POST-DISASTER HOUSING RECONSTRUCTION

In this issue:
Ireton, Jabeen, Janse, Kelly, Lawther, Meding, O'Brien, Parrack, Tharaka.

Indian Ocean Tsunami
Political Economy of Development
Prefabricated Modular Structures
Post-Disaster Reconstruction
Self-Rebuilding
Socio-Ecological Systems
 Temporary Villages
 User Initiated Modification

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The journal of an association of institutes concerned with the quality of built environment. The publishing framework is shaped around the forces which act on built environment, which maintain, change and transform it. The content consists of articles which deal with these issues and in particular with responsive, self-sustaining and re-usable environments which have the capacity to respond to change, provide user choice and value for money.

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Guest Editor: Dr. Masa Noguchi. MEARU (R&D ZEMCH Group), Mackintosh School of Architecture, The Glasgow School of Art, UK
Post-Disaster Housing Reconstruction to Enable Resilient Communities.

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

With scientific evidence pointing to the increased frequency and intensity of disasters resulting from climate change (IPCC, 2012) the impact and complexity of disasters continues to grow significantly worldwide. Climate change has also ushered in a new set of challenges; areas that have historically not experienced certain disasters are now experiencing them, such as the floods in Pakistan in 2010 (Gronewold and Climatewire, 2010); or disasters are increasingly becoming more frequent and intense in historically disaster-prone areas as in the lower Mekong Delta in Vietnam (Bird, 2009; Vinh, 2012) and the Ganges-Brahmaputra Delta in Bangladesh (Shamsuddoha and Chowdhury, 2007). The entire Pacific region is now subject to loss of land and habitat due to sea level rise, presenting tremendous challenges to human habitat, particularly when compounded by coastal disasters such as cyclones and tsunamis (World Bank and SOPAC 2009).

One of the main sectors most impacted by disasters is housing and in many post-disaster recovery programs, maximum resources are allocated to housing and infrastructure reconstruction compared to other affected sectors (Lang, 2008). It is unfortunate that unless a disaster strikes there is usually little concern for building resilient housing. It is understandably difficult for agencies to anticipate disaster impacts in advance, unless there is a history of disasters in the area. Additionally it proves difficult to mobilise extra funds for resilience from donors unless a disaster impact is evident. Thus resilient housing initiatives often tend to be part of post-disaster reconstruction programs. Most country-specific guidelines and initiatives for safer buildings have arisen after major disasters such as earthquakes and tsunamis (for example, ERRA 2006; NHDA 2005). During reconstruction, there is also the opportunity to understand and thereby address and overcome the underlying vulnerabilities that had previously prevented construction of resilient housing and the risks that threaten durability and sustainability of housing. Based on local knowledge and participation, building housing back to a better standard that is less vulnerable to context-specific hazards can contribute to reducing disaster risk in the long term (Lyons et al, 2010). For example, incorporating earthquake-resistant construction elements such as bracings and struts can reduce future earthquake risk; or building raised houses in flood-prone areas can protect from them from damage.

However, in addition to such technical aspects of resilience, agencies implementing housing reconstruction projects need to address a range of social, cultural, political, environmental and other issues, requiring a sustainable and holistic approach to building disaster resilient housing. Together with technical assistance, attention has to be paid to ensure a strong degree of skills transfer and development, leading to capacity building of homeowners, local professionals and builders, as well as increased market opportunities for local suppliers and construction workers. As opposed to merely constructing houses with the provision of funding, agencies need to ensure that design and technical support is provided and the construction is supervised – and also be aware of constraints that may prevent the implementation and uptake of resilient construction methods.

Governments and a range of international agencies from prominent bilateral and multilateral bodies to grassroots Non-Governmental Organisations (NGOs) are endeavouring to increase their technical, financial and organisational capacities to prepare for, manage and recover from disasters in a planned, timely and efficient way. The key focus of these endeavours is increasingly being placed on reducing disaster risk and building resilience. Meeting the needs of post-disaster housing reconstruction with future resilience in mind has become a high priority. An accompanying need for research has thus emerged to inform the efforts of these organisations, as well as disaster-affected communities themselves, in the design, planning, implementation, management, monitoring and evaluation of post-disaster housing reconstruction projects. Addressing this research need, this issue of Open House International on ‘Post-Disaster Housing Reconstruction’, has compiled a
number of research papers that deal with the diverse range of issues involved in reconstruction of housing after the different kinds of disasters throughout the world.

A key issue that has emerged from the papers here is how rapid and unregulated urbanisation, particularly in developing countries, creates and amplifies disaster risk and presents serious challenges to post-disaster reconstruction. This is highlighted by Jabeen in the context of Dhaka, Bangladesh; the free-for-all activities of the private real estate sector there have resulted in a highly vulnerable built environment, serving as an obstacle to post-disaster reconstruction in the event of a major disaster. However, as pointed out by Janse and Flier in the case of Haiti after the 2010 Earthquake, the complexity and large number of stakeholders in cities can lead to effective reconstruction and a better linkage between the post-disaster emergency and recovery stages, though compared to rural areas, it can be more expensive and time-consuming. Although these examples are from countries with high impoverishment, even in an affluent country such as Australia as discussed by Ireton et al, there can be severe challenges in linking emergency housing to permanent housing, where time and money also play crucial roles.

Amongst the various factors involved in post-disaster reconstruction, a key element is livelihood; disaster-affected people usually tend to prioritise shelter as their most urgent need together with livelihood regeneration. Tharaka et al have suggested quick rebuilding of housing, again highlighting the importance of time, so that disaster-affected people can soon resume livelihood activities; the authors have proposed prefabricated modular construction as a rapid and efficient solution, which also places less onus of rebuilding on impacted and often traumatised people and at the same time ensures quality.

A significant proportion of rebuilding is undertaken by disaster-affected people themselves without the support of institutional actors, as discussed in the paper by Parrack et al, as there are usually insufficient resources to rebuild housing for the large numbers of people affected. The authors have thus argued for agencies to support these self-rebuilding efforts, instead of supplanting them and building independently. Such self-rebuilding is further exemplified by O’Brien and Ahmed through the documentation of extensive user-initiated modification of post-disaster housing built by agencies in Banda Aceh, Indonesia after the 2004 Indian Ocean Tsunami; some of these extensions were many times larger than the original reconstruction house, where the owners incorporated local cultural elements lacking in the original house. On a similar note, Lawther has shown that a top-down institutionally-led reconstruction program in the Maldives, also after the 2004 Tsunami, had undermined the beneficiary community’s inherent strengths by not taking into account the value of local knowledge and culture. This message is echoed also by Kelly and Caldwell in the case of post-tsunami reconstruction in India where similarly local culture was ignored; however this paper also presented a positive message: Where built environment professionals such as architects engage with and immerse themselves in local culture and draw inspiration from it to design post-disaster housing, the results are successful. This also poses critical questions on the capacity and competency of reconstruction agencies, how well their staff are trained and prepared to deal with the complex challenges of building post-disaster housing, addressed by Meding et al; the authors have identified key barriers to competency within NGOs active in the reconstruction field and proposed ways to address them to contribute to better effectiveness of post-disaster reconstruction projects.

The authors in this special issue have drawn on both theoretical and empirical field-based research that examine existing institutional policy and practice in the post-disaster housing field. This journal issue should serve as a useful guide to agencies acting in the field to understand some of the core issues in the field and how they might be better addressed. In a world beset by an increasing spectre of tragic disasters, this publication seeks to emphasise that post-disaster housing reconstruction is not only about the construction of new houses after disasters. By understanding the local needs and cultural context of affected communities, strengthening professional capacity in the housing sector and the sensitive utilisation of construction technology, post-disaster reconstruction can serve as a vehicle to protect people and property over the long term and establish prosperous and resilient communities.
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As the world faces up to stronger and more frequent hazard events, the range of actors responding to disaster events is on the increase (Barenstein, 2006; Boen and Jigyasu, 2005). Scientific evidence is mounting that demonstrates the effect of human activity on our environment and suggests that changes in our climate must be recognised and mitigated (IPCC, 2013). In addition, populations are migrating to urban centres and in many cases becoming more vulnerable in the process (Wisner et al, 2011).

In this context, post-disaster actors must be well-prepared to manage complex projects in the midst of a turbulent environment. Government, community or international humanitarian actors may lead in disaster response, depending on the location affected. This paper builds upon the work of von Meding et al (2009, 2011, 2012), which investigated the particular mechanisms at work within the operations of international non-governmental organisations (NGOs).

NGOs participating in post-disaster reconstruction (PDR) have not always demonstrated efficiency and professionalism as part of a coordinated, multi-disciplinary effort, with various studies revealing a broad range of issues within the PDR process (Barenstein and Pittet, 2007; UNDP, 2004). This research recognises these issues and investigates specific PDR project objectives, barriers, activities, strategies and outcomes through a new competence-based lens. It is important to look at the competencies that NGOs need to develop and deploy to address project-based deficiencies when attempting reconstruction project delivery and the associated factors that prevent NGOs developing such competencies.

NGOs working within vulnerable communities are interested in achieving long-term positive impacts in economic, societal and environmental spheres. Indeed, successful PDR projects are an ideal vehicle for wider community change, and such impact is the mark of an excellent intervention (Lizarralde and Boucher, 2004; Paton, 2003). The paper argues that organisations have the opportunity to increase positive outcomes through integrated and targeted approaches, deploying competen-
cy clusters to meet specific barriers faced.

A theoretical framework based upon knowledge strands of disaster management, strategic management and project management is set forth as the point of departure for this work. This knowledge base has informed the composition of a model to link organisational and operational competency to project outcomes within PDR interventions.

**STRANDS OF KNOWLEDGE**

Many NGOs operate within their own existing frameworks, with defined strategies guiding policy and procedure. However if one looks at only deficiencies in humanitarian practice, it is evident that many of these frameworks are not ensuring successful project implementation, or indeed accountability. Initiatives such as the Sphere Project (Humanitarian Charter and Minimum Standards in Humanitarian Response) encourage NGOs to conform to certain standards of practice, but at present there is no independent regulation of NGO activities (Walker and Purdin, 2004).

The field of strategic management introduces a number of theories and concepts that, if introduced into the humanitarian mindset, can dramatically alter the way NGOs approach PDR projects. The prevailing concept of strategic management is that it is an ongoing process that enables an organisation to achieve its objectives, considering its capabilities, constraints and the environment in which it operates.

Clear and effective strategy formation is vital to the success of any organisation, including those involved in PDR (von Meding and Campbell, 2013), and various theories and principles have traditionally been created to guide mainly commercial organisations. This study, however, relates these to humanitarian sector organisations, and focuses on three main views of strategy; the resource-based view, the competence-based view and the dynamic capabilities view.

Although some strategists and managers may use each of these views exclusively, the literature suggests that the underlying theory may be the same for all three. The ‘resource-based view’ is the original assumption that organisations must match their internal resources to the external environment (Brews, 2007). Sustainable competitive advantage is created when competitors cannot duplicate a unique resource configuration (Barney, 1991).

The ‘competence-based view’ meanwhile suggests that an organisation must create for itself a strategic position within a market and embed distinctive competencies to maintain that position (Hogg, 2007). As Wilcox King (2001) argues, competencies must be valuable, rare, and difficult or costly to imitate, without an easy or direct substitute available if they are to yield sustainable competitive advantage.

The ‘dynamic capabilities view’ links these together. A dynamic capabilities approach will deploy and exploit resources, renewing capabilities and developing competencies. Hafeez et al (2002) argue that a dynamic capabilities approach will deploy and exploit resources, capabilities and competencies that are unique to an organisation. The term ‘dynamic’ can be defined as “The capacity to renew competencies so as to achieve congruence with the changing business environment” (Teece et al, 1997).

Moving beyond strategy, it is vital to bring elements of project management theory into the equation, because reconstruction is generally project-based and most NGOs operate in a project cycle framework. Project management brings structure to a reconstruction programme, allowing NGOs to plan, control and evaluate projects.

Project Management as a theoretical field has been described as a set of models and techniques for the planning and control of complex undertakings (Packendorff, 1995). The Project Management Book of Knowledge (PMBOK) (PMI Standards Committee, 1987) defines a project as a “Unique transient endeavour undertaken to achieve a desired outcome.” Thomas and Mullaly (2007) further defines a project as a “Concrete, linear set of tasks with a clear start and finish,” while Gerald et al (2008) states that a project is “A vehicle of change including a defined scope which needs to be delivered in a defined time and at an agreed cost.”

These descriptions align project management closely with the work of NGOs particularly in the area of PDR. Kreiner (2008) insists that key concepts from organisational theory such as learning, participation, renewal and innovation must feature more prominently in modern project management thinking, if it is to move forward and develop.

Various authors argue that project success is not a fixed target; success means different things to each individual (Muller and Turner, 2007). Due to the variable nature of construction projects, success remains ambiguously defined. Traditionally, it is related to time, cost and quality (Shen and Chou, 2010). If a project meets the technical performance specification and functions in the way that key stakeholders want it to, it is generally considered an overall success.

Organisations implementing reconstruction projects knowingly or unknowingly use a
degree of project management in their approach and this must be recognised to fully take advantage of such a position. A NGO that can plan, control and evaluate projects effectively will be best placed to deliver efficient projects that meet their aims and objectives. An applied understanding of the principles of organisational behaviour and strategy formation is too often lacking in the humanitarian sector, and it is common to see various barriers emerge in PDR projects that could be addressed at an organisational level using a competence-based approach.

COMPETENCY FRAMEWORKS AND MODELLING

Most existing definitions of competency modelling are quite similar. LaRocca (2011) states that “Competency modelling is the activity of determining the specific competencies that are characteristic of high performance and success in a given job.” Censeo Corporation (2007) describes competency modelling as “The knowledge, skills, abilities and other attributes (KSAOs) required for success in a job or job family.”

Meanwhile, Landy and Conte (2007) describe competency modelling as “A process that identifies the characteristics desired across all individuals and jobs within an organisation; these characteristics should predict behaviour across a wide variety of tasks and settings, and provide the organisation with a set of core characteristics that distinguish it from other organisations.”

It is clear that competency modelling is a method of improvement for both individual and organisational performance and this study posits that for NGOs it could be the key to understanding the patterns that are repeated by the most effective employees in their knowledge, skills and behaviours. (Dinsmore and Cabanis-Brewin, 2010)

In such a context, competency modelling is the method being investigated whereby it is proposed that NGOs can evaluate the performance, suitability and overall success of projects, individual staff and entire organisations.

Various competency frameworks were consulted in the course of this research (Bartram, 2006; Capacity Building Programme, 2007; CBHA, undated; DFID Core Competency Framework, 2011; National Association of School Business Management, 2009; Peter Hyde Management Consulting, 2006) prior to data collection in the field. The information gathered from these frameworks, combined with specific evidence from the field, allowed for accurate composition of a framework for NGOs in post-disaster reconstruction.

METHODOLOGY

Committing to the philosophical assumptions of critical realism (Johnson et al, 2006), this study relies upon the logical reasoning of ‘retroduction’. The study therefore took as a starting point objective reality rather than human experience and assumed that actual reality can be approximated rather than have pluralist multiple meanings.

In management research this position has been articulated to some extent by Danermark et al (2002). They argue that “The explanation of social phenomena by revealing the causal mechanisms which produce them is the fundamental task of research.” This process-based approach holds theory as a central priority and in this research this manifests in the acquisition of a deep understanding of the mechanisms, structures and context that cause competencies to be deployed within NGOs in PDR.

A two-way approach was necessary that included an exploratory approach (qualitative study) and exploitative approach (quantitative study) culminating in a mixed-methods process of data collection and analysis. Theory and knowledge from three distinct areas (disaster management, strategic management and project management) was intertwined to underpin the framework emerging from the study. This theoretical framework reflects the mechanisms observed within NGO participant organisations.

Multiple case studies were conducted, drawing evidence from expert interviews and direct observations in the field. Sri Lanka and Bangladesh were chosen as locations based on an intensity sampling strategy (information rich cases manifesting a phenomenon intensely, but not unusually), while Habitat for Humanity, Islamic Relief, IFRC and Caritas were selected as participant NGOs based on a criterion strategy (based on common criteria). A total of 24 interviews were conducted across the 8 case studies with humanitarian professionals managing reconstruction projects (see table 1).

Critical factors were extracted from the case study data through analysis in Decision Explorer and contributed to the construction of a system dynamics model in Vensim, alongside observational data from the field study. This model was then populated with quantitative data through

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Table 1. Composition of case study interviews.
a paper-based structured interview among the previous expert interview sample group. This allowed testing of the relationship between barriers in PDR, staff competencies and overall project success, while enabling simulation of changes to both the external and internal environment of the organisation.

RESULTS and discussion
Seven areas of barriers

As the research progressed through each case study, seven spheres of influence became apparent through qualitative data collection and analysis. These are areas in which barriers to PDR projects exist in the field, namely: Organisational, Political, Economic, Ethical, Community, Professional and Environmental. Figure 1 maps out these areas in more detail, specifying examples of prevalent issues.

Eight competency clusters

Based upon the multi-agency case studies in Sri Lanka and Bangladesh and building upon competencies from literature, the following framework for decision-maker competencies relevant in PDR scenarios emerged. Eight competency areas are illustrated in Figure 2 and each of these areas is broken down into the specific competencies associated with each.

It is important to evaluate the value of each particular group in dealing with different kinds of project barriers as the values associated with individual competencies can feed into a system dynamics model, allowing an accurate measure of the overall significance and relevance of each to contribute to the ability of PDR actors to measure the effectiveness of staff, projects and organisations. In this study, initial measures were taken for experimentation, but a larger survey is planned for the future.
Figure 2. NGO competencies in post-disaster reconstruction.
The eight competency clusters are integral to the system model, in that certain clusters are chosen to represent strategic positions in overcoming barriers, as suggested in the discussion of each cluster. The model will ultimately be finely tuned to a specific organisation according to a value-based approach.

**Theoretical Framework**

The exploratory and explanatory investigations have allowed each stage of the project to contribute to the growth of new theory, and this section presents and expounds the final theoretical framework for NGOs in PDR (see figure 3). At the left side of the framework, each distinct knowledge area (as investigated through literature review) should feed into project implementation, following the occurrence of a disaster. This is initially at disaster response phase, moving towards recovery.

As an organisation approaches the recovery phase of PDR, project objectives and activities require barriers to be addressed and strategies to be developed. The qualitative stage of research, along with existing competency frameworks, allowed competencies to be categorised into eight key clusters specific to PDR. These competency clusters can be applied in various configurations to implement strategies within projects. A configuration of competency clusters would usually represent the deployment of staff possessing certain individual and group competencies, which together compose a compatible configuration with the barriers to be faced.

Seven groups of barriers emerged from the qualitative study, with each group representing multiple individual barriers. The individual barriers are integral to the system dynamics model, which delves into the detailed relationship between barriers in PDR, strategies needed to overcome barriers and competencies essential to successfully imple-
ment strategies. The process involved in addressing PDR barriers and moving towards improving communities, moves the framework from disaster recovery to the disaster mitigation phase.

In disaster mitigation it is vital to recognise that communities can be transformed through holistic PDR projects, and disaster risk can be reduced by a sensitive and innovative NGO. The PDR project success indicators that have been suggested are proposed measurable indicators of the success of competency clusters deployed. These eight indicators are not an exhaustive list but rather some of the primary areas where measurement is simple and straightforward. In a more complex framework it would be viable to expand this list to be more inclusive of all measurable indicators of project success.

The disaster preparedness phase brings the framework to analysing the PDRPSIs and using positive outcomes to benefit both agencies and the humanitarian sector as a whole. When the PDRPSIs do not show improvement, the findings of this study suggest that it is necessary to re-evaluate decision-maker competencies on the project and if appropriate, to redeploy fresh competency cluster configurations. Where best practice is achieved, organisational learning and knowledge sharing occurs. Communities and organisations become more resilient and capacity is enhanced. This will only ever occur when NGOs are proactive in seeking to evolve into adaptive and innovative entities.

APPLICATION OF THEORY

The system dynamics model that has been developed using this data is ideal for a range of uses in the humanitarian sector; recruitment and retention of staff and evaluation of projects, organisations and individuals. NGOs wishing to gain competitive advantage might use the system to differentiate themselves from the competition.

The findings of this study are vital to organisational strategy formation. The in-depth studies of NGOs in Sri Lanka and Bangladesh have revealed certain naiveté and ignorance of barriers in PDR, while the competencies and barriers associated with NGOs in such environments have been classified and quantified. This knowledge is useful for the consideration of key decision-makers, regardless of whether a competency-based approach is being utilised.

There is exciting potential for highly bespoke competency frameworks to be generated for specific agencies, allowing them the flexibility to design in their own organisational structures and operating procedures. NGOs could start with a template much like that proposed in this study and set up a programme to develop the framework internally so that all can agree that the final product accurately depicts the organisations’ own processes.

Finally, the theories emerging from this research are valuable in the training and mentoring of humanitarian staff, researchers and students concerning dynamic operating environments, the barriers that are faced in the field and the competencies that can enable individuals and agencies to overcome them.

ACHIEVING BEST PRACTICE IN PDR

Something that has certainly been made clear through the research is that NGOs must deploy the correct competency configurations as part of their strategies to address specific barriers. This research can provide vital guidance as to the level of influence each competency and competency cluster is likely to exert in PDR operations and the system dynamics model (product of the wider study) links these competencies to barriers and strategies. Although humanitarian organisations have to some extent based human resources activities on competency and skills-based requirements, an organic model such as this has not previously been attempted.

In reviewing strategic management theory, best practice in the humanitarian sector is closely related to achieving competitive advantage in the commercial realm. Successfully demonstrating best practice for an NGO will ensure that donors place more faith (and cash) in their organisation. In an environment where transparency and accountability are critical, any advantage that organisations can obtain is of great value.

The theoretical model postulates that it should be possible to observe best practice in PDR, following competency cluster deployment, by watching project success indicators (PDRPSIs) for evidence of positive improvement. Several key indicators are suggested in the framework, but this list is not exhaustive.

Positive improvements in any of these indicators are evidence that the competency clusters deployed are having a positive effect. However, if any PDRPSIs remain constant, or decrease, it stands to reason that the implementing agency should reconsider their intervention. If an agency starts to think of barrier mitigation and performance measurement in terms of competency clusters, it could be that in such a scenario a simple reconfiguration of competency clusters could boost performance in key PDRPSIs.
The theoretical framework argues that some of the natural outcomes of NGO best practice will be organisational learning, knowledge sharing and collective capacity building. Besides the benefits observable for communities, organisations stand to gain from their deployment of accurate competency configurations. Not only will the organisation itself grow its internal capacity, but the sector as a whole will benefit from an enhanced facility to integrate proactive measures, rather than simply reactive, and to assign staff to roles with confidence in their competency match to the barriers they will invariably face.

Generally, theorists agree that improved performance is the most important intended outcome of strategy within an organisation. As has been discussed, in the humanitarian sector improved performance will lead to competitive advantage, in terms of attracting funding and media plaudits. If NGOs are able to differentiate themselves from the competition, a strategy championed by Porter (1998), they can combine the fact that they ‘stand out’ with their high standard of performance to secure funding.

This study has revealed that to effectively match an unstable environment, the internal capacity, capabilities and competencies of an NGO must be flexible, adaptive and diverse. To achieve this, a rethink in human resourcing is the only long-term solution. The dynamic competency system proposed in this study has the potential to enable NGO staff to develop into more complete professionals and the competency groups put forward in this research provide a focused framework for such development. Through training, education, recruitment, monitoring and development, any given NGO can revitalise and shape their workforce to exactly what is necessary, based on potential scenarios that may arise.

If NGOs commit to being proactive in investing into human resources, the standards among humanitarian staff will increase. More capable and competent staff will be able to manage projects more successfully in complex and turbulent environments. More adaptive and innovative organisations will meanwhile be able to utilise their enhanced capacity to respond to disaster scenarios to do more good, more quickly and at less cost to the donor.

CONCLUSION

In this paper the seven areas of barriers and the eight competency clusters developed through this research have been set forth and discussed. The implications of linking organisational competency to project success is a research breakthrough and the authors are pressing forward towards more refined tools based on the application of rich case study data through analytical and technical innovations.

The system model demonstrates that best practice in PDR has the potential to yield organisational learning, knowledge sharing and capacity building as well as a host of community outcome indicators. In many cases these outcomes are all but expected of NGOs as part of their responsibility and this poses an ethical dilemma as to how far humanitarian agencies and their workers can or should be regulated.

As far as providing PDR projects that are as efficient as possible, the model developed in this study suggests that rather than stretching resources beyond capacity, NGOs need to put in place a system of competency deployment, through the recruitment of particular staff to satisfy all possible requirements that may arise in an emergency scenario. The integration of such a system has the potential to demonstrate best practice to stakeholders, raise credibility and foster trust in the operations of an NGO.
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INTRODUCTION

“Architects do not invent architectural realities; they rather reveal what exists and what are the natural potentials of the given condition, or what the given situation calls for” (Pallasmaa, 2009).

The basic need for shelter; the world’s ever increasing population of refugees and internally displaced persons; the exponential growth of world disasters; and the current shortcomings of humanitarian organisations to provide adequate, effective and permanent shelter solutions validates the need for further research into the role of the architect in post-disaster reconstruction.

The continued urge of the modern designer to embrace the idealism of the industrial age, has resulted in increasingly technology-driven, often utopian shelter solutions that carry little resonance with aid workers and others wrestling with the day-to-day realities of providing a roof over the heads of families in need. If architects are to assist in meeting the increasing demand for disaster shelter, they must recall that “Architecture is a process of giving form and pattern to the social life of a community...[it] is not an individual act performed by an artist-architect charged with his emotions,” (Sinclair and Stohr, 2006). They must also realise that the success of a building project typically rests on the degree to which the community is involved in determining the quality and quantity of the services they receive (Ashmore, 2004).

This paper examines the role of the architect in post-disaster reconstruction, questioning how the architect can assist in creating permanent building solutions that respond to the site and the culture while servicing the needs of the community. The vernacular reconstruction methods implemented by EAA in Kei Gold Village have been successful in developing permanent housing solutions. Further research and development is required to gain a broader understanding of the role of the architect in disasters of varying scales and typologies.

Keywords: Disaster Reconstruction, Emergency Architects Australia, Solomon Islands, Urgenist Architects.
ARCHITECTURE AND DISASTER

Shelter is a critical determinant for survival in the initial stages of a disaster as shelter provides security, personal safety and protection from climate and assists resistance to ill health and disease (The Sphere Project, 2011). Shelter is also important for human dignity, to sustain family and community life, and to enable affected populations to recover from the impacts of disaster (The Sphere Project, 2011). Swift response at the time of the disaster is paramount, but it is also essential that the aid provided is both adequate and effective. Organisations such as the United Nations High Commissioner for Refugees (UNHCR), International Federation of Red Cross and Red Crescent Societies (IFRC) and Médecins Sans Frontières (MSF) are engaged in building shelters for victims of emergencies and war zones worldwide. However most of these initiatives are focused on the functional requirements of such structures (Lepik, 2010). Current emergency shelters are typically a blanket solution marketed to any disaster, they do not respond to the unique conditions of the culture, site or climate where they are being implemented nor do they engage the local community in the rebuilding process. Unfortunately the consequences of ignoring people’s housing culture and livelihoods within the framework of post-disaster reconstruction are coming to light in failed projects around the world (Barenstein, 2010).

More than three decades ago Davis (1978) wrote that shelter is a process not a product. Thirty years on, this statement is still relevant; a house remains the end product of a long chain of social, economic, technological, environmental, political and other interactions. Therefore long-term reconstruction begins with understanding housing as a living system - an expression of a way of life - and precise specifications for shelter can only be given in a precise, local context.

The detrimental effects that post-disaster reconstruction can have on a community when culture, vernacular housing typology and livelihoods are ignored are examined by Barenstein (2010) in an anthropological research project carried out from 2005 to 2008 in Tamil Nadu, India following the Indian Ocean tsunami. Prior to the disaster, the men, women and children of these rural coastal communities spent most of their productive and leisure time in the open, a lifestyle made possible by the warm climate and thousands of trees providing shade. Generally the houses had thatch roofs and walls, and the doors, walls and floors were decorated with bright colours and geometric patterns giving each house a unique character and identity (see figure 1). The houses usually consisted of two spaces - an internal room and the veranda.

The veranda was the most important part of the house as it modulated the climate and also acted as the intersection between the public and private realms. By day, the families would entertain their guests on the veranda and by night it transformed into a sleeping area for the family. The space around the home was also essential to livelihoods as it is where the families kept their goats and poultry, while fisherman would use it to dry their fish and store their nets.

Despite the home being such an integral part of this fishing community’s lifestyle and livelihood, the recovery process progressed with a complete lack of understanding and disregard for the community’s way of life. The reconstruction was carried out by non-governmental organisations (NGOs), private corporations and charity organisations, none of which had worked with the fishing communities of Tamil Nadu prior to the tsunami and many who had no prior experience in housing reconstruction. This lack of reconstruction experience, combined with the governments’ prejudice against vernacular housing and the unprecedented availability of humanitarian aid for reconstruction led to the demolition of all traditional houses, whether they were damaged or not, and the felling of most trees. The villages were rebuilt with identical, flat roofed, reinforced concrete houses (see figure 2), which are typically divided into a dining room, two bedrooms, a kitchen and a bathroom, following typical modern urban housing patterns. The majority of these houses did not have a veranda.

The standardised housing styles and lot sizes fail to take into account family needs and differences. This has resulted in serious physical and mental health problems within the communities, the division of extended families, and the isolation of elderly people and widows from informal social security systems. The lack of consideration for the villages’ traditional way of life has meant the locals no longer spend their leisure time together under the shade of the trees, children no longer play outside and men no longer mend their nets collectively outdoors. In spite of their discourses of empowerment, participation, sustainable and equitable development, many agencies involved in housing reconstruction remain in practice notoriously oblivious to these issues. In the case of Tamil Nadu, this lack of regard has dismantled livelihoods and led to social isolation. It must be recognised that helping communities restore their livelihoods after a disaster is a complex task, not fully resolved simply by building hazard-resistant houses.

If the needs of the growing housing emergency are to be met and resilient communities for the future to be created, functional homes and
communities have to be built. These should respond to cultural nuances, facilitate new or better communication within a community, and be environmentally sound, affordable and resistant to natural or created disasters (Coulombel, 2010).

RESPONSIBLE RECONSTRUCTION

In contrast to the story of Tamil Nadu, a growing number of organisations are employing architects and other built environment professionals who are working in close collaboration with affected communities to develop locally constructed shelter solutions. These organisations acknowledge that shelter is critical to survival, but also believe that short-term emergency shelter is not necessarily an architect’s best response; rather, architects should be rebuilding in a manner that is quick, durable and permanent (Coulombel, 2010).

This method of post-disaster reconstruction is proving to be an empowering, collaborative and socially equitable development process as it values and forges synergistic partnerships rooted in local priorities (Coulombel, 2010). It rethinks the ‘emergency shelter’ framework that humanitarian organisations have typically followed and is leading to better housing solutions where better means more durable, sound, fit-for-purpose, buildings that serve their occupants in comfort and safety. This reconstruction approach is bringing development and construction to the fore as an integral part of disaster-risk-reduction as decreased vulnerability to disaster depends on resilience and on having long-

Figure 1. Traditional housing, Tamil Nadu (photos: J. Barenstein).
term solutions (Harris, 2010). These organisations are instilling a sense of responsibility for the consequences of design (Bergdoll, 2010). Their conception of design extends beyond undertaking a building or a site plan to devising procedures for getting things done where no such procedures exist, to creating new models of involvement for local populations (Bergdoll, 2010). These professionals are finding solutions that make structures more efficient, cheaper, resilient, and better suited to their purpose (Harris, 2010). Architects are integral to this process as they are particularly skilled at helping turn aspirations and ideas into viable proposals that can be discussed, considered, and priced. After a disaster it is invaluable to help promote diverse opinions, enable active participation, and harness the ingenuity and entrepreneurship latent in communities (Stephensen, 2010).

Patrick Coulombel, director of Architectes De L’Urgence (Emergency Architects France), defines these professionals as ‘Urgenist Architects’ (Coulombel, 2010). It is believed that an architect educated in these methods of post-disaster reconstruction can produce solutions that meet the requirements of the emergency phase, through to semi-permanent and even permanent homes, without wasting time and money on interim shelters. These architects are organising their strengths and talents to respond with professional expertise to the constant, urgent crises that confront people displaced by natural disasters and conflict.
ACKNOWLEDGING PLACE

A critical element to the architectural design process is acknowledging the importance of place making (Arefi, 2004; Jackson, 1994; Trancik, 1986). It is out of lived experiences and through applied meaning that people as groups or as individuals change spaces into places (Carmona et al, 2010). When discussing place, phenomenology is often drawn upon as it refers to the phenomena that influence the experience of the human consciousness and it is this human experience that creates the understanding of place (Carmona et al, 2010).

Heath (2009) examines architecture according to the social process of place making, the multiplicity of cultural identities, issues of climatic response and the effects of dramatic social change. He demonstrates that architecture and design are inextricably linked to social and environmental processes; they are not just a technical or aesthetic exercise. He examines how architects and designers can employ a variety of tactics to achieve culturally and environmentally appropriate design solutions.

Ackerman (1980) makes three observations concerning the levels of experience involved in designing in accordance with the dynamics of place. The first is the experience of the culture, the second is personal experience with the locale, and the third is experience of the environments. He suggests that gaining experiential knowledge of a human setting is contingent upon acquiring the ability to understand how a society organises itself by collaborative interaction, internal support, and the basic human understanding of its developing needs. Designing for place requires immersion in a specific local condition in order to understand its environmental and cultural lessons; it involves effective communication with the user(s), and an informed awareness of the built, social and natural environments as collective determining factors.

Nina Maritz, a Namibian architect focusing on sustainable community projects, further reinforces this idea by stating, “Architecture is not really an international skill. You cannot come to grips with [another setting] unless you totally immerse yourself to understand its subtleties. Big societies can operate on the surface; [but] you really have to get in [these smaller] communities. It is not just a design in a community. You need to get to know the people; and understand the delicate nature of the environment” (Heath, 2009).

Thus, the role of the architect in any situation anywhere in the world is to respond to the needs of the local community, to create spaces that are meaningful, useful, and enjoyable; to create place. Therefore the question remains why has it been so difficult for architects to react and enact in disaster reconstruction? The aim of this paper is to explore the meaning of the ‘Urgenist Architect’ and to promote their recognition and value within the field of disaster reconstruction, one that goes beyond only the design of emergency shelters.

METHODOLOGY

Case Study – Emergency Architects Australia (EAA)

To examine the role of the ‘Urgenist Architect’ in post disaster reconstruction, a case study was centred on the work of EAA in Kei Gold Village, Ranongga, Solomon Islands that included a site visit in July 2011. EAA is a not-for-profit agency that dispatches architects and built environment specialists to areas needing assistance in disaster reconstruction. EAA has been working with devastated communities in the Solomon Islands since the 2007 earthquake and tsunami. Kei Gold is a village on Ranongga, a 28 kilometre long narrow island located in the northeast of the Solomon Islands. In 2007 more than fifty people were killed and 7,000 were left homeless by the tsunami (Barry et al, 2008). Aid organisations provided tents, immediate emergency support and great promises of materials and homes in the future. The villages clung to this hope of promised support, which produced a victim mentality that consequently delayed the rebuilding of their communities. Permanent communities only began to reform when EAA arrived in the country and began to implement a post disaster reconstruction plan that engaged the local community and built resilience (Barry et al, 2008).

In addition to the field visit, qualitative interviews were conducted with industry professionals to question their perception of the role of the architect in the disaster reconstruction process. The participants were selected according to two criteria; professional experience in disaster response and/or reconstruction and experience working in the field on EAA rebuilding projects in Kei Gold Village. These participant groups were selected to give both a professional and practical dimension to the findings. The sample group consisted of eight participants of varying backgrounds. The transcripts were then individually formulated into mind maps to identify the participants’ views in relation to two emerging themes: (a) The Role of the Architect and (b) The Reconstruction Process. The mind maps were amalgamated to determine the key findings from this component of the research. These findings, in conjunction with the field observations,
formed the basis for the discussion and recommendations on the role of the ‘Urgenist Architect’.

FINDINGS

EAA Process

The post disaster assistance provided to Kei Gold village by EAA enabled the community to efficiently reconstruct their village. Figure 3 outlines the five critical steps to the approach EAA implemented; this method relied on a community consultation process to develop a housing prototype specific to the needs of the Kei Gold community.

By 2011, sixty houses had been constructed where a prototype had been adapted by the Kei Gold people to suit their own lifestyle, habits and preferences (see figure 4). Common adaptations included an increase in floor area, alterations to the internal layout and variations to the external cladding (illustrated in figure 5). The ability to adapt locally sourced materials such as the sago palm leaf to a variety of cladding applications reinforces the appropriateness of using locally sourced materials. It also increases the resilience of the community as it allows them to conduct any future repairs or modifications to their buildings without external assistance.

The process implemented by EAA not only assisted in the reconstruction of the homes, but also engaged the local population in a participatory approach that has met the needs and aspirations of the village and assisted in rebuilding a resilient community. The EAA master plan allowed extended families to rebuild their houses in close proximity to each other, thereby maintaining informal social security networks. The community has also rebuilt schools, childcare centres, a church and a medical centre and recommenced livelihood activities such as subsistence farming and fishing. Kei Gold is once again a vibrant, flourishing village and one can imagine that had a similar methodology been employed in Tamil Nadu the result there would have been more successful.

Role of the architect

Participants in this study acknowledged the important role architects have to play in disaster reconstruction. They identified the unique skills and qualities that architectural professionals tend to possess, while highlighting the importance of understanding and responding to the local culture.
Figure 4. EAA’s initial prototype (left) and examples of subsequent shelters (centre and right).
A thematic analysis of the qualitative interviews identified four critical aspects to defining the ‘Urgenist Architect’:

The importance of responding to the local culture:
“…you cannot [reconstruct] without an understanding of the culture you are dealing with, and without conducting proper assessments and analysis of that particular disaster.”

“…it takes a person who has a balance of many attributes; the cultural, physical, all those things need to come together to make a good practitioner and a good team.”

“…one very important characteristic is the ability to listen, and understand what people actually need…rather than helicoptering in a solution that is not sustainable in the long-term.”

The ability to work in different scales:
“…architects are able to forge the needs of towns and cities and also [work on] a very individual scale”; they are able to “look at [multiple] aspects of a problem to develop very sophisticated solutions that encompass social, cultural, and economic
aspects of the equation.”
“...architects are good at dealing with buildings, with consultations, assessments and socio-cultural analysis.”

The ability to translate the needs of the community into architecture:
“...it is [our role to] assist and emphasise [the communities’] needs and values, and translate these into architecture.”
“...architects are most useful at coming up with designs that allow local people to easily build them. Designs that are suitable to local culture, local building practices, climate, society, law... and involving a consultation process in that.”

The importance of building capacity within the community:
“...the main focus of architects needs to be on the capacity building of existing local builders to sustainably manage the transition between shelter and long term housing...it would be a good thing for every shelter program to have an architect as part of that.”

“...the on-going capacity building and the relationships that are formed in that immediate stage are what will create a sustainable shelter program. You can’t expect people to come in and build a relationship at each phase of a disaster...these are long term relationships that require a lot of investment of time and resources.”

In the context of this study there was an absolute consensus that relationship-building is crucial to the success of a reconstruction project.

**Reconstruction Process**

Information collected in the study clearly highlights the importance of durable, sound, fit-for-purpose buildings that serve their occupants in comfort and safety. Participants also identified four key essentials to the success of any reconstruction project:

The need for immediate reconstruction response:
“...working immediately with individual families to develop shelter recovery plans [is very useful]; so that they are intrinsically involved right from the start, it is documented, they sign off on it and a plan is put in place as to how they are going to recover their shelter.”

The importance of engaging the local community in the rebuilding process:
“If you haven’t got everyone united in what the key goal is...then it will hinder [the outcome]”.
“Kei Gold [achieved a good end result] because villages took responsibility for their recovery and their own development”.

The creation of permanent solutions:
“...architects’ efforts need to be “amalgamating all of the [existing disaster recovery steps], and pulling them together as one core process [so that] what we deal with actually does cover the permanent shelter for these affected communities”.

The acknowledgment of future disaster mitigation:
“Mitigation is the whole game...there is a lot more mitigation being done and a lot more awareness that mitigation needs to be done; a lot of it is linked to climate change”.

“...in many situations we are too quick to try and repair and replace what was there rather than fundamentally review whether it was in the right place or whether it should be rebuilt at all.”

**DISCUSSION**

It is evident in the research conducted by Barenstein (2010) that the housing project in Tamil Nadu, India focused on the functional requirements of a ‘typical’ family home rather than the specific needs of a family home of the fishing people. The project did not respond to the unique conditions of the site, climate, culture or vernacular architecture, nor was the community engaged in the reconstruction and planning process. This resulted in the loss of livelihoods, serious physical and mental health problems, and isolation just to name a few.

In contrast, the process of assessments, consultations, training and workshops adopted by EAA placed the Kei Gold community at the centre of the reconstruction process, ensuring the development was rooted in local priorities. While not formally documented, EAA acknowledged the importance of place in Kei Gold village by living in the village and experiencing the culture and environment first hand. The relationship and engagement that EAA established with the locals, allowed them to understand the diverse needs and opinions of the respective members of the village. Through both the consultation process and informal interactions with the local community they were able to understand how the society organised itself and thus understand their development needs. These were turned into a master plan and subsequently a reality.

The findings affirmed that it is not the role of the architect to physically fabricate a shelter solu-
Conclusion

This article validates Davis’ (1978) idea that a house is a process, that it is the end product of a long chain of responses to the built, social and natural environment. The contrasting outcomes of the shelter programs at Tamil Nadu and at Kei Gold village reinforce that there is a role for the architect in post-disaster reconstruction and that this role is to respond to the needs of the local community to assist in the creation of spaces that are meaningful, useful and enjoyable, to create place.

The methods employed by EAA are embedded in the discourses of empowerment, participation, and sustainable, equitable development. Their work with the Kei Gold community has avowed the critical role that architectural expertise has to make in the field of disaster reconstruction. The findings of this study confirm that the response to disaster must go beyond providing temporary, prefabricated shelter. It must create permanent building solutions that respond to the site, the culture and serve the needs of the community, which is more achievable through the inclusion of an architect in the process.

Further research and development is required to gain a broader understanding of the role of the architect in disasters of varying scales and typologies. Although this paper focuses on a case study in the Solomon Islands, the characteristics of an ‘Urgenist Architect’ and the reconstruction process are applicable to the rebuilding of any disaster-affected community.

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INTRODUCTION

This paper reports the post-occupancy impact of the permanent housing reconstruction program undertaken on Vilufushi Island, Maldives, following the 2004 Indian Ocean Tsunami. The particular research reported herein forms part of a larger holistic recovery analysis undertaken of the Vilufushi community.

The paper commences by providing the research context, methodology and analytical framework utilised for data collection and analysis. Subsequently relevant recovery indicators of housing plots and housing are considered and evidence presented as to their impact upon the community.

This data is then summarised and analysed through a recovery indicator network analysis, utilising the research analytical framework, to identify more precise impacts of the permanent housing program upon the socio-ecological functioning of the Vilufushi community.

CONTEXT

Vilufushi island (Vilufushi), in the Republic of Maldives, was all but completely destroyed by the Tsunami. Following the Tsunami, Vilufushi was identified to become a ‘host’ or ‘focus’ island in accordance with long standing Maldivian Government population consolidation policy. The island was subsequently physically quadrupled in size to cater for an intended increase in population of communities envisioned to resettle there from neighbouring islands. The island had a completely new land-use plan, housing, and associated infrastructure provi-
sion. In addition, Vilufushi was the first island in Maldives to be specifically redeveloped with ‘safe’ island protection features of a perimeter revetment wall and a central elevated area. Approximately US $40 million was spent on the redevelopment of Vilufushi which took 4½ years to complete. During this period, the Vilufushi community were temporarily relocated to a nearby island. They returned to their home in May 2009, a home that was very different from that which existed prior to the Tsunami (see figure 1).

METHOdOLOGY

The overall objective of the research was to develop greater understanding of how communities recover from natural disaster; with such understanding being generated from within the social construct in which the community lives. As such, a qualitative, social constructivist research methodology was considered best suited to achieving this objective due to acknowledging the existence of multiple realities, providing for holistic investigation, and the use of thick, rich description to form a context of understanding (Philips, 2002).

Within this overall methodology, and using a case study approach, the research considered the relationship between three variables of post-disaster response programs – scale, community participation and impact. Metrics for measuring each of these variables were identified from the literature, for example, Ladder of Community Participation (Davidson et al, 2007).

Finally, the three variables were overlaid upon the four wealth capitals (social, human, natural, manufactured) (Ekins and Medhurst, 2006; Ekins et al, 2008) model of sustainable development to ensure holistic capture and analysis of recovery. This resulted in the research analytical framework of the research (see figure 2).

Data collection comprised four sequential focus group discussions (FGD) held separately with representative groupings from the Vilufushi community in July 2010. These groupings included fishermen, women, youth, seniors and the (ex) Island Development Committee. FGD 1 required each group to identify their indicators of recovery, i.e.
what they believed to be important components of recovery. These indicators then formed the basis for the remaining FGDs. FGD 2, 3 and 4 required participants to identify the scale of response program, extent of community participation, and impact respectively for each recovery indicator, using previously the identified metrics.

In addition to the FGDs, key informant interviews were undertaken with the Island Chief, Imam, School Deputy Principal, Health Centre Manager, President of the Women’s Development Committee, and the Utilities Manager. Observation and transect walks were also utilised to gather data. Interviews were conducted with Government of Maldives officials in the Capital Male’ who were involved in the Vilufushi development. Secondary data sources were obtained from the Red Cross and the Government of Maldives Department of Planning. These various data sources ensured triangulation and validity.

Within this overall research, this paper focuses only upon the two identified indicators categorised under manufactured capital wealth stocks: housing plots and permanent housing. The two are inter-related, but for the purposes of the research are presented separately. This is because whilst the Government of Maldives were responsible for the housing plots, the British Red Cross was responsible for the design and construction of the houses, albeit within the design parameters stipulated by the Government.

**HOUSING PLOTS**

A new land use plan was developed for Vilufushi (see figure 3).

The size of individual housing plots under the new land use plan was stipulated by the Government of Maldives at 2000 square feet (185 square metres). This was done to facilitate the ultimate construction of 800 houses to accommodate the envisaged future island population of 5000 people. The evidence from the FGDs indicates that the new housing plot size is generally in the order of 2/3 of what people had prior to the Tsunami. The impact of this reduction in plot size upon recovery was overwhelmingly perceived as negative. The reduced plot size is a recurring theme in the data has had a fundamental negative impact on many aspects of people’s lifestyles including privacy, livelihoods, food security, waste management, mental health, public safety and traditional lifestyle activities as evidenced by the following comments by community members:

“As all the houses are adjacent to each other, we are not in a position to live without disturbing the neighbours. We are unable to do anything without disturbing others….now we are exposed to everyone” (Women).

“Prior also the people of Vilufushi do fish processing. This was done within their household plots. Today there is a separate area assigned for this, which is far from residential areas…Just giving land is not enough. We need water, electricity” (Youth).
"There is a Carpenter around, but he doesn’t have a workshop. He can’t work at home as it would disturb the people” (Seniors).

"No space for agriculture on land lots now. Before, there was ample space to grow plants and trees; enough to earn an income” (Women).

“Everyone has to do some work for a living, hence will carry spade, sticks, and so many other tools and equipments. But it is not possible to keep this at home. We can’t keep them outside (the plot) as it is not allowed” (Key informant).

“(Previously), we had a lot of house lots that were huge. I never brought any fruits for making juice. All were grown within my house plot. Especially passion fruit and guava. Now there isn’t even a small front or back yard to put up joali fathi (outdoor chair). Even on this big island….Previously we were able to get everything that we need for the house within the house plot. Example, even we don’t have to go to a shop with a friend to buy most of the items. There are lots of trees such as passion fruit trees and many other stuff” (Seniors).

“There is no space for waste disposal within the house. This is due to close proximity of the houses” (Women).

“We cannot plant any trees….psychologically this just doesn’t seem right” (Youth).

“Fire and rescue is very important to Vilufushi as the houses are very close to each other” (IDC).

“Where can we build and keep traditional stoves now? We can’t keep them outside. So sometimes
we have to burn coconut shells inside pots and use them in the corner of the house” (Seniors).

The overall impact of the reduction in plot size was summarised by the following comments:

“The housing plot size became smaller, at the same time people lost their satisfaction of life” (Key Informant).

There is evidence that people (perhaps reluctantly) accepted a trade-off between the reduced plot size and a new house, because of perceived functionality and asset value:

“We requested for 3000 square feet. People expressed that even though the plot size area was small, they chose over this the construction of the houses, as on their own they could not (afford to) build a house until they are very old” (Fishermen).

“We were told that we would be getting 2000 square feet, although this is much smaller than we had, because of the design of the house it would be easy to live. However, when we moved we found that this wasn’t the case” (Women).

It is clear that the community was aware of its adaptation limitations and the barriers that a 2000 square foot (185 square metres) plot would impose, as evidenced by the Seniors:

“We pleaded and begged desperately in the meetings not to assign 2000 square feet. We told them it is going to be difficult to live within such a small space, especially for huge families. Even in one of the atoll meetings a woman strongly expressed our frustrations and needs. … The problem was with the government”.

The move to 2000 square feet plot sizes represents a tangible gulf between the exogenous (Government of Maldives) and endogenous (community) response mechanisms as reflected in the imposition of a peri-urban land use plan upon a rural community, as summarised by the following former Government of Maldives key informant interview:

“To my mind we are getting 1900 square feet [176 square metres] in Male [the capital of Maldives]. So 2000 square feet is just enough for a small family, and they have to learn to live to adapt to the new change. They cannot expect to get large plots like in Gan or the other islands and this was explained to them. The Government explained to them very clearly. The Minister of Planning when this question was raised. He explained to them this is the reason and the people will have to learn to adapt to the new size, and this is an improvement in their lives”.

The data suggests that people were aware of the limitations that the reduced plot size would impose. Whilst there is evidence to suggest that this was protested (and ignored), there is also evidence to suggest that the community (perhaps reluctantly) accepted the trade-off between reduced plot size, new house, and the concept of income generation (fish processing) being done away from the houses. However, as the latter has not transpired due to lack of services, the result is dissatisfaction with the size of the housing plots as they are not able to be used in the traditional manner. However, beyond livelihoods, there are other effects of the reduction in plot size as evidenced above in terms of privacy, food security, waste management, the natural environment, mental health, public safety and traditional lifestyle activities.

In addition to the reduced size of the plots, the introduction of a new pedagogy of land ownership has exacerbated the decline in social cohesion in the Vilufushi community (British Red Cross, 2010). Previously, land title was given to the owner whom passed it to the oldest son. On Vilufushi, the issue became complicated as it was decided by the Government that families with more than nine members would be able to receive additional houses (up to a maximum of four). In turn, people felt that the historical method of ownership was not equitable in this context (i.e. all houses in one name and passed to one next of kin), and preferred that title be passed to the person living in the house, rather than one owner. This situation has exacerbated the decline in social cohesion within family units:

“In addition to the reduced size of the plots, the introduction of a new pedagogy of land ownership has exacerbated the decline in social cohesion in the Vilufushi community (British Red Cross, 2010). Previously, land title was given to the owner whom passed it to the oldest son. On Vilufushi, the issue became complicated as it was decided by the Government that families with more than nine members would be able to receive additional houses (up to a maximum of four). In turn, people felt that the historical method of ownership was not equitable in this context (i.e. all houses in one name and passed to one next of kin), and preferred that title be passed to the person living in the house, rather than one owner. This situation has exacerbated the decline in social cohesion within family units:

“Social tensions and anxiety have also emerged within Vilufushi families over land rights... This has
led to a lack of clarity regarding ownership and inheritance rights, as this sort of ownership system did not previously exist in the Maldives... and has led to disputes within families over ownership and inheritance.”
(British Red Cross, 2010)

The Khateeb (Island Chief) underscored this issue further, emphasising the uncertainty and resultant insecurity emanating from the land tenure issue:

“Houses are not registered... they [the people] have to build the boundary walls themselves. ... Buy household furniture and all the other household items at their own expenses. What will happen if people have to stop half way through in case if the plot is not theirs?... I think this creates another mental burden for the people as they have no security and ownership of the land... they do not have any guarantee that the houses or lands will be registered in their name... it’s as if they are slaves with ownership of nothing”.

In addition, the impact of the new land tenure upon women in particular was identified as an equity issue (British Red Cross, 2010).

“... a number of women in Vilufushi were concerned that the changes to house ownership... may possibly adversely affect their future inheritance and access (in the event of divorce) rights”.

PERMANENT HOUSING

The design and construction of the private housing was undertaken by the British Red Cross. A contractor was engaged to provide a design and construction solution. The design solutions were established to suit the plot sizes and within guidelines established by the Government of Maldives (common to all Maldivian Tsunami reconstruction projects) which set overall floor size, ceiling height and number of rooms (British Red Cross 2010; Lawther, 2009).

A design consultation process (Lawther, 2009) was instigated with the community whereby the housing designs (5 in number) were presented in visual formats using drawings and models. Following a general presentation, focus group discussions were held with various segments of the community, including the women, the fishermen, youth and seniors. These discussions were facilitated by a female Maldivian Architect and obtained

Figure 4. New housing on Vilufushi.
feedback on the various design options which was integrated where possible into the final design solutions. Further, each beneficiary was able to provide written feedback and nominate their preferred design. Upon completion of construction, a lottery was held to allocate the chosen housing designs within the groups whom had chosen them. People were subsequently able to swap houses after the lottery.

The construction of the houses was undertaken by a private contractor with little involvement of the community whom were living away from the island. Nevertheless, the British Red Cross did establish a Technical Liaison Committee within the community which made regular monthly visits to the island from their nearby transitional accommodation during the construction period. Over 59 per cent (115) of the beneficiaries interviewed in a post-occupancy survey said that they were satisfied with their involvement in the choice of house and 10 per cent (20) said they were very satisfied (British Red Cross, 2010).

The impact of the housing response intervention upon recovery was mixed, with positive comments generally relating to the quality of construction, and negative comments to the size (floor area, number of bedrooms). This finding correlated with the British Red Cross (2010) evaluation which found that:

Over 78 per cent (152) were overall satisfied (141) or very satisfied (22) with their new houses;

Nearly 84 per cent of the beneficiaries interviewed (194 in total) were either satisfied (115) or very satisfied (20) with the layout of their houses (162);

Almost 78 per cent (151) thought the quality of the new house was better than the old house;

Only 17.5 per cent (34) had a bigger house now than the one they owned prior to the Tsunami.

However, the same study identified deficiencies due to the:

“Urban bias of the design and insufficient beneficiary consultation, (which) meant that important considerations were missed, such as the space and other features (e.g. outdoor kitchens) required for rural livelihoods activities”.

The final point noting the decrease in house size was mentioned by some groups in this study, clearly linked with the plot size. Generally, the house size causes problems for larger families, as there is not enough room to accommodate extended families, as summarised by one key informant as follows:

“There are only 3 rooms in the house and we have to make one room as storage (as) there is no way to keep anything outside...There are many large families. So how can we possibly live? Previously, even though the size of the island was small, plot size was big. We can make a separate place for each family member” (Key Informant).

The house design also has an impact upon traditional aspects of Maldivian life, such as funeral services:

“Before as well we didn’t have funeral service, but this can be done in the home. Now, as the houses are small, coffin cannot be removed” (Seniors).

“But it is depressing to know that our last moments on earth cannot be carried out within our households. What I want is my funeral to be carried out in the house. But I know this cannot be done in my home now” (Key informant).

Similar sentiments were expressed by other groups. Nevertheless, the post-completion occupancy rate of the housing is quite high. A housing occupancy survey of the 250 houses built in Vilufushi in April 2010 (British Red Cross, 2010) found that 206 houses (82.4%) were occupied approximately one year after the community had returned to their island. Among these, 194 were occupied by the owners (94.2%), three by relatives of the owner (1.4%), and nine by renters (4.4%). A total of 44 (17.6%) houses were vacant. The reasons given for vacancies included seeking work opportunities elsewhere and anomalies in the number of houses received by more influential families in relation to household size (i.e. some families receiving more houses than required).

The relationship between housing and plot size is summed up by the Seniors as follows:

“Building is good but living is difficult. It is really good to go inside the house, take a shower and sleep. But in other aspects of living it is very difficult. There is no way to earn any income within the house plot. This is more than 2/3rd of our living. Previously we were able to everything that we need for the house within the house plot”.

**RECOVERY INDICATOR NETWORK ANALYSIS**

Each of the recovery indicators was subsequently mapped within the four wealth capitals framework to develop a recovery indicator network analysis (insert left). The private land and housing compo-
The extract shows the (left to right) upstream to downstream impact of one recovery indicator upon another. All of these impacts are negative.

In summary, the permanent housing reconstruction program implemented on Vilufushi island following the Tsunami has largely undermined other socio-ecological capital wealth stocks of the community. Whilst the quality of the housing itself was considered acceptable (thus enhancing manufactured wealth capital), the reduced plot and house size has undermined food security, led to a loss of garden and associated space for traditional gathering and income generating activities; predominantly fish processing. Thus basic indicators of human capital: livelihoods, health (both mental and physical) have been depleted, along with the loss of natural capital (vegetation), as a result of the permanent housing recovery program.

Further, difficulties associated with land registrations (tenure) and lack of space (plot and house) has undermined social capital in terms of its main indicators of leadership, equality and civic participation. The community leadership has struggled to meet the demands of the community in terms of land registration because this is predominantly a central government issue. However, the community only have recourse to the local leadership, and thus perhaps understandably target their frustration toward them. Ultimately, this has eroded the leadership of the community both in terms of their own decision making capacity, and also the confidence of the community in them.

Coupled with the above, the permanent housing reconstruction program, and particularly the new pedagogy of land ownership, has undermined equality or social cohesion, especially within family units and for women. Further, the reduction in garden gathering space has contributed to a general reduction in socialisation between people.

Overall, the permanent housing reconstruction program has contributed to undermining the social capital of the Vilufushi community through a reduction of trust in community leadership, general equity/equality and engagement or civic participation.
The positive impact of the permanent housing reconstruction can be identified as the quality of the housing construction. Interestingly, there was no evidence to suggest that people felt safer in their new homes. This would suggest that either perceptions of safety are simply taken for granted and/or considered as fateful (The will of Allah) and are thus not overtly articulated, or they are simply not an issue for concern.

**CONCLUSION**

The permanent housing reconstruction on Vilufushi island following the 2004 Indian Ocean Tsunami comprised 250 houses constructed at a cost of approximately US $10 million. This represented the single biggest manufactured capital investment on the island apart from the reclamation itself. Notwithstanding the strong participation of the community in the housing design and allocation, and the overall acceptable quality of the construction of the housing, the permanent housing reconstruction program has contrived to undermine the existing wealth capital stocks of the Vilufushi community. This is most noticeable through the impact of the reduced plot size upon human capital (livelihoods and health), natural capital (vegetation) and social capital (leadership, equality, civic participation). This negative impact has been exacerbated through the imposition of a new pedagogy of land ownership.

The results of the research confirm the importance of permanent housing in the socio-ecological system that is a community, and moreover the delicate nature of its role within that system. Notions of participation and construction quality in the housing itself are largely negated/outweighed through top down imposed solutions regarding plot and house size. Clearly at the time of data collection, such an abrupt rural to urban shift was beyond the adaptive capacity of the community. If it is accepted that recovery from a natural disaster equates to the ability of people to adapt to the ‘new normal’ then, in terms of the permanent housing program, this has not been successful on Vilufushi.

The four wealth capital analytical framework provides an established mechanism to plot the indicators of recovery and the relationships between them. This research has done so in an ex-post context, yet there would seem to be no reason why the same mapping exercise could not be completed ex-ante in a post-disaster scenario. This would provide insightful support to a risk management strategy to underpin post disaster permanent housing interventions beyond established project management metrics of time, cost and quality.

Such a notion has implications for the agencies and professionals responsible for implementing post disaster response interventions and requires that they inculcate such holistic underpinnings into program design. This requires expanding the skill-sets of built environment professionals and mindsets of agencies (where necessary), and the provision of additional tools and training to assist program delivery. Ultimately, this will enhance the longer term success of community recovery from natural disaster.

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INTRODUCTION

The 2004 Indian Ocean Earthquake and Tsunami killed more than 160,000 Indonesians and made a further 500,000 homeless. At between magnitude 9.1 and 9.3, the initial earthquake was the second largest recorded and occurred over a ten-minute period. The results were apocalyptic – “It was as if towns were hit by an atom bomb” (ADB 2005).

The earthquake occurred 150 kilometres from the coast of Aceh province, Indonesia, affecting more than a dozen countries from South East Asia through to East Africa. As a result of the earthquake, the seabed rose by up to five metres in some areas and displaced an enormous volume of water (about thirty cubic kilometres), generating gigantic tsunamis across the Indian Ocean, which travelled up to 1,000km/hour (ADB 2005). It took less than an hour for a tsunami to reach Aceh’s coastline, with waves reaching more than seven kilometres inland (Eye on Aceh 2006). The wave was 24 metres high when it came ashore rising to 30 metres inland. Twenty metre deep floodwaters temporarily sat over coastal areas with sand deposits of up to 800 millimetres thick (Moore et al 2006).

In the days and weeks following the disaster, people from around the world united to provide support – more than seven billion US dollars were donated for both long and short-term reconstruction projects in affected countries. A significant proportion of this funding was allocated to the construction of new houses in Aceh to enable communities to begin the rebuilding process. More than 100,000 new houses were built by a team of 124 international non-government organisations (NGOs) and 430 Indonesian NGOs.

Both Indonesian and international agencies worked to rebuild infrastructure and housing bringing together different expertise and ideologies. Some of these ideologies were internationally driven while others were bonded to local traditions. This paper looks at these differences to identify how the resident’s own aspirations can be accommodated by these reconstruction strategies and reflects on the outcomes and the overarching ideological influences.

In recent years with the impacts of major disasters such as the Indian Ocean Tsunami and the vast reconstruction needs, a plethora of literature on post-disaster housing reconstruction has emerged. The ‘building back better’ paradigm advocated in the aftermath of the 2004 Indian Ocean Tsunami by former President of the USA, Bill Clinton, permeates the literature. This is reflected in
the widespread claims by various agencies in their project documentation that post-disaster housing implemented by them are of a better standard than previous housing that was devastated and hence more resilient to future disasters (see for example, ACHR 2006; Caritas 2007; Greenblott 2007), together with a range of guidance documents promoting resilient housing (see for example, ERRA 2006; NHDA 2005). The other paradigm is the increasing recognition of the significance of consultation with and participation of post-disaster housing beneficiaries (see for example Lyons et al 2010). The authors’ research in Aceh, Indonesia found that the first paradigm was given more priority over the second one by post-tsunami reconstruction agencies there, resulting in the subsequent owner-driven transformations to the housing, discussed in this paper.

This research is an extension of a body of work conducted by the authors between 2008 and 2011. The research reveals that the residents in Aceh rarely see their reconstruction houses as ‘complete’ and modify these houses to suit their personal needs and aspirations (O’Brien and Ahmed 2011; Ahmed and O’Brien 2012). On first sight it could be argued that a mismatch has occurred between the types of housing offered by provider agencies and the needs and aspirations of the end users. This paper goes deeper to argue that the resident’s are, in fact, often advantaged by the reconstruction agency’s inability to pose a singular framework that responds to the diversity of various types of households’ aspirations.

This paper seeks to understand the relationships between the global and regional forces that drive reconstruction agency housing procurement and production, and to compare it with the outcomes of user-initiated modifications to the houses. Global forces are well described by theorists such as Robertson (1992), King (1991), Wallerstein (1991) and Appadurai (1996). They talk of transformations that occur through practices of cultural diffusion that then lead to the merging of distinct groups and by the universalism that comes from sharing key collective traits. In contrast stands the regional condition where these forces of globalisation are mediated by local factors to form a hybridised form that clearly shows that global and local forces mesh in a deliberate manner to accommodate differences, such as that described by theorists such as Frampton (1983).

Several ‘research tactics’ (Groat and Wang 2002) were used to gather the residents’ stories and architecturally map houses with a series of drawings. Typically after the tsunami reconstruction housing was built in clusters in new settlements, some built in-situ on sites devastated by the tsunami, or on newly developed land usually on the urban fringes. While many hundreds of houses were reviewed in twenty-five such settlements over a period of four years, this paper focuses on four houses in two settlements constructed by different agencies with differing strategies and outcomes. These four houses, out of the hundreds reviewed, have been selected to overview a range of key differences in the outcomes observed in the broader study. Two reconstruction agencies have been selected as prime examples of the different ideologies driving the reconstruction effort of each agency. The Asian Development Bank’s (ADB) reconstruction effort in Banda Aceh was significant with about 2,500 new houses built using an authoritative global model described by many agencies as ‘world’s best practise’ (Steinberg and Schmidt 2010). By contrast Bank Mandiri, an Indonesian banking organisation based in Jakarta, developed the other case study that differs from the ADB model in that it references regional housing cultures and uses a localised interpretation of the housing aspirations of the future inhabitants. These two agencies, incidentally both from the banking sector, enable comparing outcomes and theorise on any differences between the respective models.

OVERVIEW

The two settlements selected, ADB and Mandiri, were driven by ideologies that have different intent and physical outcomes. ADB was selected because it played a significant role in the reconstruction effort and was beholden to the high levels of international scrutiny and administrative overview. Current international standards, measured by ‘world’s best practice’ governed its operations and while the houses themselves were modest in scope, and can be classified as ‘bungalows’ (cottage-like single storey dwellings), the overall scope of the construction program was immense.

In many ways, the ADB houses built at Gampong Pande in Banda Aceh typify the types built by the majority of agencies working in the aftermath of the tsunami. The bungalows are small (six by six metres in plan), with one bedroom, one living area, and an external washroom/bathroom and space for cooking on the small rear veranda. The ADB type is relatively well-built in comparison to many other types implemented by various reconstruction agencies, despite the residents’ lack of conviction of their quality.

The Bank Mandiri settlement on the outskirts of Banda Aceh at Neuheun was chosen because it contrasts with the modernist, highly internationalised model to reflect a ‘regional’ type to
use the language of Kenneth Frampton (Frampton 1983) that mediates between global and local architectural languages to retain elements from Aceh’s extensive housing culture.

The Mandiri development is unusual in that the sixty-one houses have been built in small semi-circular clusters with five or six houses per cluster. The houses are located within significant amounts of communal open space and with room for expansion. The houses can be read as a hybrid typology, coupling the traditional ‘house on stilts’ model with industrialised materials such as reinforced concrete, glass, and plywood. Residents find these houses easy to modify, and most have been enclosed at ground floor level. However other residents have made quite significant alterations to the rear and/or side of the house. Residents express their gratitude that the houses are easy to work with and modify.

To mark the comparisons the authors, aided by research assistants, have used photographs, maps, drawings, descriptive narratives and archives to map and investigate the complex nature of the transformation process. The following two sections outline four examples – two built by ADB in the bungalow style and two built by Mandiri in a regional style. It is also important to note that in each location a house with a relatively lower degree of modification has been selected along with an example with higher levels of modification.

**BUNGALOW STYLE**

Most of the survivors in Gampong Pande had spent at least a year living in tents, barracks, and transitional shelters before construction began on their new houses. The new 36m² bungalow-styled houses were rarely up to the standard of the houses destroyed by the tsunami. However the residents had quickly tired of living in tents and saw this development as a way to significantly improve their living conditions.

The ADB houses maximised internal space with the minimum of construction materials. Built to a square plan and with modular-sized components, the houses were significantly smaller than the average Acehnese house constructed pre-tsunami. The bungalows were single-storey, asymmetrical with a decorative front porch. A formal living room with attached bedrooms opened at the rear to utility spaces such as bathroom and kitchen. ADB’s houses were basically a significantly cut down, or core, version of the urban houses common throughout the cities in Southeast Asia.

Almost every house occupied by residents has been modified. Typically the rear veranda has been enclosed to create privacy, but there are also examples where more significant renovations have taken place. Many residents have further plans to extend their houses, adding more bedrooms and full kitchens. Nearly 50% of the ADB houses remained unoccupied for up to five years as they are poorly serviced with necessary infrastructure. Unoccupied houses tend to be located away from roads, often in swampy areas, and unconnected to sewerage, water, or electricity. However, the neighbouring residents claim these unoccupied houses are not abandoned, but rather are allocated to Acehnese who are still unsure whether to return.

**Example 1 – Bungalow style with a low-degree of modification**

Hendra, like the majority of his neighbours, has a strong preference to enclose his rear veranda space and provide a workable kitchen space connected with the house. The primary rationale for this is twofold – first to provide some more facilities as

![Figure 1a. Asian Development Bank bungalow style house (left) contrasted with a regionally styled Bank Mandiri house (right).](image-url)
Hendra undertook these modifications himself. He purchased timber framing, timber boards, and plywood panels and spent a week undertaking the work. The result is not of lasting or professional quality with pragmatism outweighing any attempts to make the house more robust or stylised. (See Figure 3)

Hendra hopes to start his own family and divide the living room to make another bedroom. High youth unemployment makes it difficult for households like Hendra’s to extend their asset base.

**Example 2 – Bungalow style with a high-degree of modification**

Idrus does not use his ADB house as a place for everyday living. Instead it is a place to formally receive guests and has been decorated highly. He has made many modifications, all reflecting his higher status in the community. The portico has been remodeled and he has extended the concrete slab, installed new concrete posts, and extended the portico roof. The perimeter of the portico has been beautified with decorative plants. Double doors have replaced the standard front entry doors, and the glass inserts are shaped in intricate coloured and textured patterns. The front façade has decorative tiles applied while the interior has been significantly upgraded. The original light fittings were poor quality and Idrus replaced them with more decorative varieties. Concrete floors are finished with decorative ceramic tiles and furniture is contemporary urban in style. (See Figure 4)

Idrus described his ADB house as a ‘monument’ to the tsunami and the help his community received from the aid agency. However his preference is to live in a fragmented open-air house, as he did when he was young, as it is a more natural way of family living. To satisfy this he has built a series of pavilions at the rear of the ADB house for his day-to-day living. His house is formed from a set of interlinked pavilions derived from the traditional Acehnese house type (the link with the garden, the undercroft type space, the living spaces at ground level with sleeping spaces above), but differ as the pavilions are all located to look inwards to a central private courtyard. (See Figure 5)

Before the tsunami Idris had worked in Bali and was familiar with the resort styled architecture manufactured for Western tourism. He admired the ways modern materials complemented regional characteristics. The inspiration for his household’s pavilion style, in an almost ironic twist, is via a globalised/westernised interpretation of the traditional ‘tropical house’. Idris appreciates the reconstruction agency’s gift of the bungalow, even going so far as to improve its value, but refuses to adopt it as his day-to-day house. Instead Idris demonstrates a preference for a hybridised typology reflective of a regionally influenced notion of house style.

**REGIONAL STYLE**

Bank Mandiri, a government-owned bank and one of Indonesia’s main financial institutions, built sixty-one two-storey houses on the northeastern urban fringe of Banda Aceh, in a region known as...
Komplex Nuranimandiri Dua Neuheun Blok Nangra. The houses were located in 12 semicircular clusters, an unusual configuration in the urban setting of Banda Aceh. Each cluster contains between five and six houses, separated by substantial amounts of open space.

These two storey houses can be viewed as hybrid types, as they were built with a combination of traditional and contemporary building materials and styles. The ground floor is framed with a post and beam system, similar to the traditional house, but built with reinforced concrete. The concrete in the reinforced posts has been poured into formwork specially designed to give the posts a patterned decorative finish. The framing timber is from the coconut tree, which is quick-growing and plentiful.

The planning is straightforward: twelve columns form a grid with six square modules of approximately three by three metres each.

Cladding is a combination of timber boards at the upper level and rendered brick infill panels at the ground floor. Verandas and balconies create the semi-enclosed, outdoor living spaces that were a feature of Aceh’s traditional housing vernacular.

Example 3 – Regional style with a low-degree of modification

Ruslaimi knows her neighbours because people in this village moved here collectively from the devastated Kampung Bawa. Her house has an unusual orientation, in that, while most house clusters in the village are approached from within the semicircle, her cluster is more easily accessible from the road at the rear. In one sense, her house is ‘back to front’ as compared to both her neighbours and the typical pattern throughout the industrialised world. Ruslaimi and her children use the street entrance –
the rear of the house as it was originally designed – rather than the ‘front’ facing into the cluster. (See Figure 6)

This creates some spatial confusion, as it is ambiguous which façade is the front and which is the rear. Hence there is no clear idea of the best location for informal activities such as washing dishes, hanging clothes to dry, or raising chickens. In most contemporary Acehnese houses, designed and built for the housing market, the formal front of the house faces the street and informal activities take place at the rear. This house, like many others in this settlement, has a fluid relationship of front/back and formal/informal space, and Ruslaimi uses the side of her house with the closest relationship with the street for her informal tasks. (See Figure 7)

Ruslaimi has enclosed the four modules initially left open at ground level. Brick infill panels have been built with window openings for ventilation and light. The new infill panels have been made with poorer quality bricks than those of the original house, and they have yet to be painted or rendered. No additional doorways between interior and exterior have been allowed for. To date, Ruslaimi has not had the finances to complete the project, and the window frames and glass have not been purchased or installed. It remains unclear why she has done this but, somewhat in the manner of residents of traditional Acehnese houses, she now uses the enclosed downstairs space during the daytime and moves to the upper floor at night to sleep.

**Example 4 – Regional style with a high-degree of modification**

Junaidi, the patriarch of this family, lives with his
wife and daughter in a cluster close to Ruslaimi’s. Junaidi works as a policeman. His house forms part of a cluster of six and one of the most heavily modified. Junaidi has added a large double height kitchen/living room equal in size to the Mandiri house. A reinforced concrete frame and slab supported walls of rendered brick infill panels. A new corrugated iron roof was laid, and timber-framed doors and windows were inserted. This new room remains unpainted, both externally and internally with resources used to complete and fit out a large bathroom. (See Figure 8)

With these additions underway, the family turned its attentions to the Mandiri house. They began with a series of interlinked modifications, including a new concrete stair linking the addition to the upper area of the Mandiri house where the family slept. This enabled them to remove the timber staircase at the front of the house. With the timber stair removed, they repaired both the ceiling of the ground level space and the floor of the room above. The repaired ceilings, along with other ceilings in the Mandiri house, have been modified to include decorative features. To do this the perimeter sections of the ceiling were lowered to form a bulkhead around a raised middle section. This ceiling treatment has become a common feature on many modified houses in Banda Aceh. (Figure 9)

Enclosing the four modules at ground level with a perimeter wall, as Ruslaimi did at the third example, adds more internal space to the house. This has created a formal living room with prayer

Figure 8. Floor plans of Junaidi’s house showing modifications (in red).

Figure 9. This Bank Mandiri built house has been extensively remodelled and extended by Junaidi. There are plans to improve it into the future.
mats, large television, pictures on the wall and a decorative wall unit. Junaidi has painted the exterior of the Mandiri house bright orange and the interior lime green. In part, the painting is intended to be decorative, but he also believes it will help protect and extend the life of surfaces such as timber.

Junaidi has recently completed a new portico roof at the front of the house. This has substantially changed its appearance which now appears much larger and grander than his neighbour’s houses. This addition protects the upstairs balcony and reduces the weathering on the poorer quality coconut tree timber. He has thought a great deal about the type of house he wants and has the interest and skills that enable him to achieve his future modifications.

DISCUSSION

In the aftermath of the earthquake and tsunami the reconstruction agencies were entrusted to distribute significant resources over a large number of beneficiaries. At the same time they were expected to follow guidelines to construct houses no larger than 36m². While some efforts were made to include input from surviving households other factors such as time constraints, economic restrictions and the need for optimised building systems were highly prioritised. While these ‘top-down’ influences played a significant role shaping the reconstruction processes, this paper concentrates its study on the physical outcomes that have emerged in the years after residents occupy the houses.

The authors’ previously published research has revealed that the most common modifications involve increasing the size and functionality of the house, its potential to provide additional income through commercial enterprises, its capacity to demonstrate and enhance the owners’ status, and its capacity to provide space for communal social activities (O’Brien and Ahmed 2012). It is recognised that the types of residential households in Aceh Province are quite varied and that they are dynamic over time – as were the houses built in the decades preceding the tsunami. Hence households have tended to prioritise needs in many different ways, and combinations of these common modifications are often selected to work together. It is common, for example, to see a household that combines modifications to improve functionality, increase size, provide space for commercial activities, and enhance residents’ status. Alternatively, another less fortunate household might only choose to only improve the functionality and perhaps attempt to increase the size of the house.

The Bank Mandiri houses require only some additional walls to enclose the lower floor. Quite economically, since it utilises local materials and common trade skills, the overall floor area could be doubled. The ADB house commonly has the kitchen area enclosed quite simply with plywood before residents aspire towards more extensive additions. ‘L-shaped’ housing layouts, such as those built by the Turkish Red Crescent at Gampong Lampuuk, enable residents to easily and economically enclose the space between the wings (O’Brien and Ahmed 2011). These examples exemplify the ways in which reconstruction agencies, perhaps inadvertently, empowered residents by enabling them to easily improve their own housing.

However other types are more limited in their adaptability, either because the plot of land was small or because inadequate materials were used in construction. The authors’ research has thus led to the somewhat counter-intuitive conclusion that the existence of widespread and extensive modifications to a particular house type does not necessarily signal a design failure but, rather – judged within the context of the severe post-disaster constraints under which reconstruction housing is usually built – demonstrates a relatively robust and enabling core dwelling. With this in mind, it is most helpful to consider housing built by the reconstruction agencies as ‘core’ dwelling designed with the expectation that individual households will make modifications over time as their aspirations and economic capacity permit.

In a pragmatic sense a well-built core house can act as a safe refuge in the event of another natural disaster. In most cases, but not all, the reconstruction houses were engineered to withstand earthquakes and professionals supervised the construction process. In the cases where the newer extensions are constructed to poor standards and remain prone to future damage the risks to the residents is mitigated when the core section of the house is robust.

However another significant lasting benefit must also be recognised. The reconstruction agency built housing, properly serviced with water, sewerage and power, lays the foundation for long-term incremental housing development. As this paper has demonstrated, households with the economic capital aspire to modify their six by six metre (36m²) house to accommodate their future aspirations. Irrespective of the differences between the two typologies outlined in this paper, be they bungalow types based on internationalised models or a more regionalised typology, there is a desire for the resident to demonstrate something of their own selves in their housing.
CONCLUSION

This paper has extended the evidence that reveals that owners typically modify reconstruction agency built housing. It discusses two models, paradigms in effect, that govern the ideologies that drive reconstruction efforts – one based on globally driven notions of quantity, cost effectiveness and disaster risk reduction, while the other extends this to include a regionalist narrative evident through an analysis of form and function. The four case study houses, representing the two models, show that a complex web of factors drive the modification process.

The core houses built by ADB and Mandiri and discussed in this paper reveal a snapshot of the process happening throughout Aceh. Across the province tens of thousands of households are expressing their own aspirations via the modification process. Where resources permit these is significant evidence that hybridised housing models are seen to be highly desirable against the urbanised bungalow-type mass housing often produced by international agencies that can confine aspirations to expand the house as families grow over time and space.

Those residents with the economic capital to improve their houses do so in particular ways that suggest there is a desire to recapture some of the local housing culture and reflect regional housing characteristics. Large rooms, high decorative ceilings and open-air living spaces are built with an array of forms, materials and colour suggesting that a ‘glocal’ typology emerges when the opportunity arises.

ACKNOWLEDGEMENT

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INTRODUCTION

This paper is concerned with promoting safer reconstruction amongst families rebuilding their homes after a natural disaster. “Safety” refers to building techniques and practice that make buildings more able to resist hazards such as flood, earthquake and severe storm. As the focus is on safer construction, the list of hazards does not include those better dealt with by site selection and planning such as landslide, fire and volcano.

Self-recovery can imply self-build, but also can also include rebuilding using the local informal building sector. Either way, households rebuild or repair damaged or destroyed homes using their own assets. Assets can be savings, materials (salvaged, donated or owned), social and community assets, local skills and labour. Increasingly, remittances from family members living abroad are an important asset.1

Faced with the impossibility of providing shelter assistance to all families post-disaster, beneficiary selection is often tailored to assist the most vulnerable. An unintended consequence can be that the majority who self-build incorporate the same bad building practice that caused their home to be damaged in the first place. The recent disasters in Haiti and the Philippines both provide ample examples of construction that ignores best practice and simple safety features.

This paper investigates the level of engagement of the humanitarian community with self-rebuilders and addresses risk management in this process. With reference to recent responses, it explores and analyses shelter programmes that include the promotion of messages about safer building to self-rebuilders, and presents the case for a change of emphasis that will increase the impact and effectiveness of a humanitarian response.

THE CASE FOR SUPPORTING SELF-RECOVERY

There are two particularly compelling arguments for supporting self-recovery: first, it is evident that the majority of houses destroyed by storm, flood or earthquake are re-built by the families themselves using their own resources; and second, if the international response continues with conventional product-based responses such as transitional and permanent shelter, it will not meet a significant proportion of the need with a solution that is long term, high quality and safe. Neither realisation is new, as pointed out by Ian Davis over 30 years ago: “… the vast majority of all low income small dwellings are owner built within the ‘informal sector’, and are likely to remain so, we have to ask what impact can be made on future housing” (Davis, 1981); and by

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1 According to the 2013 Multilateral Investment Fund report on Remittances to Latin America and the Caribbean (Maldonado and Hayem, 2013) “almost USD$2 billion flowed into Haiti in the form of remittances in 2012.”
the 2011 Humanitarian Emergency Response Review: “Providing adequate shelter is one of the most intractable problems in humanitarian response” (Ashdown, 2011). In very stark terms, this implies that many houses built after an earthquake, storm or flood incorporate the same inadequate building practices that caused so much death, injury and economic damage in the first place.

The strongest case for supporting self-recovery is the recognition that it is an inevitable process. A discussion of the scale and complexity of shelter responses is continued below, but the assertion can be illustrated and explained using the 2010 Haiti earthquake as an example. The shelter practitioner standing amongst the rubble of Port-au-Prince a few weeks after the earthquake could have pointed out, with some degree of certainty that the majority of the city’s houses would be rebuilt by the Haitian informal sector and would be made from stone, reinforced concrete and hollow concrete blocks. Despite the subsequent efforts of engineers, architects and donors the prediction proves to be correct². The exposition of over 60 designer houses at Zoranje on the outskirts of Port-au-Prince is an embarrassment of empty and inappropriate one-off prototypes that was opened with great fanfare and supported by the Bill Clinton Foundation. Intended as a demonstration site, a kind of marketplace for housing solutions, it remains a folly of unsuitable (and empty) homes.

Another example of inappropriate housing is the nearby Morne a Cabri, a site of 3,000 identical concrete cubes that appear to have been built without consideration of basic services, employment opportunities or transport links. By comparison it was estimated by mid-2012 that 130,000 permanent homes had been rebuilt by Haitians themselves.

The international community did provide, over three years, around 113,000 temporary homes (referred to as t-shelters) for destitute families (IFRC, 2011). This is no small feat under the circumstances as materials had to be imported, land secured, designs approved, beneficiary families identified and contracts awarded. The fact remains, however, that these one-room buildings have a life span of three to five years and cost on average over US$4,000 each (Beunza and Eresta, 2011). Many were built to very low construction and engineering standards that would not withstand hurricane-force storms. These buildings, as they deteriorate, will either be replaced by owner-built houses or will be extended and patched-up to become sub-standard and potentially dangerous permanent homes. Rather than a problem solved, this is a problem postponed. It will be the owners themselves, relying on their own resources, who will rebuild these t-shelters with little or no guidance on building more safely.

Haiti illustrates many of the problems facing humanitarian intervention. The earthquake

²Some observers, for example Thummanakudy (2010), have pointed out that the inhabitants of Port-au-Prince initially were understandably reluctant to return to concrete homes for fear of another earthquake. This does not detract from the argument except to underline that in the world of post-disaster housing reconstruction uncertainty is a key factor.
killed more than 200,000 people and destroyed or damaged as many as 375,000 houses in the capital city of the poorest country in the hemisphere. It also wrecked the already weak government institu-

Figure 2. Self-build just a few weeks after Typhoon Haiyan in the Philippines 2013. However little attention is paid to safe building practice: there are no bracings, poor connections and no foundations (photo: Bill Flinn).

Figure 3. A transitional shelter in Port-au-Prince, Haiti 2012. This was the option of choice for many international agencies. (photo: Bill Flinn).
Charles Parrack, Bill Finn, Megan Passey

Open House International Vol. 39 No. 3, September 2014
Getting the Message Across for Safer Self-Recovery in Post-Disaster Shelter.

While the Haitian example is particularly extreme, disasters are unique and direct comparisons are difficult. Despite this, a brief overview of shelter responses from several recent disasters (see table) illustrates that the inability of the international community to make an impact on overall shelter needs within the first year is the norm and not the exception.

The percentage figures in each of the examples show that humanitarian organisations rarely reach more than thirty percent of the shelter needs within the first year after a major disaster, and some significantly lower, with single figures not uncommon. The vast majority therefore cope on

<table>
<thead>
<tr>
<th>Emergency Name, Date</th>
<th>Description</th>
<th>No. households with shelter needs</th>
<th>No. of transitional or permanent shelters built within 1 year</th>
<th>% Shelter needs met with transitional or permanent shelter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haiti Earthquake, January 2010</td>
<td>Around 3.5 million people were affected by the 7.0 magnitude earthquake that struck Haiti's capital Port-au-Prince in January 2010. The epicentre was a densely populated urban area with poor quality housing. Much of this was severely damaged or destroyed and 1.5 million people were left homeless. The emergency shelter response was swift, and there was an extensive distribution of tarpaulins within 4 months. The reconstruction phase however was much slower and out of a palette of available options, many agencies opted for transitional shelters. By July 2013, more than three years later, an estimated 113,316 transitional and permanent shelters had been delivered, reaching approximately 30% of those with shelter needs (IFRC, 2011; Shelter Cluster, 2013).</td>
<td>375,000</td>
<td>38,219</td>
<td>10.4%</td>
</tr>
<tr>
<td>Cyclone Sidr, Bangladesh, November 2007</td>
<td>The number of homes damaged by cyclone Sidr was four times greater than the number of homes affected by the 2005 Pakistan earthquake, leaving almost 1.5 million households without shelter. Less than five months later, a joint government and United Nations assessment estimated that three-quarters of these families had begun to rebuild and were living without external assistance. Shelter Cluster members voiced fears that the lack of technical assistance meant that these families were replicating the same unsafe building techniques. By May 2009 the cluster reported that 14,200 transitional and permanent shelters had been completed. These represented less than 1% of the total shelter need and reached only around 4% of the most vulnerable families considered incapable of rebuilding on their own (Davidson, 2008)</td>
<td>1,470,419</td>
<td>14,200</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Pakistan Floods, July-August 2010</td>
<td>The widespread flooding in 2010 affected an estimated 20 million people across 77 of Pakistan’s 137 provinces. As the damage was so widespread and the floodwaters slow to recede in some areas, the Shelter Cluster suggested a nuanced approach to permanent and transitional shelter: One Room Shelters for those who could return, and Transitional Shelters for those who could not. Within a year, 453,293 one room shelters and 63,700 transitional shelters had been constructed, covering almost 38% of the total shelter need. Construction continued quickly, with an additional 100,000 shelters completed before December 2011 (Pakistan Early Recovery Shelter Cluster, 2010); (Pakistan Early Recovery Cluster, 2011a)</td>
<td>1,875,000</td>
<td>516,933</td>
<td>27.5%</td>
</tr>
<tr>
<td>El Salvador Floods and Landslides, October &amp; November 2009</td>
<td>Tropical Depression 12-E caused heavy rainfall and storms in October and November 2009, which led to extensive flooding and landslides in El Salvador. An estimated 300,000 people were affected and thousands of homes damaged or destroyed. The Shelter Cluster was activated for only a three month period, November to January, during which it agreed on a model for temporary housing and was able to deliver over 1,000 units. By the time the Shelter Cluster handed over to the government of El Salvador in January 2010, over 50% of households with shelter needs had received one of three temporary shelters. However, the construction of permanent homes took much longer and the first of these were not completed until May 2010 (Belen, 2011).</td>
<td>2,350</td>
<td>1,310</td>
<td>55.7%</td>
</tr>
<tr>
<td>Cyclone Nargis, Myanmar, May 2008</td>
<td>An estimated 2.4 million people were affected by Cyclone Nargis in May 2008 and 1.4 million left homeless. The initial emergency shelter response prioritised the delivery of plastic sheeting, which was provided to 83% of affected households within two months. The recovery phase focused on both shelter construction and repair. In addition to the 13,000 transitional and permanent shelters constructed within one year, repairs had been carried out on an estimated 30,000 damaged homes (Emergency Shelter Cluster 2008, (Alexander, 2009); (Shelter Cluster, 2008)</td>
<td>410,000</td>
<td>13,000</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Table 1 Shelter Needs and Shelter Response for some Recent Emergencies.
their own, either self-building or using their own resources to obtain the services of local builders and tradesmen. The total figures show that the task of rebuilding to meet all shelter needs, or even a significant proportion of them, is well beyond the capacity of the aid community. What is not considered is whether messages about safer building are transmitted by agencies or received by beneficiaries. Since this is rarely measured, the lack of data makes it difficult to assess and is a limitation of this paper. We recommend that further research be carried out to determine the degree and efficacy with which messages on safer reconstruction are communicated to self-rebuilders.

The scale of the problem makes the task of building back safer, or making a significant impact on the safety of post-disaster self-recovery, seem challenging. The evidence shows that the task is likely to become more demanding. The number of climate related disasters (floods, storms and droughts) is steadily increasing. Since 1980, the number of floods has almost quadrupled and the number of storms has doubled (UNDRR, 2012). While the number of earthquakes remains constant, the number of quakes with significant death tolls has been increasing over the past centuries as population increases, cities expand and building materials become more dangerous. Earthquakes that will kill more than 10,000 people can now be expected to occur sixty times a century – more than one every other year.4

Most families rebuild using their own resources and this is the central reason for trying to shift the emphasis towards supporting the process of self-recovery. However there are several other advantages that should be persuasive. Professor Ian Davis (2013) paraphrases the late Otto Koenigsberger, professor of the Development Planning Unit at University College London, by saying that “relief is the enemy of recovery”. Davis expands on this to explain that we should avoid doing anything best left to the house owner, avoiding paternalism and dependence. The second guiding principle of the World Bank/GFDRR Safer Homes, Stronger Communities states: “reconstruction begins the day of the disaster. If traditional construction methods need to change to improve building safety, governments must be prepared to act quickly to establish norms and provide training. Otherwise, reconstructed housing will be no less vulnerable to future disasters than what was there before. ….Owners are always the best managers of their own housing reconstruction” (Jha et al., 2010). It is possible that aid, or the promise of aid, can delay the commencement of reconstruction. On the other hand support for self-recovery can start very quickly while any NGO-driven construction project has a long lead-in time while designs are agreed, land tenure assured, materials procured and builders contracted. This has never been more evident than in the recent Typhoon Haiyan in the Philippines (November 2013). Filipino families began clean-up and reconstruction immediately. At the time of writing, it is too soon to know if the shelter sector can respond effectively and rapidly to support families in rebuilding more safely.

Clinton (2006) provided ten defining propositions that led to an increase in “build back better” initiatives and programmes after the 2004 Indian Ocean tsunami. Kennedy et al. (2008) point out the risks of misinterpreting the word ‘better’ which was understood by beneficiaries to mean masonry because it was modern and represented progress. Kennedy and his co-authors proposed renaming the initiative ‘Build Back Safer’ to avoid confusion and reflect more accurately what the principles were designed to support.

Risk management is an understandable concern for NGOs undertaking shelter programmes. The appeal launched after the Indian Ocean tsunami of 2004 raised a quantity of money unequalled before or since. Agencies with no previous experience of shelter and no internal capacity took on substantial housing programmes. Many got their fingers burnt and the spectre of the tsunami still casts a shadow over the shelter community. Houses had to be rebuilt or strengthened retrospectively because they were shown to be designed without taking the considerable seismic risk into account (Da Silva, 2010). Shelter has often been considered a risky undertaking; the tsunami exacerbated that belief. The difficulties experienced by INGOs working on post-tsunami projects were not unique: there are other examples of failed and troubled shelter projects (for example Sanderson, Sharma and Anderson, 2012; Saunders 2004).

Although shelter is recognised as an essential human right and a key component of recovery, many NGOs understandably steer clear because of their own lack of experience and the evident risks. The danger of designing and building an inappropriate house is only one aspect of risk: the house could also be badly engineered or badly constructed; it could be built on illegal land; it could be built on a site that subsequently floods. For others, the transitional shelter may be a more risk-free route. If the shelter is sub-standard, somewhat inadequate transitional shelter may be a more risk-free route. If the shelter is sub-standard, somewhat inadequate transitional shelter may be a more risk-free route. If the shelter is sub-standard, somewhat inadequate transitional shelter may be a more risk-free route. If the shelter is sub-standard, somewhat inadequate transitional shelter may be a more risk-free route.

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By contrast, supporting self-recovery removes much of the risk from the compass of the relief agency and places it with the decision-maker, the house-owner. It is a fundamental of risk management that the risk should be borne by those best placed to do so, but this is often not the case in shelter programming. While it is incumbent on the NGO providing technical support to give good advice and to encourage safe practice in construction and choice of site, the ultimate decision rests with the family concerned. Frequently we are unable to support families that live on dangerous or illegal land but equally frequently those families have no choice: they don’t want to live there, they are probably aware of the dangers, but their circumstances allow for no other option. Supporting them in the construction of their own dwellings might help reduce the inherent danger.

An important caveat is due at this point. Supporting families in their own decisions about where and how to build does not remove a duty of care from the agency involved. Assisting families that live in precarious circumstances should never be seen as endorsing unsafe building on dangerous sites. However, creative ways need to be found to support the most at-risk families living in the most precarious conditions. Too often, for example as in the case of landless families living on government-owned khash land in Bangladesh, the most vulnerable are passed over because they are on unsafe or illegal sites.

A decision to support self-recovery does not preclude other forms of shelter assistance. A nuanced response might include some t-shelters where needed, some cash support for repair and rebuild, perhaps some rental support. Self-recovery can also overlap with owner-driven reconstruction programmes, community driven reconstruction, Build Back Better programmes and aided self-help programmes. A small construction programme of permanent houses for the most vulnerable families could form the training programme for local builders. As always each disaster has its own characteristics; no two are ever the same; and there are no simple answers.

Many international NGOs are now seeing cash transfer projects as an effective way of delivering relief to disaster affected families in a way that is speedy and efficient as well as supporting and stimulating local markets (for example Creti and Jaspers, 2006). A shelter programme that combines conditional cash transfer with support for self-recovery could result in rapid reconstruction as well as safer building practice. Cash transfer, training and technical support for building safety are obvious bed-fellows. Cash programmes coupled with technical support also enhance the family’s freedom to choose and direct the progress of recovery. A delightful example of this is a major international

Figure 4. A cash transfer project in West Sumatra, Indonesia (2010). 3,500 houses, each different, were built in a nine month period. The construction was either self-build or using the local informal building sector (photo: Bill Flinn).
NGO’s cash transfer programme in West Sumatra following the 2009 Padang earthquake. Three and a half thousand houses were built by the families themselves, each one different and tailored to their individual needs and means. The sense of pride is clear in the personal touches of each house, the well tended gardens and verandas (Ashmore, 2012).

DO SHELTER PROGRAMMES SUPPORT SAFER SELF-RECOVERY?

In the series of shelter case studies (Ashmore, 2008, 2010, 2012, & 2013) a total of 108 shelter projects are presented in four volumes: the most comprehensive collection of shelter case studies available in the sector. A survey of the case studies shows that while many include some element of DRR, only a minority demonstrate support for safer self-rebuilding as part of a shelter programme, and only one case study is concerned with communication and messaging as the central theme.

While many post-disaster shelter programmes have a building safety component, this is often very limited in scope with very few studies available to assess impact. Some exceptions are mentioned below, for which the dissemination of good building practice was a central pillar.

The first example is from Haiti where one of the many problems faced during reconstruction was the poor quality of locally available concrete blocks. Following the 2010 earthquake, Build Change invited suppliers in Port-au-Prince to participate in training on how to improve the quality of the building materials they produced. Participants were taught how to improve the compressive strength of the blocks through a range of different techniques. Some required no additional investment at all, such as mixing more thoroughly and prolonging the mechanical compression period. Other recommendations required some additional investment, such as adjusting the proportions of the materials in the mix and increasing curing time. Improvements in quality were considerable: after training, one supplier was able to increase the compressive strength of his blocks from 4 to 14.36 MPa, twice the minimum recommended strength for an earthquake zone. For this supplier, improved quality led to improved demand, allowing him to expand his business and increase production from 300 to 2,000 blocks per day (Build Change, 2012).

Larger scale examples of implementing programmes for building safety which have had an impact on self-rebuilders include the SEEDS Masons’ Association, founded in response to the Gujarat earthquake of 2001, which turned into an 800 member organisation organising peer to peer training (UNISDR, 2007). More recently the One Room Shelter programme in Pakistan, in response to the 2010 floods trained over 200,000 people in safer building techniques (IOM Pakistan, 2014).

While still the exception rather than the norm, there are other examples in which the impact of safer building programmes has been assessed. An Education for Safe Building programme was run by a consortium of NGOs including Oxfam and Concern after an earthquake in Yemen in 1982. The project was run for three years, and half of the 638 affected villages were visited by a mobile unit providing training in safer construction. Almost a quarter of region’s builders, 820 in total, were trained. An evaluation found that 84% of the homes built by trainees used improved building techniques, despite the extra cost (Benson, Twigg and Myers, 2001).

In 2010, Development Workshop France (DWF) carried out an impact assessment to evaluate a typhoon damage prevention project in central Vietnam, implemented by DWF over a ten-year period. The study examined contemporary construction in five communes in Thua Thien Hue province, which is vulnerable to annual typhoons and flooding (Norton and Chantry, 2010).

DWF’s project activities included training local builders in safer construction techniques, raising awareness among families about the importance of prevention, and providing small loans for house strengthening. The assessment found that although many new homes remained vulnerable to floods and typhoons, there was a greater awareness of risk, and an increased use of safer construction methods in communes where DWF had worked for a long time. It concluded that households in these areas “tend to build their houses with stronger materials and better structures” compared to in areas where DWF had worked for fewer years or none at all. In general the study found that safer construction principles and techniques promoted by DWF had been applied “relatively widely” and were seen as effective methods of preventing typhoon damage by community members, builders and local government staff (Norton and Chantry, 2010).

The findings of this study highlight the importance of reinforcing messages about safer building over time—something very difficult to do in a post disaster context where humanitarian actors are unlikely to stay for long. Effective involvement of national authorities and development actors to support safer building initiatives in the long term is vital to ensure that messages, both post-disaster and developmental, are not forgotten.

These examples show that support for self-
recovery is not new. Indeed, most agencies recognise the need to embed DRR into all their programmes including in those shelter projects that are dominated by construction. However there is a lack of evidence that efforts in training and communicating are having a significant impact on post-disaster recovery. The examples cited above demonstrate that some shelter programmes already contain elements of support for safer rebuilding. However, the extent of the success of these programmes is difficult to ascertain as there are few impact studies. The Development Workshop study suggests that support for safer self-rebuilding can take many years to bear fruit. The challenge to the humanitarian shelter sector is to build on the work already done, particularly by developmental agencies, to find effective ways of promoting incremental improvements that will significantly improve the safety of houses built by self-builders or the informal sector.

BUILDING FOR SAFETY OR SAFER BUILDING?

Any improvements in building practice have to be affordable. They also need to make the structure significantly safer, and must take existing building practice as the point of departure. The concept of incremental improvement is based on what we know, or what we can assume with a high degree of certainty, will be the materials and techniques that families will employ as they begin to rebuild their homes. The shelter practitioner mentioned at the outset of this paper, standing in the rubble of Port-au-Prince, knew that the city would be rebuilt in masonry; if she was in Myanmar it might be timber; in rural Peru it would surely be adobe.

There is an important distinction to be made between “safe” and “safer”. Clearly the safer, the better, but some degrees of safety cannot be achieved. Designing against landslides and tsunamis is not feasible and the term “earthquake-proof” is unhelpful as well as un-achievable. In the realm of self-build, or building through the informal sector, where codes are not enforced and guidelines are simply guidelines and no more, then any argument has to be made for shifting the culture of building practice towards incremental changes that are easily understood and replicable and that make for safer buildings. Here we are mainly concerned with making houses that are less likely to cause death, injury or ruinous economic loss. To rebuild safer would be a great advance; to rebuild entirely safely remains an aspiration.

Any discussion on safer building practice has to happen alongside a debate about all aspects of appropriate design, especially the importance of a participatory process. There are examples of housing projects that may have been engineered to withstand a major earthquake but have been less than satisfactory to live in because they have not considered cultural appropriateness, comfort and adaptability (for example Sanderson, Sharma and Anderson, 2012).

EXAMPLES OF SAFER BUILDING PRACTICE

There are many simple and affordable ways in which small domestic buildings can be made safer. A few examples might help to appreciate the kind of improvements that can be simply communicated to homeowners and self builders in the informal sector.

One example is simplicity of design. It is not immediately apparent, for instance in an earthquake zone, why a building that is rectangular in plan is better than an L-shape, but this is a lesson that can be easily communicated and learnt. Another design detail to avoid is having the doorway immediately adjacent to a corner. It could also be an idea to consider two doors so that escaping from a building is easier. A building is stronger if the openings are in the long wall and avoided in the short wall. These are all design decisions that cost little or no money but can make a building safer. They are also simple messages to communicate.

In a timber frame building the hurricane strap is simple and cheap. This is a thin strip of metal nailed across a joint that makes it several times stronger than a normal nailed connection. The metal ties can be snipped from inexpensive galvanised metal sheet available world over. This technique was widely adopted in the construction of transitional shelters in Haiti, but frequently applied incorrectly. A simple orientation on the correct application of hurricane strapping would have improved the strength of the shelters and avoided the time and money wasted in doing it wrong.

Most builders know that a ring beam is an important element in increasing the strength and safety of a concrete building. However its strength relies on the quality of the reinforced concrete. There are simple messages that can be communicated on the correct bending, tying and lapping of steel bars and the correct way to mix and pour concrete to avoid honeycombing (where the steel-work is exposed and will rapidly corrode) and ensure strength and durability.

These are just three examples of safer building practice that can be communicated in a straightforward manner. Moreover, they show that these messages might fall into the categories of...
design, materials and skills. There are many others that are specific to context, hazard, local vernacular building typologies and indigenous skills. Other messages, such as the design principles mentioned above, can be considered to be general good building practice applicable in many circumstances. Currently there is a lack of consensus on the relative priority and impact of different good construction messages and a lack of methodologies for successful communication strategies. However there is a growing consensus that getting these messages across, and ensuring that they are implemented, is an important step towards improving building safety and improving the long-term resilience of hazard-prone communities.

CHALLENGES AND BARRIERS

In this paper we argue for more emphasis on support for the inevitable process of self-recovery. There are several counter-arguments and by considering a few of them here we are recognising that they need to be carefully taken into account. Furthermore, no two disasters are ever the same and there are no blueprints or standard solutions.

There will always be a need to balance the immediate needs of homeless people with longer-term support for recovery. The case for the t-shelter is that it bridges a gap between the emergency and recovery or reconstruction. By supporting self-builders in the construction of permanent homes we are open to the criticism of condemning families to longer in tents or t-shelters. There may be some truth in this – the construction of a permanent home is never a quick process – but it is also interesting to note that the cost of a permanent house is sometimes not that much higher than the cost of a temporary t-shelter (Davis, 2012). Transitional shelters do also have a habit of becoming post facto permanent, but sub-standard and unsafe. The provision of transitional shelters in large numbers is also very expensive and according to evidence from Haiti, the community itself does not necessarily put housing as the top priority (Rule, 2013).

Changing the attitude of donors and international agencies is another challenge. As one shelter practitioner stated: “donors required concrete numbers of beneficiaries and shelters (which) doesn’t really promote the idea of working through a medium of information to assist the larger affected populations”. Donors like solutions that are easy

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5 The British Red Cross found that a Haitian community ranked housing ninth in order of priority. From a presentation by Amelia Rule, BRC, to the UK Shelter Forum September 2013 (Rule, 2013).
to count and have a clear beneficiary list; trainings, mass-messaging, and informal support to local builders are all difficult to clearly quantify. There may be a need for long term project support for safer self-rebuilding in order to make an impact, which may encounter funding and institutional support barriers. Undeniably, there is also a capacity and skills gap within the sector. The shelter practitioner with humanitarian experience, knowledge of effective communication techniques as well as sound construction and engineering skills is a rare breed in a world of increasing need. If effective communication of safer building strategies should become a key component in reconstruction programmes, the necessary skills will need to be encompassed by the practitioner or the shelter team.

CONCLUSION

Throughout this paper we have referred to the “inevitable” process of self-recovery. We argue that this process requires the shelter sector and the donor community to redirect resources towards support for this process. Failing to do so has a consequence: it runs the risk that the post-disaster reconstruction of houses will incorporate the same unsafe practice that caused so much damage in the first instance. We show that current shelter practice, particularly in major disasters, rarely provides for the needs of the majority, sometimes covering less than ten percent of the housing loss within the first year. Furthermore, this is often in the form of temporary one-room shelters. Consequently we conclude that the majority of permanent dwellings are built using the owner’s own resources, either through self-build or using the informal building sector. This provides an opportunity, as well, arguably, as a moral obligation, to augment the effectiveness and impact of a shelter response through increased support for the process of self-recovery. This does not imply a complete volte face; all shelter responses are complex and varied and the process of improving safety as part of self-recovery fits well with cash transfers, livelihood programmes, integrated neighbourhood projects and so on. Communication of safer construction techniques can also complement t-shelter, one-room-shelter, prototype model houses and other construction projects.

Some successful examples of communicating good practice in both development and humanitarian settings have been illustrated in this paper. However, the authors’ research also shows that these examples are few and far between and that there is little evidence to show the effectiveness and impact of messaging, training and awareness-raising in a post-disaster scenario. To increase this impact and engender an understanding of safe building good practice, there has to be an increase in the relevant skills within the sector and reliable access to good, technical information.

There is never a one-size-fits-all solution to shelter programming. However there is a strong case to be made for placing much more emphasis on increasing the safety of owner-built housing. This will have a significant impact on the lives of many by reducing their risk to future hazards and encouraging a change across the community towards safer building practice.

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Getting the Message Across for Safer Self-Recovery in Post-Disaster Shelter.


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INTRODUCTION

Providing permanent housing to disaster victims is one of the most critical and time-consuming activities in the post-disaster reconstruction process. As shown in figures 1 and 2 the Federal Emergency Management Agency (FEMA), the Florida Department of Community Affairs and the Florida Division of Emergency Management predict that permanent housing may take up to five years to realise from the time of the disaster’s impact. For an average citizen, this is a very long time period to wait to restore their normal livelihood. As many experts term it, a ‘new normal’ is therefore set in many circumstances rather than providing exactly what existed previously.

Long-term solutions such as permanent housing are as important as the emergency relief provided after a major natural disaster. Prefabricated modular structures can provide a holistic approach to permanent housing reconstruction in disaster-struck areas. As analysed in this paper, many of the common issues that have arisen in previous post-disaster permanent housing reconstruction programmes can be provided with highly time-efficient and holistic solutions through modular construction.

The many inherent characteristics of modular structures, as listed below, allow for a speedy construction as well as a solution that is friendlier to the end user. Some of the relevant characteristics of modular structures are as follows:-

- All components of a building, including stairs, lift shafts, façades, corridors and services can be incorporated in such modules.
- The modules are mass produced in a quality controlled production facility ensuring greater quality control as well as more beneficial economies of scale.
- A module’s shape and size can vary to suit a desired architectural plan, where the dimensions may only be limited according to the transportation arrangements such as truck dimensions and height restrictions on roads that need to be travelled on during transport of the modules.

Keywords: Post-Disaster Housing Reconstruction, Prefabricated Modular Structures, Natural Disasters, Time- Efficient Construction.
There is minimal work on-site to complete the buildings as the façade and interiors themselves form parts of the modules.

The modules can easily be removed from the main structure for future reuse or relocation. Many developed economies now have a market for used modular units.

Modular construction at present reduces construction time by over 50% from a site-intensive building (Lawson et al., 2012).

Reduced construction time means that the modular houses become habitable for the end users much sooner than it would after the completion of a conventional construction.

In addition to the above mentioned characteristics, Rogan et al. (2000) assess the costs and benefits of modular construction as against traditional construction, for a typical four-storey residential building in London. Where the initial investments have only been a mere 2 per cent higher for modular construction, it has shown to reap far greater benefits than the traditional construction approach, from the beginning of the usable life of the structure. With a 39 per cent greater turnover estimated and a 43 per cent higher Internal Rate of Return (IRR), modular construction was clearly shown to provide more benefits to the builder as well as the client.

This paper thus evaluates how these features of prefabricated modular structures can be used to provide a holistic and speedy solution to post-disaster housing reconstruction issues commonly raised by many of the major disasters that have occurred around the world.

**PREFabricated MODULAR HOUSES IN REAL WORLD APPLICATIONS**

Although the concept of prefabricated modules is only beginning to gain popularity worldwide, quite a few such buildings have already been built and inhabited in many developed countries. Almost all of these buildings are residential, and there is an increasing demand for this construction technique.
mainly due to the speed at which the final products are realised.

Prior to applying the technology to post-disaster applications, it must be observed how the concept is applied in real world applications. A few examples from around the world are described briefly to observe how prefabricated modular construction has become established as a practical commercial building methodology.

**Little Hero building, Melbourne, Australia**

The low-rise apartment building ‘Little Hero’ in Melbourne, Australia consists of 58 single-storey apartment modules and 5 double-storey apartment modules (see figure 3). The authors were part of the development team for this project. The eight modular stories were assembled with finishes within eight days, and the building was constructed at a site with a very narrow access road, thereby demonstrating some of the many advantages of modular construction.

**Domino Housing 21, Spain**

This is a four-storey structure built in Spain, where modules can be added or dismantled as the client pleases. The time taken to set up the full structure once planned is just 15 days. The building speaks volumes for the speed of construction that modular concepts provide, as the units can be added with additional boxes to add spaces and customise the existing ones even further.

**Student housing building, Wolverhampton, UK**

This 25 storey structure is claimed to have been completed in just 27 weeks of work on-site (see figure 4). Lawson et al (2012) explains this as a 50 per cent saving from the on-site time estimated for a site-intensive construction; they have estimated the productivity in terms of savings in man-hours as an 80 per cent improvement from a site-intensive construction. In general, Lawson et al (2012) state that modular construction can reduce site wastage up to 70 per cent compared to site-intensive construction methods.

Therefore, not only have modular structures proven time-efficient, but they have also proven to be more environmentally friendly, providing energy-efficient solutions. As discussed by Lawson et al (2012) in general prefabricated modular buildings have proven to reduce construction waste considerably and this is mainly through means of minimised off-cuts (Osmani et al, 2006). This in turn will result in significantly improved efficiency in energy, cost and time of construction.

Figure 3-1. Little Hero Building (modular building in Melbourne, Australia).
Due to the large housing demand which followed the Hurricane Katrina disaster in 2005, much research has gone into improving the previously used ‘FEMA Trailers’ and to implement modular construction for temporary housing. A design by Architect Marianne Cusato inspired this modular house, which was named the ‘Katrina Cottage’ (see figure 5). It was designed to be installed with a floor area of 27.8 square metres. However this was improved to incorporate a more permanent housing solution with 20 different cottage models that allowed for future extensions (McIntosh, 2013).

\textbf{Haiti post-earthquake reconstruction - temporary housing}

Following the Haiti earthquake in 2010, the Canadian Embassy in Haiti carried out the installation of 46 modular housing units as temporary shelter for 75 individuals (see figure 6).

\textbf{INTERNATIONAL GUIDELINES ON POST-DISASTER HOUSING RECONSTRUCTION}

FEMA (2005) and Oxfam (2003) define the terms ‘Shelter’ and ‘Housing’ with respect to post-disaster relief operations. Both institutions identify shelter as temporary dwellings, provided until such time that the affected people could be moved into more permanent houses. Shelters are meant to be only a temporary safety net for the displaced to protect against diseases, health issues and further disasters.

In a more non-traditional context, Shelter Project. org (2003) defines a shelter as a “Habitable covered living space, providing a secure, healthy living environment with privacy and dignity to those within it.”

‘Housing’ on the other hand is identified as permanent dwellings, which are associated with necessities in the form of physical, social and administrative infrastructure. This in turn reflects the need of permanent housing to cater to the livelihoods of the disaster-affected communities in the long run.

Many agencies such as Oxfam (2003), APEC (2009) and UNDRO (1979) have identified that the transfer of technical know-how to the parties involved in a disaster relief operation can slow down or affect the process adversely. It is understood that most disaster relief operations include the help from many non-technical parties such as locals including the disaster victims themselves. As most of them may not be experts in construction technology, the knowledge gap will affect a mass housing construction operation in a very adverse manner.

As many locals show a great deal of enthusiasm during the post-disaster housing process, Oxfam (2003) suggests the following ‘pre-emptive strategies’ to handle the inputs:

\begin{itemize}
  \item “Matching technology to capacity” – This
involves an initial study on the individuals that are involved in the process, and the time commitments, expertise and skills that can be expected from them.

- “Project schedules should be realistically based”
- This is to ensure that the housing process makes effective use of the parties involved and their expertise and skills.
- “Building model houses” – This will provide a
Tharaka Gunawardena, Tuan Ngo, Priyan Mendis, Lu Aye, Robert Crawford

better understanding to the planners as well as everyone involved as to how the full process will pan out. All involved parties can identify what they can expect in the real process.

Oxfam (2003) further identifies the importance of the technological know-how in dealing with construction materials.

In addition to the construction-related issues discussed here, HIC-HLRN and PDHRE (2005) have identified human rights related concerns that need to be addressed in a post-disaster housing process. It strongly suggests that no resettlement programme should be undertaken without considering internationally recognised human rights being in place. In general, it strongly states that the livelihoods of affected individuals should be reinstated as soon as possible to ensure that their natural development is not hindered or damaged beyond repair.

**POST-DISASTER HOUSING RECONSTRUCTION IN THE PAST**

Post-disaster recovery processes for many of the recent disasters have been recorded by the parties involved and it is worthwhile to examine them. This gives an understanding as to which key problems have occurred more commonly and which may need an innovative solution. The post-disaster reconstruction processes of the following disasters are studied here as case studies:

- Housing reconstruction in Turkey following the Kocaeli Earthquake in 1999.
- Housing reconstructions in Sri Lanka, India and Indonesia following the 2004 Indian Ocean Tsunami.
- Housing reconstruction in Pakistan following the Kashmir Earthquake in 2005.
- Housing reconstruction in Japan following the 2011 Tsunami.

Table 1 shows a summary of the background data of these natural disasters and Table 2 is a summary of the housing reconstruction undertaken. This is a depiction of the magnitude of damage that natural disasters of this nature can cause, and how long it can take to permanently restore the livelihoods of those affected.

Studies carried out on the post-disaster housing reconstruction of the above mentioned cases are analysed to identify how a modular construction can solve many of the commonly faced issues as identified through these examples.

**KEY ISSUES IN THE RECONSTRUCTION PROCESS AND SOLUTIONS OFFERED BY MODULAR HOUSING**

Although different in magnitude and nature, the disasters studied in this paper have provided a set of common issues to the process of reconstructing houses. It is useful to therefore identify some of these key issues and then assess how a smart solution can be provided through modular construction. Explained below is how these issues were identified by many researchers who analysed these post-disaster processes.

**Time**

People displaced due to natural disasters need assistance in restoring their original livelihoods.
Therefore time is a critical factor, as restoring their lives needs to be done as early as possible. Tas et al (2010) have identified ‘time’ to have a significantly higher rank over the other factors that determine the design of post-disaster permanent housing (see figure 7).

In the above mentioned case studies, the finished housing projects have taken at least five years to complete. This is a considerably long time for disaster-struck communities to wait to rebuild their lives. Weerakoon et al (2007) identified how factors such as inflation and foreign exchange rate fluctuations have drastically increased the price of construction materials over a lengthy stretch of time (see figure 4) and the changes in wages for labour over time (see figure 5), which made the reconstruction process in Sri Lanka costlier than it should have been.

Time efficiency of modular construction is one of the key features that make it a highly desired new technology. As Lawson et al. (2012) claims, modular buildings can reduce construction time by

Table 2. Reconstruction data summary for the natural disasters of the analysed case studies.

<table>
<thead>
<tr>
<th>Disaster</th>
<th>Source</th>
<th>No. of Houses Reconstructed</th>
<th>Value of Housing Reconstruction</th>
<th>Completion of Housing process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kocaeli Earthquake, Turkey</td>
<td>Tas et al. (2011)</td>
<td>43,093</td>
<td>$5 billion (estimated)</td>
<td>Over 6 years</td>
</tr>
<tr>
<td>Indian Ocean Tsunami in Sri Lanka</td>
<td>Weerakoon et al. (2007)</td>
<td>Approx. 60,000</td>
<td>$700 million (estimated)</td>
<td>3-5 years</td>
</tr>
<tr>
<td>Kashmir Earthquake in Pakistan</td>
<td>Areshad &amp; Atwar (2013)</td>
<td>463,000</td>
<td>$1.3 billion (estimated)</td>
<td>Approx. 5 years</td>
</tr>
<tr>
<td>Japan Tsunami</td>
<td>Structural Engineers Association, Washington (2011)</td>
<td>-</td>
<td>-</td>
<td>Still continuing 2.5 years after disaster</td>
</tr>
</tbody>
</table>

![Figure 7](image1.png) Ranking of the determining/restricting factors in permanent housing design – with respect to the Kocaeli-Turkey earthquake in 1999 (source: Tas et al, 2010).

![Figure 8](image2.png) Price changes through time of imported and local construction materials (source: Weerakoon et al, 2007).

![Figure 9](image3.png) Changes through time in wages for labour (source: Weerakoon et al, 2007).
Almost 50% compared to more conventional site-intensive constructions.

Many houses can be simultaneously built through mass production facilities and also simultaneously installed on-site, which will cut down construction time. This time saving means that the affected communities can recommence their livelihoods much sooner. Further, the funding for the project will also make greater savings by avoiding time fluctuations in material and labour costs and exchange rates.

**Resource availability and integration**

Yan et al (2010) have categorised resources as “Government-driven, Market-driven and Donor-driven” prior to identifying the related issues. They have identified that although government-driven operations have an initial advantage of price and rate interventions from the government, eventually they succumb to economic factors such as inflation of material prices and rises in wages. Donor-driven processes have shown a lack of capacity in having resources available. Market-driven processes are seen as the most desirable in terms of performance and results, but they lack support from the stakeholders such as governments and humanitarian agencies.

In a later study, Yan et al (2011) identified five main types of factors that affect resource availability in post-disaster reconstruction, namely:

- Market-related factors
- Logistics-related factors
- Project-related factors
- Organisation-related factors
- Environment-related factors

Tas et al (2011) have reported that almost 16 different contractors were involved in the reconstruction process after the Kocaeli earthquake in Turkey. This is a large number of different firms working on the same project, which would eventually require a good platform of integration.

Although modular construction as a technology may not solve the resource availability issue, it has the potential to considerably reduce the burden of finding resources. Many logistics-related factors as stated by Yan et al (2011) can be reduced by having almost all of the operations running under one manufacturing plant; whereas in a site-intensive construction different resources would need to be called upon at different times by different contractors.

Arshad and Athar (2013) in their study on the rehabilitation after the Kashmir earthquake have pointed out that engaging a limited number of parties in the reconstruction process is a key success factor. Modular construction by its character involves a minimum number of parties, as the house is already built by the time it arrives on site. Most of its construction is done as pre-organised mass production, which is streamlined and will mostly not be affected by the nature of the situation. Most processes are already integrated before modular units are assembled on site. Modern integration techniques, such as Building Integration Modelling (BIM), can also be applied easily to support the design and planning process of modular construction.

Further, Rogan et al (2000) have stated that the ‘lead-in time’ from ordering to delivery can be cut down to as low as 6 to 8 weeks if the products have been prototyped previously through projects of similar nature. This may vary with the location in consideration and how far away it is from a production facility. It is advisable therefore, for a disaster management organisation to have typical designs for several types of modules to suit different post-disaster conditions. Since these module types will be predesigned and pre-engineered it will improve the planning and lead-in times considerably. However, this suggests that if the parties involved in disaster relief operations can plan early and be prepared, ideally before disaster strikes, they will benefit tremendously with modular construction.

Considering the large amount of houses often required following a natural disaster, suppliers will need to possess capability to deliver large number of modules at short notice. However, modular construction would still be the best equipped to cater to this large demand as economies of scale will largely benefit modular construction as opposed to traditional means (Rogan et al 2000).

**Availability and skills of workforce**

As observed from the data in Tables 1 and 2, the number of houses that need rebuilding after a large-scale natural disaster can be extremely large. This requires an appreciably large workforce, which may be unrealistic to be found at once. Arshad & Athar (2013) acknowledge that lack of knowledge and/or skills of the locals assisting was a key issue during the reconstruction process in Pakistan after the 2005 Earthquake.

The expertise for the construction of a modular housing unit is mostly needed inside the manufacturing facility. Once the modules arrive on site, they will only require a minimum amount of labour for the installation process. As mentioned previous-
ly, it is observed that local communities volunteer during many housing reconstruction processes, and the expertise needed in the on-site construction of modular houses is minimal where they can provide a better and more efficient service. The activity needed on-site can be as minimal as tightening a few nuts and bolts, and local volunteers with minimum work experience could be trained easily to carry out these tasks.

**Lack of expertise in planning**

As previously mentioned, publications such as Oxfam (2003) and Roosli et al. (2012) identified a lack of expertise and knowledge in the relevant authorities about the process of housing reconstruction acting as a major setback in the housing reconstruction process. They also identified the importance of all approaches and plans being integrated as a universal plan, which is lacking in many large-scale post-disaster housing operations.

A high percentage of the construction process of a modular structure is a pre-planned process carried out in a factory environment. The process to construct a module from its raw materials should not require any drastic changes even during a post-disaster reconstruction scenario.

External parties would only get involved in the on-site construction and for integrating the infrastructure. Modular units are generally built with provisions for services. It is only a matter of connecting them on-site once the modules are assembled. Further, since the interiors as well as façades, roofs, etc. are all pre-constructed into the modules, the planning required becomes much simpler. This provides a more workable platform for institutions of various disciplines, such as contractors, governmental institutions, non-governmental organisations and humanitarian agencies, to work together and produce better results.

**Overall quality of houses and end user satisfaction**

Eventually, the satisfaction of the end users is a key concern. Although the affected individuals may eventually be thankful for the resettlement of their livelihoods after possibly losing all their possessions, it must be understood that they are entitled to be opinionated of the quality of the finished product. For this reason institutions such as FEMA, APEC and UNDRO have set standards for post-disaster housing reconstruction.

SEAW (2011) with respect to post-disaster operations in Japan, suggests that having timely solutions to housing will reduce the burden on social services, and the stress on affected individuals by living in temporary shelters. To satisfy this requirement fully, the housing solutions will need to cater to most of the requirements of those individuals, which will then reduce their grievances by having minimal defects and desires not fulfilled.

The production of a housing module is done in a highly quality controlled environment. The quality checks inside a mass production facility will be more reliable compared to an on-site construction, especially in a post-disaster scenario where on-site construction will be under heavy pressure for delivery.

Further, modules can be adjusted to suit the needs of the end users, and as the construction is highly time efficient, the parties involved can take time to analyse the situation and to plan for the specific requirements of the affected community. This will make sure that the final product suits them with respect to both structural stability and liveability.

**Other benefits**

Modular construction requires minimum access roads as on-site construction will be minimal. Modular units can be shipped in or transported on trucks and placed on site using mobile cranes. This is a very convenient and practical method of construction, especially in a disaster struck area where vehicle access could be a key limiting factor.

Modular structures have proven to be more environmentally friendly than conventional steel or concrete buildings. Far less waste is generated by modular construction, thereby giving it an edge in having a smaller impact on the environment, which may result in time and cost savings over reduced expenses in dealing with waste. In further studies, Aye et al. (2012) have found that more than 80% of the embodied energy in an original steel modular system can be saved by reusing the modules. It is important to notice the advantage provided by modular units by its ability to be easily dismantled and relocated as and when the need arises. This can provide a great deal of flexibility in a post-disaster housing operation.

Modules can also be easily dismantled for relocation. If the tenants are unhappy with where they are located the relevant agencies can help them relocate with the houses they have been provided with. This adds value to the operation by being more oriented towards the human needs as suggested through HIC-HLRN and PDHRE human rights requirements.
CONCLUSION

It is observed from the different examples from around the world that permanent housing can take years to realise after a disaster, while temporary housing could be provided in a matter of days. Modular construction can drastically improve this time gap. The faster construction times, which are characteristic of modular construction, make this form of construction a great solution for providing faster permanent houses.

Factors such as scarcity of resources, deficiencies in transportation, funding, etc. can still have a detrimental effect on the efficiency of a modular construction. However such factors can be expected in a post-disaster scenario. Modular construction can provide a more integrated approach where economies of scale that arise through mass production will provide a valuable solution to funding difficulties. As almost all the building components would be integrated into one single module before it leaves the manufacturing plant, the disaster relief operation would depend on a single contractor instead of various different contractors and subcontractors. This characteristic of modular construction will simplify the entire process of post-disaster housing.

A great advantage of using modular structures as a post-disaster housing solution is that much of the expertise in reconstruction is directed to one solution provider. As seen in many cases studied in this paper, the expertise of appointed officers and institutions on the technologies involved is a key factor related to the speed of providing housing solutions.

The higher quality standards that can be assured due to the modules being constructed under a quality controlled environment such as a manufacturing plant will ensure greater satisfaction to the end users. Modules can be pre-engineered to perform at various climatic conditions in order to provide a better indoor climate to the dwellers. Better preparedness and having a set of modules that were prototyped previously with well-established production logistics, can result in even faster delivery of final products. Techniques such as BIM can be used to efficiently gather and channel all such design requirements from a disaster struck community to the designers, and modular construction will be highly compatible to associate such requirements to produce custom-designed houses in a much faster time period. This is a great way to ensure that the livelihoods of the affected communities are restored to their satisfaction, and to ensure that their basic human rights on permanent housing are provided as early as possible.

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Reflections on Residential Rebuilding After the Victorian Black Saturday Bushfires.

Greg Ireton, Iftekhar Ahmed, Esther Charlesworth

Abstract
After the catastrophic 2009 bushfires in the state of Victoria, Australia, the State Government provided information and advice, short-term and temporary accommodation as well as financial assistance to bushfire-affected communities. A tension developed between quickly rebuilding housing and re-establishing known social and economic networks versus a slower and more deliberative process that focuses on long-term community outcomes. Whilst there was a widespread assumption that quick rebuilding would be beneficial, resulting in immediate pressure to do so, it became evident that many people were not prepared to, or even did not want to rebuild. Thus it became important to provide time and support for people to consider their options away from the immediate pressures to rebuild that are often inherent in post-disaster recovery processes. This became known as “holding the space” and included the introduction of interim supports such as building temporary villages and other supports which enable people to achieve appropriate interim accommodation without having to rebuild immediately. However, even two years after the bushfires a significant proportion of people remained undecided whether they wanted to rebuild or not. The post-bushfire experience pointed to a number of lessons including the importance of appropriate timing of post-disaster activities, careful targeting of financial assistance, need for developing better and lower cost interim housing options and pre-impact planning. Given the complex nature of rebuilding following a disaster, design professionals should focus not just on the final house, but also look at housing options that blur the distinction between temporary and permanent. Their designs should be quick to build, offer a good quality of life, be affordable for most and be flexible in design for future use.

Keywords: Bushfire, Rebuilding, Temporary Villages, Victoria.

Introduction
The 2009 bushfires in the state of Victoria, Australia, also known as the Black Saturday bushfires, saw the greatest loss of life in any bushfire in Australian history. The fires devastated 109 towns across the state, destroying more than 2,300 homes and damaging around 43,000 hectares of land. More than 70 National Parks and reserves were damaged, and over 11,000 farm animals killed or injured. More than 10,000 insurance claims were made, totalling AUD$1.09 billion (VBRRA, 2011).

The rebuilding of residential housing post-disaster in Australia, as in many developed countries, is an owner-driven process. It is expected that private resources such as insurance, loans and savings will provide the primary means for funding repair and rebuilding or another long-term housing solutions (Zhang, 2010). The role of government is in the form of providing information and advice, short-term and temporary accommodation as well as some financial assistance based on eligibility criteria. For catastrophic events such as the 2009 bushfires, the range of activities of the State Government increased to reduce the burden on those remaining within devastated communities as well as assistance from the Victorian Bushfire Appeal Fund.

Catastrophic disaster events, such as the 2009 bushfires, have a wide range of impacts that persist over a long time and these events often highlight the complexity of post-disaster housing policy and programs. Sapat et al (2011) articulate this point in saying, “We find that as a policy issue, post-disaster housing continues to be a ‘wicked’ and ‘messy’ policy problem, exacerbated by unrealistic expectations of governmental agencies.” For catastrophic events in particular, it is clear that housing recovery is not a short-term activity. The issue cannot be left solely to the market and must be considered as a core part of the long-term recovery planning (Zhang, 2010).

Well-considered and deliberative decision-making is often very difficult in the post-disaster environment with the pressure to rebuild quickly (Evans-Cowley and Kitchen, 2011; Olshansky, 2006; Olshansky et al, 2008; Paul and Che,
Many are keen to rebuild quickly based on the pre-existing housing and infrastructure to restore a familiar community, whilst others advocate reconstruction that incorporates new planning and hazard minimisation. Often this tension develops between quickly rebuilding and re-establishing known social and economic networks versus a slower and more deliberative process that focuses on long-term community outcomes. This is particularly worrying when it is considered how important small things may be in the rebuilding process. Following the 2009 bushfires, the Victorian Government was keen to make available a free clean-up program that would seek to expedite the often lengthy clean-up process if the affected community is left to arrange for it themselves. It was clear though to the government that this would only succeed with a people-centred approach that was mindful of the needs of individuals and families more than only focusing on timelines.

The narrative below from a member of the bushfire-affected community in Christmas Hill, expressed at a Community Leadership Forum in 2010, highlights the importance of seemingly minor matters:

“Our insurance company was efficient. Too efficient. The demolition crew arrived unannounced. Before the government had organised the Grocon [a private developer and construction company] clean-up and before we had a chance to search properly for surviving ‘treasures’. My husband discovered the demolition activity by accident, having driven past our property for a quick look. He threw himself in front of the bulldozer to stop them and called me to bring the kids so we could have a quick sift through before they continued. To be honest there wasn’t much left after the fires. There was even less after the bulldozer had been through. BUT, incredibly, my eldest son, Jess, spotted a little yellow and brown foot amidst the rock and dirt and the ash. He carefully excavated & pulled out a little china cat. It was one of those $2 special varieties. I remember thinking when he bought it “Oh great, more rubbish!” But it had survived not only the fire, but a bulldozer and 2 bobcats and it was pristine apart from a couple of slightly charred paws. Well, we took it home and placed it on an altar of other surviving ‘treasures’- a molten piece of glass, some burnt crockery and a bent fork or two. That little china cat has no monetary value. But it’s true worth is immeasurable. Seeing the look of joy on our children’s face when it was discovered makes it more valuable than any Ming vase or valuable piece of pottery.”

Stories such as this clearly indicate that the process around decision-making and rebuilding is a very important part in seeking meaning and long-term wellbeing, rather than just the end outcome of a house to live in.

Lack of strong evidence base

These challenges in the residential rebuilding process post-disaster are exacerbated by the lack of detailed studies and information on these often devastating social and physical losses (Zhang, 2010). In the aftermath of the 2009 bushfires, there was very limited information on how long the rebuilding process following a catastrophic bushfire actually takes or any detailed information on how many people would be likely to rebuild. Additionally, there was very little information on whether outcomes for individuals and families are improved if they remain within the community or move to another, less affected community.

Seeing the level of devastation, loss of infrastructure and services, and lack of immediate access to services, it can be easy to hypothesise that it might be beneficial to relocate to less affected areas. It is equally easy to surmise that the benefits of remaining within a tight-knit community where social networks can be maintained and with easy access to the house site during rebuilding. There is evidence to support both of these views (Bonnanno et al, 2010). In reality, the benefits and hindrances for individuals with either of these choices will depend on a range of factors including the services available within affected communities and timelines for personal financial resources, pre-existing issues or resources within the community prior to the disaster, disruption and likely restoration of lifelines, personal factors such as the availability and access to employment, as well as the availability of housing options within the affected community and surrounding areas.

In the absence of any clear evidence either way, it can be deduced that the role of the government is to ensure that there is clear information about the range of options so that individuals can make informed decisions about what is most likely to suit them. It is most important to realise that this decision may change over time and so it is important to continue to provide this support in the months and years following the event. Where additional government or other donated assistance is available, there may additionally be the opportunity to provide tailored local accommodation options.

Further research is thus needed into the outcomes for individuals and families affected due-
The pressure to rebuild, real or perceived, are often encountered by affected people from friends, donors, the government and media. It was found in many conversations with people considering their options after losing their home that they felt they would be letting down the community and the broader society who had donated money if they did not rebuild within the community; whether they thought that this was in their own and their families’ interest or not seemed of less consequence. They experienced pressure to quickly make decisions that would impact on their lives for many years to come.

There often appears a pre-conceived idea within the government and media that anyone who has lost a house to a bushfire (or other natural disaster) will naturally want to rebuild. There seems to be little thought about whether these people have ever built a house or ever had a desire to build a house. This is not limited to bushfires in Australia. A resident in Kansas, USA, who lost their house in a tornado in 2007 stated, “With stunned minds, we began trying to decide what to do next. Ray did not have the mental and emotional energy to rebuild. I clung to the thought of rebuilding for a while, but to be honest, the last thing that I’d ever wanted to do was build a house” (Paul and Che, 2011).

A common story that can be heard in many of the bushfire-affected communities was of elderly couples who had established extensive gardens over decades and had no inclination (and perhaps no longer the physical strength) to re-establish their gardens. There are other similar reports, some from bereaved people who did not wish to consider rebuilding on the site where loved ones had perished, and also from many others who never thought that they would regain the lost sense of safety and security within their community, and also a number of other people who had tentative plans to move out of the community prior to the fire and saw this as an opportunity now to act upon those plans.

In the rush to help people re-establish their lives, governmental and other agencies should be cautious that people are allowed time to consider their options and choose what they consider best for themselves rather than feeling forced into rebuilding either through perceived pressure or the assistance that unduly focuses on rebuilding rather than other long-term housing options. In fact I would argue that the role of the government, Non-Governmental Organisations (NGOs), as well as built environment professionals is to assist people in realistically considering the range of options open to them rather than advocating any specific and defined outcome. This approach of providing time, space and support for people to consider their options is well described by a community worker as “holding the space” (River, 2013).

**Approaches to “holding the space”**

The idea of “holding the space” is to ensure that immediate needs are catered for (such as short term or temporary accommodation, access to support and advice as well as immediate financial assistance where required) whilst providing time and information to allow an individual or household to make informed decisions about what might be in their best interest. Making informed decisions will involve having access to a range of information. Direct advice such as legal, insurance, financial and building advice can be made available through specialist advisers or pro-bono services, but it can often be difficult to mark the importance of this advice prior to individuals making decisions. Rebuilding advisors engaged after the bushfires remarked, often despairingly, that they were often asked for advice only after people found themselves in trouble after previous decisions.

Many residents were also concerned about what the community would be like in the future as they were considering whether they wished to rebuild. Although this is next to impossible to predict, some processes work to establish a shared vision and provide an opportunity for residents to understand how that vision may look. In Marysville, one of the most severely affected towns, a workshop was conducted to prepare an Urban Design Framework for the community and surrounding townships. This allowed residents to be actively involved in shaping the future direction of the township. A key element of the workshop was the involvement of urban designers who were able to illustrate what these hopes and ideas may look like and to give a better sense of the future community (see figure 1).

**Temporary accommodation**

The Victorian Government decided to develop a
number of temporary villages to provide additional housing options within some of the most significantly affected communities. The idea of temporary villages was not part of any pre-existing planning and was developed primarily in response to the desire of the community of bushfire-affected Flowerdale town to have a village there (VBRRA, 2011).

Following further community consultations, two more temporary villages were established, one in Marysville and the other Kinglake were opened. Further units were also built in Whittlesea town. At their full capacity in April 2010, 314 people resided in the temporary villages and the final residents moved out of the villages gradually during 2011 (Flowerdale & Whittlesea) and 2012 (Marysville & Kinglake). The time pressures of getting the villages, the community and service infrastructure quickly established without any prior planning meant that there was little time to consider the most suitable or cost-effective solutions or what would be in the best interest of the community in the long term. It was also difficult to know how many people would eventually utilise the villages and it was therefore important to plan the villages to expand as required. Nonetheless, for many of the people who stayed at the villages, it was a positive experience, as captured by a resident: “It [the temporary village] was the best ever thing that happened after the bushfire. It really kept our community together.”

It is important to note that temporary accommodation support cannot be successful in isolation and requires a cohort of other supports to be effective. Extensive communal facilities and activities were put in place in the temporary villages. While people resided at the temporary villages, housing workers worked closely with them to develop housing plans and to maintain a focus on attaining more permanent accommodation. Regular meetings with residents ensured that critical issues could be addressed before they could create further stress. These included ideas from residents to install backyards and pet enclosures, television antennas, wireless internet and a games room at Marysville and Kinglake.

Wider support

For those remaining on their blocks, a range of other initiatives sought to provide assistance. These included:

- A property clean-up program that cleared a total of 3,053 properties with 98% of these properties cleared within the first 18 weeks. The program was designed to meet community-wide health and safety objectives as well as providing support for those who required demolition and clean-up services. The coordinated service reduced the risk of demand for suitably qualified demolition contractors that would have driven up prices for individuals. The program’s main success came from an extensive engagement program with each property forming a separate contract. This allowed the contractors to respect each owner’s timing and site-specific requirements.
Greg Ireton, Iftekhar Ahmed, Esther Charlesworth

• A temporary toilets-and-showers program involving the provision of over 450 units delivered to properties and subsequent cleaning and disposal. This initiative supported people who chose to remain on their blocks, assisting them to maintain a higher level of hygiene than may otherwise be available. The program was initially envisaged to remain in place for 12 months, but was extended twice to meet the needs of those still rebuilding with further options for people to continue the contract beyond the end date of March 2011.
• A rebuilding advisory service was established based on the advice of the building industry to provide general building advice and to assist people in navigating the rebuilding process. Two teams of roving advisors were employed who could provide advice face-to-face, over the phone or by meeting people at their homes or blocks. The service proved popular with support provided to nearly 1,000 households through 4,300 consultations as of June 2011.
• Many other forms of support were also available such as surveying support, the provision of communal laundry facilities and many not-for-profit agencies supporting with block clean-up and maintenance.

The Victorian Bushfire Reconstruction and Recovery Authority (VBRRA) was formed after the 2009 bushfires by gathering together professionals with relevant skills from different government departments. After actively supporting the post-bushfire recovery process, VBRRA ceased operations in June 2011 after almost two and half years and a small unit, the Fire Recovery Unit, was established to carry on the support to communities still recovering from the fires. It was initially considered that after two years most of the residential rebuilding would be complete or nearing completion and that the role of the Unit would focus on referral, community capacity building, advocacy and ongoing monitoring.

Table 1. Percentage of post-bushfire households by housing status (source: Fire Recovery Unit, 2012).

<table>
<thead>
<tr>
<th>Status</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebuilt Onsite</td>
<td>43.6</td>
</tr>
<tr>
<td>Permanent Offsite</td>
<td>37.0</td>
</tr>
<tr>
<td>Temporary Onsite</td>
<td>10.4</td>
</tr>
<tr>
<td>Temporary Offsite</td>
<td>9.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>
However, a telephone survey conducted in 2012 indicated that whilst 80.6% of 1,380 households who were able to be contacted were in permanent accommodation, 19.4% were still in temporary accommodation (see table 1) (Fire Recovery Unit, 2012).

Of the 19.4% in temporary accommodation, a little more than one third were currently rebuilding, another third were intending to rebuild but not yet started, 1.5% were converting a temporary structure. However, 28.3% remained undecided after over two years since the bushfire (see table 2).

This survey was the first extensive one indicating the housing outcomes for those affected by the fires and highlighted the lengthy process encountered by many of those rebuilding. This lengthy period of time in temporary housing for some people raises the question whether the focus on the provision of housing as temporary is in the best interest of individuals. The approach to Hurricane Katrina in the USA saw the development of the ‘Katrina Cottages’ in a variety of styles as temporary housing that could be incrementally extended over time. This initiative sought to blur the distinction between temporary and permanent housing, providing a reasonable quality of life and appropriate for longer term habitation or incorporation as a core model into a larger house.

### CAN WE BE DOING THIS BETTER?

In reflecting on the above issues and the challenges for people rebuilding after natural disasters such as the 2009 bushfires, the following considerations should be taken into account by agencies, governmental or otherwise, that seek to assist post-disaster reconstruction in Australia and similar contexts:

- It is very important to get the timing of activities right and this could be enabled by comprehensive prior planning for post-disaster rebuilding. It makes sense to provide support for re-surveying of boundaries prior to people replacing fences but most people, concerned about stock welfare and public liabilities, replace fencing as one of the first rebuilding activities. A number of people later finding out after some months that the previous fence line was actually on the neighbours’ property just adds to stress and costs. This timing of activities includes having advisory services available early on when people are making critical decisions.
- Financial assistance whether government or appeal funds presents difficulty where the process is bureaucratic (long timelines which do not work well with tight building schedules), resulting in lack of focus on long-term housing outcomes, unless targeted specifically to individual household needs. How such targeting can be done effectively is worthy of much more research.
- Better interim housing options are required that seek to protect the capital of those rebuilding. Some evidence of people spending a significant amount of money on making a shed liveable for which they will never be able to obtain a building permit suggests the importance of advice and support for interim solutions. For example, a community in the bushfire-affected town of Strathewen organised highly mobile ‘holiday cottages’ that maintained some resale value and were more comfortable and accessible than a caravan.
- Options and advice on lower cost intermediate housing options that can develop into long-term housing can prove valuable after a disaster. The idea of commencing with a core housing module that is sufficient for immediate needs and is economical and that can be further developed as time and money becomes available, a concept that has been applied in other countries, is worth exploring in the Australian context.
- There is a need for robust planning prior to events. Pre-impact planning for housing recovery when a disaster occurs is needed to be able to coordinate the wide range of supports, services and policies required to support people in the endeavour to rebuild or find other long-term housing options.

### Conclusion

The complex nature of rebuilding following a disaster means that there will never be any easy solution to these complex housing issues. There will also remain a requirement for a suite of initiatives to cater for the range of needs and to best enable individuals to determine how to achieve a long-term housing outcome that is in their best interest. The rebuilding of housing should not been seen as a race and the outcome should focus on individuals and families choosing the right option for long-term housing rather than focusing solely on rebuild-

<table>
<thead>
<tr>
<th>Intentions</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently Rebuilding</td>
<td>38.1</td>
</tr>
<tr>
<td>Converting temporary structure into permanent dwelling</td>
<td>1.5</td>
</tr>
<tr>
<td>Intend to rebuild, not yet started</td>
<td>32.1</td>
</tr>
<tr>
<td>Undecided/Unknown</td>
<td>28.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 2. Percentage of households in temporary accommodation by intention.
ing destroyed houses. The lengthy period of time that many people remain in temporary accommodation should force a rethink of marginal on-site accommodation in caravans and the provision of options that allow a reasonable standard of living for a longer period of time.

Amongst the suite of support from the government and NGOs, there exists an opportunity for design professionals and architects to not focus just on the final house (which may be unaffordable and not appropriate amongst the difficult post-disaster decisions), but to look at housing options that blur the distinction between temporary and permanent. Such designs would be quick to build, offer a good quality of life, be affordable for most (reducing the dependency of individuals on extensive government or donor support) and be flexible in future use. By considering the lived experience of disaster, the rapid need for some form of accommodation, often limited financial resources, designers can assist those who are most in need.

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INTRODUCTION

A heavy earthquake struck Haiti on 12 January 2010. The scale of damage and the number of casualties were unprecedented. That was mostly due to the poor condition of the buildings as in the widely quoted adage: “Earthquakes don’t kill people, but poorly built buildings do.”

International aid poured into the country and to non-governmental organisations (NGOs) that assisted in the rebuilding of Haiti. However, news reports in 2011 were not very positive about the results because the relief efforts are only putting Haiti on life-support instead of evolving into the next stage of development (Price, 2011). This touches upon the question how to ‘Link the stages of Relief, Rehabilitation and Development’, known as ‘LRRD’ (Christopoulos and Hilhorst, 2009), often very hard to achieve in practice (Cordaid Shelter Program Manager, 2012).

O’Donnell et al (2009) conclude that most examples of post-disaster reconstruction in the literature deal with rural areas. Analyses of (transition) strategies for urban areas are scarce. The most likely reason is that natural disasters in the past mostly happened in rural areas. Since the world is becoming more and more urban, future disasters will occur in urban contexts on a wider scale. It is therefore necessary to enlarge the knowledge about post-disaster reconstruction and the transition from relief to development in an urban context.

One of the elements of post-disaster reconstruction, together with other elements such as education, health, nutrition and WaSH (Water, Sanitation and Hygiene), is shelter. According to the LRDD-vision the transition from relief to development should also be supported by shelter strategies. In these strategies the transition should be made from providing provisional shelter against the elements (relief) to permanent dwellings that facilitate the social and economic participation of the residents in society (development). The implementation of shelter or housing strategies in urban areas is often more difficult than in rural areas. Rural areas offer more space, which makes it easier to create temporary shelter and a permanent house on the
same building plot. Dense urban areas usually do not offer that space, what often leads to the well-known large refugee-camps in public areas like parks and squares. Urban areas are also more complicated to operate in because they comprise houses with multiple tenants, informal ownership and illegal building plots.

This paper is based on a study conducted in 2011 of the work of the Dutch NGO Cordaid in Haiti. Cordaid was implementing a ‘transitional shelter strategy’ to support the transformation of neighbourhoods from a state of life-support to a state of self-sustaining development. The strategy was implemented in multiple areas, among which was the rural area ‘Septième Gérard’ and the urban area ‘Villa Rosa’. The main feature of the strategy was the provision of structures that could be adapted from simple shelters into permanent houses. In the rural area tangible results had been achieved: a substantial number of new dwellings had been constructed, but the contribution to the social and economic development of the residents was not clear. In the urban area only a small number of damaged dwellings had been reconstructed after adaptation of the building method. But developmental results could be observed during the building process, in better organisation of residents and more cooperation between them.

The mixed and ambiguous results were a reason to conduct a comparative case study to describe and evaluate the shelter strategy of Cordaid in both areas. The objective was to draw lessons from the comparison on what has to be taken into account when formulating a future shelter strategy that supports the transition from relief to development. The reason for this focus on urban shelter strategies was the scarcity of knowledge about strategies in urban areas. The case study is discussed in this article, structured along three main questions:

- What are the main features and results of Cordaid’s shelter strategy in the rural and urban areas?
- How can the strategy be evaluated using the general evaluation criteria of effectiveness, efficiency and support?
- What lessons can be drawn from the evaluation for future shelter strategies for urban areas that support the link between relief and development?

In the following section some of the main concepts from the literature about post-disaster reconstruction and the role of shelter strategies are discussed to elucidate the objective of the transitional shelter strategy: supporting the link between relief and development. After that, the methodology used in the case study is presented: the set-up of the case study and the operationalisation of the evaluation criteria, followed by the case study. The implementation of the ‘transitional shelter strategy’ in the rural and the urban area is described and the results are compared and evaluated, addressing the first two questions above. The concluding section addresses the last question.

**KEY CONCEPTS ON POST-DISASTER RECONSTRUCTION**

Disasters can be defined as crises that overwhelm, at least for a time, people’s capacities to manage them and cope with them (Krimgold, 1976). Or in other words, a disaster is born when a society fails to cope with a crisis (Anderson and Woodrow, 1998). A crisis can be managed by the society itself, but when disaster happens, external aid is necessary to restore a controlled situation (UNISDR, 2009). Capacity can be defined as the ability to use resources, and vulnerability as the lack of access to resources (Lizzaralde et al, 2010). Two types of resources can be distinguished: ‘hard’ resources, tangible and physical, such as food, buildings and infrastructure, and ‘soft’ resources, intangible or non-physical, such as employment, education and information. It is often necessary to pair hard and soft resources to increase capacity or reduce vulnerability. A building, for example, can be used as a school to teach people to build new buildings.

An analysis of capacities and vulnerabilities in a region that has been met by a disaster can be used as a tool to organise an approach for reconstruction. The analysis can determine what needs could be addressed by the society itself and what needs have to be provided by external aid. The stricken society has to be enabled to rebuild itself by strengthening its capacities in line with the observation by Hilhorst (2007): “Societies reconstruct, they are not being reconstructed.” In the end, external support needs to move away and to leave the region to let the damaged society become independent and self-sustaining, succinctly stated by a Cordaid Rural Shelter Manager (2012): “The paradox of the ideal NGO is that they are very good in making themselves unnecessary.”

Lizzaralde et al (2010) define post-disaster reconstruction as: “The process of improvement of pre-disaster conditions, targeted to achieving long-term local development and disaster risk reduction through the pairing of local and external resources, thus giving residents increased access to ‘hard’ and ‘soft’ resources (see figure 1). Both local and external resources to improve the present capacities and to diminish vulnerabilities are critical ingredients of
a strategy to restore a society to its pre-disaster condition. Special attention has to be given to less-developed countries as they suffer most from natural hazards and therefore more in need of external (international) aid.

**LINKING RELIEF AND DEVELOPMENT (LRDD)**

Over the years, international NGOs have categorized aid interventions into two main areas: emergency relief and development. These two kinds of intervention often require specific skills and approaches, and specific timings (Lizzaralde et al, 2010).

The main issue is that both relief and development are necessary, but have a different perspective and lead-time, making it hard to link them in a sequence. Priority is often given to emergency relief, but relief measures can damage the prospects of long-term development, as observed by Eade and Williams (1995): “There is no such thing as relief projects that are neutral in terms of development. They either support it or undermine it.” Relief for food and healthcare for example can save lives in the short-term, but can undermine the ability to develop local food distribution and healthcare systems over the long-term (Christoplos and Hilhorst, 2009).

Long-term development helps make a society self-sustaining, but it does not necessarily save lives in the short-term. The challenge is therefore to define effective relief interventions that benefit the victims of an emergency crisis, but do not jeopardise development strategies (Dieci, 2006).

‘Linking Relief, Rehabilitation and Development’ (LRDD) refers to linkages in disaster response between immediate relief operations and subsequent efforts in rehabilitation and development (Christoplos, 2006). Rehabilitation as an intermediate phase is positioned between relief and development. Rehabilitation is defined as: “An overall, dynamic and intermediate strategy of institutional reform and reinforcement, of reconstruction and improvement of infrastructure and services, supporting the initiatives and actions of the populations concerned, in the political, economic and social domains, and aimed towards the resumption of sustainable development” (Dieci, 2006). It is an intervention that combines short-term and long term goals.

The benefit of the LRDD-vision is that it can diminish deficiencies and make each effort of post-disaster reconstruction more effective (see figure 2). As further observed by Dieci (2006): “Better ‘development’ can reduce the need for emergency relief, better ‘relief’ can contribute to development, and better ‘rehabilitation’ can ease any remaining transition between the two.”

**TRANSITIONAL SHELTER STRATEGY**

Finding a balance between the efforts of relief and development was also one of the main issues when Cordaid was designing their shelter program in a

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**Figure 1.** A process of reconstruction has to bring a post-disaster situation to a level of sustainable development (adapted from Lizzaralde et al, 2010).
response to the Haiti earthquake of 2010. The result was a transitional shelter (T-shelter) strategy, which had to supply the beneficiaries with a pre-fabricated structure in a short-term, fit for living during the first phase of emergency relief. The wooden frame and roof could be erected within 12 hours and were certified to be hurricane-proof. In the second phase additional cladding could be added to the frame that would upgrade the shelter to a semi-permanent house, and interventions in infrastructure and WaSH could be implemented. In this way the strategy supported a beneficiary with basic conditions, leading to an independent and self-sufficient existence after the departure of Cordaid. The strategy started early in the relief phase and overlapped the phase of rehabilitation and the first part of the development phase (see figure 3).

**METHODOLOGY**

The comparative case study describes, compares and evaluates Cordaid’s transitional shelter strategy for the rural and the urban areas. Figure 4 depicts the design of the study.
The first part of the case study is a description of the context and the implementation process of the shelter strategy for each of the two areas. The second part is a comparative evaluation of the results using the general evaluation criteria effectiveness, efficiency and support.

The objective of the case study is to highlight specific occurrences and results that can be connected to the rural and urban contexts and to find out how the context influenced the possibility to connect relief with development. Given this objective the general evaluation criteria have been operationalised as:

- ‘Effectiveness’: This criterion looks at the extent to which the strategy has been able to link the phase of relief with the phase of development; the extent to which a community is supplied with resources to increase its internal capacity and reduce vulnerability; and the extent to which the dependence on external resources has been reduced and the social and economic participation of the residents has grown.
- ‘Efficiency’: This criterion looks at the relation between input and output. Given the restricted means it is important to find out which strategy realises the objective with the least amount of money and time.
- ‘Support’: The appreciation of the program by the beneficiaries and the local society. This support is important for the execution of the strategy and is a condition for the transition from relief to development.

The evaluation of the strategy however has its limitation for a number of reasons:

- Quantitative data indicating the results were only partially available. The number of shelters built was known, but developmental results are hard to quantify (Jansen and Molenaar, 2011). Therefore the authors have assessed the cases comparatively on the basis of ‘which case scores better’.
- The evaluation regards only two cases.

THE CASE STUDY

The description below is derived from a more substantial description of density, geography, accessibility, economy, policy, social conditions, NGO performance, local stability and local capacity as reported elsewhere (Janse, 2012).

Location and main characteristics of areas

The epicentre of the earthquake was located under the mainland of Haiti, near the capital Port-au-Prince. The selected cases are both situated in the region that suffered severe damage. The first case ‘Septième Gérard’ represents the rural area and the second case ‘Villa Rosa’ the urban area (see figure 5). Table 1 gives some of the main characteristics of the cases.

<table>
<thead>
<tr>
<th>Area</th>
<th>‘Septième Gérard’ (rural)</th>
<th>‘Villa Rosa’ (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (approx.)</td>
<td>74 square kilometre</td>
<td>0.25 square kilometre</td>
</tr>
<tr>
<td>Population</td>
<td>2000 families, 10,000 people</td>
<td>2000 families, 10,000 people</td>
</tr>
<tr>
<td>Density</td>
<td>135 residents per km²</td>
<td>40,000 residents per km²</td>
</tr>
<tr>
<td>Earthquake damage</td>
<td>40% of houses destroyed; 30% in need of repairs</td>
<td>40% of houses destroyed; 20% in need of repairs</td>
</tr>
</tbody>
</table>

Table 1. Main characteristics rural and urban cases.
Septième Gérard is a collection of small villages, located between the coast and mountains, west of Port-au-Prince. Parallel to the coast runs a national highway served by public transport. Connections from this road to the south (up into the mountains) are unpaved and run partially through riverbeds. Most of the villages within the mountains depend on the rivers for fresh water supply. Travel time for children to commute to school can be more than 4 hours a day.

A program to erect 1,200 shelters for the area of Septième Gérard started in October 2010, several months after the earthquake. The implementation of the program took until January 2011. In this period the decision was made to add solid walls and floors directly to the basic T-shelter, without an intermediate phase in which the shelter could become cladded with tarpaulins. Intended measures to improve WaSH failed because partnering NGOs were hard to find. The construction of the basic T-shelters in Septième Gérard (the wooden skeleton) grew from 20 shelters a week in November 2010 to 10 shelters each day in January 2011. The construction of the solid walls and floors started in April 2011. Many T-shelters were not being used for months, until the construction of walls and floors were finished. Some of the beneficiaries lost faith in Cordaid and thought that Cordaid would never finish the shelters (Janssen and Molenaar, 2012).

The original goal of Cordaid was to replace all destroyed houses in Septième Gérard with T-shelters. But the estimated amount of shelters was only sufficient to replace 75% of the destroyed houses. The underestimation of the number of residents in need for a shelter hampered the preparation process, which involved the local community. The originally intended process of assessing the residents would have taken Cordaid two years to complete. A compromise was made in executing ‘emergency assessments’ conducted by community representatives. Ideally the most vulnerable families should have been selected, but it also occurred that the representatives gave preference to their relatives.

The beneficiaries appreciated the T-shelter when the solid cladding was added. In their opinion Cordaid did not build shelters, but houses. Residents of neighbouring areas started to complain that they also wanted a Cordaid shelter. They were even willing to demolish the shelter they were given by another NGO, to be able to apply for a Cordaid shelter.

Villa Rosa is one of the many informal areas in Port-au-Prince dating from the 1970s. It never had an official zoning plan. It has grown near the border of the city as a relatively well-organised neighbour-
hood. Electricity and water is often available through informal means. Dwellings are stacked on each other and uninhabited pieces of land are very scarce. The area of Villa Rosa was selected as an operational zone, because Cordaid supported preceding projects in the area. This made communication with local NGOs and residents easier. Cordaid’s initial plan was to build 1,200 T-shelters in Villa Rosa, but from the start of the program in November 2010, it was clear that these results could not be achieved due to lack of space. Force-fitting the T-shelters resulted only to maximum 400 shelters. They could not be erected on the majority of the building plots because of the small plot sizes and the incompatibility with multi-story buildings.

An alternative strategy, to collaborate with other NGOs and local committees, was developed in May 2011. This was called the integrated approach, including ‘owner driven housing’ to deal with individual houses. Owner driving housing included a tailor made solution for each beneficiary, for the same cost as of the T-shelter program. The program resulted into 680 retrofits, 102 T-shelters and 40 new-built houses.

The implementation of the integrated approach did address the multiple problems of Villa Rosa: rubble clearance, providing infrastructure and WaSH. The strategy that was adapted had to function as an example for future reconstruction projects. Cordaid undertook the coordination of the project to create a community development plan and dispatched an urban planner. The integrated approach was mostly dependent on the decision-making process in the neighbourhood committees, but as mentioned by a Cordaid Urban Area Manager (2012): “The community always came up with solutions, but they did not directly take the responsibility of the decisions that would make it possible not to rely so much on Cordaid.”

The beneficiaries of Villa Rosa were extensively informed about the shelter process. The T-shelter was well-received in the neighbourhood during the first months. Later, beneficiaries became sceptical about retrofitting their houses, because they were expecting a T-shelter. A display of a retrofitted house shifted their preference from the T-shelter towards a retrofitted house.

The coordination of the integrated approach did take additional time and money, which lowered the output of the program. The coordination was handed over to the main neighbourhood reconstruction committee. Thereafter Cordaid left the project in June 2012.

COMPARATIVE EVALUATION

The general achievement of Cordaid can be considered successful. In some regions of Haiti people had been very hostile towards NGOs. Several organisations had to cancel their aid programs because they could not guarantee safety to their employees. Given these circumstances, the program although experiencing a few downfalls during the process eventually led to results that were locally appreciated, was in a sense an extraordinary achievement. In both the rural and urban cases the T-shelter strategy was, at least partially, successful. A substantial number of shelters had been constructed in both areas (see table 2). However the strategy had to be adapted to local conditions in both cases, which influenced the effectiveness and the efficiency.

<table>
<thead>
<tr>
<th>Intended number of shelters</th>
<th>Rural case</th>
<th>Urban case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of shelters built</td>
<td>1,200</td>
<td>822</td>
</tr>
<tr>
<td>Operation period</td>
<td>18 months</td>
<td>22 months</td>
</tr>
</tbody>
</table>

Table 2. Number of shelters per case.

Effectiveness

The shelter program in Septième Gérard predominantly supplied hard-resources, giving new houses to the most vulnerable people of the community. The program in Villa Rosa supplied soft resources next to hard ones and addressed various problems of the residential area. The latter program can be assessed as being more effective in terms of leading the community into development. The T-shelters given by Cordaid in the rural case only offered a (short-term) solution to a limited number of people. The shelters reduced the vulnerability of some individuals, as long as the shelters stood. Almost no other conditions of the community had been addressed to increase the capacity of the local participants. The urban shelter program reduced the vulnerability of the area by building local capacities through a process of participation and cooperation. Committees had been formed and appointed to be stakeholders in decision-making about the (long-term) reconstruction of their neighbourhood. That contributed to the local social and economic development through the shelter program, which can last in the years to come.
Efficiency

The efficiency of the rural shelter program was higher than the efficiency of the urban program. The supply of tangible (hard-) resources answered the need for shelter, the intended number of shelters was erected within the time and budget that were set, and overhead costs were below 15% of the total costs (Cordaid Rural Shelter Manager, 2012). The more substantial intervention, which became necessary to assist the majority of residents in the urban case, brought about additional costs. This investment resulted in an integrated urban plan for the area, which could facilitate additional aid programs next to providing shelter. But the results of the shelter program itself were low and had to be compensated in other areas. (Cordaid Shelter Program Manager, 2012).

Support

There were differences in the willingness to support the building process and the appreciation of the end results in the rural and urban area. Beneficiaries in the rural area were easier to please, while beneficiaries in the urban area were more critical. They wanted answers to many ‘why’ questions, whereas in the rural area beneficiaries wanted to know ‘when’ and ‘how many’. Beneficiaries in the rural area were less educated and less informed, but more self-sufficient in comparison to the beneficiaries in the urban area who were more dependent, and thus were more able to assist in the adaptation of the shelter strategy.

CONCLUSION AND DISCUSSION

The last question mentioned in the introduction is concerned with lessons that can be drawn for future urban shelter strategies. The comparative evaluation of the case study is summarised in table 3.

The conclusion is that the implementation of the shelter strategy was more complicated in the urban area than in the rural area. In the urban area it was more difficult to reach objectives in an efficient way than in the rural area. But the conditions for effective strategies (linking relief and development by implementing soft-resources) were more favourable in the urban area. However it can be debated if soft-resources were necessary in the rural area. A common cause such as dealing with multiple damaged living conditions in the same (urban) area stimulates a variety of stakeholders who are willing to rebuild their residential area. In this context, participation and cooperation are needed to make it possible to rebuild an area from rubble. The local society has to become enabled with soft-resources to create ‘know-how’ in order to rebuild their neighbourhood. A common cause, which can lead to a need for soft-resources, is less present in the rural context. Issues that require cooperation and participation are less in the rural context. This fundamental difference, resulting from the higher complexity in terms of problems and participants in urban areas, has to be taken in account when creating future shelter strategies.

Shelter strategies within the urban context, cannot be as efficient as strategies for the rural context. Urban shelter strategies require a process orientated approach because effectiveness needs the cooperation of local stakeholders. The integrated approach, which has been implemented in the urban case, can be taken as an example. Soft-resources had been supplied, in order to find realise implementation of hard-resources. The effective pairing of soft- and hard-resources in the urban case has started a promising long-term development process.

What does this mean for NGOs and for their communication with donors? NGOs need to engage in a debate about the extent to which they are able to focus on long-term (urban) post-disaster reconstruction strategies. Donors mostly prefer to give money for short-term results. "When a newspaper reports that thousands have become homeless, the reaction of international aid is to provide houses. Not even housing, but purely a roof" (Cordaid Urban Shelter Manager, 2012). However, effective long-term strategies in post-disaster reconstruction are essential to lower the necessity of efficient short-term interventions. NGOs need to be able to supply soft-resources and to accept lower efficiency. They have to find ways to communicate this to their donors. The experience from rural shelter strategies, which mainly incorporated the implementation of hard-resources, would not be able to help rebuild urban areas. The conclusion from this case study is that in urban areas the link between relief and development has to be made by a process-orientated approach focusing on capacities of local participants.

Table 3. Summary of comparative evaluation.
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PRIVATE SECTOR INVESTMENTS AND ASSOCIATED RISK IMPLICATIONS FOR POST-DISASTER HOUSING DEVELOPMENT IN DHAKA.

Huraera Jabeen

Abstract
Dhaka is one of the most vulnerable cities facing exacerbated disaster risks from climate change impacts. While these risks have escalated rapid population growth has made Dhaka one of the fastest growing megacities in Asia with a very high housing demand. In the absence of significant interventions from the public sector, the private sector has become responsible for 70 per cent of the city’s physical development. The political economy of development and limitations in institutional arrangements allow private sector investors an almost free hand, resulting in increased and transferred risks to the public sector and city dwellers in general. Any post-disaster reconstruction in future will be influenced by these existing dynamics. Future plans for post-disaster reconstruction of housing in Dhaka must address issues of growing demand, limitations of risk-free land for development, ownership of land and housing, and limitations of resources.

Keywords: Dhaka, Housing, Political Economy of Development, Private Sector Investments.

INTRODUCTION
Dhaka, the capital city of Bangladesh, is one of the fastest growing megacities in Asia with high population growth rate. Centralised administrative and institutional arrangements have concentrated major economic, social, and cultural activities of the country in Dhaka. Apart from the internal population growth, every day people migrate to this city for better livelihood opportunities, in anticipation of a better life with access to education and healthcare facilities along with better living conditions. As a consequence, the population of Dhaka Statistical Metropolitan Area covering 1,353 square kilometres has increased from 6.48 million in 1991 to 14.54 million in 2011 (Rabbani et al, 2011; City population, undated). With the increasing population growth, demand for housing has increased exponentially. The private sector has played a key role in meeting the growing demand for housing development.

Yet Dhaka is considered to be one of cities most vulnerable to natural disasters. The city is naturally prone to fluvial flooding from its geographical location in a delta, surrounded by rivers and water-bodies. In addition the city drainage system is inadequate to cope with the intense rainfall that is becoming more common in recent years, thus increasing the risks of pluvial flooding. Intense rainfall usually follows extreme weather conditions with temperatures near about 40 degrees Centigrade during the summer. Extreme heat coupled with repeated power outages, acute water crisis, shortage of gas supply, infestation of mosquitoes and the resultant near-epidemic level of diseases like diarrhoea threaten people’s well-being (Staff Correspondent, 2010). Furthermore, Dhaka is located in an earthquake prone area; a strong earthquake in a populous city with inadequate physical infrastructure may cause widespread disaster.

The Hyogo Framework for Action (HFA) 2005-2015 identified reducing underlying risk factors as one of the five priorities for action (UNISDR, 2005). For urban areas the HFA suggested incorporating disaster risk assessments into urban planning and management in particular highly populated areas; mainstream disaster risk considerations into planning procedures for major urban infrastructure projects; and to encourage the revision of existing, or the development of new, building codes, standards; and rehabilitation and reconstruction practices (UNISDR, 2005). Bangladesh as a signatory of the HFA, has accepted its obligations to work towards achieving these objectives and goals. This paper contributes to discussions on defining and redefining the underlying risk environment in Dhaka city through hazard analysis, vulnerability assessment, risk evaluation and risk treatment options in urban planning.

The paper explores private sector investment decisions relating to housing in Dhaka with
future resilience in mind. The political economy of development and limitations in institutional arrangements has allowed private sector investors in the city a lenient environment, and thus in many instances transferring risks to the public sector and city dwellers. In a city where the private sector plays a key role in housing development through the market, the dominant actors of the private sector are likely to influence any post-disaster reconstruction as well. The aim of tracing the investment decisions is to highlight the challenges associated with planning, designing, implementation and management of housing for the future.

The paper begins by exploring the development trend and private sector investment decisions in housing in Dhaka, focusing on the dynamics and motivations for decisions. The following section explores existing institutional arrangements for guiding private sector investments - how they contribute in reducing or increasing risk. Drawing from these discussions, the impacts of investment decisions and institutional arrangements explaining the vulnerability of the city are discussed, followed by a brief summary of measures suggested for managing underlying risks in similar contexts. The paper concludes with indicating the future challenges and opportunities for post-disaster reconstruction of housing in market-based economies.

**METHODOLOGY**

The concepts and data of this paper have been developed and collected from review of academic papers, reports, government policies, plans, laws and statistical data collected for a background paper for the UNISDR’s Global Assessment Report 2013 (UNISDR, 2013). Based on these initial findings, selected key stakeholders involved in private sector investment decisions in building and construction in Dhaka were interviewed with open-ended questions. These interviewees included senior executives of real estate companies, architects working closely with private owners and real estate developers, and urban planners associated with structural planning of cities in Bangladesh, all of them having more than twenty years of work experience in their respective fields.

The discussions explored whether private sector investments in building and construction are
DEVELOPMENT TRENDS AND PRIVATE SECTOR INVESTMENT DECISIONS IN HOUSING DEVELOPMENT

Socio-economic factors
Several socio-economic factors have contributed to the physical development trend in Dhaka and other urban areas. Due to robust and sustained macro-economic growth, the per capita income of many middle and high-income households increased, especially those that preferred to invest in property development. The investments of these households changed the pattern of family formation, living styles and even construction trends. Formation of more nuclear families demanded more housing units, while the number of first-time homebuyers also increased. Such motivations were supported by the policy environment as well, which provided a number of incentives to boost the real estate sector of the country. Inflow of remittances in the country was another important factor that contributed to private sector investments in property development. However these developments are not uniformly distributed across the country, but are concentrated mostly in and around Dhaka. High population growth rate, densification and expansion of the city, as well as environmental vulnerability, as discussed in the introduction, are inter-related with housing development in Dhaka.

Land development patterns
High demand of land for development has resulted in high and rising land prices, high density development and land speculation in the city. A study based on Landsat images revealed that the city expanded by more than 6,000 hectares during the 17-year period from 1975 to 1992 and more than 4,000 hectares in the 11-year period from 1992 to 2003 (Dewan and Yamaguchi, 2009). But the urban expansion did not occur evenly in all directions; new developments were observed along the periphery of urban areas as well as in the areas that had already been urbanised. In addition the unregulated freedom allowing land fragmentation by the landowners has changed the city fabric over time. Most land in Dhaka is privately owned. The tenure system gives its owners authority to subdivide the land to any size and sell to multiple parties. Due to the socio-political and institutional arrangements, more than 70 per cent of the people living in the city do not own any land; among those who own, 10 per cent own more than 60 per cent of the city’s private land (Islam, 1999). This small group of city dwellers, who own land in Dhaka, are the key stakeholders in the city’s development. New developments take place through land fragmentation by the owners without any concern for availability or capacity of the services. These socio-economic and political factors facilitate a high rate of densification and expansion of urban areas without any effective urban development plans for the city.

Housing demand
REHAB (Real Estate and Housing Association of Bangladesh), an umbrella association of real estate companies which estimated housing demand through their clients’ responses in 2012, projected that the demand for houses by 2015 will be around 30,000 to 40,000 units growing to around 95,000 to 130,000 in the next 10 years. In the case of apartments, estimated demand in 2012-2015 will be around 75,000 to 100,000 apartments; while in the following 10 years demand will remain around 70,000 to 95,000 (REHAB, 2012). Against this scenario of high demand, the public sector will make very limited contributions - it does not invest in housing development and the number of serviced plots it offers to various income groups is insignificant compared with the demand. The government decided to change its position from provider to facilitator during the 1980s and since then encouraged housing development through the market. The private sector capitalised on these opportunities and invested in speculative developments as well as investments for productive purposes. It is estimated that 70 per cent of the physical development (i.e. housing and land development) in Dhaka is mediated by the private sector with little control by the government (World Bank, 2007). The total investment in real estate, renting and business service sector increased every year with the overall GDP growth.
INSTITUTIONAL ARRANGEMENTS FOR GUIDING PRIVATE SECTOR INVESTMENTS

The institutional arrangements guiding the massive private sector developments remain inadequate to cope with the dynamic and growing demand. All building and construction activities in Dhaka are principally guided by two sets of guidelines - regulatory frameworks for individual buildings and planning guidelines at the city level.

Regulatory frameworks
Dhaka Mohanogor Imarat Bidhimala (Dhaka City Building Regulations) addresses the issues of floor area ratio (FAR), ground coverage, setbacks and access facilities according to the site area for development; protective measures for constructing in environmentally vulnerable sites as well as requirements for light, ventilation, water, sanitation, drainage, waste disposal and fire safety (RAJUK, 2008). The individual buildings and construction following these regulatory frameworks are supposed to adhere to the 10-year Dhaka Metropolitan Development Plan (DMDP 1995-2015) at the city level. The Detailed Area Plans (DAP) within DMDP are supposed to provide basic good quality urban design; provide programmes for public sector action to implement plans; provide controls for private sector development; provide land re-adjustment pilot schemes for unplanned density growth areas; and provide clarity and security with regards to future development for inhabitants and investors.

Institutional capacity
In fact, despite having these regulatory frameworks and planning guidelines in place, the planning authorities in Dhaka have little actual influence over land and housing development, for several reasons. The government paid little attention to build the capacity of Rajdhani Unnayan Kotripokkho (RAJUK), the city development authority, to implement DMDP. As a consequence, although the structure plan was formulated in the early 1990s, it took almost two decades to prepare the detailed area plans, by which time many areas had been intensively developed. Moreover, the DAPs did not fully comprehend the dynamic growth rate and pattern. According to a senior urban planner interviewed, the plans also shifted from their original aim and have been designed following a land-use planning approach that seeks to limit and regulate development in certain areas while setting aside open areas either for use in emergency or for lifeline infrastructure managed by the city’s authorities (such as water, drainage, transport and energy infrastructure). With almost negligible capacity for implementation and monitoring, these land-use plans faced challenges coping with the development trend. Meanwhile the DAPs are still awaiting legal authorisation and are not expected to be resolved soon as these are not in the interest of politicians nor of powerful stakeholders such as real estate developers.

Unlawful activities
At the same time, private landowners and real estate developers who were responding to the increasing demand were looking for land to develop in the peripheral areas of the city. In most instances they developed in the vulnerable low-lying flood-risk areas marked by RAJUK to be left open for drainage and water retention. Although permission for such developments has to be approved by the development authorities, in many cases the land developers did not follow the plan they submitted to the development authorities for approval, bribed officials to get approvals, encroached on areas beyond the submitted plans, or took advantage of the overlapping of administrative zones (Staff Correspondent, 2012a; Staff Correspondent, 2012b; Staff Correspondent, 2012c). The lack of flood-free land in the city encouraged many private land developers to fill up rivers, canals and water bodies for housing and industries that led to the obstruction of the flow of water, reduction in flood plain areas, and thus increased flood risks. Evidence for such activities has been provided by site visits and interviews.

All of these local and city level limitations are influenced by the broader political economy of development. The private investors in real estate and land development are powerful groups who can influence political parties and leaders, and governmental decisions, by their financial contributions. Moreover, some of the influential land-grabbers have the political power to defy the regulations and directly increase the risks for the city as a whole. In spite of these political realities, the policy makers of RAJUK still foresee development control through land-use planning that is purely administrative in nature. Any strategic planning to incorporate dynamic urban development requires institutional capacity through engagement of adequate number of skilled professionals such as urban planners, architects and environmental planners, which the present authorities are unwilling to do. Such limitations in institutional arrangements have allowed private sector investors an almost free hand, thus having resulted in increased and transferred risks to the public sector and city dwellers in general.
INCREASED AND TRANSFERRED RISKS FROM UNGUIDED DEVELOPMENTS

Certain general characteristics of urban areas increase the risks from any natural disasters and environmental stresses. These include: (a) High density populations with limited or no access to emergency or disaster reduction services, and have high exposure to disasters and climate change impacts; (b) Higher land prices in the housing market, which all but force people to acquire land and build housing outside the official system of land-use controls and building standards that are meant to reduce risks; c) Large impermeable surfaces and concentrations of buildings that disrupt natural drainage channels and accelerate runoff; d) Possibility of urban heat islands especially in high density areas that exacerbate problems of heat stress; and e) Industrialisation, inadequate planning and poor design generating secondary risks from extreme weather (for example, industrial chemicals or waste contaminating floodwaters) (Khosla and Masaud, 2010; Satterthwaite et al, 2009). As described in the previous sections, most of these characteristics are clearly evident in Dhaka, increasing the risks for millions of people.

Infrastructure development

In recent years intense rainfall has created pluvial flooding in Dhaka as the drainage system is incapable of managing events like 290 mm rainfall in 6 hours that happened in 2009 (Staff Correspondent, 2009). The government, while formulating the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), recognised that the current storm drainage systems of major cities in Bangladesh were designed using historical rainfall data (MoEF, 2008). They are unlikely to cope with the increased number of episodes of short-duration heavy rainfall. In addition, the sewer systems are inadequate to prevent water-logging. Thus the BCCSAP suggested assessing the drainage capacity; investigating structural and non-structural causes of water-logging within cities and their immediate surroundings using hydro-dynamic models; and designing and investing in improvements in the drainage capacity. These are all excellent ideas, but unfortunately for the people of Dhaka, little progress has been made so far to implement them.

The inadequate drainage systems are often overburdened with housing developments by real estate developers as well. One of the architects interviewed stated that very few private developers consider drainage facilities while they increase existing density with new developments, and also leave inadequate open space for natural runoffs. The developers do not invest in development or maintenance of infrastructure as they assume that it is the responsibility of the city authority to provide drainage for all the housing developments. In many instances some of the existing drains are clogged through improper construction management. To date there is no definite guidance or monitoring on how the private developers should take responsibility to reduce damage to roads, footpaths and drainage they use during any construction work. As a result, building materials (for example, sands and brick chips) deposited near the drainage are washed in with the rainwater or muddy water from the piling shaft are drained directly into the storm drainage system, greatly reducing its efficiency.

Development in vulnerable areas

Dhaka has experienced three major flooding events in 1988, 1998 and 2004. The flooding resulted from overflowing of surrounding rivers, runoff from excessive rainfall that could not flow into the surrounding rivers as the river stage was higher than the inside flow, as well as failure to operate the regulators (sluice gates) and a lack of timely pumping of accumulated water (Alam and Rabbani, 2007). In 1998, 30 per cent of housing in the Dhaka metropolitan area sustained damage; while during the 1988 flooding, 85 per cent area of the city was submerged under 0.3 to more than 4.5 metres flood water for several weeks (IFRC, 2010). These disaster events coincide with the period when the private sector was investing in speculative development and development for productive purposes in and around the city, changing the land-use and built environment patterns. While new developments suffered from such flooding events, it seems very likely that some of the changes in development pattern by the housing developments have contributed in exacerbating the causes and impacts of flooding.

The encroachment of housing development on wetlands and low-lying areas around the city has increased the risks of both fluvial and pluvial flooding. Filling low-lying areas for housing development that used to function as natural area for retaining flood water has in effect blocking the natural water-flow around Dhaka and increasing risks of water-logging as well. Such developments contribute to indirect or secondary risks as well. Many of the factories and production plants drain their industrial waste into these wet-lands causing severe water pollution (Staff Correspondent, 2012d). The natural habitats are destroyed as a consequence of development for production near the wetlands. Furthermore, during any major flooding the polluted waters mix with flood waters and increase the risks of various water-borne diseases. During 1998’s flooding, people who had to wade...
through flood waters reported much higher levels of skin diseases (Rashid, 2000). High density development for profit making ventures with such concentration disrupt natural drainage channels and accelerate runoff, thus contributing directly to pluvial flooding within the city.

**Improper use of building materials**

New developments designed with modern building materials create large impermeable surfaces adding to the risks of flooding. Similarly, the use of reflective glass and building materials in commercial developments appears to follow globally fashionable trends, without consideration of the local climate, contributing to heat stress in the surrounding neighbourhoods and creating urban heat islands. The scientific evidence of urban heat islands in Dhaka is still scarce, however, many practitioners are relating the recent increased heat with such possibility because of the modification of land surface with concrete and asphalt pavements within the city (Islam, 2008). Also the energy demand for light and ventilation in these high density developments are greater than the government at present is able to meet. In addition, to meet the growing demand for construction materials, more than one thousand brick kilns has been established in the low-lying areas around the city. These brick kilns use top soil, damaging the quality of the land for any other use; also, the smoke produced from brick burning causes major air pollution.

**Pressure on ground-water usage**

The high density development of Dhaka is dependent on the availability of ground water supply for the city. Dhaka Water Supply Authority supplies 1,560 million litres a day against a demand of 2,000 million litres; of the total supplied amount 1,250 million litres are lifted from underground (Roy, 2012). As a consequence, the ground water level has been lowering every year with increased demand and inadequate recharging of aquifers from less runoff absorption. One study estimated that Dhaka is sinking over half an inch a year on average because of excessive extraction of ground-water and inadequate recharging of the aquifers. However such claims are yet to be confirmed for limitation of data.

The lowering water table increases the risks of earthquake. The 2011 Global Assessment Report on disaster risk reduction drew attention to Dhaka’s rapid urban expansion and higher density
with earthquake risk while discussing how drivers such as badly planned and managed urbanisation, ecosystem decline, and poverty, exacerbate risk over time. The report argued that despite restriction from the DMDP on development in the flood-prone areas, these areas are still being rapidly urbanised through mainly private, but also public sector projects. Building in drained wetlands also increases earthquake risk. According to the report, “During an earthquake, sands and silts can liquify to the point where the soil no longer supports the weight of buildings and infrastructure, which may subsequently collapse or suffer heavy damage. Dhaka’s wetlands, drained and filled with sand for housing development, are prime candidates for liquefaction” (UNISDR, 2011).

Although the city did not experience any earthquake-related disasters in recent years, the country experienced seismic disturbances 110 times between 2007 and 2010; while between 1997 and 2009 ten earthquakes within the magnitude of 4.0-6.0 affected different parts of the country including Dhaka (CDMP, 2010). In an earthquake risk assessment for the city in 2009, the Comprehensive Disaster Management Programme estimated that for the worst-case scenario of a magnitude 6.0 earthquake, 83 per cent of the total number of buildings in Dhaka City Corporation area would be at least moderately damaged while an estimated 238,164 buildings would be damaged beyond repair (CDMP 2009).

**Recipients of the increased risks**

These increased risks from flooding, water-logging, heat stress and earthquake are transferred in most cases either to the public authorities who are responsible for providing or maintaining infrastructure like drainage, sewerage and waste management, water, gas and power supply; or to the users who become responsible for maintenance and development of housing after the real estate developers handover the property.

**NEW RISK REDUCING MEASURES**

Against these above increased and transferred risks, there are a few positive developments underway in the institutional arrangements affecting housing development by both the private and public sectors.

**Institutional arrangements**

The increased risks from earthquake from recent events have encouraged both the public authorities and private developers to take up risk-reducing measures. The Bangladesh National Building Code was modified to include some structural measures to increase resilience against earthquake which the real estate developers are obliged to follow. After the collapse of a garment factory near Dhaka in 2013 that killed more than eleven hundred people, RAJUK has begun the process of employing 20 new authorising officers and 288 new inspectors to supplement 40 inspectors who were responsible for overseeing more than 1.2 million buildings of the city (Chowdhury, 2013). Also the Institute of Architects Bangladesh is working closely with RAJUK to find out effective ways to ensure the enforcement of building codes and quality during a construction (Chowdhury, 2013). New rules have been added to the Dhaka City Building Regulations to leave 50 per cent site area as mandatory open space to ensure natural run-off (RAJUK, 2008).

**Corporate responsibility**

As the clients are becoming conscious of these risk reducing measures, the real estate developers are beginning to advertise measures they take to reduce risks of disasters to improve the projects’ acceptability. One of the executives of a real estate company during an interview said that they are working with architects and designers to incorporate environment-friendly solutions such as rainwater harvesting and managing run-offs. These design solutions make their projects more attractive while bringing in other qualitative returns. These measures help to secure a project’s investments for both the developers and the end users. Although the number of such initiatives is still very limited and mostly adopted by well-established, corporate business organisations, yet they are indicative of the qualitative improvement of housing development. Private sector investors are gradually realising the benefits of incorporating risk reduction measures. Lessons can be learnt for improving the performance of the private sector in adapting risk-reducing measures from similar contexts which the next section summarises.

**THE UNDERLYING DRIVERS OF RISK IN PRIVATE SECTOR INVESTMENTS AND MANAGING RISKS**

Comparing housing development trend in Dhaka with international contexts illustrates that similar to many low and middle-income nations, the real estate and construction sectors are important parts of national economies, and will continue to increase their share arising from high demand. However there remain a number of underlying dri-
vers of risk in private sector building and construction in low and middle-income nations (Johnson et al, 2013). These include: (a) The amount of information available about hazard risks to consider in construction projects; (b) The prevalence of other factors in making a return on investment prioritising financial viability over hazard risks; (c) Availability of insurance (at an affordable price) that makes development in hazard-prone areas less of a risk; (d) Weak regulations or the possibility to flout them through corruption; and (e) Short-term view by investors about the financial gain from the projects while disasters risks are usually something that comes into effect in the long term (Johnson et al, 2013). Consideration of these risks motivates both public and private sector in different countries to seek effective approaches for housing development.

Use of regulatory frameworks
One popular suggestion is to upgrade building standards and change building regulations to reduce disaster risk. There are arguments against regulation that go back to the concern that the imposition of standards increases the cost of housing beyond affordability of certain communities. In addition, often standards are borrowed from other countries or circumstances that are not appropriate for low and middle-income nations (Choguill, 1994; Watson, 2009). Also regulations on their own are not sufficient to reduce risks in private sector construction projects since technocratic planning processes tend to prevail and are susceptible to corruption (Spence, 2004; Johnson et al, 2013). On the other hand, arguments in favour of regulations point to the complexity of modern urban living and the vast array of risks. Standards are there to guide development, appraise quality, provide a framework for the regulation of building construction, and direct and regulate the process of social change (Yahya et al, 2001). In such a context what are needed are more dynamic planning processes that allow interaction between the multiple actors shaping the built environment as well as context-specific, appropriate and affordable building standards (Dodman & Satterthwaite, 2008; Johnson, 2011).

Strategies for guiding market
Another suggestion is related to strategies and tools to guide the market. The significance of the private sector as one of the key stakeholders in housing reconstruction is associated with their skills and resources that supplement public services, reduce the need for imports, and help stimulate the local economy (Barakat, 2003). However after a large-scale disaster, the housing process is susceptible to numerous resourcing bottlenecks inherent in post-disaster circumstances like availability of funding and resource management; supply chain disruption of building materials and speculative behaviour of material procurement; along with availability of high quality physical and technical assistance (Chang et al, 2010). Thus, it is appropriate for governments to forge strategies, tools and mechanisms to guide the market and ensure that the built environment and communities can respond appropriately to a future disaster and its aftermath (Chang et al, 2010). Also governments of low and middle-income nations with a limited resource base come under enormous pressure to invest directly in post-disaster reconstruction. Investing in housing reconstruction receives enormous political motivation as the activities are seen to be investing in people. In such a context, where the housing sector is dominated by the private sector, Freeman (2004) suggests to adopt ex ante planning tools, for example to introduce government-sponsored insurance programmes created before a crisis targeting the vulnerable groups of population; support income stabilisation for the poor to avoid pitfalls of capturing of the government funding by the economic elite; and ensure that those exposed to risk do not change their behaviour regarding implementation of self-help measures (known as the ‘Samaritan Dilemma’). In addition, the government needs to devise strategies that do not conflict with the broader long-term objective of allocating resources to ensure private markets continue supplying housing (Freeman, 2004).

CONCLUSION
It is highly likely that the private sector will continue to be the primary stakeholder in housing development in Dhaka. Increasing demand for housing from rapid urban population growth while the government’s role remains as facilitator, acquiring housing through the market will stimulate higher housing prices as well. Institutional limitations to guide and control the developments may restrict contributions in revising the existing or developing new building codes, standards, and rehabilitation and reconstruction practices. Despite all the good intentions with a limited implementing capacity of the city development authority RAJUK, mainstreaming disaster risk reduction activities into planning procedures for housing and infrastructure projects will face challenges. Possibilities of any future disaster event like city-wide flooding similar to the one in 1998 or 2004, or an unprecedented earthquake, raise concerns about how well Dhaka is
prepared to reduce, manage risks and invest in post-disaster housing reconstruction.

The concern about disaster risk reduction is bringing the wider issues of housing provision into sharp focus. The international experiences of similar contexts offer ideas that can be effectively implemented in Dhaka considering the city’s own challenges. The present trend of individual ownerships may become problematic to acquire resources in a post-disaster circumstance. The option of claiming insurance against loss is not a common practice in Bangladesh. The recent event of flooding from intense rain that are not recorded as disaster have left the households to cope with any repair or rebuilding with their own resources. Thus the future trend will be owner-driven housing reconstruction for Dhaka. The National Plan for Disaster Management needs to consider the issues of increasing housing demands, affordability for disaster-resilient structures, limitations of risk-free land for development, multiple ownership of land and housing, limitations of resources, formulation and implementation of flexible and appropriate building codes and standards for post-disaster housing reconstruction.

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BOOK REVIEW
by Dr. Jia Beisi,
Department of Architecture, The University of Hong Kong.

Although experimental buildings have been built around the world, the difficulties of implementation on a larger scale prevail. Only a few efforts have been made to organize the knowledge and to formulate the implementation strategies for the builders and designers. The research on flexible buildings address the technical components, but the possibility of integration with the current housing market is overlooked. Thus, this book is a significant contribution in the effort to fill the gap “between theories pertaining to flexibility and the reality of housing market” not only for North America, as the author explained, but also for the rest of the world. The publication of the book is a significant addition to the literature on flexible housing.

The objectives of the book are premised on the understanding that flexibility has not been generally accepted in North America because of the problems of implementation. It intends to develop a project based decision-making model to assist designers and builders in determining the relevant level of flexibility which is best fit to their particular projects.

The book is informative and serves as a conceptual instrument for the housing decision makers, including governmental housing organizations, private housing developers and builders, designers, and other promoters who want to design flexibility projects. It is useful for programmers, housing researchers, and students of architecture and building management. It can provide inspiration to residents and the general public who are interested in new living styles as well as in benefits from monetary savings and better living standards during their residency.

Selected keywords: Flexibility, implementation, strategies, economics, alternatives.
DESIGN STUDIO PEDAGOGY: Horizons for the Future
Ashraf M. Salama & Nicholas Wilkinson (editors).

This groundbreaking book is a new comprehensive round of debate developed in response to the lack of research on design pedagogy. It provides thoughts, ideas, and experiments of design educators of different generations, different academic backgrounds who are teaching and conducting research in different cultural contexts. It probes future universal visions within which the needs of future shapers of the built environment can be conceptualized and the design pedagogy that satisfies those needs can be debated.

Addressing academics, practitioners, graduate students, and those who make decisions about the educational system over twenty contributors remarkably introduce analytical reflections on their positions and experience. Two invited contributions of N. John Habraken and Henry Sanoff offer visionary thoughts on their outstanding experience in design pedagogy and research.

Structured in five chapters, this book introduces theoretical perspectives on design pedagogy and outlines a number of thematic issues that pertain to critical thinking and decision making, cognitive and teaching/learning styles, community, place, and service learning, and the application of digital technologies in studio teaching practices, all articulated in a conscious endeavor toward the betterment of the built environment.
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