the 35-year period of 1975-2010 (ADRC 2012). Because of the physical nature of shelter, it is particularly vulnerable to disasters, often representing the greatest share of loss in the total impact of a disaster on the economy (Lyons 2009). For example, in the 2004 tsunami and earthquake in Indonesia, the shelter sector experienced maximum damage (Marti 2005). In developing countries particularly, the impact of disasters on the built environment is much higher than in developed countries, estimated at more than 20 times in magnitude (Barakat 2003).

With growing scientific evidence indicating the increased frequency and intensity of disasters resulting from climate change (Anderson and Bausch 2006), many agencies from prominent bilateral and multilateral bodies to grassroots NGOs have begun to take disaster risk reduction seriously. However this is yet to converge more strongly on the shelter sector in developing countries.

3.3 Post-Disaster Reconstruction: Opportunity for Disaster Risk Reduction

In many post-disaster recovery programs, maximum resources and priority is allocated to shelter and infrastructure reconstruction compared to other sectors (Lang 2008). Most country-specific guidelines and initiatives for safer buildings have arisen after major disasters

such as earthquakes and tsunamis (for example ERRA 2006; NHDA 2005). In places where disasters are frequent and recurrent, such as in the case of floods in Bangladesh, or typhoons in Vietnam, resilient shelter initiatives are on the agenda of agencies (Ahmed 2005; Tro 2011). During reconstruction, there is the opportunity to understand and thereby address and overcome the underlying vulnerabilities that had previously prevented resilient shelter construction and the risks that threaten durability and sustainability of shelter. Based on local knowledge and participation, building shelter back to a better standard that is less vulnerable to context-specific hazards can contribute to reduced disaster risks in the long term (Lyons et al 2010). Reconstructed or rehabilitated shelter with future risk in mind will prove more sustainable. To provide a few basic examples: incorporating earthquake-resistant construction elements such as bracings and struts can reduce future earthquake risk; or building raised shelter in flood-prone areas can protect from them from damage.

A study on mainstreaming disaster risk reduction (Wilderspin et al 2008) where one of the researchers was a team member, highlighted that during reconstruction of permanent shelter, the main thrust of the intervention should be to build back better so that the repaired or new shelters are more resilient and local capacity is developed for constructing, replicating and maintaining such shelter. This should be implemented within a framework of local risk assessment, improvement of local building practices and skills, support to local industry and employment, development of improved and more resilient building materials and techniques, and contingency planning for subsequent disaster events.

Agencies implementing shelter reconstruction projects need to be aware of the balance between the provision of grant shelter and ensuring capacity building and technical assistance. Attention has to be given so that there is a strong degree of skills transfer and capacity building for homeowners and local builders, in addition to increased market opportunities for local suppliers and construction workers. As opposed to merely constructing shelter, with the provision of technical assistance, agencies need to ensure that it is followed and the shelter is monitored – but also be aware of constraints that may prevent its uptake.

3.4 Shelter Resilience in Response to Hazards

The exact nature of interventions in shelter in most cases will be guided by the type of hazard, as indicated in a compendium by Clayton and Davis (1994). In rapid onset events (earthquake, cyclone, landslide, flash flood, etc), devastation or loss of shelter can often be extensive, impacting on the capacity of communities and agencies to repair or reconstruct safe and habitable shelter in a timely manner (Williams et al 2009), necessitating a phased approach to permanent shelter (IFRC 2011). Disaster resilience involves strengthening the shelter structure, focusing particularly on roofing in areas affected by strong wind (see for example MAYO 1988; Lapish and Lynch undated), and walls in earthquake-prone areas (Arya et al 2010; Boen 2001). Slow onset events, particularly recurrent or annual floods which are pervasive throughout the Asia-Pacific region, can weaken or damage the foundation or

lower part of buildings within one flood season or gradually over several seasons, and therefore attention is given to the base of the shelter (Ahmed 2005).

3.5 Multi-Hazard Context

It is important to note that a number of hazards can be inter-linked, with one hazard triggering off other hazards, or several hazards impacting concurrently or in close succession, resulting in a multi-hazard context affecting shelter in various ways (McCullough and Kareem 2009). For example, an area located in a flood-plain which is close to a seismic fault may experience flooding and earthquakes at the same time. A cascading effect where a primary hazard triggers off a set of secondary impacts is common. A cyclone may have primary impacts due to strong winds and heavy rain, but can be followed by secondary impacts such as inundation due to a tidal or storm surge; an earthquake can lead to a tsunami or fire; a heat wave can cause a bushfire. Therefore resilient shelter programs need to be based on a comprehensive risk assessment that points to the specific hazards to safeguard against.

3.6 Challenges of Climate Change and Urbanisation

Climate change has ushered in a new set of challenges; areas that have historically not experienced certain disasters are now experiencing them, such as the floods in Pakistan in 2010 (Gronewold and Climatewire 2010), or disasters are becoming more frequent and intense in historically disaster-prone areas as in the lower Mekong Delta in Vietnam (Bird 2009; Vinh 2012) and the Ganges-Brahmaputra Delta in Bangladesh (Shamsuddoha and Chowdhury 2007). The entire Pacific region is subject to loss of land and habitat due to sea level rise, presenting tremendous challenges to the shelter sector, particularly when compounded by coastal disasters such as cyclones and tsunamis, such as in the Solomon Islands in 2007 (World Bank and SOPAC 2009).

Rapid urbanisation is another phenomenon that has resulted in unpredictable disaster patterns, for example the flood in Bangkok in 2011 (Barta et al 2011). Reconstruction and resilient shelter building are often confronted by a specific set of challenges in cities in developing countries that have densified and grown rapidly in unregulated patterns (Habitat for Humanity 2012; IASC 2010; IFRC 2010). This is strongly evident in Haiti after the massive earthquake in 2010 (Gillman 2011).

3.7 Key points and Implications for this Study

There is a complex set of challenges for agencies to incorporate disaster resilience into shelter because of the dynamic nature of disasters in the current Asia-Pacific context. Because of the long term nature of shelter, often exceeding 50 years of service life, shelter agencies need to anticipate the wide range of factors that may emerge in the future and undermine resilience.

Often evident in post-disaster situations, affected people tend to prioritise shelter as their most urgent need together with livelihood regeneration (Delaney and Shrader 2000;

Skinner 1990). In many Asia-Pacific developing countries, shelter and livelihood are linked as the house is often a workplace (HFHA undated (b)); additionally construction activities support local industry by creation of jobs and procurement of building material.

Thus shelter is not only about constructing dwelling units, but encompasses various social and economic factors, requiring a sustainable and holistic approach to building disaster resilient shelter.

It is unfortunate that unless a disaster strikes there is usually little concern for building resilient shelter. It is understandably difficult for agencies to anticipate disaster impacts in advance, unless there is a history of disasters in the area. Additionally it proves difficult to mobilise extra funds for resilience from donors unless a disaster impact is evident. Thus resilient shelter initiatives often tend to be part of post-disaster reconstruction programs.

The above key points indicate the following implications for this scoping study:

- The evaluation tool in this study will require incorporating a long-term framework.
- The evaluation tool will need to explore the link between shelter and the local/household economy and livelihoods.
- The study will have to explore both physical and socio-economic aspects of shelter and position it within a sustainable shelter systems framework.
- Although the focus is not on reconstruction *per se*, the projects to be studied may in most cases end up in being post-disaster shelter reconstruction

4.0 LESSONS FROM PAST PROJECTS

Moving from the broad overview above, this section presents the findings of a review of key literature on shelter. It should be noted that there is a lot of literature on shelter that is specific to certain places, agencies, projects or types of approaches, and a lot of it is not recent. Therefore the approach here has been to focus on a few key examples of recent literature that assembles a variety of projects and highlights good practice, and allows operationalising this study.

4.1 Limited Focus on Permanent Shelter

Although diverse and numerous agencies have implemented shelter projects in the Asia-Pacific region, particularly after major disasters such as the 2004 Indian Ocean Tsunami and 2005 Pakistan Earthquake, there appears to be limited literature on permanent shelter. The focus seems to be on the post-disaster relief and response stage, and less so on long-term recovery and reconstruction, particularly on building disaster resilient shelter. This is

reflected in the *Shelter Projects* reports from 2008-10 led by UN-Habitat and IFRC (2012; 2010; 2009). Most of the reported case studies of shelter projects in Asia are of temporary and transitional shelter and there are only a few examples of permanent shelter projects as evident from Table 1 below. There are no reported projects in the Pacific, a region with very little coverage in the literature on shelter and disasters.

Despite the partial picture evident in Table 1, there is a multitude of agencies active particularly in Asia and implementing diverse shelter projects, as can be seen from the websites of various agencies. The number of disasters impacting the region and the shelter activities of agencies in response is comparatively vast, but not adequately reflected in the literature. Only in one year, 2010, there were 144 recorded disasters in 30 Asian countries (ADRC 2012); this does not even include any Pacific country. Even in one country after one disaster - Indonesia after the 2004 Tsunami - admittedly the most affected country after one of the most massive disasters in recent times, more than 140,000 shelters were built by 124 international agencies and 430 local agencies (Aceh Recovery Newsletter 2009; O'Brien and Ahmed 2011).

Thus this study faces the key challenge of selecting a small number of case studies from this large array to fit its scope, yet offer useful lessons.

Country	Disaster	Year	Impact on Shelter	Shelters Built*
Bangladesh	Cyclone	2007	458,492 destroyed; thousands more damaged	1,250
Indonesia	Earthquake & Tsunami	2004	252,000 destroyed or damaged	1,564
Pakistan	Floods	2010	1.8 million damaged	175
Pakistan	Floods	2010	1.8 million damaged	300
Vietnam	Typhoon	2009	23,500 houses destroyed	650

Table 1: Key aspects of permanent shelter projects in the Asia-Pacific featured in the UN-Habitat and IFRC 'Shelter Projects' reports (2008-10)

* The number of shelters built shown here is only by the agencies featured in the IFRC reports, not all agencies that built shelter after the respective disasters; the names of implementing agencies are not given in the reports.

4.2 Some Leading Practices

The book *Beyond Shelter* (Aquilino 2011) catalogues a number of examples of leading practice in shelter. One example here, also discussed in the UN-Habitat and IFRC *Shelter Reports* (2012), is Development Workshop France (DWF) in Vietnam. The agency has been pioneering and promoting typhoon-resistant construction in central Vietnam for more than two decades and has succeeded in building resilience of some of the most vulnerable communities there. DWF has won a number of international awards and in recent work by the researchers it was confirmed as exemplary in the disaster resilient shelter field.

Another example discussed in *Beyond Shelter* is the work of Emergency Architects (EA) in Solomon Islands after the tsunami in 2007. Although most of the work focused on rebuilding schools, the process involved explicit demonstration of resilient designs and construction techniques, which was replicated by local people in their shelters. This seems to be potentially an example worth examining in this study, particularly as there are so few examples of work in the Pacific region.

Indeed, compared to the literature on shelter in Asia, there is much less on the Pacific countries. This is possibly due to some of the extreme disaster events impacting Asian countries such as the 2004 Tsunami, but also larger concentrations of population there causing widespread and extensive impacts. However, although smaller in scale, Pacific countries experience a range of disasters, and due to climate change, face an almost continual disaster situation (World Bank and SOPAC 2009). The work of the Australian Red Cross in several Pacific countries, including the Solomon Islands after the 2007 Tsunami (Barton 2012), is worth highlighting. Here a unique ‘Beneficiary Driven’ approach is followed, where support for shelter is matched to individual beneficiaries’ needs, capacity and condition of shelter. The approach has been replicated in several Pacific countries by a number of agencies, and has even influenced the work of the state government authorities in Victoria, Australia after the 2009 Bushfire.

4.3 Pathway for this Study

Two of the countries where a large number of agencies have been active in the shelter sector to the greatest extent are Indonesia and Sri Lanka, where after the 2004 Tsunami respectively more than 140,000 and 120,000 shelters have been built (Aceh Recovery Newsletter 2009; Worldwatch Institute 2012). Because of the research team’s previous engagements in Sri Lanka (see for example Mulligan et al 2012; Shaw and Ahmed 2010), fieldwork for this study can be conducted fruitfully there. Because Indonesia is close to the Pacific region and hence has many similar conditions, Sri Lanka is more representative of Asia. The scope of this study permits studying projects in one country in Asia and one in the Pacific, and therefore Sri Lanka seems to be an appropriate choice.

While there are many scattered publications on shelter in Sri Lanka, the book *Towards Sustainability: Building Practices in Post-Tsunami Housing Programmes* (2006) is a useful compilation of leading practice in the field. However in only one project, that of Caritas, it is

explicitly mentioned that “disaster-resistant technologies” have been used (also see Caritas 2007). Disaster resilience does not seem to be a central issue in this book, though it may well be that many agencies did take that into consideration when designing and building shelter, a matter worth exploring.

Given the complexity of the field and the large number of agencies and projects, to operationalise this study it would be useful to focus on member agencies of SRG in light of practical considerations of fieldwork logistics and dissemination of the findings of the study. Table 2 below provides a snapshot of the work of regular SRG members relating to shelter in the disaster context in some of the main countries where they have recently been or are active as per their respective websites.

Agency	Key shelter project countries
Australian Red Cross	Burma; Cambodia; Indonesia; Solomon Islands; Sri Lanka; Tonga
Caritas Australia	Burma; India; Indonesia; Pakistan; Sri Lanka
World Vision Australia	India; Indonesia; Sri Lanka; Thailand
Emergency Architects	Indonesia; Solomon Islands
Habitat for Humanity Australia & International	Bangladesh; Burma; Cambodia; China; Fiji; India; Indonesia; Mongolia; Nepal; Pakistan; Papua New Guinea; Philippines; Solomon Islands; Sri Lanka; Vietnam;

Table 2: Countries where regular SRG members have or are active in disaster-related shelter projects
(Sources: Respective agency websites and personal communications)

The larger organisations (Red Cross, Caritas and World Vision) listed in the table have a wide range of community development programs and shelter is one of them, often integrated with other programs. Thus although they may work in many countries, they do not build shelter in all of them. Habitat for Humanity Australia (HFHA), while taking a holistic community development approach has a specialisation in shelter and therefore builds shelter (alongside WaSH, governance and livelihood activities) wherever they work; this is reflected above in the greater number of countries listed. HFHA operates in six countries in the Asia-Pacific, but when also including the work of HFH International, this list is increased. The work of HFHA offers great potential for looking at disaster resilient shelter as case study projects for this study.

As mentioned above, permanent shelter projects of Caritas in Sri Lanka have explicitly included risk reduction and would therefore deserve being considered for selection as case studies in this study. Also, according to a report of World Vision’s post-tsunami shelter

projects (Greenblott 2007), particularly in India, risk reduction features are included. This requires further exploration with World Vision to understand whether its work would be suitable as case studies for this study.

5.0 SHELTER EVALUATION FRAMEWORKS

The field of evaluation is sophisticated and wide-ranging, and various assessment tools have been developed in the recent past relating to the development field (see for example Pearce and Batchelor 2010). Appraisal (or project planning), monitoring and evaluation have long since been part of a project cycle (Rubin 1991), with the latter two being interlinked (M&E) in terms of assessing a project's progress and outcomes. Every agency tends to have its own M&E procedure and there are a myriad of evaluation tools, though often derived from key frameworks as outlined below. While monitoring checks a project's ongoing performance, evaluations are usually conducted at key interim stages or after project completion. Here the focus is on evaluation, as in order to assess resilience in shelter, it needs to be done after the shelters have been built and ideally in a context where they have experienced hazards after being built. ***In this study, the scope is limited to assessing disaster resilience in shelter in developing countries of the Asia-Pacific region and thus provides a focus for the evaluation tool to be developed.***

There are shelter evaluation tools developed by some SRG members such as ASPIRE by Arup and Engineers Against Poverty (see Pearce and Batchelor 2010), Post-Occupancy Evaluation by Emergency Architects (EA undated), Adequate or Minimum Housing Standards by Habitat for Humanity (HFHA undated (c); HFHI-SL 2009) or on Socio-Economic Aspects of Shelter by the Red Cross (Dijk and Leersum 2009). There are also program evaluation tools, such as that used to evaluate Caritas's post-tsunami program in Sri Lanka (MDF 2009), but here shelter is one of the many program elements that are evaluated and hence not the main focus as in this study. These tools offer useful insights, but they are designed to examine broader aspects of shelter or issues other than disaster resilience. In many cases, these tools are derived from or correspond to the broader evaluation frameworks discussed below, which are explored with a view to facilitate the development of the evaluation tool for this study.

5.1 Disaster Risk Reduction (DRR) Evaluation Frameworks

The Hyogo Framework of Action (HFA) adopted by 168 governments is the most comprehensive global DRR initiative with rigorous periodic assessments. Aspects of its key methodological process are outlined below in Table 3.

HFA Priorities	Review Tools	Thematic Areas
<ol style="list-style-type: none"> 1. Making disaster risk reduction a policy priority, institutional strengthening 2. Risk assessment and early warning systems 3. Education, information and public awareness 4. Reducing underlying risk factors 5. Preparedness for effective response 	<ol style="list-style-type: none"> 1. Literature review 2. Structured workshops at regional and national level 3. In-depth studies 4. Interviews of policymakers 5. Online debates 	<ol style="list-style-type: none"> 1. Expected outcome 2. Strategic goals 3. Priorities for Action 4. Future implementation

Table 3: Key aspects of the HFA and its review process (adapted from UNISDR 2010)

The HFA review framework offers a holistic perspective and offers some useful insights. Some of its tools correspond to approaches appropriate for this study, such as literature review, workshops and interviews, and local studies involving direct observation and documentation. However its thematic areas indicate that it is more of a monitoring than evaluation tool. Perhaps with the completion of HFA in 2015, a final evaluation will be done, which might offer valuable insights on DRR evaluation frameworks.

Another useful framework by Twigg (2007), provides guidance specifically on evaluating DRR. The main steps suggested here for evaluating DRR are shown below in Table 4.

Steps	Key Issues
Step 1: Planning	<ul style="list-style-type: none"> ▪ Project design ▪ Purpose and approach ▪ Stakeholders ▪ Time and timing ▪ Indicator selection ▪ Baselines
Step 2: Data collection	<ul style="list-style-type: none"> ▪ Selection of methods ▪ Participation
Step 3: Data analysis	<ul style="list-style-type: none"> ▪ Inadequate baselines ▪ Cause-effect linkages ▪ Cross-checking ▪ Unforeseen impacts ▪ Identifying beneficiaries ▪ Sustainability
Step 4: Application of findings	<ul style="list-style-type: none"> ▪ Use of findings ▪ Transparency

Table 4: Steps in evaluating DRR (adapted from Twigg 2007)

On initial reflection the steps in Table 4 seems applicable to evaluation of a wide range of initiatives and sectors (health, education, etc), certainly not specific to shelter and even not only DRR. Nonetheless, and perhaps because of that, it has potential for adapting for the purpose of the evaluation tool of this study. The steps could follow a similar logical sequence, though the issues may vary according to the scope and purpose of this study. It is important to note the final step 4 where the findings of the evaluation are suggested for practical application. This is very much in line with the purpose of the evaluation tool of this study where findings will be fed back to key stakeholders with a view to informing their future shelter and resilience initiatives.

5.2 The Log Frame Approach

One of the most widely used tools for designing and monitoring, and thereby evaluating development projects is the *Log Frame* (shortened from logical framework) (Villanueva undated). This tool relies on framing project activities in terms of desired outcomes, then setting up indicators of both coverage and impact, and thereby verifying them. It recognises built-in assumptions, particularly when defining project outcomes, as this is often done within practical considerations of project implementation. Table 5 below presents the key features of a log frame.

Activity Description	Indicators	Means of Verification	Assumptions
Goal or Impact – The long term development impact (policy goal) that the activity contributes at a national or sectoral level	How the achievement will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Goal indicator(s) – including who will collect it and how often	
Purpose or Outcome – The medium term result(s) that the activity aims to achieve – in terms of benefits to target groups	How the achievement of the Purpose will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Purpose indicator(s) – including who will collect it and how often	Assumptions concerning the Purpose to Goal linkage
Component Objectives or Intermediate Results – This level in the objectives or results hierarchy can be used to provide a clear link between outputs and outcomes (particularly for larger multi-component activities)	How the achievement of the Component Objectives will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Component Objectives indicator(s) – including who will collect it and how often	Assumptions concerning the Component Objective to Output linkage
Outputs – The tangible products or services that the activity will deliver	How the achievement of the Outputs will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Output indicator(s) – including who will collect it and how often	Assumptions concerning the Output to Component Objective linkage

Table 5: Key features of a Log Frame (Source: AusAID 2005)

As evident from Table 5, the log frame should be used right from the beginning of project design and its scope encompasses the entirety of a project. It allows defining what the project will do, and produce, its objectives and assumptions, and how the project's impact will be measured, monitored and evaluated. In that sense, it is not an evaluation tool by itself, but allows conducting evaluations in line with project design. Quite often project activities and indicators are set out in order to implement a project and an evaluation can only inform whether these indicators are being met, without being able to revise the project activities. Thus the evaluation is only able to assist designing a new project. As this study is concerned with evaluating completed projects, this approach has limited applicability.

Lizarralde (2002) has extended the log frame to evaluating completed post-disaster reconstruction projects and offers a methodological approach potentially useful for the evaluation tool for this study as it "highlights the performance of the project in terms of the results for the community rather than being simply based on the products offered". As opposed to a typical log frame, this approach evaluates the project itself, not only its outcomes. A possible adaptation of this approach for developing a framework for the evaluation tool for this study is shown below in Table 6. In line with the purpose of this study, the focus is on a key objective of the project to be evaluated - the application of options for enhancing the resilience of shelter against disasters and thereby reducing the disaster risks of the beneficiary group.

FACTORS	DEFINITION	ASPECTS	KEY QUESTIONS
f) Inputs	Human, material and financial resources required to incorporate resilience in shelter	Efficiency	<ul style="list-style-type: none"> ▪ Were the local and external resources optimised (cost-effectiveness)? ▪ Was the community specifically engaged in design/construction? ▪ Was there a dedicated skills transfer/training component?
g) Output	Articulation of resilience options before applying it	Results	<ul style="list-style-type: none"> ▪ Were the resilience options realised?
		Timing	<ul style="list-style-type: none"> ▪ Were they available at the right time?
		Quality	<ul style="list-style-type: none"> ▪ Are the resilience options 'good' in the local context?
h) Result	Direct consequence for the beneficiary of applying the resilience options	Pertinence	<ul style="list-style-type: none"> ▪ Were the resilience options available to the most vulnerable people?
		Acceptability	<ul style="list-style-type: none"> ▪ Did the local community use the resilience options? ▪ Were they pre-determined/required, or optional? ▪ Were they replicated outside the project? ▪ Are they easy to maintain?
i) Impacts and Effects	Indirect or later consequences for the beneficiary of using resilience options (or the situation originating from the project)	Strategy	<ul style="list-style-type: none"> ▪ Did the resilience options correspond to the needs of the community?
		Scope	<ul style="list-style-type: none"> ▪ What proportion of vulnerable people was covered?
		Ultimate objective	<ul style="list-style-type: none"> ▪ Did the project reduce the disaster risks of the community? ▪ Do the community/ households feel a greater sense of security?
j) External Factors	Factors beyond the control of the implementing agency.	External aspects	<ul style="list-style-type: none"> ▪ How did the context and environment affect the results of the project?

Table 6: Possible framework for SRG evaluation tool (adapted from Lizarralde 2002)

Although not focused specifically on shelter and disaster resilience, guidelines by the former UNCHS (2001) (now UN-Habitat) for evaluating post-disaster programs provides a set of evaluation questions, which to a large extent are consistent with the proposed framework in Table 3. These questions relate to seven key factors, which will be taken into consideration in the evaluation tool for this study: (a) Effectiveness; (b) Efficiency; (c)

Relevance; (d) Sustainability; (e) Impact; (f) Cost-effectiveness; and (g) Unanticipated consequences.

5.3 Shelter Design and Technical Assessment

Shelter includes intrinsic design and technical factors in relation to resilience and therefore these factors need to be incorporated within the evaluation framework for this study. At a general level, as suggested by Greenblott (2007) such factors include “improved land-use planning, enhanced building construction methodologies, and more rigorous safety regulations”. An evaluation by the Hunnarshaala Foundation (2006) of post-tsunami shelter reconstruction with a specific technical focus provides more detail on such factors. Table 7 below lists these factors and adding a key factor, sustainability, presents some of the key aspects relating to these factors. When developing the evaluation tool for this study, these factors and aspects would need to be built into the framework proposed above in Table 6, with a corresponding set of questions that would guide the investigation.

FACTORS	ASPECTS
a) Construction practices	Specific risk reduction technologies; Quality of construction and building materials
b) Shelter design	Dimensions; Layouts; Functional provisions; Potential for extension; climatic response
c) Site selection/ planning	Location; Elevation; Drainage; Infrastructure and services
d) Repair and maintenance	Ease; Accessibility of materials and skills; Cost-effectiveness
e) Sustainability	Replicability; Livelihood potential*; Environment friendliness

* See section 5.4

Table 7: Technical and design factors relating to shelter evaluation (derived Hunnarshaala 2006)

5.4 Linkage to Livelihood

As mentioned above in section 3.7, the link between shelter and livelihood is important and contributes to the sustainability of a shelter project, especially in the context of disaster risk reduction. Beside shelter being a workplace and having strong implications for health and well-being contributing to economic productivity (HFHA undated (a)), production of shelter after a disaster can create local jobs and regenerate the local economy through production, procurement and transport of building materials (Cosgrave 2008; Feinstein International Center 2011). A study showed that households whose homes were rebuilt after a disaster were able to resume income-generating activities, which allowed economic recovery from the disaster’s impacts (HFHA undated (b)). Importantly, local capacity can be developed for building resilient shelter and in this sense allows the disaster risk reduction

initiative to be sustained over the long term. The significant linkage between shelter and livelihood is explicitly recognised and addressed in shelter projects of the SRG members such as Caritas and Habitat for Humanity (Caritas 2007; HFHA undated (b)).

Therefore within the programmatic and technical aspects of shelter resilience, a key aspect that will be incorporated in the evaluation tool for this study is the ability of a shelter project to contribute to and build capacity in local livelihoods within a sustainable shelter systems framework.

6.0 CONCLUSION

The above review of literature led to a number of key conclusions as outlined below.

6.1 Significance of disaster resilience in permanent shelter

The above literature review indicated that although Asia is the continent experiencing the greatest disaster impacts and the shelter sector often most severely affected, there is limited or scattered literature on leading practices on building disaster resilient shelter therein. While there is some literature on shelter practices in Asia, there is very little on the Pacific region with regards to disaster resilient shelter. Additionally, compared to the literature on temporary and transitional shelter, literature on permanent shelter is scanty; most people expect to live in permanent housing over the long term and face several possible disaster cycles, hence the importance of disaster resilience in this form of shelter.

6.2 Need for identifying good practice

Nonetheless, many agencies have been active in facilitating and building permanent shelter, particularly after some major disaster events, thus offering the opportunity for understanding how disaster resilience has been and can be enabled through such efforts. There is a strong need for demarcating good practice and bringing it to the forefront to enable a wide set of stakeholders to adopt them. To do so, an appropriate evaluation tool is required, and the literature review provided some important pointers on the possible nature and scope of this tool. Given the range of challenges confronting shelter and its multi-dimensional implications for household and community well-being, the evaluation tool proposed to be developed in this study needs to be positioned within a sustainable systems framework encompassing various physical and social aspects.

6.3 Towards a shelter resilience evaluation framework

A review of approaches to evaluation again indicated limited literature on the key concern of this study - evaluating disaster resilience in permanent shelter. This problem was thus addressed by reviewing the most widely used evaluation framework in the development field – the log frame. While this framework by itself is not suitable for this study, a derived version modified to evaluate post-disaster reconstruction was found useful

and hence adapted to inform the development of the evaluation tool in this study. In addition, because the mentioned framework was found to be at a somewhat general level, it was suggested incorporating socio-technical aspects relevant to shelter as evident from other frameworks.

6.4 Link between the literature review and evaluation tool

This literature review serves as a background document to the actual evaluation tool itself. It has allowed understanding the critical issues involved, where the gaps are and relevant approaches to evaluating disaster resilient shelter. Therefore this document should be read in conjunction with the evaluation tool in order to get a comprehensive understanding of the basis and purpose of the tool.

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APPENDIX 2:

Evaluation Tool

Evaluation Tool

Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region

20 July, 2012



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1.0 INTRODUCTION

This evaluation tool was developed as an activity in Stage 1 of the *Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region* undertaken for the Shelter Reference Group (SRG). It is preceded by a literature review on disaster resilient shelter, which allowed developing a framework for the tool. It is designed to serve as a resource to assess the outcomes of shelter projects specifically with regards to disaster resilience. The tool is to be used primarily by SRG member agencies to enable its staff to assess the effectiveness of disaster resilience options incorporated into their shelter projects. The assessment should be conducted sometime after project completion, ideally after one or more disaster events, so that the performance of the resilience options can be assessed vis-à-vis disaster impacts. In addition to SRG agencies, the tool can be useful for three main groups of people:

- i. Staff of agencies who are involved in implementation and management of shelter projects particularly in disaster-prone areas.
- ii. Program/project evaluators independent or otherwise who are tasked with evaluating and advising shelter projects and programs in terms of disaster risk reduction.
- iii. Communities themselves that can use it to support their own investigations and learning, and also for local level action and lobbying to CBOs, NGOs and local government agencies.

The tool comprises three main stages of the assessment process consisting of the key activities of the evaluation (see Fig. 1):

- iv. **Pre-Assessment Stage:** Firstly set the geographical boundaries and select the project case studies to be assessed. Once this is done, collect and review relevant project documents of agencies and other secondary literature on the project context and environment, particularly on hazards. Then prepare for fieldwork by establishing local contacts.
- v. **Assessment Stage:** This is the central stage of the evaluation where assessments will be carried out at two levels: (a) Community level, including project beneficiaries and/or resident of the shelters built in the project; (b) Agency level, mainly staff of agencies who were involved with and/or familiar with the project. A series of semi-structured activities will guide the assessments.
- vi. **Consolidation Stage:** After conducting fieldwork, analyse the data collected and produce a draft report. Share the findings of the assessment with stakeholders for validation, and thereby produce a final evaluation report.

Prior to developing this tool, a literature review on shelter and DRR, and evaluating shelter projects was undertaken, which allowed developing a conceptual framework within which this tool is positioned. The key findings from this literature review indicated a limited focus on permanent disaster resilient shelter and thus a need to identify leading practice in this field, which this tool addresses.

The next section provides an overview of the evaluation framework followed, and thereby the following sections provide guidance on using the tool through the three stages of the assessment process as shown in Fig. 1.

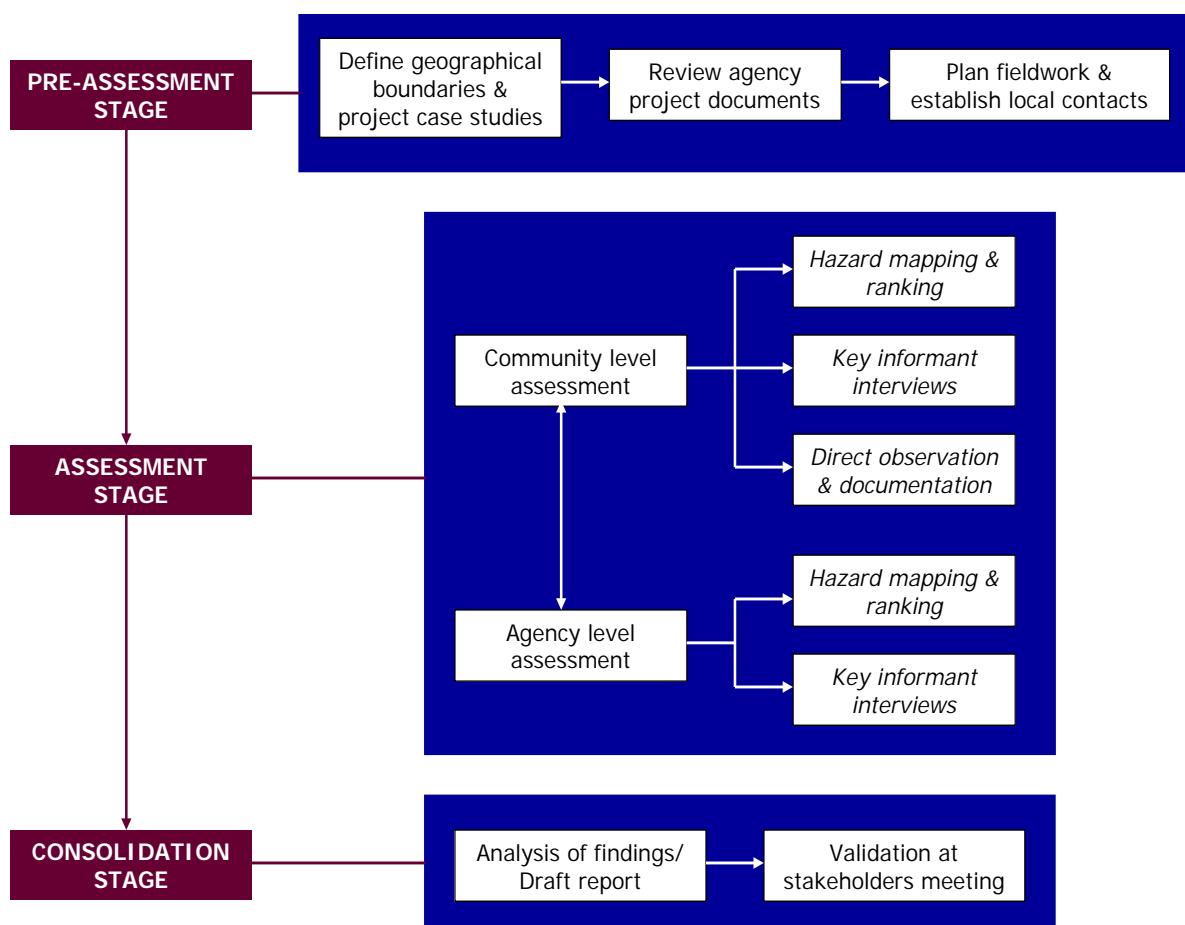


Fig. 1 Salient aspects of the assessment process

2.0 CONCEPTUAL FRAMEWORK

Three key issues have allowed framing the evaluation tool conceptually:

- i. Although the evaluation is concerned with shelter, it takes into account a wide range of physical and social factors that are related to production and sustainability of shelter.
- ii. The evaluation tool will have to be used with a long-term outlook particularly with regards to anticipated future impacts of climate change.
- iii. Within the programmatic and technical aspects of shelter resilience, a key aspect to be assessed is the ability of the concerned project to contribute to and build capacity in local livelihoods.

Regarding the third point above on livelihoods, it will have to be focused around the programming of the specific case study project and not on the broader aspects of livelihoods. The following three points have to be borne in mind, as reflected in the Checklist Template below in section 4.2:

- i. It will need to be made sure whether the implementing agency had included a dedicated skills transfer and capacity building component on disaster resilient construction, which has the potential to lead to increased participation, ownership and sustainability through ease of maintenance.
- ii. Whether the community members have utilised these skills for livelihood activities during the project implementation and/or afterwards will need to be examined.
- iii. It would also be useful to find out if there are any flow-on positive benefits such as a disaster-resilient shelter enabling income-generating home-based livelihoods.

It should be noted that the evaluator or evaluation team has to become familiar with the local context where the evaluation is to be done, particularly with the type of hazards that affect the area and typical vulnerabilities. This can be done through a review of agency project documents and other secondary literature, but it is also necessary to assess this at the local level. The hazard mapping and hazard ranking activities included in this tool allow gaining an understanding of the local hazard context, as well as allow building rapport with the community for conducting subsequent assessments.

Table 1 below shows the framework for the evaluation tool. This will serve as the backbone of the pre-assessment review of agency project documents, and the community and agency level assessments during fieldwork. The key questions in the table are reflected in the interviews of key informants from community and agency groups.

FACTORS	DEFINITION	ASPECTS	KEY QUESTIONS
k) Inputs	Human, material and financial resources required to incorporate resilience in shelter	Efficiency	<ul style="list-style-type: none"> ▪ Were the local and external resources optimised (cost-effectiveness)? ▪ Was the community specifically engaged in design/construction? ▪ Was there a dedicated skills transfer/training component?
l) Output	Articulation of resilience options before applying it	Results	<ul style="list-style-type: none"> ▪ Were the resilience options realised?
		Timing	<ul style="list-style-type: none"> ▪ Were they available at the right time?
		Quality	<ul style="list-style-type: none"> ▪ Are the resilience options 'good' in the local context?
m) Result	Direct consequence for the beneficiary of applying the resilience options	Pertinence	<ul style="list-style-type: none"> ▪ Were the resilience options available to the most vulnerable people?
		Acceptability	<ul style="list-style-type: none"> ▪ Did the local community use the resilience options? ▪ Were they pre-determined/required, or optional? ▪ Were they replicated outside the project? ▪ Are they easy to maintain?
n) Impacts and Effects	Indirect or later consequences for the beneficiary of using resilience options (or the situation originating from the project)	Strategy	<ul style="list-style-type: none"> ▪ Did the resilience options correspond to the needs of the community?
		Scope	<ul style="list-style-type: none"> ▪ What proportion of vulnerable people was covered?
		Ultimate objective	<ul style="list-style-type: none"> ▪ Did the project reduce the disaster risks of the community? ▪ Do the community/ households feel a greater sense of security?
o) External Factors	Factors beyond the control of the implementing agency.	External aspects	<ul style="list-style-type: none"> ▪ How did the context and environment affect the results of the project?

Table 1: Framework of the evaluation tool (adapted from Lizarralde 2002)

Table 2 shows the key design and technical factors and aspects specific to shelter that should be explored within the above framework; investigation of these should be incorporated into the community and agency level assessments.

FACTORS	ASPECTS
f) Construction practices	Specific risk reduction technologies; Quality of construction and building materials
g) Shelter design	Dimensions; Layouts; Functional provisions; Potential for extension; climatic response
h) Site selection/planning	Location; Elevation; Drainage; Infrastructure and services
i) Repair and maintenance	Ease; Accessibility of materials and skills; Cost-effectiveness
j) Sustainability	Replicability; Livelihood potential; Environment friendliness

Table 2: Technical and design factors relating to shelter evaluation (derived Hunnarshaala 2006)

3.0 PRE-ASSESSMENT STAGE

3.1 Define Boundaries and Project Case Studies

Define the following boundaries in consultation with key stakeholders, particularly the group(s) commissioning the evaluation:

- **Geographical:** Countries and areas within each country where the evaluation will be undertaken.
- **Scale:** Number of projects and their respective sizes.
- **Time:** The amount of time required to feasibly carry out the work.

The selection of case study projects will also require boundary conditions or criteria.

Table 3 below shows a criteria matrix used in this study, which can be used as an example.

<i>Agency: Emergency Architects</i>	Sri Lanka	Cook Islands
▪ Shelter project wholly or largely complete		Yes
▪ Built within the last 8 years		Yes
▪ DRR elements explicitly incorporated		Yes
▪ Documentation available (drawings, project documents, etc)		Yes
▪ In location exposed to natural hazards		Yes (cyclone)
▪ Accessible without too much difficulty		Yes, but may require time
▪ Type of key built environment professionals		Architects
▪ Local contact person available preferably from agency		Yes
▪ Intentional skills transfer approach included in the project		Yes

Table 3: Example of a criteria matrix for selection of project case studies

3.2 Review Secondary Documents

Collect all project related documents, including shelter design drawings, from the concerned agencies and related secondary literature, and review them. Before starting the evaluation, an extensive and thorough review of locally relevant secondary information will allow gaining the necessary background knowledge. The secondary information will also allow cross-checking and comparing the information collected in the risk assessment process. Bear in mind the following guidelines:

- Not all desired information might be available or even exist. Attempt to collect as much as possible within the limitations of the situation.
- Do not collect too much information such that it leads to overload. Keep the focus on shelter. Use judgement to screen information so that it relates directly to the context and the community.
- Although it is best to get the bulk of the work done before moving on to the next activities, the collection and review of secondary information can be expected to continue during the next stages while the assessment process progresses.

The following questions provide a guide to some of the key issues that should be examined when reviewing the documents:

- **Hazard context:** What are the hazards common to the project location? When was the last major disaster and related impacts on shelter? What vulnerabilities exist?
- **Inputs:** Was the project cost-effective? How were local and external resources used?
- **Output:** What resilience options were incorporated in shelter? Any indication of their performance?
- **Result:** Who were the beneficiaries? Were the resilience options replicated outside the project?
- **Impacts & Effects:** What local needs were addressed? Any evidence of vulnerability reduction?
- **External Factors:** Did the context and environment affect the project outcomes?

Table 4 below provides guidance on the type of background information that might be useful and their possible sources.

Activity	Purpose	Information Types	Sources
Collecting secondary information.	To collect and review secondary information to gain an understanding of issues and the context before the assessment.	Collect, compare and review information about local, regional and national level issues, such as: <ul style="list-style-type: none"> ▪ Disaster profile: Hazard types, frequency and intensity. ▪ Shelter design drawings and photographs. ▪ Climate change projections: National and local climate studies. ▪ Urban demographic aspects, e.g. population density and growth trends. ▪ Environment: Both natural (topography, elevation, water bodies, etc) and man-made (land-use patterns, settlement patterns, infrastructure, etc). 	<ul style="list-style-type: none"> ▪ Agency project documents. ▪ National census and statistics offices. ▪ Municipal and district government offices. ▪ Resource centres of NGOs and UN agencies. ▪ Local urban and regional development planning offices. ▪ GIS and cartography offices for maps. ▪ Remote sensing offices for satellite photos and maps. ▪ Meteorological offices and weather stations. ▪ National and local libraries. ▪ Civil sector forums.

Table 4: Guide for collection of background information

3.3 Plan Fieldwork & Establish Local Contacts

Fieldwork constitutes the central element of the assessment process and needs to be carefully planned. This is best done in consultation with the agencies whose projects will be evaluated. Some basic guidelines are given below.

- Plan for contingencies arising from local conditions and allow for extra time.
- Through project implementing agencies, identify local contact persons and if possible contact them beforehand and inform them about the visit, its purpose and duration.
- Ideally, local contact persons should be staff of the implementing agencies that are knowledgeable about the project. This will allow carrying out the agency level assessment.
- Try to find out if the local contact persons would be able to assist in providing introductions to beneficiary communities.
- Find out what logistics support for fieldwork is available locally.
- Where necessary, appoint suitable translators in consultation with the local contact persons.

4.0 ASSESSMENT STAGE: COMMUNITY LEVEL

As mentioned earlier, this is the central part of the assessment process. It consists of three main activities:

- **Hazard mapping and ranking:** Arrange this as a half-day event in consultation with the local contact persons, who should organise the appropriate beneficiary community members to attend. If appropriate this can be an evening event when a broad spectrum of the community is able to attend. Run this as a workshop by selecting a suitable venue and have provisions such as flipcharts and markers ready. If the community is semi-literate, explore other options such as using sticks on the ground. Keep a budget for tea/snacks, and a per diem for participants if that is the local norm.
- **Key informant interviews:** Conduct semi-structured interviews with local key informants from the beneficiary community, or residents of the shelter project. Select the appropriate interview respondents in consultation with local contact persons. Ensure a balance of male and female respondents, and take special care to include the most vulnerable and poorest community members. Conduct the interviews with a wide range of community members including project beneficiaries, local builders and construction workers, and others directly associated with the project.
- **Direct observation and documentation:** To supplement the interviews, observe and inspect the shelters and their component parts, and the site conditions. With permission, document by extensive photography.

4.1 Hazard Mapping and Ranking

Hazard mapping

Time: 1 $\frac{1}{4}$ hours (45 minutes for group work and 30 minutes for presentations and discussion)

- Work with about 25-30 residents of the area or community where the case study project has been implemented. Ensure that beneficiaries and/or residents of the shelters built in the project are included, as well as others associated with the project (local builders, materials suppliers, etc)
- Form break-out groups of 4-5 participants in each group. Ensure that each group has a mix of different types of people (e.g. women, men, elderly, etc). Staff of the agency working in the area can also join, but distribute them among the different break-out groups.
- Ask each group to plot on a flipchart the main features of the area such as houses, community buildings, roads, natural features, etc. Exact details are not necessary; for example, not all the houses have to be mapped, only the area where houses are located, using a symbol for housing.
- Then ask each group to identify the hazards and which areas and resources are most affected, highlighting areas in the map with different colours for each hazard, using colour marker pens. Different hazards may affect the same areas, so use different colours in overlapping patterns for such areas.
- Consider exposure to hazards as a key criterion.
- Ask each group to present its hazard map in 3-5 minutes.
- Compare the different maps, identify commonalities and differences, and discuss with the whole group to build consensus.
- Keep a record (digital photos) and/or store all the hazard maps for future reference.

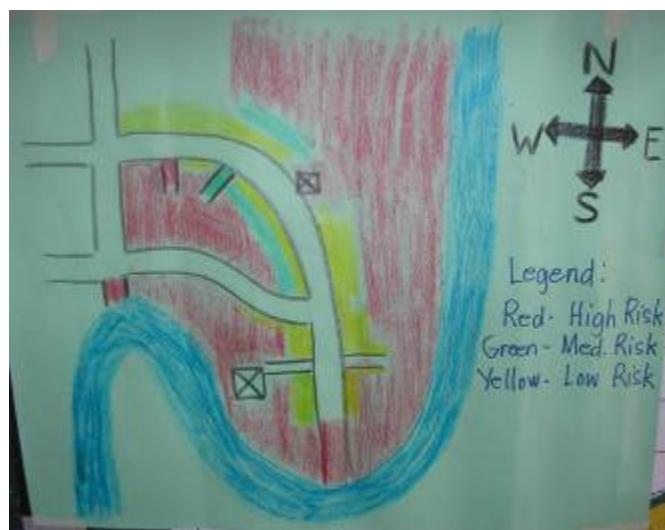


Fig. 2 Example of

a Hazard Map for

flooding in a ‘barangay’ (neighbourhood) in Dagupan, Philippines. Note that this is only an indicative example.

Hazard ranking

Time: 50 minutes (20 minutes for group work and 30 minutes for presentations and discussion)

- Continue working with the same groups as before and ask each group to fill out the worksheet below.
- In case the participants are partly or not literate, the evaluation team member(s) and agency staff should assist in the writing task.
- Ask the participants to list the main hazards that the community faces in the extreme left column.
- Ask them to then rank the hazards, using tick marks or crosses in the next three columns.
- Explain that the hazards should be ranked not only in terms of their frequency and intensity, but also the sensitivity of the areas and people affected.
- Ask each group to present its hazard ranking in 3-5 minutes.
- Compare the outputs of the different groups, identify commonalities and differences, and discuss with the whole group to build consensus.
- Use both a flipchart and worksheet to record group responses, and preserve the outputs for future reference (digital photos and/or hard copies).

Hazard	High Risk	Medium Risk	Low Risk

4.2 Key Informant Interviews

- ***Checklist Template***

<i>Date</i>	<i>Location</i>	<i>No</i>		
<i>Name</i>	<i>Sex, Occupation</i>			
<i>Implementing Agency & Year Built</i>				
1) Inputs				
a) How were beneficiaries selected and houses allocated?				
b) What consultation took place?				
c) What was the cost of the shelter?				
d) Contribution by beneficiary?				
e) Do you think the cost is ok?				
f) Any specific engagement in training & skill transfer activities?				
g) Any engagement in general DRR training or awareness-raising?				

2) Outputs	
a) What resilience features are included?	
b) Do they work well?	
c) Were they available at the right time?	
d) Is the quality of construction and building materials good?	
e) Is the site free from flooding/water-logging? Have plinths been raised?	
f) Earthquake and/or wind-resistant design if relevant in the context?	
g) Has the site been compacted against settlement?	
h) Has appropriate landscaping been done (wind-protection, shading, etc)?	
i) Are there adequate infrastructure and services?	

3) Result	
a) Did the most vulnerable people benefit from this project?	
b) Did anybody here use the resilience options by themselves?	
c) Are the shelters easy to repair and maintain? Is it too expensive?	
d) Is it easy to extend the shelter?	
e) Is the shelter too small or big?	
f) Is the room layout ok? Does it accommodate household needs?	
g) Is it too hot or cold in the shelter? Does it protect from rain?	

4) Impacts & Effects	
a) Did the resilience options meet user needs?	
b) Were local workers involved in building the shelter?	
c) Were the building materials from local sources?	
d) Did the project reduce the disaster risks of the wider community?	
e) Do you/households/ community feel more secure?	
5) External Factors	
a) Did anything outside the control of the agency and community affect the project?	
b) How was it addressed?	
Anything else you would like to add?	

5.0 ASSESSMENT STAGE: AGENCY LEVEL

An assessment similar to that conducted at the community level should be done with project staff of the concerned agency who are familiar with the shelter project. This will allow triangulating, validating and addressing any gaps in the findings of the community level assessment. This stage will include the following activities:

- **Hazard mapping and ranking:** For hazard mapping, it would be best to include agency staff in the community level exercise. If there are a number of staff members, they should be divided among the different break-out groups. If there are only 1-2 staff members, they can assist in facilitating the exercise. For hazard ranking, the flowchart used in the community level assessment (section 4.1) should be used with agency staff.
- **Key informant interviews:** Using the checklist above in section 4.2, as at the community level conduct semi-structured interviews with key agency staff. Ensure that interviews at the community and agency levels should be done separately to avoid any possible bias or influence.

6.0 CONSOLIDATION STAGE: AGENCY LEVEL

6.1 Analysis of Findings/Draft Report

- A lot of data might be amassed from secondary sources and the assessments; so review and screen the data to select the findings most relevant to the concerns of the evaluation.
- Remember that if the draft report is too large, it might not be very effective in communicating the outcomes of the assessment to stakeholders. Look for a right balance between the contents and volume of the report.
- As a rough guide follow the structure of this tool: Three stages, each with a series of activities as shown at the outset in Fig. 1.
- At this stage, it is important to compare the findings of the community and agency level assessments and identify similarities and differences. These should be analysed and interpreted, and discussed in the draft report.
- Think forward to the next stage on how the findings of the evaluation may inform strategies for building disaster resilient shelter.

Table 5 provides an indicative structure for the draft report. Note that this is only indicative, as the specific findings of the evaluation may require revising it, or even following a different structure. Revising the structure may also depend on recommendations from stakeholders for contextualising and adapting the tool for specific project contexts. Here

only the main sections and sub-sections are suggested. Additional sections and/or sub-sections can be included according to the evaluation findings.

SECTION NO.	SECTION HEADING
1.	Introduction
2.	Evaluation Process
3.	Pre-Assessment Stage
3.1	Defining the boundaries of the evaluation
3.1	Review of secondary information
3.2	Initiating contact and finalising key local persons
4.	Assessment Stage
4.1	Community level assessment
4.1.1	<i>Hazard mapping</i>
4.1.2	<i>Hazard ranking</i>
4.1.4	<i>Key informant interviews:</i> <i>a) Inputs; b) Output; c) Result; d) Impacts & Effects; e) External Factors</i>
4.2	Agency level assessment
4.2.1	<i>Hazard mapping</i>
4.2.2	<i>Hazard ranking</i>
4.2.3	<i>Key informant interviews:</i> <i>a) Inputs; b) Output; c) Result; d) Impacts & Effects; e) External Factors</i>
4.3	Direct observation
5.	Consolidation Stage
5.1	Key findings: Matching community and agency level findings, and observations
5.2	Feedback from stakeholders
6.	Recommendations for disaster resilient shelter

Table 5: Indicative Draft Report Structure

6.2 Validation at Stakeholders Meeting

- When the draft report is ready, it should be presented to the agency or agencies commissioning the evaluation (in the case of this project, it will be SRG).
- Present to them the key findings of the evaluation and seek feedback in terms of identifying gaps and suggestions for improvement.
- Incorporate the feedback received at the meeting into the draft report afterwards (section 5.2 in Table 5). While all the feedback should be documented, use careful judgement to decide what is relevant and useful.
- Use the flowchart in Table 6 below to facilitate and record the discussions at the meeting. Use a flipchart or whiteboard and ask participants to contribute.

KEY ISSUES	COMMENTS/ SUGGESTIONS
What did the evaluation achieve adequately?	1. 2. 3. etc
How can these achievements be strengthened?	1. 2. 3. etc
What didn't the evaluation achieve? What are its shortcomings?	1. 2. 3. etc
How can these shortcomings be overcome?	1. 2. 3. etc
How can the evaluation inform and support disaster resilient shelter projects?	1. 2. 3. etc
FURTHER COMMENTS:	

Table 6: Validation Checklist

APPENDIX 3: List of Interview Respondents

AGENCY STAFF			
Name	Designation	Agency	Location
Joeseph Akaruru	Project Manager	Ministry of Infrastructure & Planning	Rarotonga, Cook Islands
Temanu Unuka	Infrastructure Coordinator	Aitutaki City Council	Aitutaki, Cook Islands
Panua Marsters	Builder	Independent Contractor	Aitutaki, Cook Islands
Tua Matepi	Builder	Partner Housing/ Red Cross	Mangaia, Cook Islands
Gill Vaiimene	Branch President	Red Cross Mangaia Chapter	Mangaia, Cook Islands
Felix D. Rathnasekara	Regional Programme Coordinator	Habitat for Humanity – SL	Galle, Sri Lanka
G.K. Liyanage	Programme Coordinator	Caritas - SED	Galle, Sri Lanka
Clarance Sutharsan	Project Director	World Vision – SL	Colombo, Sri Lanka (interviewed in Kirinda)
Ajith Melder	Senior Coordinator	World Vision – SL	Colombo, Sri Lanka (interviewed in Kirinda)
BENEFICIARIES			
Name	Occupation	Agency	Location
Kuraono Pakochhi	Housewife	Emergency Architects	Aitutaki, Cook Islands
Piakura Messine	Housewife	Emergency Architects	Aitutaki, Cook Islands
Ngaupoko Hewett-Pukenga	Housewife	Emergency Architects	Aitutaki, Cook Islands
Serena Tuaiti	Hotel Housekeeper	Emergency Architects	Aitutaki, Cook Islands
Ioane Vaevae	Handyman (odd jobs)	Emergency Architects	Aitutaki, Cook Islands
Andy Matapo	Farmer	Partner Housing/ Red Cross	Mangaia, Cook Islands
Tei Nataakama	Pensioner	Partner Housing/ Red Cross	Mangaia, Cook Islands
Mum Atariki	Housewife	Partner Housing/ Red Cross	Mangaia, Cook Islands
Noka Tumaria	Mechanic	Partner Housing/ Red Cross	Mangaia, Cook Islands
Mohamed Mashur Fahira	Housewife	Habitat for Humanity – SL	Galle, Sri Lanla
Girly Gunawardena	Housewife	Habitat for Humanity – SL	Galle, Sri Lanla
Abdul Wadud	Trader	Habitat for Humanity – SL	Galle, Sri Lanla
S.W. Lily	Home-based Entrepreneur	Caritas - SED	Galle, Sri Lanla
K.D. Danister	Mason	Caritas - SED	Galle, Sri Lanla
Priyantha Hettarachehi	Construction Manager	Caritas - SED	Galle, Sri Lanla
Sadurdeen Rajeen	Fisherman	World Vision – SL	Kirinda, Sri Lanla
Malini Sitti Jasima	Housewife	World Vision – SL	Kirinda, Sri Lanla

APPENDIX 4: References

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