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Incorporating Local Building Practices in Response

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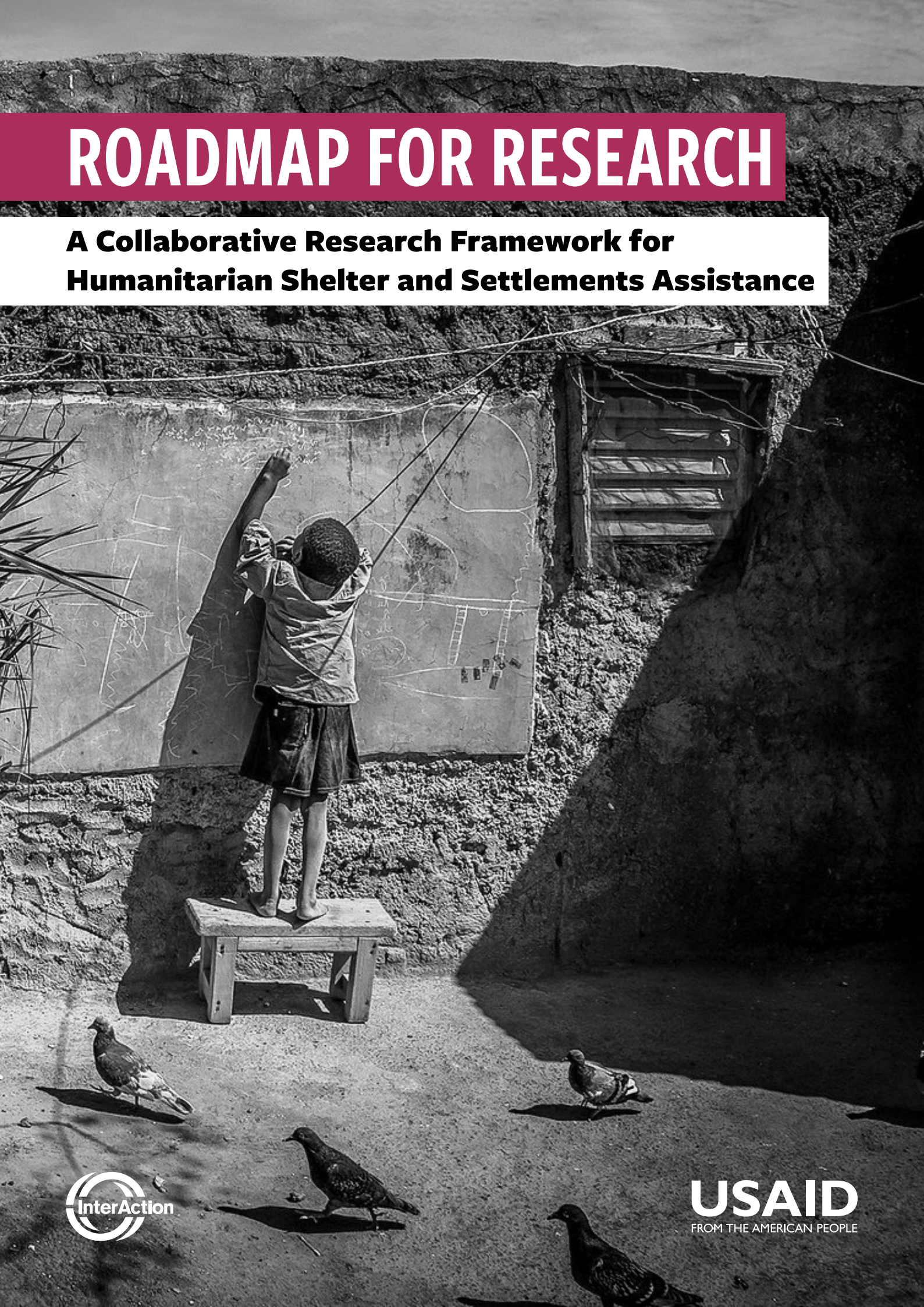
ROADMAP FOR RESEARCH

A Collaborative Research Framework for Humanitarian Shelter and Settlements Assistance



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CHAPTER 15

Incorporating Local Building Practices in Response

Credit: Eefje Hendriks, Nepal (2015)

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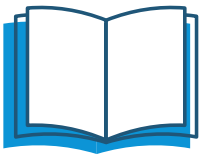
1. BACKGROUND AND RATIONALE

1.1. What are the issues?

To enhance resilience, households affected by disasters must be able to make informed choices during reconstruction. They must balance the adoption of safety measures with their other needs (Flinn, 2020). Disaster risk reduction (DRR) techniques that fit with local circumstances are likely to represent the best fit for affected households (Garnier et al., 2013; CRAterre, 2010; Dekens, 2007; Twigg, 2006; Carazas-Aedo et al., 2004; Jigyasu, 2002). The exclusion of local techniques and the shift toward non-traditional DRR practices can, therefore, be problematic for community resilience. However, during reconstruction, local non-engineered DRR construction techniques are frequently absent from building codes and neglected by technical authorities, government institutions, and funding agencies.

Local DRR building practices are a research priority for shelter practitioners seeking to support those affected by disasters (Opdyke et al., 2021). This is in line with the growing emphasis on supporting shelter "self-recovery," a process where households rely on their own resources, networks, and local capacities to repair or rebuild their homes (Hendriks 2020; Morel et al., 2018; Twigg et al., 2017; Parrack et al., 2014).

This research will focus on these techniques as part of a broader reflection on how to include diverse local DRR building practices in the recovery of shelter and settlements after disaster. The research focuses on structural issues because structural reliability is often considered too sensitive to rely on non-engineered techniques. However, structural safety is just one aspect of a home. There is a need to consider other non-structural local DRR practices and support their inclusion in post-disaster reconstruction.



1.2 What is known already?

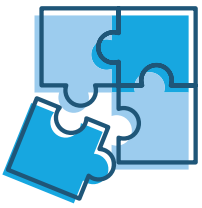
Local building cultures cover a range of local knowledge and practices relating to organisational models, settlement strategies, and housing design (Caimi, 2014). They incorporate DRR building practices that include non-engineered techniques. These techniques are implemented spontaneously and informally, with little or no input from qualified architects and engineers (Arya et al., 2013). Local techniques evolve constantly and vary from traditional techniques to more recent adaptations. This research seeks to illustrate the relevance of local DRR practices (Ferrigni, 2005) and to give more credibility to local experts who implement "safe enough" solutions.

Support for self-recovery acknowledges that affected populations have their own perceptions of what is safe enough, based on their own priorities and acceptance of risks. But it is difficult for donors and humanitarian actors to bear responsibility for solutions they do not consider scientifically safe enough or where there is no consensus with government bodies (Flinn, 2020). It is essential to better understand what inhibits these decision makers such as national and regional authorities, NGOs, and funding agencies from accepting a shift in this responsibility, to work with households to make sure they have the best information and knowledge to make informed decisions regarding safety and technical aspects.

CRS has studied the factors influencing households to adopt hazard-resistant construction practices in post-disaster settings (Turnbull et al., 2015). Hendriks & Stokmans (2020) have developed a "motivation, ability and opportunity" model that forms the basis of a communication strategy for key messages. The proposed research will also benefit from insights from a similar approach that questioned the accountability of humanitarian actors

to affected populations when measuring programme impacts (Emergency Capacity Building Project, 2007).

Despite recent interest, the lack of technical research and quantitative data on local non-engineered DRR techniques makes it difficult to assess their efficiency (De Filippi et al., 2020; Lourenço et al., 2019; Sadeghi et al., 2017). Several academic laboratories study non-engineered techniques, using experimental work and numerical modelling (Meybodian et al., 2020; Misseri et al., 2020; Xie et al., 2019; Yadav et al., 2018; Alam et al., 2017; Vieux-Champagne, et al., 2017; Islam et al., 2016). But these studies are restricted to specific settings and challenged by local variations. Some engineering associations carry out technical assessments of structures based on post-disaster field observations (for example, EEFIT). However, academics face major difficulties in including these data in research projects because of the numerous unknown and varying parameters. This type of evidence is often rejected by technical authorities (such as national authorities in charge of building codes) as not being scientific enough (Joffroy et al., 2019).



1.3 What evidence is missing?

As a result, humanitarian practitioners still lack reliable evidence to support the inclusion of local building techniques. This lack of evidence regarding the seismic advantages of local DRR techniques prevents their integration into building codes and reconstruction programmes.

With international funds coming to an end, interest in these local techniques often rises among state bodies, as these are the only ones most people self-recovering can rely on (Mughal et al., 2016). The process of gathering "good enough" evidence on non-engineered techniques raises questions about the technical and logistical limitations and about the kinds of field survey of local practices that would be useful to inform engineering projects.

There is also a need to better understand how different stakeholders define "safe enough" and how this perception evolves during reconstruction. It is a challenge to communicate evidence on local techniques without limiting their evolution or preventing local variations. This is important, as specific variations of a technique should never be implemented without questioning their relevance to household conditions, and households themselves are the best decision makers (Flinn, 2020).

1.4. What questions need to be answered?

This research aims to better understand what causes households, technical authorities, governmental institutions, and funding agencies to include or exclude local techniques and find pathways to facilitate their acceptance if necessary. It will examine what leads these stakeholders to accept techniques as safe enough.

The research will also consider how to produce and communicate acceptable evidence of the structural value of non-engineered techniques to enhance their adoption.

The primary research question is:

Which pathways for evidence production and communication of local non-engineered DRR construction techniques can lead to adoption by different stakeholders in the recovery of shelter and settlements after disaster?

This is supported by three subquestions:

1. ***How is "safe enough" defined by different stakeholders during reconstruction processes?***

This subquestion relates to the criteria that should be considered in a comprehensive assessment of a technique. That is, measuring not only a technique's structural reliability but also its replicability, affordability, and cultural acceptability.

2. ***How can communication of DRR construction techniques encourage informed choices by disaster-affected households?***

This subquestion aims to investigate ways to communicate appropriate information to households so they can make informed choices. It seeks to better understand the varied stakeholder perceptions of different types of evidence and knowledge providers.

3. ***What processes for technical evidence production regarding local non-engineered DRR techniques could enhance adoption by different stakeholders?***

This subquestion relates to the production of "good enough" evidence regarding local non-engineered DRR structural techniques.

2. RESEARCH METHODOLOGY AND OUTCOMES

2.1. Methodology

We suggest conducting a comparative analysis of data collected in:

- Haiti after the 2010 earthquake.
- Haiti after the 2012, 2016, and 2017 hurricanes.
- Nepal after the 2015 earthquakes.
- Philippines after the 2013 typhoon.
- Bangladesh and France between 2010 and 2020.

The data was collected during different academic field surveys, laboratory work, and humanitarian missions. It consists of:

- Formal, semi-structured, and informal interviews.
- Focus group discussions with community members and key stakeholders.
- Grey and academic literature review.
- Field observations.
- Building surveys.
- Experimental work using shaking table and reaction wall apparatus for shear test.

The complementarity of the different data is key to answering the overarching research question, as it connects social and engineering sciences. The scientific rigour of academic data

collection and analysis complements the field observations, access to key actors and meetings, and informal interviews by practitioners.

Subquestion 1. How is "safe enough" defined by different stakeholders during reconstruction processes?

Preliminary research in Haiti and Nepal shows that the lack of technical "good enough" evidence on local non-engineered DRR construction techniques is a major legal and ethical barrier to accountability towards the households that agencies aim to support. It prevents agencies accepting informed household decisions regarding safety and technical aspects. Further interviews with funding and operational agencies (NGOs, Red Cross, development agencies, boards of standards) should be conducted to consolidate the preliminary findings. This work will contribute to identifying safe enough technical solutions and good enough evidence regarding them.

We propose using the process of recovery from crisis in Haiti as the main case study, integrating the results from ongoing research at the AE&CC laboratory. The AE&CC research analyses the different aspects of local building practices with respect to the recovery of shelter and settlements. It uses a qualitative document analysis of about 60 field mission reports, publications, project documents, and conference presentations. It also uses a thematic content analysis of interviews conducted in 2019-20 with 23 stakeholders involved in specific reconstruction projects using local practices. They included international researchers and experts (architects, civil engineers, humanitarian actors) from universities, INGOs and associations, and Haitian construction professionals.

The methodology used in the AE&CC research and in the work identifying and characterising local DRR practices (Caimi, 2014) should be applied to a holistic analysis of local non-engineered DRR techniques supported or implemented in the selected contexts (in connection with Subquestion 3 activities). Interviews should include disaster-affected households (including direct beneficiaries of reconstruction programmes and self-recovering populations), practitioners, governmental bodies, and engineering consultants. Shelter assessments should focus on structural aspects, technical and financial accessibility, replicability, and cultural appropriateness.

This will allow in-depth analysis of the perceptions of what is safe enough according to different actors, what influences this judgement, and how it evolves during reconstruction.

Subquestion 2. How can communication of DRR construction techniques stimulate informed choices by disaster-affected households?

The role of the various actors in the reconstruction process (affected households, technical experts, and construction workers) in DRR decision making should be analysed using the theoretical framework developed by Hendriks et al. (2018). That framework connects different factors and barriers to knowledge adoption. Researchers should analyse key stakeholder and household interviews from reconstruction processes in different countries to understand what inhibits acceptance.

Preliminary research in Haiti (Joffroy et al., 2019) showed that families who did not directly benefit from international or government support included technical improvements based on local DRR techniques and promoted by some shelter programmes, with their own resources and networks. Additional research in Haiti should include interviews with households and construction workers to assess their knowledge of different techniques and their sources of information. The interviews should consider structural aspects, technical and financial accessibility, replicability, and cultural appropriateness. The researchers should also participate in ongoing analysis of the connection between stakeholders' adoption of local

DRR techniques in Haiti and the production of several pieces of technical evidence between 2010 and 2020. These include field reports based on post-disaster observations and academic research on the structural behaviour of non-engineered constructions.

Researchers should also review the communication tools and analyse the main communication strategies used by professionals and supporting agencies in shelter and settlement response in the different contexts. We suggest reviewing three existing tools:

- A collection of examples of local non-engineered DRR practices (Caimi et al., 2017).
- The Shelter Response Profile (Carazas-Aedo et al., 2017; Sevillano Gutierrez et al., 2018) disseminated by the Global Shelter Cluster.
- The Informing Choice for Better Shelter protocol developed by the Global Shelter Cluster (Dalgado, 2019).

The first two were developed to help shelter and settlement practitioners and project managers identify, document, and support local DRR techniques. The third supported affected households by conveying adequate information on non-engineered techniques and should be the main perspective of analysis in this tool assessment.

The researchers should also analyse the limitations and unintended consequences of some shelter programmes in Haiti that intended to support households make informed decisions about their shelter. This work can be further complemented by feedback from the National Society of Earthquake Technology (NSET) regarding the popularisation of technical elements they worked on in Nepal. Researchers should analyse a comparative study (Dixit et al., 2017) conducted in different districts of Nepal that highlighted that the level of safety of rebuilt structures was not correlated with the involvement of humanitarian actors. The levels of compliance with earthquake-resistant construction techniques were analysed against guidance from government engineers and financial support of the government for applying the technical guidelines. It also compared people's understanding of the techniques with the humanitarian assistance they received.

The activities relating to Subquestion 2 will contribute to effective communication of technical evidence by:

- Assessing the varying perceptions of different types of evidence, knowledge providers, and communication processes.
- Understanding different shelter and settlement projects' contributions to informed decisions of self-recovering households through their communication strategies and the limits they faced.
- Identifying examples of activities to be planned in order to stimulate informed choices by affected households regarding DRR construction techniques.

Subquestion 3. What processes for evidence production regarding local non-engineered DRR techniques could enhance adoption by different stakeholders?

The first step is to assess the limits of different processes used to produce technical evidence regarding non-engineered practices (mainly experimental work, numerical modelling, and field observations) with shelter and settlement response perspectives. A literature review should include the work of Vieux-Champagne (2017), Hofmann (2015), and current work by 3SR laboratory.

A second step (connected to Subquestion 1 activities) uses field surveys to collect information about local DRR structural techniques. It should assess the reasons for choosing specific structural components and variations (relating to materials and implementation

modalities, in building design, or during the works). The tools used for these field surveys should be co-produced by engineers, academics, and practitioners to incorporate different perspectives on the production of academic technical evidence on non-engineered techniques. This step will ease technical comparative analyses of different practices.

Researchers should use these field studies to select a specific non-engineered DRR structural technique (connected to timber structures cross-bracing or inclusion of seismic bands in load-bearing masonry walls) with local variations observed in two different sites. Numerical models and experimental work should then be used to assess the impacts of these variations on static and dynamic structure behaviour. This third step will contribute to a better understanding of the mechanical sensitivity of the technique.

This work will provide shelter and settlement practitioners and researchers with a critical analysis of different evidence-production processes from a technical and logistical point of view and of their complementarity. Moreover, this will identify useful field surveys of local DRR techniques and their variations to inform engineering research projects. It will also contribute to reflection on technical sensitivity and the impacts of the gaps between theory and practice. Finally, it will help in developing tests to cost-effectively assess the likely performance of a local variation of a recognised technique.

3. RESEARCH CONTEXTS

3.1. Potential contexts

Nepal, Pakistan, Haiti, Philippines, and Bangladesh are proposed as research contexts. These low-income countries have all been supported by humanitarian shelter and settlement actors in post-disaster recovery. Moreover, various shelter and settlements responses were promoted in these contexts in the aftermath of earthquakes or typhoons. This should facilitate discussion on the relative impacts of newly introduced techniques and non-engineered local construction techniques to build back safer. Moreover, the researchers should analyse the evolution in technical authorities' and humanitarian actors' considerations of local non-engineered DRR structural techniques over several years and its correlation with the development of engineering research relating to them (Xie et al., 2019; Yadav et al., 2018; Alam et al., 2017; Vieux-Champagne et al., 2017; Islam et al., 2016).

Researchers could compare the evolution in considering local DRR techniques in reconstruction programmes in Nepal with the reconstruction programme after the 2005 Pakistan earthquake (Mughal et al., 2016). There, the government first supported Bhatar /Tag (timber bands) and Dhajj dewari (timber frame with multiple diagonals). The government then rejected them due to a lack of evidence of their structural behaviour, before eventually allowing them.

Haiti provides an opportunity to reflect on the relative impact of academic works and of field evidence. Shelter practitioners encountered limitations when they aimed to support informed decisions by households regarding their shelter.

The case study of self-recovering communities on the west coast of the Philippines explains that key messages do not always reach self-recovering communities. This is partly due to the lack of clear responsibilities for knowledge dissemination between different stakeholders, especially at institutional and governmental levels. The study also highlights that safe housing is not always a first priority for communities recovering from disasters. Two shelter programmes in rural communities on Panay Island that aimed to support local DRR techniques (Joffroy, 2018) can be included in the comparative study.

Finally, several authors of this proposal were involved in shelter programmes in eight rural communities in Bangladesh, and in a partnership of international and national academics (ENSAG, BUET), technical consultants (CRAterre), and operational agencies (Caritas Bangladesh, France, and Luxembourg). The programmes supported local building practices in the recovery of shelter and settlements during the last 10 years (Moles et al., 2020). The second phase of that research project is starting and will last for the next 10 years until 2031, offering opportunities to collaborate.

3.2 Potential partners

Supporting local building practices in the recovery of shelter and settlements requires the expertise of practitioners and academics of different backgrounds. Academics working in social sciences and engineering can contribute to this research, such the University of Grenoble Alpes, University of Sydney, Eindhoven University of Technology, and the Institute of Engineering of Tribhuvan University. Practitioners, such as CRAterre, NSET, Lumanti, and CARE International UK, can contribute in two major ways to this research. First, they can provide direct information to academic researchers in relation to the different fields they were involved in. Second, they can critically review the data collected by academic researchers and analyse it through their own experiences and field knowledge.

This research project will connect two complementary professional communities from different countries. This collaboration is fundamental to the inclusion of local non-engineered DRR techniques in shelter and settlement response, and by extension the diversity of local DRR building practices. This will ultimately enhance their safety, affordability, replicability, and acceptability and support local livelihoods; all are key elements in recovery processes.

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