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Knowledge adoption in post-disaster housing self-recovery

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Abstract

Purpose – The purpose of this study is to explore communication of hazard-resistant construction techniques after disaster in the absence of outside influence. It further aims to unpack the barriers and drivers in the adoption of knowledge processes to identify strategic recommendations to enlarge adoption of safer construction practices by local construction actors.

Design/methodology/approach – This paper is based on an analysis of stakeholders' perspectives during post-disaster reconstruction in the Philippines in the province of Busuanga after Typhoon Haiyan in 2013. Data were collected from six communities that received no external housing assistance, analyzing surveys from 220 households, 13 carpenters, 20 key actors coordinating reconstruction or recovery efforts, as well as 12 focus group discussions.

Findings – This research argues for a stronger role of governmental agencies, vocational training schools and engineers. Current communication of typhoon-resistant construction knowledge is ineffective to stimulate awareness, understanding and adoption by local construction actors and self-recovering households.

Research limitations/implications – The analysis in this study focuses on a small sample of communities in the west of the Philippines that are not frequently affected by typhoons.

Originality/value – This is one of the few scholarly works in the Philippines focused on adoption of safer construction practices by community-based construction actors when technical housing assistance is absent.

Keywords Philippines, Technical guidelines, Knowledge adoption, Housing

Paper type Research paper

1. Introduction

Most of the disaster-affected households reconstruct their house with little to no external or formal support – they self-recover, defined as rebuilding using their own assets (Parrack

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et al., 2014). Morel (2018) estimated that over the last decade Global Shelter Cluster-activated responses accounted for only 6% of people affected by disasters stemming from hydrometeorological and geological hazards. Reporting data further revealed that only 10% of disaster-affected households in these responses were covered by product-based shelter assistance (e.g. materials) by agencies reporting to the Global Shelter Cluster, an Inter-Agency Standing Committee coordination mechanism that supports people affected by disasters with the means to live in safe, dignified and appropriate shelter. Parrack *et al.* (2014) further noted that rarely are more than 30% of shelter needs met by humanitarian organizations within the first year after a disaster. While there remains debate over exact figures of households that self-recover in their shelter, the numbers paint a bleak picture of dwindling reach of humanitarian institutions. Despite calls to extend humanitarian assistance, coverage is unlikely to increase without radical transformation. Available humanitarian funding is shrinking despite, worldwide demand for assistance increasing. Therefore, it is crucial to learn from the needs of those who self-recover after disaster, especially in developing and resource-constrained communities.

Past research has extensively reflected on the impact of humanitarian shelter programs, although often without reporting on those are left without assistance. Maynard *et al.* (2017) systematically analyzed evidence based on the effectiveness and efficiency of interventions supporting shelter self-recovery and called for more evidence based on the impact of humanitarian interventions on self-recovery. Limited examples compare humanitarian shelter projects with self-recovery processes, resulting in a gap in our understanding of how these two recovery trajectories differ (Parrack *et al.*, 2014). Bridging this gap is crucial for strategies to scale humanitarian aid and create more inclusive recovery. Twigg *et al.* (2017) previously used an interdisciplinary approach to study barriers and drivers of self-recovery in the Philippines and Nepal. In their further analysis, Schofield *et al.* (2019) studied barriers to urban shelter self-recovery in the Philippines and Nepal. These studies selected households under a broad definition of self-recovery, including households that had received a certain degree of formal humanitarian or governmental technical assistance, often a combination of material, financial and technical assistance during the relief and recovery phase (Maynard *et al.*, 2017). This study aims to understand a more acute form of rural self-recovery, excluding beneficiaries of governmental and humanitarian technical assistance.

While the growing humanitarian funding gap is problematic, it raises deeper questions over why this gap exists in the first place and more fundamentally whether humanitarian aid is actually having an impact. Renewed calls to reform and innovate are injecting new life into scaling assistance (Government of Sweden *et al.*, 2016). Nevertheless, the question of the effectiveness of these new strategies remains open to debate (Régnier *et al.*, 2008). New approaches, such as supporting shelter self-recovery, are often grounded in flexible modalities, such as cash, and approaches that move behind transactional giving to recognition of building local capacities and knowledge.

Especially in hazard prone areas, where low-income communities are confronted with recurring hazards, understanding vulnerabilities is indispensable to reducing disaster risk (UNISDR, 2015). Despite significant work to develop hazard-resistant construction guidelines, application of relevant knowledge in policy and practice is hindered by a number of factors and actors. Earlier research has indicated several barriers and drivers for knowledge adoption: conflicting priorities (Norton *et al.*, 2015), insufficiently adapted knowledge to local building practices (Thanurjan and Seneviratne, 2009) and poor communication strategies (Paton and Johnston, 2001; White *et al.*, 2001). Knowledge from available hazard-resistant construction guidelines is not necessarily acquired, accepted or translated into action by communities that are most vulnerable to recurring hazards (Chou *et al.*, 2015; Gaillard and Mercer, 2013). Humanitarian organizations need to question how knowledge interventions can be more effective in enabling adoption of safer construction

practices. There remains limited evidence from process-oriented impact studies and large-scale evaluations of knowledge exchange in multistakeholder environments (Phillipson *et al.*, 2012).

We seek to identify factors that enable or inhibit the exchange of knowledge that is crucial for self-recovering communities to build back safer housing, studying both the individual stakeholders and knowledge networks. This research aims to understand knowledge adoption processes of safer construction practices in hazard prone areas by examining knowledge exchange processes across stakeholders in self-recovering communities and mapping what knowledge sources are available and trusted. Toward these goals, the study answers two questions:

RQ1. How is hazard-resistant construction knowledge communicated, understood and applied by stakeholders in housing self-recovery processes?

RQ2. What inhibits or enables exchange of hazard-resistant construction knowledge in housing self-recovery stakeholder networks?

We first reviewed why knowledge processes are important for disaster risk reduction, described our methodology and then discussed findings of this study. Based on lessons from self-recovering communities in the Philippines after Typhoon Haiyan in 2013, this study presents recommendations for the design of knowledge interventions.

2. Background

The word "knowledge" appears 23 times in the Sendai Framework for Disaster Risk Reduction, and while this may not seem significant, it appears more than the words "response," "recovery," or even "preparedness" (UNISDR, 2015). At a policy level, there is increasing emphasis on knowledge as a means to reduce disaster risk across all phases of the disaster cycle. In this research, we focus on safer housing construction knowledge as a means to examine broader tensions that exist between scientific and local knowledge in disaster recovery.

During post-disaster recovery processes, limited importance has been given to knowledge use by community actors and their perspectives have been inadequately represented in global decision-making (Gaillard and Mercer, 2013). How communities interpret scientific knowledge and decide what information to use is poorly understood (Opdyke *et al.*, 2018, 2019). This study acknowledges the necessity to understand adoption processes that are already taking place within local knowledge networks and learns from these processes. Earlier research (Cadag and Gaillard, 2012; Fazey *et al.*, 2014; Spiekermann *et al.*, 2015) has highlighted the significant role of knowledge exchange in multistakeholder environments to increase knowledge adoption. However, exchange between community stakeholders and scientists often remains absent.

2.1 Knowledge exchange in humanitarian response

Knowledge exchange can be defined as "a process of generating, sharing and/or using knowledge through various methods appropriate to the context, purpose and participants involved" (Fazey *et al.*, 2013, p. 20). There is growing recognition of the importance of understanding knowledge exchange processes (Straus *et al.*, 2011), including how exchanges manifest from one-directional transfer to cocreated interactions between stakeholders spanning formally organized to informal implicit processes. Often humanitarian approaches for knowledge exchange are derived from a positivist belief that knowledge is transactional. The methodology of this study challenges these notions and will ground its approach in a subjectivist perspective, recognizing that knowledge is dependent on individual perspectives

and ways of "knowing," encouraging cocreation of knowledge that is appropriate to local needs. If communication is not sensibly adopted in contextual traditions, habits, skills and knowledge, application is likely to be hindered (Weichselgartner and Obersteiner, 2002). For effective knowledge exchange, previous research has identified mutual trust (Goh, 2002), hierarchies (Fazey *et al.*, 2013; Nonaka, 1994) and learning mechanisms (Twigg, 2004) as necessary drivers for knowledge to remain and diffuse within communities.

Local knowledge is generally tacit, invisible to anyone but the "knowledge holders" themselves. The existence and value of this type of knowledge is often overlooked in aid approaches. Tran *et al.* (2009, p. 152) go as far as to state, "Communities have shown themselves to be a source of strength, contributing innovative ideas and local knowledge which, when mobilized and used appropriately, can lead to solutions that can make a fundamental contribution to mitigating the negative impacts of natural disasters." Yet, successful knowledge adoption is often perceived as local communities implementing international knowledge – a common example in humanitarian shelter is the application of "build back safer" key messages in reconstruction. However, we need to understand how this explicit knowledge is received, interpreted, adapted and used at a local level. Guidelines use abstract images, color coding and symbols that may even be misunderstood by communities and/or may conflict with local tacit knowledge, such as engrained local beliefs or "ways of knowing." For example, communities may be superstitious of unfamiliar building techniques that are culturally incongruent – examination of these knowledge conflicts is critical, yet rarely explored.

3. Methods

This study follows the Knowledge Exchange Framework (Hendriks *et al.*, 2018), which describes how the adoption of hazard-resistant construction principles is theoretically enabled or inhibited. This framework conceptualizes factors and stakeholders influencing knowledge adoption in post-disaster housing recovery, highlighting the role of knowledge interactions between end users, construction professionals and experts. This framework seeks to understand knowledge as a two-way exchange that relies on trust and the nature of knowledge being communicated. We approach three concepts that are part of a chain of events that contribute to knowledge adoption of hazard-resistant construction knowledge by individual stakeholders: (1) communication, (2) understanding and (3) application.

3.1 Context

This study draws on data collected from communities affected by Typhoon Haiyan (2013) in the Philippines. The Global Shelter Cluster initially targeted support for 50% of affected households, filling gaps that were not met by government agencies (Shelter Cluster Philippines, 2014). However, funding of humanitarian organizations was insufficient to provide this level of programming and only 70% of these initial shelter targets were met (Shelter Cluster Philippines, 2014). Also, 62% of affected households were left without either humanitarian or governmental assistance (Opdyke *et al.*, 2017). Furthermore, funding was largely allocated to emergency relief goods and not for long-term housing or livelihood recovery, leaving gaps in support for long-term resilience (Shelter Cluster Philippines, 2014). In addition, humanitarian organizations prioritized vulnerable communities where damage was most severe, such as the eastern regions of the Philippines, where the typhoon first made landfall (Van der Veen, 2016). This left western areas with limited humanitarian assistance because of perceptions of less damage.

To understand the knowledge networks that are formed in the absence of humanitarian agencies, six communities are selected in the western region that faced recovery without

humanitarian shelter assistance. The communities were located in the proximity of Busuanga Island in the Municipality of Coron. We opted to bound our communities to specific sitios, or neighborhoods, within barangays, which are the lowest level politically represented administration in the Philippines. Communities were selected based on the absence of technical housing assistance, a similar damage degree, approval of barangay leaders and accessibility within one day travel from Coron.

3.2 Data collection

Data were collected from February to May 2017, approximately 3.5 years after Typhoon Haiyan. All research protocols were developed based on extensive literature and in close collaboration with humanitarian agencies, contextualizing questions to the Philippines. We gathered 240 semi-structured household interviews and 13 interviews with community-based carpenters. Households were selected through stratified random sampling (using sitios as strata) but aiming for equal participation to understand the role of male and female genders during reconstruction. Statistical power calculations were used to ensure that a 90% confidence interval could be achieved based on known community populations for each community.

Interviews included characteristics of respondents such as gender, income and occupation. Interview questions which sought to gain a general understanding of self-recovery processes included asking questions such as "what limited you to start earlier?" To unpack household understanding of construction concepts, we primed discussion of comparisons to pre-typhoon building techniques, asking, for example, "if you compare this house with the one before the typhoon, which one do you prefer and why?" Household knowledge acquisition was mapped through asking who they sought advice from during rebuilding. Interviews with carpenters targeted construction professionals involved in the design and labor for reconstruction. These interviews captured demographic characteristics and assessed how they provided, acquired and applied hazard-resistant construction knowledge. Interviews with carpenters included similar questions and mapped expertise, asking "how did you learn to build typhoon-resistant housing?" and "which rules to construct safer housing did you apply?" Actual application of techniques was verified through field notes, photo documentation and by asking households "did you apply techniques to construct hazard-resistant housing?" and "if not, why not?"

We conducted six interviews with the barangay leaders and another six interviews targeted governmental, educational and humanitarian key stakeholders actively involved in the coordination or reconstruction and recovery in the area of Coron. These interviews focused on broader recovery progress, such as "what assistance did you receive or give?" and "did your community have guidelines or experience on how to reconstruct typhoon-resistant housing?" Respondents were also asked to describe assistance, communication about the damage, other hazards, access to construction sites, materials and knowledge. Interviews were further supplemented with 12 focus group discussions, disaggregated by male and female groups. Questions focused on priorities for community resilience, a recovery timeline and ideal housing designs.

Qualitative data were collected from the case communities by research assistants that were native to Coron but not from the selected communities, enabling cultural insights while removing potential sources of bias. In addition to the research team, humanitarian and government agencies were also consulted on the development of data collection instruments. The first phase of data collection raised questions about the role of the governmental, educational and humanitarian agencies involved in the post-disaster reconstruction. Therefore, a follow-up study was conducted between March and April 2018, in which eight additional semi-structured interviews focusing solely on these key stakeholders were conducted.

The research protocols used in this study, developed in consultation with humanitarian practitioners in The Netherlands and the Philippines, were approved by the Director of the National Commission on Indigenous Peoples (NCIP) in the Philippines in accordance with ethics review procedures at the primary author's institution. Approval to approach households was given by the elderly of each community and the barangay leader.

3.3 Thedata analysis

Household and carpenter interview responses were categorized and analyzed based on frequencies. These findings were triangulated with frequencies from the focus groups discussions. Interviews were recorded, translated and transcribed by Filipino interpreters and imported to Atlas.ti qualitative data analysis software. Data were then systematically coded, characterizing the type of involvement of the participants in reconstruction using grounded theory (Glaser and Strauss, 1999) through iteration of open, axial and selective coding.

4. Findings

Below, early assistance and decisions in the housing self-recovery process of affected communities are discussed, as are how knowledge was communicated, understood, applied, as well as what factors influenced the effectiveness of communication.

4.1 Early recovery assistance and decisions

Almost all focus group participants reported receiving emergency relief within the first two months after Typhoon Haiyan, and in many cases this initial assistance came within the first two weeks, coming primarily from nongovernmental organizations (NGOs). One-third of households interviewed (36%) started directly rebuilding their shelter and a quarter more followed within one month (26%). Most of the initial construction decisions were made by households themselves and people started to live in their house almost immediately while often making improvements incrementally. For households that delayed reconstruction, this was attributed to insufficient financial resources (90% of households) and the lack of available materials (26% of households). The majority of construction materials used were timber and concrete, though concrete construction was only observed in the least remote community. Materials were mainly obtained from suppliers (77%), direct surroundings (33%) or given by a neighbor or friend (9%). Only few households, all from the same community, received materials from a government agency (5%).

Early reconstruction rapidly outpaced government financial assistance to aid material purchasing and was noted as arriving too late in five out of the six case communities. Government officials acknowledged in 2017 that the housing assistance arrived too late and that a large group would never receive such assistance, which households noted as an unfair distribution process that lacked transparency and connection to actual damage. Despite being aware of inconsistent damage reporting by barangay leaders, often no steps were taken by the Municipal Department of Social Welfare and Development (MDSWD) to reach consensus.

4.2 How construction knowledge is communicated, understood and applied

Despite uncertainty expressed by households and carpenters on how to build back safer, only 55% of households and 42% of carpenters sought out other sources of knowledge during construction. Carpenters' questions were related to general building techniques in 72% of cases, and households inquired most about how to incorporate typhoon-resistant elements (92%). Only 5% of households and one-third of carpenters searched for written documentation, such as posters and manuals on safer building methods. Reasons were

mostly because households interviewed did not see the need (70%) or could not find documentation (17%). If found, half of these households were not able to understand the material in its entirety. They showed difficulties in understanding the technical images representing details of connections, the meaning of icons and the exact meaning of brief textual descriptions. Furthermore, only 29% of households mentioned seeking advice. Of these households, 39% obtained advice from community members, 25% from owners of houses and 21% from carpenters in the proximity of the community. Nearly half of carpenters did not consult anyone for advice. Friends, other carpenters, homeowners and other so-called "experts" were of equal importance, as knowledge sources for those carpenters that did seek advice. They generally did seek for advice outside of the direct community. If their knowledge was insufficient, other "experts" (50%) and engineers (25%) were consulted. Half of households mentioned copying designs from others, resulting in homogeneous building typologies.

4.2.1 Communicating knowledge. Knowledge exchanges outside of selected communities were rarely mentioned by respondents. Barangay leaders stated that NGOs primarily used demonstration homes to communicate typhoon-resistant housing construction within communities. Although these examples were followed, households were not guided on how to implement the example building techniques and carpenters were not engaged. The first study showed the urgent need to unfold the mechanism of knowledge sharing at a more institutional level.

4.2.2 Understanding knowledge. Households primarily attributed the damage to their house to the use of weak construction materials (56%) and a vulnerable location (42%). Only 25% considered attributing the damage to the overall lack of resilient design, showing a gap in the awareness about key principles for typhoon resistance. However, respondents attributed the ability to withstand the typhoon of houses other than their own to a resilient design (67%), strong materials (53%) and location (40%). Importance of location arose in only one of the communities but was not consistent across others.

Carpenters largely lacked belief in their own work (42%), thinking that these houses would not survive another typhoon of Haiyan's magnitude. To assess the safety of these houses, carpenters assessed primarily the use of durable materials (54%) and the process of construction (39%) and referred to a trust in their own work (15%). Similar to the perceptions of households, three-quarters of carpenters also regarded nondurable materials as the primary cause for destruction by the typhoon, and nondurable materials were identified as the main aspect that reduces the ability of their constructed houses to withstand a typhoon (92%). At least 25% of the carpenters attributed the lack of safety to the chosen location. Only few notions were found of the resilience of the design.

Despite poor understanding of principles, 62% of carpenters considered themselves experts in typhoon-resistant construction, emphasizing that this expertise stemmed from their experience. However, construction experience of the carpenters varied greatly. Less than a quarter of carpenters interviewed had constructed four houses or more. About seven of the 13 carpenters interviewed did not have any experience before the typhoon and only two had received any formal construction-related training. In each community at least one carpenter claimed to apply typhoon-resistant guidelines. Yet, they referred mainly to the guidance on materials. Confidence of the carpenters in their own expertise resulted in low interest in receiving new knowledge about typhoon-resistant construction techniques.

4.2.3 Applying knowledge. Some governmental engineers had a strong understanding of typhoon-resistant construction knowledge aligning with guidance provided by the Global Shelter Cluster. However, this knowledge was not found to be shared with communities. Despite the government's staff offering to respond to inquiries for information on safer housing construction, there was no initiative found to approach communities with this knowledge. Other government staff from departments involved in the distribution of construction

materials and training selected shared knowledge, such as promoting hipped roofs, locally termed "quatro aguas," as a key element for typhoon resistance but omitted information about foundations or connections. Consequently, knowledge of hipped roofs was widely spread within the governmental agencies, among the community members and by one of the vocational training centers. Actual application of typhoon-resistant construction principles was generally limited to the shape of the roof and the use of high-quality materials. Nevertheless, households regularly felt considered as they applied techniques (35.6%).

4.3 What inhibits or enables effective knowledge adoption?

In analyzing the factors that impacted knowledge adoption, we will discuss three themes that emerged that include the disputed responsibility of knowledge, lack of available contacts and the role of trust and authority.

4.3.1 Disputed responsibilities of knowledge sources. The role of knowledge in reconstruction was widely recognized as vital by participants in this research; however, responsibility over engagement in knowledge sharing was disputed. Organizations in the area showed potential as important knowledge sources for communities. Nevertheless, most of them missed opportunities to engage in local knowledge networks. Our interviews showed that, although all institutions involved in the reconstruction could potentially contribute their knowledge to safer construction practices, limited knowledge was shared between them and with community-based stakeholders.

For example, the MDSWD shared knowledge through the construction of demonstration houses in selected communities, engaging carpenters involved in reconstruction, but they did not enforce implementation by communities. The engineer of the Municipal Department of Disaster Risk Management Office (MDDRMO) expressed responsibility for the reconstructed houses, but he acknowledged not having actively reached out to communities. In our second encounter, a year later, the engineer had found financial resources to help people take disaster prevention measures, included risk, resource mapping and evaluating solutions. The engineer from the MDRRMO highlighted that what hindered households most was budget and availability of materials. Training given to barangay leaders and in community orientations contained only preventive measures for multiple hazards. However, technical guidelines for typhoon-resistant housing had not yet been incorporated in this program. The engineer was involved in sharing his approach as follows: "I'm not yet giving information directly to carpenters. I'm giving information to community officials about how to copy the guidelines of resilient houses. Any carpenters or individuals that work for their house get the information from there by seeing the drawings. In this way, they familiarize with techniques that they do not usually apply."

Furthermore, the engineers of a national government housing agency (National Housing Authority [NHA]), who likely had the highest level of understanding of typhoon-resistant construction of all participants, in line with international standards, did not disseminate this knowledge in communities. The agency followed orders from the national office and was still waiting for projects to start in the area of Busanga (in 2017). They planned to share knowledge on-site as part of the reconstruction of a selection of housing typologies and only provided technical assistance to those communities. They had developed high-quality construction manuals that could potentially be distributed to other communities. However, the most common, generally lightweight, materials used in marginalized communities were not included in their construction manuals.

The vocational training center for carpenters, the Technical Education and Skills Development Authority (TESDA), showed the largest potential to disseminate knowledge. Most engineers in the area of Coron, from the different agencies and municipal departments, believed that trained carpenters were aware of typhoon-resistant construction techniques and put their trust in existing training methods without actually being personally involved in

the education programs. Vocational training carried out by a national agency was the predominant carpenter training in Busuanga but occurrence of these programs was sporadic due to funding constraints. Initiation of these courses often depended on support from communities, the local government unit and the national agency responsible. Community demand was assessed through community interviews and low levels of interest were noted as a barrier, stemming from ingrained notions of preexisting expertise and low demand for specialized labor in local construction markets. The cost of the course at this private institute was also not affordable for many households. The educational director of the vocation center expressed the overwhelming lack of formalized training across the region. On top of that, their program did not include guidelines for typhoon-resistant construction practices. The school director refers to the government being responsible for safer construction practices; "...the effective way is to coordinate activities with the local government because they are in the position to serve the people. The government should still focus on the regular dissemination of information." Nevertheless, the school identifies their potential role and responsibility for effectively disseminating safety principles. They supervise and monitor construction projects of participating carpenters when in the proximity of the city. In remote areas this is not financially feasible. Even if they did teach carpenters about typhoon resistance "...to control the application of the typhoon-resistant construction principles it is a matter of what the contractor decides to use" (2018).

4.3.2 Limited collaboration between knowledge sources. Most stakeholders were found to be waiting for initiatives to be taken by others. Governmental institutions were not always aware of the low adoption rates of typhoon-resistant construction principles and none of the interviewed households even expected technical advice from them. Interviews revealed that these institutional engineers often share knowledge through informal networks, on construction sites, for example, but do not take steps to spread their knowledge more systematically, often because of a lack of incentives. Forms of top-down knowledge transmission such as the training courses, while not sufficient by themselves, can certainly be helpful in fostering self-recovery and enhancing community resilience. Hierarchy and lacking connections to the community level found in this study are illustrated in Figure 1, showing isolation of many key actors.

One of the NGO Country Directors interviewed expressed the importance of working on an evidence-based level with the government to strengthen coordination among stakeholders. According to her, construction policies were not lacking but the implementation was limited and required intervention of humanitarian organizations. One NGO, for example, worked to integrate hazard-resistant construction principles in the building code and national training programs but remained absent in the area of Busuanga. Another NGO highlighted the lack of a professional organization to support the technical updating and spreading of knowledge at a community level.

4.3.3 Trust and authority as barriers and drivers. A national commission for indigenous people (NCIP) was also involved in the reconstruction in indigenous communities, from which some were part of this study. The commission mentioned both drivers and barriers as a knowledge source. Their engineer stated, "They look at you as an expert so they will follow everything you say [...] When you say you are an engineer it comes with the trust in that agency" (2018). They underlined the importance of gathering all the community members together, especially leaders and elders, because of hierarchical social structures. An NGO also highlighted the importance of relationships during the process "going out, sitting down and having conversations with the communities is the most effective." However, they found that, besides economic problems, some of the recommended construction principles are not acceptable for indigenous households as they often trust their experience more than outside knowledge. Another obstacle was that safe housing is not always the main priority: "if we go in the area and we inform, we will come to teach, for an IP he or she will prioritize his or her

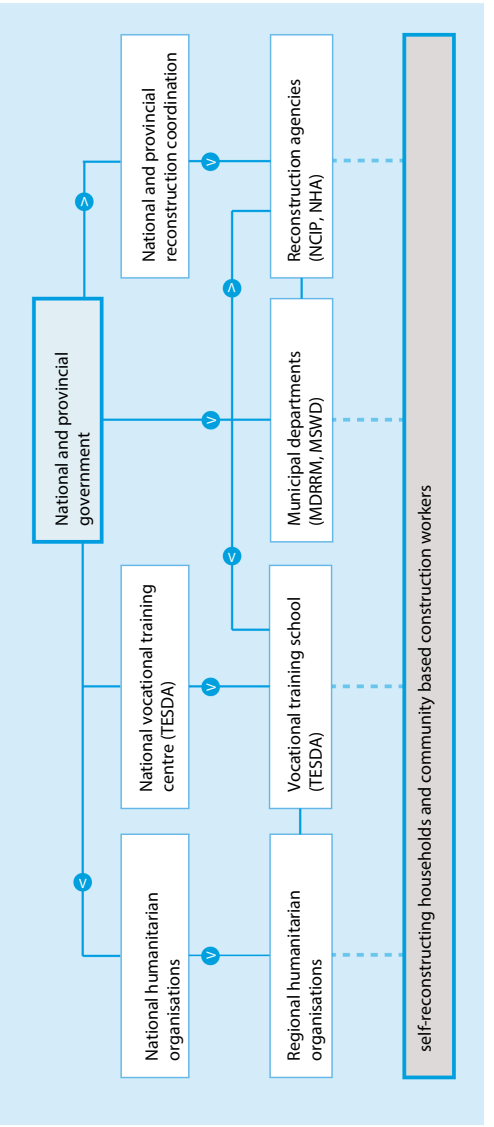

Figure 1.
The institutional hierarchy in the knowledge network

usual activity like going to fishing, because they do not use to do it every day; the basic needs are more important."

The typhoon motivated many households to change their housing design with 42% noting immediate safety as the reason, while another 21% mentioned protecting the next generation of their family. About 30% of carpenters were noted changing their construction practice out of fear of another typhoon, while another 40% mentioned improving safety. Despite the importance of location mentioned earlier brought up by households, only 16% picked a location because of safety. Two-thirds of households had access to alternates for land and most chose the site because of livelihood proximity and security of tenure. According to carpenters, the main problems during the construction occurred because of the lack of materials and finance. Proximity to the city of one community gave access to microfinance and no financial issues were reported there. Governmental engineers from the MDDRMO were aware that in many cases the demonstration houses built were out of financial reach of affected families, as one individual stated: "I think some of the families cannot afford to build houses like the demo design." There was a general assumption that safety was out of reach for most households. Furthermore, there were concerns expressed that designs may not have been aligned with traditional construction methods and size of plots available to build on.

In the aftermath of disaster, safer housing was situated in a larger web of household priorities, and often, it is not foremost in household goals. Household interviews revealed slightly more importance for investment in housing than in food, education and daily needs. Focus group participants reinforced the relative importance of housing for the resilience of their community, in order of importance included the following factors: (1) secure livelihood, (2) clean drinking water or a water system, (3) safe housing, (4) education of their children, (5) food security, (6) health care, (7) unity and togetherness of family and community, (8) faith, (9) environmental protection, (10) vocational training and (11) transport. In line with the responsibilities in families, women gave more importance to food security and faith than men. Men prioritized secure livelihood, safe housing, clean drinking water, electricity, transport and communication.

The income of most households depended on fishery (57%) and only a small percentage was involved in construction labor (5%). Households indicated that they would spend additional income on their house (31%), food (24%), daily needs (28%) or the education of their children (22%). This indicates that people would potentially make investments in their house if their income was sufficient to cover their other needs. Of the households, 46% said they would invest in concrete elements but only 20% would invest in a more resilient structure. Household members also indicated the need for livelihood projects (83%) and educational programs (32%) to enable them to achieve their aspirations. Findings around priorities show that safe housing is important for the communities but once a structure is standing priorities shift.

5. Discussion

This study identified potential entry points in communities for enhanced knowledge dissemination. Earlier theory has found the relevance for knowledge exchange, but this study found that it is crucial to define who is responsible for the exchange. Furthermore, most local engineers are averse to taking on responsibility for knowledge dissemination in the absence of direction to do so. At a regional level, the need for safer construction in remote communities should be acknowledged and communicated to the municipal level. One of the municipal stakeholders stood out as a potential entry point because of his strong network with barangay leaders, his educational background and rather profound understanding of disaster risks, his willingness to learn and genuine interest in reducing disaster risks.

Sufficient funding for his program could potentially have made a significant impact on safer construction. These two, potential entry points to knowledge dissemination in communities are illustrated in Figure 2, which depicts actors' levels and knowledge connections.

While communities are often interpreted as lacking knowledge, previously narrow definitions have often excluded a complex web of objectives. Humanitarian agencies interviewed also expressed the importance of linking work on the international, national and community levels simultaneously. Advocacy is crucial, while fundamental work needs to be done at a municipal level. More evidence is needed to convince local governments of the value of disaster risk reduction policies. Another organization explained that this work does not have to be done by alone and can link efforts across organizations, such as spreading technical guidance to governmental agencies and the engineering community, while partners support municipal implementation. These linkages however do not happen at the speed often required by current donor restrictions, as one organization noted, "It is a quite important consideration that we do not just come in for a project to build houses and we walk away and expect everything sorted out. . .Not only the disaster response saves lives and is able to uplift the condition, but being able to anchor that learning in a long-term development and get the government to start to invest on that. Policies are fundamental but also the implication on the ground, and it requires a lot of commitment of resources."

In all of the communities studied, households heavily depended on construction labor within their community, making these connections an ideal entry point for knowledge dissemination. Their skill sets are often overlooked when strategies for knowledge dissemination are crafted. Increasing the awareness and understanding of carpenters toward safer construction methods frequently starts in vocational training and was mentioned as a preferred learning source. Communities could benefit from a greater awareness and understanding of typhoon resistance that would create a larger demand for such knowledge from their carpenters. However, the Philippines national vocational training program needs to be updated for typhoon resistance as these guidelines currently lack rigor. The program is in need for additional funding and a stronger mandate to train a larger group of carpenters. Furthermore, where change is supported in a local level, these efforts run into barriers under national standards. During our second field visit, 4.5 years after the typhoon, the local vocational training facility had started to improve the program together with two NGOs and included hazard-resistant construction techniques. They even offered additional household training focusing on awareness of these principles. However, the training center highlighted that carpenters rarely return to their villages as higher wages are paid in the city and that training does not necessarily enhance knowledge adoption in the communities.

Another entry point is material suppliers. Though the role of suppliers in post-disaster reconstruction has seen as limited research among informal markets, our results indicate a strong role in the knowledge dissemination. Nearly 40% of carpenters, even in remote communities, were noted purchasing from suppliers they trusted. This relationship could potentially leverage additional information about safer construction practices.

Different training formats were used which showed advantages and disadvantages. Despite robustness of concepts behind key messages for typhoon-resistant construction developed by humanitarian agencies, we found that this knowledge often challenged local norms without basis and was difficult for low-income communities to interpret and trust. Training programs should allow for face-to-face exchange of knowledge during which engineers, carpenters and households can cocreate affordable and locally embedded technical solutions. Households have shown an intrinsic motivation after the typhoon to construct safe housing for the generations to come, however limited financial resources constrain these investments. Finding synergies that can support across multiple needs is where programming is posited to have the most impact, particularly in secure livelihoods. Communities should be supported to define priorities for the resilience of their communities.

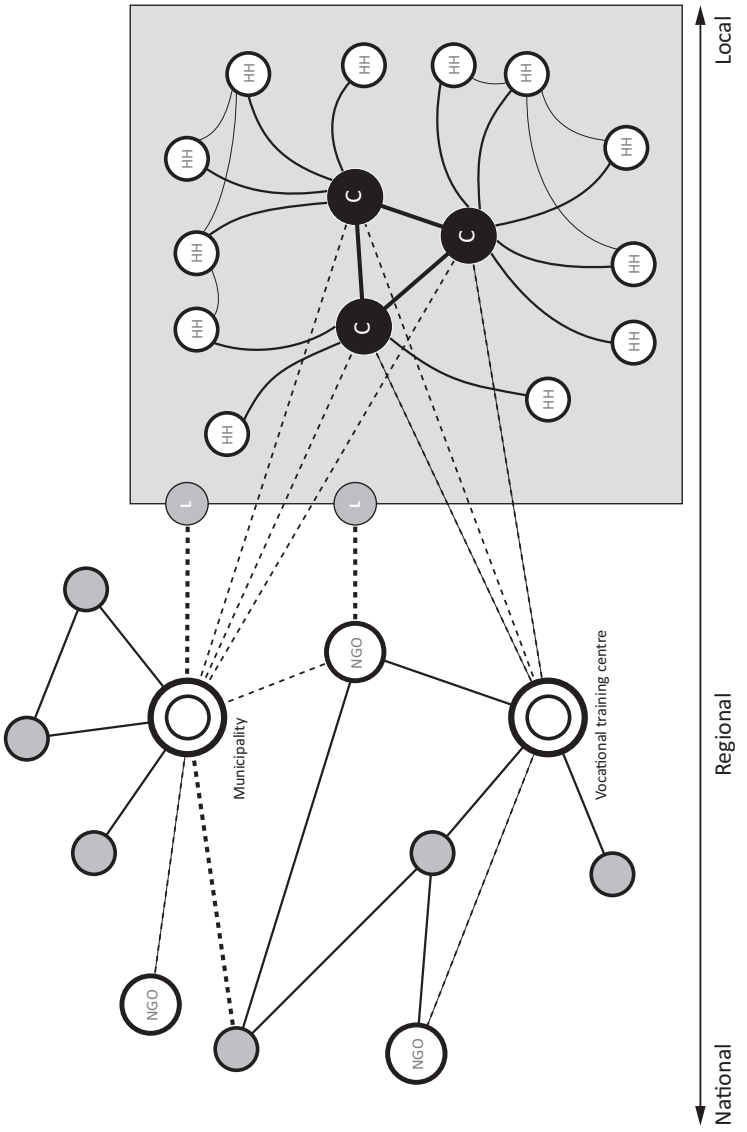

Figure 2.
The proposal to connect national and regional knowledge via municipal departments and vocational training centers through exchange with carpenters (C), barangay leaders (L) and households (HH)

6. Conclusion

There is a growing body of research that seeks to understand shelter self-recovery. This study has attempted to unpack lessons from self-recovering communities and finding gaps in the penetration of construction knowledge from external actors. Unsurprisingly, the adoption of many of the safer building messages promoted elsewhere in the Philippines after Typhoon Haiyan did not reach the studied communities. Limited knowledge sharing was found to partly be derived from disputed knowledge responsibilities, weak ties with the communities and discontinuity in trust of the methods used to share knowledge from extern actors. There is a need for further exploration of what factors inhibit knowledge exchange in housing recovery, particularly bridging local and international institutions.

The knowledge adoption of safer construction practices in the Philippines is challenging and complicated. A larger evidence base is needed to enlarge understanding of these processes, especially in self-recovering communities. People who self-recover are willing to increase their safety in order to protect their family and possess abilities to construct but often lack awareness and understanding of typhoon-resistant construction techniques to do so. Households often have access to materials and manpower yet lack the knowledge capital to best utilize these resources in reconstruction. Independent recovery often takes years and conflicting priorities such as food, clean drinking water and livelihood and education have shown to be a major barrier for safer construction practices. Communities assume that safer construction practices are out of their financial reach, when this goal is closer than most think.

This study identified a need to more deliberately consider responsibilities for knowledge dissemination in communities by supporting institutions. There is also a need for housing actors to seek out and verify knowledge to achieve consensus from a broader diversity of stakeholders, not only to confirm their supporting approaches but also to better understanding conflicting social and cultural interpretations. In particular, we found that bottlenecks in communication to the community level are often local governments and vocational training schools and partners that merit further support from humanitarian actors. Further research is recommended into factors that could enhance knowledge exchange between stakeholders in construction networks. In particular, long-term studies are needed to monitor the effectiveness of knowledge interventions intending to reach household and construction labor.

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