Building safety in post-disaster shelter self-recovery: A review of current knowledge

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I. Introduction

Each year, natural disasters damage or destroy the homes of hundreds of thousands of people worldwide. Between 1994 and 2013, more than 116 million homes were damaged by disasters (CRED, 2015). The frequency of climate-related disasters in particular – floods, storms, and droughts – has been increasing over recent decades, and this trend is expected to continue (Schilderman & Lyons, 2011; UNDSR, 2012; Schilderman, 2014). As the global population rises and more people are compelled to live in urban, hazard-prone areas, poor communities continue to be disproportionately affected due to dangerous building practices. Inadequate local construction standards, limited knowledge about safer construction techniques amongst local builders and householders, and building on restricted hazard-prone sites all contribute to this situation (Arnold & Burton, 2011; Schilderman, 2004). The number of people at risk of losing their homes, or being injured or killed as a result of unsafe construction, will continue to increase unless, as Davis (2016) states, “disaster risk reduction measures can radically expand to reduce losses in the poorest, most vulnerable communities”.

Building back safer

Disaster risk reduction measures are considered to be an essential component of any post-disaster strategy that supports affected communities. The recovery phase after a disaster can provide a critical opportunity to ‘build back better’ – a term that encompasses a community’s physical, social, and economic state, and refers to the possibilities for enhancing resilience across these domains (Clinton, 2006; Mannakkara, et al., 2014; Schilderman & Lyons, 2011; Paul, 2011; Wisner, et al., 2005). Using this window of opportunity to ensure that safer structures are built, ones that will be more able to withstand the shock of recurring hazardous events, is advocated by practitioners, policymakers, and academics alike (Schilderman, 2010; Ong, et al., 2016).

Restoring and rebuilding homes is essential for the safety, health, and livelihood restoration of affected communities (Duyne Barenstein, 2006; The Sphere Project, 2011). Government agencies and humanitarian organisations will instigate shelter programmes that are able to support a relatively small proportion of the shelter needs of a disaster-affected population (Parrack, et al., 2014). The majority will recover on their own, often beginning to act within days of a disaster to address their immediate shelter needs where they can, constructing makeshift temporary shelters, or beginning to repair or rebuild their homes using whatever materials are available to them, with no assistance or support from any external organisation (Flinn, 2015; Parrack, et al., 2014). Self-construction is often the most viable and least costly option (Green, 2008).

However, when affected communities build back themselves it is common for construction processes to include the same inadequate building practices as before, and for the repaired or rebuilt homes to leave householders at risk from future disasters (Green, 2008; Coburn & Spence, 2002; Parrack, et al., 2014). The additional expense of including hazard resistant construction techniques may be prohibitive for many householders, so that, even where adequate construction standards exist, investing in increasing the safety of their homes may not be a priority. The impact of limited resources can be exacerbated by a lack of understanding of safer building methods (Yahya, et al., 2001; Schilderman, 2004; Powell, 2011; Maynard & Barritt, 2015).

An overview of the shelter response to Typhoon Haiyan reported that “affected households that had received shelter assistance were widely reported to have achieved a higher level of Build Back Safer (BBS) standards when rebuilding and repairing their homes compared to those that relied only
on their own resources” (REACH Initiative, 2016). The level of implementation of BBS standards was related to the degree of control that agencies had over design and implantation, with shelters built entirely by agencies most consistently featuring BBS measures. Even though it is well-established that the majority of disaster-affected families will rebuild their homes themselves, and that these homes are less likely to incorporate safer construction techniques, humanitarian support that encourages safer building practices is in self-recovery is limited (Parrack, et al., 2014).

What is ‘self-recovery’ in post-disaster shelter?
The term ‘self-recovery’ has only recently become part of the common vocabulary in post-disaster shelter literature, even though it is the most widespread practice (Davis, 2016). The provision of support for household self-recovery was identified as a strategic objective during the response to Typhoon Haiyan in 2013 (Shelter Cluster Philippines, 2014) and has been a strategic objective in other humanitarian shelter responses since then (Maynard, et al., 2017). During this time, the term ‘self-recovery’ has been used in the post-disaster shelter literature with increasing frequency.

Understanding the concept of post-disaster shelter self-recovery is complicated by the fact that the term ‘self-recovery’ is used inconstantly in the shelter literature to describe a broad spectrum of activities. At one end, it refers to the unassisted self-repair and self-reconstruction householders engage in without any external support. In the context of shelter programmes that aim to support self-recovery, it commonly refers to programmes that provide material, financial or technical assistance (Maynard, et al., 2017). Reconstruction and repair may be carried out by affected individuals themselves, or households may engage the local informal building sector to carry out this work. However, describing the activities of beneficiaries as ‘self-recovery’ does not always reflect the actualities of a shelter programme. Owner driven reconstruction (ODR) programmes may be described as ‘self-recovery’, but in reality beneficiaries may have limited opportunities for choice, and may not be in charge of many aspects of the process (Davidson, et al., 2007; Powell, 2011). Some programmes that are described as ‘community-based’, ‘participatory’, or ‘self-build’ may also be labelled ‘self-recovery’, even though they are donor-led.

In searching for coherence in the concept of shelter self-recovery, the critical factor is the degree to which disaster-affected individuals are actors and decision makers in all of these different shelter activities. To be accurately described as ‘self-recovery’, the post-disaster shelter reconstruction process must be driven by the householder. Shelter programmes can be considered to support self-recovery if the beneficiaries are making key decisions about how to build their homes, and are in charge of the shelter construction processes (Duyne Barenstein, 2006).

Safety in shelter self-recovery – the evidence base
For humanitarian action to be effective and fully accountable, reliable, high quality evidence matters. Accordingly, there is increasing demand for evidence about what works in post-disaster shelter and how (Knox Clarke & Darcy, 2014). A recent analysis of the evidence base of evaluations in humanitarian assistance as a whole found that “with the exception of health and nutrition, most areas in the humanitarian sector suffer from a paucity of evidence, especially of studies that show a causal relationship between assistance and changes in targeted results” (Clarke, et al., 2014). The same report highlighted shelter as an area in particular need of robust evidence. Humanitarian interventions that support shelter are relatively under-researched, shelter programmes that support self-recovery even less so. A comprehensive review (Maynard, et al., 2017) that synthesised evidence for the impact of shelter-programmes supporting self-recovery reported a positive effect on “perceptions of safety and security”, but was not able to provide evidence about the safety of construction techniques or the hazard-resistance of reconstructed houses. To better understand...
how shelter programmes can effectively support safer shelter self-recovery, this review aims to synthesise current knowledge on safety in post disaster shelter self-recovery, with a particular focus on how safety in post-disaster shelter self-recovery can be maximised.
II. Method

Academic and grey literature sources have been searched for any articles, papers, or reports that discuss self-recovery processes during post-disaster shelter reconstruction. These articles and reports have been screened to identify those that address the safety of repaired and reconstructed houses – both improved safety and poor safety – as part of the shelter self-recovery process.

Terms for ‘self-recovery’
As the phrase ‘self-recovery’ can be used to refer to a wide range of processes and activities, the first step of the review was to establish as many alternative terms for the concept of ‘self-recovery’ as possible, to ensure that the literature search was comprehensive. So that all possible interventions and activities that include any elements of self-recovery would be captured, the set of terms for ‘self-recovery’ was developed systematically.

The review team devised an initial list of terms meaning self-recovery – for example, self-repair, self-built, owner driven - based upon their current knowledge of the field. Additional terms for self-recovery were searched for by examining reports and articles about certain types of humanitarian shelter programmes. Following Maynard, et al. (2017), a list was compiled of the kinds of humanitarian shelter programmes that are typically designed to support self-recovery. The types of shelter programme include:

- material assistance (such as construction materials, tools, salvaging and re-use of debris)
- financial assistance (cash or vouchers)
- technical assistance (such as training, construction monitoring, provision of guidelines/mass communications)

Three key humanitarian shelter resources – shelter literature in the Humanitarian Library, the Shelter Cluster website, and Shelter Case Studies - were searched for reports on these types of programmes. The search terms used to identify these reports were:


This search produced 1246 reports, all of which were screened by members of the review team for any additional terms meaning self-recovery that had not already been identified. New terms identified in this way were added to the initial list, to give a comprehensive final set of self-recovery terms that were used in the academic database search, and the search of the grey literature. The final list of words and phrases meaning ‘self-recovery’ is described in the following sections.
Academic literature search

Sources
The cross-disciplinary nature of the review subject matter meant that relevant articles and papers were likely to be published in academic sources across a range of subjects. The review team compiled a broad list of academic journals that publish articles in key subject areas: development studies, built environment, geography, anthropology, and medicine. This list of journals was cross-checked with the contents of a number of databases, to ensure that the database search would provide full coverage of this range of disciplines. The following academic databases were identified and searched for articles published between January 1970 and July 2016: ProQuest, Web of Science, EBSCO, PubMed, and Engineering Village.

Search strategy
The databases were searched for articles that contained terms for self-recovery, disaster, and shelter. Terms for [SHELTER] were searched for in the TITLE & KEYWORD database fields; terms for [DISASTER] were searched for in the TITLE, ABSTRACT and KEYWORD fields; terms for [SELF-RECOVERY] were searched for in the TITLE, ABSTRACT and KEYWORD fields.

The following terms were used:

**Shelter**: shelter, home, settlement, neighbourhood, neighborhood, village, dwelling, camp, hous*, housing, “collective centre”, accommodation, tent, tarpaulin, hut, community, architecture

**Disaster**: disaster, crisis, crises, catastrophe, hazard, conflict, “complex emergency”, “complex political emergency”, war, displac*, refugee, migration, IDP, flood*, earthquake, storm, hurricane, volcan*, cyclone, typhoon, landslide, landslide, tsunami, tidal wave, avalanche, fire, “climate adaptation”, drought, famine, starvation

**Self-recovery**: ‘self-recovery’, ”self recovery”, ”self-buil*”, ”self build*”, ”owner-driven”, ”owner driven”, ”recovery without assistance”, ”own assets”, ”self-help”, ”self help”, ”locally driven”, ”informal aid”, ”self-rescue”, ”self rescue”, ”self-reliance”, ”self reliance”, ”community built”, ”own resources”, ”own recovery”, ”own solutions”, ”self-repair”, ”self repair”, ”self-construct*”, ”self construct*”, ”self-reconstruct*”, ”self reconstruct*”, ”local capacity”, (build NEAR/5 themselves), (rebuild NEAR/5 themselves), (repair NEAR/5 themselves), (construct NEAR/5 themselves), (reconstruct NEAR/5 themselves)

Identification of articles for inclusion in the review

Abstract screening
The titles and abstracts of all articles were screened by two members of the review team to identify which documents should be obtained and their full texts read. Any disagreement or uncertainty about whether to take an article forward to the full-text stage was discussed by the whole team.

Articles with abstracts that met the following criteria went through to the next stage:

- All documents that are or appear to be about post-disaster shelter AND that discuss any shelter construction or reconstruction activities that are undertaken by members of the disaster-affected population themselves

Articles with no available abstract but whose title suggested that it might be eligible for inclusion were taken forward to the next stage.
Full-text screening – inclusion criteria

Full texts of articles that passed the abstract screening stage were scrutinised by two members of the review team. As any of the terms for self-recovery can, and often are, used to describe a range of beneficiary experiences in the shelter reconstruction process, the criteria that had to be met for an article to be included in the review were very specific. For the purposes of this study, the review team wanted to identify literature that described shelter self-recovery where householders were able to own the process, reflected in their ability to make key decisions throughout all stages of design and construction. Included reports and articles also needed to discuss the safety of the construction.

Criteria for inclusion in the review were:

- **Written in English**
- **Published 1970 onwards**
- **Describes post-disaster shelter reconstruction** - repair or rebuilding of homes that have been damaged or destroyed by a specific disaster. Householders with or without support from other organisations must be fulfilling their immediate shelter needs, and not be part of a longer-term development programme
- **Disaster is defined as a ‘natural disaster’**
- **Describes shelter repair or reconstruction activities that members of the disaster-affected population take responsibility for themselves.** This will exclude processes where, for example, beneficiaries provide manual labour to rebuild homes under the instruction of other persons leading the project; it will include projects that provide assistance or guidance, but where beneficiaries are active decision-makers in how their homes are rebuilt or repaired and are in charge of the process, either building the shelter themselves or procuring local labour to do so
- **Humanitarian shelter programmes were only be included if beneficiaries have been able to make key decisions about layout, materials, construction details and construction techniques used.** Programmes that require beneficiaries to choose a specified design, even where there are two or more designs to choose between, have been excluded. Programmes that recommend hazard-resistant design, where beneficiaries are free to build according to this design or not, as they choose, are included. Programmes that require inclusion of certain safety features in the construction, usually as part of a cash-based programme, have been included.
- **Describe shelter recovery activities engaged in by householders and supporting organisations in sufficient detail that it is possible to judge the degree to which householders have been involved in the process, with particular regard to making decisions about the design and construction of their houses.** These will mostly be case studies and programme evaluations and reviews; overviews of region-wide responses will usually not be included as they do not provide sufficient detail about the self-recovery process.
• **Must include discussion of aspects of safety (or lack of) in the construction process,** where safety is defined as **the degree to which the shelter structure is likely to withstand future hazards or shocks.**

Bibliographies of included articles were also checked for any relevant studies not picked up by the database searches, and a citation search of key articles was carried out.

### II. Grey literature search

**Sources**

The review team identified key humanitarian literature sources likely to contain information about post-disaster shelter. To keep the humanitarian literature search manageable within the scope of the project, the following key sources were chosen:

- Architecture for Humanity
- ALNAP (ALNAP publications only)
- British Red Cross
- Building and Social Housing Foundation
- Build Change
- Care UK
- Global Communities
- Habitat for Humanity
- IFRC
- Interaction
- Institute of Migration
- IRIN
- Norwegian Refugee Council
- NSET
- Oxfam
- Reach Initiative
- Reliefweb
- Save the Children
- Shelter Case Studies
- Shelter Cluster
- UN-HABITAT
- UNISDR (Preventionweb)

**Search strategy**

The majority of these sources are searchable via organisation websites, using their own search functions. The website search facilities vary hugely – some allow comprehensive searching of a library of reports and research articles; others have very limited search functions that apply across the whole site, and do not recognise Boolean search terms. Searching for articles that contain [search term 1] AND [search term 2] AND [search term 3] often yields articles that contain *any* of those terms, rather than only articles that contain *all* of them. Because of these limitations, searches using the same three sets of terms as used for the academic literature search resulted in an immense number of hits, the majority of which, it was clear from the title alone, were not relevant to this review. The review team therefore decided to utilise two complementary approaches in order to maximise the likelihood of retrieving all relevant documents:

1) The website of each chosen source was searched using only the set of terms for ‘self-recovery’, via the website’s general search facility. Although this approach picked up some articles outside the interest of this review, it eliminated very many of reports about shelter or disaster that were not relevant.

The following terms were used:

`self-recovery, self recovery, self-buil*, self buil*, owner-driven, owner driven, recovery without assistance, own assets, self-help, self help, locally driven, Informal aid, self-rescue, self rescue, self-reliance, self reliance, community built, own resources, own...`
A large proportion of the articles identified in this way were short news reports, opinion pieces and overviews. In order to identify all relevant shelter programme evaluations and project reports, a second approach was also used.

2) Many humanitarian websites display a dedicated “resources” or “publications” section, and categorise documents according to key terms. Where this facility was available, appropriate filters were applied to identify relevant documents. For example, some websites allowed selection of all articles and reports that had been assigned the category “shelter”. For websites with a relatively small number of documents categorised in this way (<200), all such articles were retrieved and assessed for whether they included information about self-recovery processes. Some websites contain such a vast library of resources that the “shelter” filter alone was not sufficient to offer up a number of documents that was manageable within the limitations of this project. For these websites, additional filters for type of document and type of emergency were utilised. Where no filter on “shelter” was available in the resources/publications section but searching for specific terms in titles/keywords was possible, “shelter” was used as a search term. Alternative appropriate filters (e.g., “disaster risk reduction”, “self-help”) were selected to search publications on shelter specialist websites.

The review team also investigated using advanced search facilities in Google, which allow searching of specific terms on individual websites, and limiting the search to particular document types, such as pdfs. Whilst it is possible to use Boolean operands to some extent on Google, the limitations of Google’s search facility meant that this was not an efficient way to find relevant grey literature. Google allows searching for particular terms either in the title of the web-page (which is not the same as the title of a document), or in the full text of the whole page.

Identification of articles for inclusion in the review

Reports and articles for inclusion in the review were identified using the same criteria as for the academic literature search. Many documents retrieved in the grey literature search do not have abstracts or summaries, so were scanned in full in the first instance, and then scrutinised more closely to determine eligibility in the second stage.

Quality

It is common practice to compile some measure of the quality of studies that are included in a review such as this one, and to use quality rating as criteria for inclusion. The aim of assessing study quality is to understand how reliable the information it contains is, and how relevant the findings are to the research question that the review is considering. In the field of post-disaster shelter safety, key areas for consideration are likely to include the overall quality of reporting, the quality of the shelter programme, appropriateness of study design, generalisability of findings and how well outcomes are measured.

In their review of evidence for the impact and effectiveness of shelter programmes that support self-recovery, Maynard et al. (2017) reported that the most common reason for exclusion was because the document did not sufficiently detail the intervention or the outcomes, and those that were included “did not contain sufficient information on the methodology for the research team to confidently and accurately attribute a quality rating”.

[10]
As this review aims to synthesise what is known about safety in shelter self-recovery, rather than to evaluate effectiveness or impact of shelter interventions, the decision was taken not to assign quality ratings to the documents that were found. This would ensure that all documents that met the other strict inclusion criteria could be reviewed, and contribute to an analysis of the quality of evidence that is currently available in this field. The quality of the available evidence, and the associated implications for its utility, will be analysed further in the Discussion section.
III. Findings

Studies included in the review

Academic literature
After deduplication and rejection of clearly irrelevant items, the initial database search identified 1012 articles. Of these, 53 passed the abstract screening stage. It was not possible to access the full text of 3 articles, leaving 50 full texts that could be fully screened for inclusion. Full screening yielded 6 articles and book chapters that met the criteria for inclusion in the review. Two of these described the same shelter programme - the more detailed article was chosen for inclusion, yielding a total of 5 articles.

Grey literature
Searching the selected humanitarian literature resources identified 1068 reports and articles; 94 passed the first screening stage; 15 were assessed as meeting the study inclusion criteria. Two of these were reports by one agency on the same shelter programme, and were considered as one record for the purposes of analysing programme information, yielding a total of 14 shelter programme case studies or reviews.

In total, 19 reports and articles met the inclusion criteria (see Annex 1 for a full list). The majority of articles that were fully screened did not discuss safety as any part of the building process or outcomes. Of those that did discuss safety, close reading revealed that the recovery processes were not self-recovery according to the definition developed for this review. As a typical example, one programme described as ‘community-led self-help’ appeared in fact to be a donor-led participatory programme in which beneficiaries provided labour and received some construction training, but did not appear to have ownership of key parts of the process. Other reports made broad statements about community involvement, or that recovery was ‘owner-driven’, but provided too little detail about what actually happened for it to be possible to determine whether beneficiaries were engaged in self-recovery or not.

<table>
<thead>
<tr>
<th>Document type</th>
<th>Disaster location</th>
<th>Disaster type</th>
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<tbody>
<tr>
<td>Agency shelter programme reviews / case studies (n=14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shelter Projects</td>
<td>Philippines 5</td>
<td>Typhoon</td>
</tr>
<tr>
<td>Care International</td>
<td>Pakistan 4</td>
<td>Hurricane</td>
</tr>
<tr>
<td>CRS</td>
<td>Indonesia 3</td>
<td>Cyclone</td>
</tr>
<tr>
<td>BRC</td>
<td>Myanmar 1</td>
<td>Earthquake</td>
</tr>
<tr>
<td></td>
<td>Columbia 1</td>
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<td></td>
<td>Vietnam 1</td>
<td>Flood</td>
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<td></td>
<td>China 1</td>
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<td>Haiti 1</td>
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<td>Peru 1</td>
<td></td>
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<tr>
<td></td>
<td>Uganda 1</td>
<td></td>
</tr>
<tr>
<td>Academic journal articles (n=5)</td>
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<tr>
<td>Programme delivered by Intermediate Technology</td>
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<td>Development Group</td>
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<tr>
<td>Programme delivered by Coffee Growers Organisations</td>
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<tr>
<td>Government reconstruction programme</td>
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<tr>
<td>University department project</td>
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<tr>
<td>Evaluation of unassisted self-recovery</td>
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</tr>
</tbody>
</table>

Table 1. Document type, location, and disaster type of reports included in the review
Unassisted self-recovery

Unsafe building practices

Just one article was identified that evaluated the safety of post-disaster shelter that had been built by owners without any external assistance or advice [4]. An interview study with self-building householders that had not received any assistance found that they less frequently incorporated specific hazard-resistant features (such as continuous beams) in their house design, compared with donor-built houses in the same region. This appeared to be largely due to economic constraints and limited awareness and skills of local workers, mainly masons, of resilient construction techniques; knowledge about climate-resilient housing was often absent among self-builders. Self-builders appeared address safety within the context of the construction of their houses in a different way, as they were more likely to have a safe space – a “solid box” – in their house, where the family could retreat during catastrophic typhoons. Donor-built houses had no such emergency facility. It is worth noting that this study has an extremely small sample of just 10 households in each of the self-built and donor-built groups (alongside interviews with 2 small groups).

One case report included the anecdotal observation that affected households that did not receive cash or technical assistance (because they did not own land or had damaged houses) often rebuilt dangerous brick structures [8].

Safer building in unassisted self-recovery

No case studies or reviews were identified that reported in any detail about safer construction practices amongst householders who repaired or rebuilt their homes without any external support. Anecdotal observations about safer construction in unassisted self-recovery were included in a number of documents, but these observations were generally brief, limited to one or two sentences. Observations included:

- families who did not receive cash grants copied safer construction techniques because they had free access to the safer construction training for beneficiaries provided by the supporting organisation [13]
- families that did not receive direct assistance replicated the construction techniques used in the project, and carpenters and masons trained by the project had begun to advocate for the use of safer construction methods [12]
- beneficiaries who learned new masonry techniques were employed by non-beneficiary families to build their houses [15]
- safer construction methods were implemented by households that had not received assistance, thanks to improved understanding of build-back-safer measures within the wider community [17]

No additional information was reported about these processes or activities.

Assisted self-recovery

Almost all – 18 out of 19 – of the reports that met the inclusion criteria for this review were about shelter self-recovery amongst communities that received some support from Government, NGOs and other organisations. The table below shows the type of support provided by these programmes:

[13]
The amount of detail provided about the structure of these programmes and how they were delivered varied enormously – from a few paragraphs in a short two-page case report, to many pages in a comprehensive programme evaluation. Key elements within each programme that were designed to encourage safer building practices have been identified, as far as possible from the information provided, and are summarised in the following table.

<table>
<thead>
<tr>
<th>Type of support included in shelter programme</th>
<th>Number of programmes offering type of support (N=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash/vouchers</td>
<td>15</td>
</tr>
<tr>
<td>Technical assistance</td>
<td>14</td>
</tr>
<tr>
<td>Training for householders / local artisans</td>
<td>14</td>
</tr>
<tr>
<td>Construction guidelines/information</td>
<td>11</td>
</tr>
<tr>
<td>Materials</td>
<td>5</td>
</tr>
<tr>
<td>Tools</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 Type of shelter support provided

<table>
<thead>
<tr>
<th>Key features of shelter programme aimed at improving safety</th>
<th>Number of programmes including feature (N=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical assistance</td>
<td>14</td>
</tr>
<tr>
<td>Training in safer construction techniques</td>
<td>14</td>
</tr>
<tr>
<td>Monitoring of construction process</td>
<td>13</td>
</tr>
<tr>
<td>Written guidelines/information about safer construction techniques</td>
<td>11</td>
</tr>
<tr>
<td>Householder / contractor participation in construction of demonstration building</td>
<td>5</td>
</tr>
<tr>
<td>Cash conditional on compliance with safer building guidance</td>
<td>10</td>
</tr>
<tr>
<td>Improved hazard resistance of local building techniques</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3 Key elements of programme that improved safety

Some of these features overlap – expert technical advice about safer construction was often provided through training sessions and during monitoring of the construction process. Programmes that provided cash conditional on compliance with guidance on safer building techniques offered
monitoring and technical advice during the building process, to enable beneficiaries to meet the programme requirements.

As the selection criteria for this review excluded shelter programmes that required beneficiaries to choose a pre-determined house design, the compliance element of all of these programmes concerned inclusion of recommended safer building techniques or features, rather than compliance with a specified design. One review described householders who had begun reconstruction prior to the initiation of the shelter programme. The construction work that they had undertaken had not included hazard-resistant techniques. The programme provided expert technical advice on remedial measures that could be taken to ensure that modified or non-compliant houses could be made compliant [3].

Monitoring of construction was a key feature of the majority of programmes (13/18), but this was not always as effective as the delivering organisation would have hoped. The most significant issue reported was the capacity of programme staff to carry out the intended programme activities.

“Not all of the implementing partners had the shelter experience or the staff capacity to cope with the project requirements.” [11]

“The 120 field monitors and community volunteers had only a few days technical training. It was not realistic to expect them to check the construction quality of 3,400 unique houses.” [8]

Another programme overview identified similar issues with the delivery of parts of the programme designed to improve safety. The programme management was unable to deliver training and technical assistance in line with the pace of reconstruction, partly due to a reluctance amongst major donors to fund training and technical assistance [3].

The capacity of some organisations to monitor construction and provide technical advice was stretched by the freedom of choice exercised by householders.

"Completed homes were likely to be ‘safer’ than the construction practices that have become prevalent over the past 30 years but cannot be described as earthquake or hazard resistant. The freedom which was a strength also lead to a wide variation in quality and divergence from design principles” [8]

“Because households were free to choose the construction materials they wanted, giving out disaster risk reduction advice to each household was difficult.” [11]

Most of the programme descriptions included an element of training in safer construction techniques (14/18); participation in initial training sessions was often necessary for beneficiaries to receive further material or cash support. A subgroup of these reports explicitly described how the supporting organisation or its partners had developed the hazard resistance of construction materials and techniques that had traditionally been used by local communities (6/18). Of these six, three programmes reported how they had conducted research into vernacular construction that had survived disaster, and how this had informed their development of improvements in the hazard resistance of local techniques.

“The main aim was to record the different types of structures that survived, the techniques and practices that largely withstood the flood waters and the ones that led to house collapse. Once the best construction methods were identified and improved they were
compiled into a construction manual used for practical and theoretical capacity building
trainings for affected households." [13]

A common feature of programmes that developed the hazard resistance of local construction
techniques is that they had the resources to do this – especially the necessary time commitment.

“One of the problems ITDG faced in later work was that development agencies were often
in a hurry to reconstruct. In no other project was the ITDG team given the six months it
had spent in the Alto Mayo to get the technology and methodology right. Haste does not
allow for as much participation and training as would be wanted.”[1]

Amongst those programmes that provided training in safer construction, around one third (5/14)
offered the opportunity for beneficiaries and local builders to participate in the construction of a
prototype house. This was widely regarded as a successful means to build skills and transfer
knowledge.

“The demonstration of the model house proved to be an effective tool for knowledge
transfer and skill building, as the communities learnt a new skill, and also became aware
of DRR features that could strengthen their house. Prior to this, they were unaware of
techniques to make the house resistant to disasters. 86.9% respondents had
participated in the demonstration of the model house and 96% of them found it useful
as they learnt about construction methods and disaster risk reduction (DRR) features
and with this knowledge, they could help others to rebuild their houses.”[10]

However, knowledge about safer construction techniques did not guarantee their implementation.
One evaluation reported that:

"local artisans were centrally involved in actual reconstruction work and experiential
learning about SRTs [seismic-resistant technologies]. But, despite generally possessing
more knowledge about SRTs, they had little authority to make decisions about
construction styles, which largely rested in the hands of the homeowners.”[3]

Programmes that provided written advice and information about safer building practices generally
used posters showing construction typologies and techniques that could make houses more hazard
resistant, and instruction manuals. One programme produced a music video and jingles to promote
build back safer messages [18]. Generally, the impact of these approaches is reported in the vaguest
of terms:

“These behaviour change communication methods reinforced knowledge/skills that
resulted in the adoption of the “build back safer” techniques.” [18]

Other programme reviews offered similarly imprecise descriptions of how build back safer messages
were communicated:

“Many field visits were made to ensure that the messages were being disseminated to
communities and used in the construction” [10]

Neither of these programme reviews reported on how well beneficiaries had understood this
information, or attempted to measure the impact that it had on construction techniques. One
programme review, however, did report on the impact that of lack of training and build back safer
materials can have. In the absence of these resources, beneficiaries used the distributed shelter kits
to constructed unsafe shelter [19] (see the next section for more information).
Follow-up / End of programme evaluation

End of programme or follow-up evaluations that considered building safety were described in just four (4/18) documents. All the rest (14/18) reported no information about the impact of the parts of the programme that aimed to improve hazard resistance. One programme final evaluation identified the percentage of beneficiaries that had built houses that adhered to Sphere guidelines (89%), but this in itself does provide reliable information about the hazard resistance of these houses.

The relevant follow-up/programme evaluation information reported in the four documents is summarised below:

- One region suffered a second earthquake during the reconstruction process of one shelter programme, demonstrating the hazard-resistance of the new technology – all 70 houses that had already been built with the new technology withstood the quake. Although no additional details are given, this report indicates that the spread of the safer building technology to other parts of the region was assessed sometime after the programme had finished:

  "An external evaluation the next year found that quincha had become a mainstream technology in the Alto Mayo, accounting for 30% of the housing stock compared with 7% nationwide." [1]

- A 3-month follow-up assessed the percentage of houses that had included specific safety features, such as posts fixed firmly into the floor, cross-bracing, quality of roof fixings, and how well beneficiaries thought their houses would withstand hazardous conditions. Between 89% and 100% of beneficiaries had included three of the six safety features examined, all concerning secure fixings; 20% had incorporated wall cross-bracing, 46% appropriate roof projection, and 62% adequate roof pitch. [10]

- One programme follow-up at 6 months and 18 months assessed self-reported levels of understanding of safer construction measures, and how well beneficiaries thought they had applied them in the construction of their houses. The follow-up also included field visits that incorporated technical assessment of the houses. A description of the findings of these assessments is reports a “generally a good uptake of the main build-back-safer measures...although in some cases this was not very well done”. Quality of foundations was difficult to assess as almost all building had been completed. The quality of implementation of some build-back-safer measures was found to be poor in some houses, and specific construction weaknesses are described, along with suggested reasons – lack of resources, lack of understanding of construction principles, and varying levels of technical support.

  “It was very noticeable that areas where the roving teams offered more support, or where community cooperation was more widely used, achieved much higher and more consistent construction standards. In the worst areas the application of build-back-safer measures was patchy and there were flaws in the basic structural arrangement of houses. In the best cases, the quality of construction was exceptionally good and the build-back-safer measures were fully applied.”[17]

The fourth reported follow-up identified aspects of the programme that had had a negative impact on building safety.
• One year after the end of the shelter programme, follow-up visits assessed the safety of the houses. This programme had provided beneficiaries with materials and cash in the absence of safer construction training or information dissemination:

“After logistic delays materials were distributed without IEC materials or full training of builders in build back safer technology... A September 2015 shelter repair assistance report on Post Distribution Monitoring on Building Quality highlighted serious shortcoming in improving resilience of shelters, with 94% of roofs assessed as weak or very weak due to the lack of knowledge in build back safer by carpenters. In addition, 80% of walls still needed bracing and 80% of columns required treatment. Similar problems existed in other structural components” [19]
IV. Discussion

What does make shelter more – or less - safe?
To gather reliable and useful information on what makes shelter safer in post-disaster self-recovery, we need to be able to:

- Define what self-recovery means
- Have a clear idea of what has happened during the shelter reconstruction process, whether it is assisted or not
- Measure the safety of the construction that has taken place

All of these are necessary in order to understand which aspects of humanitarian shelter programmes have had an impact on construction safety. The literature that has been reviewed here points to some aspects of shelter programmes that may have an impact on the safety of the houses built by affected householders. The evidence assessed for this review is limited by shortcomings across all of these areas, which are explored further in the next section. The following observations need to be considered in the context of these limitations.

Technical support
Training householders and artisans in safer construction techniques is a key component of shelter programmes that aim to support self-recovery, but monitoring construction to ensure that hazard-resistant features are effectively incorporated is likely to have a substantial effect on the whether this training has an impact. Providing technical support requires time, expertise, personnel, and sufficient funds. The capacity of the delivering organisation to provide technical assistance is crucial, particularly when householders are able to exercise freedom of choice in the range of materials and techniques used, as supporting this approach is may be more resource-intensive than other types of shelter programmes.

Adapting local construction techniques
Adaptation of local construction techniques to increase their hazard resistance was a common features of a number of programmes. This approach can support affected householders with safer construction methods that are accessible and can be easily replicated. New technologies are more likely to be adopted by communities if it they are easy to modify by end-users, which increases the likelihood that such methods will continue to be used and developed (van Leersum & Arora, 2011). Effective adaptation of local methods requires a significant time commitment, which may be problematic with regard to reconstruction timetables or donor financing.

Knowledge transfer
Anecdotal evidence reinforces the theory that knowledge about safer construction techniques can transfer to non-beneficiary households, either via free access to training, transfer of knowledge between communities, or employment of trained artisans.

Unsafe construction
There is some evidence to support the theory that shelter self-recovery amongst householders who have not received training or technical assistance is more likely to be unsafe.
Quality of reporting

What is ‘self-recovery’ in post-disaster shelter?

The most challenging aspect of the literature search was determining whether a shelter reconstruction process could be defined as ‘self-recovery’, as this is dependent on understanding to what degree the process has been driven by the beneficiaries. Numerous documents were excluded from this review because they did not describe the shelter recovery process in sufficient detail to allow a clear understanding of the role of beneficiaries – most notably, the parts of the process that beneficiaries took responsibility for and were able to make decisions about.

A particularly imprecise term that is frequently used to describe shelter programmes is ‘owner driven’. Although this description “implies that the home owner is in control of all aspects relating to the brief, the design and the construction process with the donor assisting in a financial and technical capacity only” (Aubrey, 2008), is not consistently employed in this way. In the absence of a more informative description of activities, the term ‘owner driven’ cannot be relied upon alone to identify programmes that support self-recovery. Reports that made general claims about the role of the beneficiaries in processes that they described as ‘owner driven’ without description of what actually happened during the shelter programme could not be included (for example, reports on the Government response to the 2001 Gujarat earthquake, including Duyne Barenstein (2006); Powell (2011)).

Programmes that supported self-building by providing cash but that also specified designs that beneficiaries were obliged to conform to could not be included either, on the grounds that this approach does not allow participation in initial decision making in the design of houses, or offer the capacity to make meaningful choices. Taking a leading role in managing the building process does not guarantee that beneficiaries are fully empowered – they may still have little option but to manage with the choices given to them, with varying degrees of support and guidance. (Davidson, et al., 2007).

Unassisted Self-recovery

Even though the majority of affected communities will begin to repair and rebuild their homes immediately after a disaster with no external support, much of the reporting about unassisted shelter self-recovery is anecdotal, or vague. A number of documents reported observations about how safer construction techniques that had been included in shelter programmes had spread to non-beneficiary households, but these observations limited to a few sentences or less. Invariably, there was no informative analysis of how, or why, this had occurred. More coherent, in-depth reporting about what happens in these circumstances would make a significant contribution to our understanding of how best to support safer self-recovery.

Quality of studies / evaluations

Effective evaluation

End-of-programme assessment and reporting is routine in the humanitarian sector, at multiple levels of analysis – programme, agency, sector, disaster (Buttenheim, 2010) - but traditionally these have tended to be process evaluations, focusing on programme implementation and whether outputs have been achieved rather than outcomes or impact (White, 2009; Nath, et al., 2017). There is little in the way of effective impact evaluation: “theory-based, reliable evidence causally linking the interventions with the observed outcomes” (Puri, et al., 2014).
The reports and studies reviewed here are a clear reflection of this state of affairs. Theories of change are implicit in the design of many of the shelter programmes included in this review – e.g., designing a programme to include participation in model house building and other types of training in safer building practices reflect theories about knowledge transfer and engagement - but any assessment of the impact of these aspects of the programme is largely absent from programme evaluations and reports. Beneficiary interviews may suggest that build-back-safer messages have been communicated; without any information about whether and how they have been implemented, there are missing links in the causal chain of understanding how input relates to outcome and impact. Knowledge of safer construction practices alone does not guarantee that householders will include them when building their homes (Powell 2011); effective dissemination of build-back-safer messages does not inevitably translate to an effective programme in terms of improving construction safety.

The importance of carrying out impact evaluations of humanitarian programmes has begun to be more widely discussed over the last decade (Puri, et al., 2014; White, 2009). The kind of experimental and quasi-experimental impact evaluation methodologies frequently advocated in these discussions are often reliant on counterfactual logic – ‘what would have happened without the intervention?’ – to infer causality, and are assumed by many to be the best or only robust methods. But the complex nature of humanitarian shelter programmes and the circumstances within which they operate means that such methods are less suitable, and the notion they are necessarily superior techniques has been challenged.

In their study of designs and methods for impact evaluation, Stern, et al. (2012) propose that there are alternative evaluation methods that can be equally robust and credible. Particularly relevant for evaluation of shelter programmes, especially those that support self-recovery, is the possibility of carrying out ‘case-based studies’. Methods that invite comparisons across a number of ‘cases’ – in this context, shelter programmes – may be especially suitable; Qualitative Comparative Analysis (QCA), for example, systematically compares cases in a way that allows exploration of how and why some interventions were successful in achieving a particular outcome while others were not (Stern, et al., 2012; Schatz & Welle, 2016). However, the impact of a shelter programme cannot be evaluated without reliable information about programme activities and outcomes.

Are the houses really safer?

An effective evaluation of a programme that aims to improve shelter safety will measure safety - by assessing how well hazard resistant materials and techniques have been adopted by householders, or how well houses withstand future disasters through long-term follow-up. Without these, is it not possible to assess whether the aim of improving building safety has been achieved, which in turn makes answering the question “what makes shelter self-recovery safer?” even more challenging.

Most reports about shelter programmes that aim to encourage safer building practices do not measure construction safety in any meaningful way, and very few evaluate building safety over the long-term. A very small number of studies reported on these issues: 4 out of 18. Many of the reports included in this review are short case reports, and they contain little useful information. Longer-term follow-up was reported in only one of the studies. This reflects previous findings that most of the information about the outcome and impact of shelter programmes comes from observations and evaluations that take place during or soon after the end of a project (Schilderman, 2014).

One of the most important elements that was lacking from the studies in this review was robust measurement of the hazard-resistance of the repaired and rebuilt homes. Two end-of-programme evaluations included this information, one more effectively reporting percentages of houses that
had included specific features, and the other providing a descriptive analysis of technical assessment of houses. Consistent collection and reporting of this type of information is essential if the impact of shelter programmes on safety is to be better understood.

**Effective, informative data collection**

Shared reporting guidelines and standards for data collection, as recommended by Clarke et al. (2014), would maximise the utility of the information gathered about individual programmes. In an attempt to develop a standardised instrument, Nath, et al. (2017) have developed a single evaluation tool based upon over 1500 indicators selected from the numerous tools that exist to support shelter programme monitoring and evaluation. The disaster risk reduction indicators in this and other tools are less useful for evaluating the impact on safety of programmes supporting self-recovery, as they are not sensitive enough to establish how safe individual shelters are, or the percentage of beneficiaries that have included specific hazard-resistant features.

Deciding which questions to ask in order to understand how safe a house is will be heavily context-dependent (UN-Habitat, 2013). Nevertheless, the principle of assessing this aspect of a programme’s outcome can be built into a programme’s monitoring and evaluation system, as can measurement of the percentage of houses with specific hazard resistant features as a proportion of all repaired or reconstructed houses.

Measuring the impact of a shelter programme is challenging for a many reasons, including lack of capacity and staff turnover, the need to obtain information within short time frames (Knox Clarke & Darcy, 2014), and the need for specialist expertise. A pilot of the Shelter and Settlement Impact Evaluation Tools (SSIET), designed for specific use in the shelter sector, demonstrated that asking beneficiaries technical safety questions about before and after a disaster – for example, how secure the roof was before and after the disaster and assistance – required technical knowledge that was frequently not available to the householder (UN-Habitat, 2013). Technical assessment of safety features may require observations by shelter experts, which in turn requires dedicated resources and a willingness for donors to fund activities that are necessary for effective evaluation.

**Limitations of this review**

Humanitarian websites and other online resources are substantial sources of literature about post-disaster shelter. Carrying out and managing website searches presents a significant challenge to conducting a transparent and reproducible review. A well-planned rationale, consistent searching across resources, and thorough record keeping ensured that the grey literature search undertaken here followed the principles of a robust review (Stansfield, et al., 2016). Nevertheless, compared to an academic database search there is a greater possibility for not picking up relevant documentation, either by omitting suitable online resources from the search, or because of how individual organisations choose to organise and label their publications. The fact that much of the literature about humanitarian shelter programmes comprises programme evaluations, which are often implemented by agencies themselves, also means that there is a greater risk of bias in the evidence available for review.

The search strategy for this review was limited to literature that reported on safety in post-disaster shelter. A potentially useful source of additional information might also be literature about development programmes that focus on disaster risk reduction (DRR). Follow-up evaluations of DRR programmes that aim to improve shelter construction safety might include revisiting communities post-disaster to establish their impact, and could help to inform our understanding of what can make post-disaster shelter self-recovery safer. Unfortunately, it was beyond the scope of this review...
to expand the search to include this field, or to include searching the literature on shelter response after specific disasters, which may also prove fruitful.

The most significant limitation of this review is the poor quality of the evidence, which makes it unfeasible to draw reliable conclusions about what affects safety in shelter self-recovery. We can, however, draw useful conclusions about evidence gaps and identify areas for future work.
V. Conclusions

In order to support disaster-affected householders in rebuilding their own homes to better withstand future hazards, shelter practitioners need good evidence that can be used to underpin shelter programme development. Much of this evidence currently comes from programme evaluations and case reports, which too often do not contain the clear, coherent recording of shelter activities or robust measurement of output and outcome. Evaluations of shelter programmes that aim to support safer self-recovery need to include reliable reporting of their key activities and assessment of their outcome – such as assessment of how effectively training in safer building techniques has been implemented in actual construction, or technical assessment of how safe repaired and rebuilt houses are. With this kind of consistent information gathering, suitable impact evaluation methods, such as ‘case-based’ methods, can be employed to build a picture of what works to make shelter self-recovery safer, and what does not.

Despite its widespread occurrence, evidence about the safety of unassisted self-recovery is mostly anecdotal. These observations can guide further research into how households rebuild without any assistance after a disaster, which could provide valuable information.

Gathering reliable information as part of a humanitarian programme is challenging, not least because of the resources that it requires. Ensuring that shelter programmes have sufficient resources to carry out effective monitoring and evaluation will play a significant role in building the evidence base for safer shelter self-recovery - essential for informing shelter policy and practice.
VI. References


Clinton, W. J., 2006. Lessons learned from tsunami recovery: Key propositions for building back better, New York, USA: Office of the UN Secretary-General's Special Envoy for Tsunami Recovery.


### Annex 1 – Table of included studies / reports

<table>
<thead>
<tr>
<th>Author(s), Year of publication, Title</th>
<th>Country</th>
<th>Hazard type</th>
<th>Disaster year</th>
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