An exploration of current planning, design and building issues in post-disaster housing reconstruction

Carolyn Hayles,
Planning, Architecture & Civil Engineering,
Queen’s University Belfast
(email: c.hayles@qub.ac.uk)

Abstract

A number of housing projects funded by charities and NGO’s in response to disasters, in developing countries are deemed to be inappropriate due to poor project management and limited resources which may comprise one or more of the following: limited knowledge of local climatic conditions; local materials; and the way people live and work within their communities; and often simply lack of experience. Habitually it is believed that there is neither the time nor resources to undertake detailed analysis to ensure what is being constructed is ‘fit for purpose’. Large amounts of funding, often from charitable giving, are used to plan, design and build housing projects, projects unlikely to be sustainable due to ineffective and inefficient use of resources. Hasty decisions made without appropriate local consultation inevitably create inappropriate and unwanted results, such as housing which cannot be used by local communities; and housing that does not even meet local standards for safe building. The introduction of structured decision making to allow for the audit of the cognitive processes adopted, alongside access to appropriate tools and techniques to engender the adoption of local knowledge, will reduce the risk of unsustainable building projects. Research is currently being undertaken to capture tacit, implicit and explicit knowledge and map the project management practices of leading aid agencies (NGOs and charities working in disaster relief) to understand decision making practices that result in best practice amongst these organisations. This information will subsequently be used to develop best practice guidance to be disseminated widely amongst organisations providing housing during reconstruction following both man-made and natural disasters.

Keywords: disaster relief, decision making, housing, knowledge management, sustainability

1. Background

Housing recovery passes through four stages in the aftermath of a disaster: emergency shelter; temporary shelter; temporary housing; and permanent housing [1]; consequently reconstruction of housing stock after a disaster is not the same as providing shelter immediately following an event [2]. A number of what are intended to be permanent housing projects funded by charities and NGO’s in response to disaster events are deemed to be inappropriate [3] [4] [5] due to poor project management and limited resources which may comprise one or more of the following: limited knowledge of local climatic conditions; local materials; and the way people live and...
work within their communities; and often simply lack of experience. Habitually it is believed that there is neither the time nor resources to undertake detailed analysis to ensure what is being constructed is ‘fit for purpose’. Large amounts of funding, often from charitable giving, are used to plan, design and build permanent housing projects, projects unlikely to be sustainable due to ineffective and inefficient use of resources. Rushed decisions, made without appropriate consultation have resulted in inappropriate and unwanted housing provision, including housing which cannot be used by local communities [6].

Following the 2005 Tsunami the Royal Institute of British Architects (RIBA) made public statement in ‘Building Design’ that it had contacted BRE and Construction Industry Council to make sure the reconstruction effort’s in Asia were sustainable and able to resist any future natural disaster. The RIBA also called from an education programme to ensure that rigorous construction methods would be used in countries vulnerable to future tsunamis [7]. It is uncertain whether this can be seen as a realistic goal or even attainable where there are innumerable relief and aid agencies working in isolation using different approaches and different solutions to meet people’s needs.

Recent research undertaken by Levine et al. on disaster relief as it relates to housing provision and associated social concerns, has demonstrated that it is still deficient [8]. There is a perceived gap in the understanding of the longer-term impacts of post disaster reconstruction. It has been demonstrated that more research is needed on the effectiveness of longer-term development in communities where international aid and expertise have been provided. Implementing agencies rarely have the time and/or expertise to document properly what they have done or undertake comprehensive research on the value of their interventions. The aim of the wider research project is to capture tacit, implicit and explicit knowledge and map the project management practices of leading aid agencies (NGOs and charities working in disaster relief) to understand decision making practices in the final stage of housing recovery (permanent housing); decision making processes which have lead to best practice amongst these organisations. In this paper the major issues surrounding post disaster housing reconstruction are discussed.

2. Natural hazards and disaster events

There has been a significant rise in the number of disaster events over the past decade, as well as in the number of people affected by disasters associated with natural hazards; as documented since the beginning of reliable recording in the 1960s [9]. Far from being under control, evidence suggests that losses associated with the built environment due to these extreme natural hazards are increasing rapidly [10]. Indeed, there is a broad consensus that the number and cost of natural disasters is escalating worldwide1 [2]. Traditional coping methods in both rich and poor societies are breaking down while evidence indicates that climate change is bringing new hazards as well as increasing risk from known hazards. In all this uncertainty, there is one undeniable fact; there is an unequal burden of disaster mortality [11] and climate change impacts on poorer countries.

---

1 This increase is as a result of more frequent disasters; the growth of global populations located in increasingly vulnerable areas; and continued environmental degradation.
As a result disaster relief work has increased substantially in the past two decades [12]. However questions have arisen surrounding the appropriateness of the responses made to these disasters and how they are monitored in order to assess their effectiveness over the short, medium and long term [13]. Waiting for events to occur is no longer a viable option. The ‘crisis survival’ mindset needs to change to one of anticipation, intervention and prevention [14]. It is not enough to return hazard-hit communities to their frequently impoverished and vulnerable pre-disaster state [15], it is now necessary to ‘future proof’ design rather than adapting buildings for a changing climate once complete [16]. It makes economic sense to build in resilience and when there is adequate time and resources to make these sorts of design decisions. Rebuilding operations can be seen as an opportunity to create a more sustainable environment [17]; one which can withstand future hazards and builds in climate change considerations; making housing and communities safer, reducing the potential impact of any future disaster [18]. Consequently, ‘hazard risk reduction’ and ‘vulnerability planning’ can and should be seen as a subset of sustainable development [13].

3. Climate change and increasing vulnerability

Since the beginning of this millennium, natural hazards have resulted in human disasters, which have in some instances reversed years of development work [11]. Climate change is expected to lead to changes in temperature and precipitation patterns over the next century that will, amongst other things, significantly affect human livelihoods. The predicted increase in extreme weather events disproportionately impacts the poor located in these at-risk areas [20]. Indeed some of the most significant impacts of climate changes are expected in tropical and sub-tropical regions, where most developing countries are situated [19]. In the context of past and present day failures to address poverty adequately, climate change is an additional obstacle to the achievement of sustainable development, the result of which is an increase in vulnerability of the poor

As climate change exacerbates vulnerability, measures to mitigate increased risk need to focus on reducing built environment vulnerability in the context of development efforts; particularly building adaptive capacity and technology transfer [21] [11]. Indeed the unpredictability generated by climate change places more emphasis on the need to identify and support generic adaptive capacity alongside hazard-specific response capacity [11].

The supply of appropriate housing is intrinsically capable of reducing vulnerability amongst the poor, not only against future disasters but in the shocks and crises that occur in routine life for the poor [22] living in the most vulnerable of geographical locations. Permanent housing must, above meeting basic accommodation needs [23] provide for peoples’ psychological, social and

---

2 Vulnerability is also increasing due to rising poverty, a growing global population, armed conflict and other underlying development issues. People can be exposed to physical and social vulnerability. The former includes old, poor or inadequate buildings. The latter considers the ability of an individual, household or the community to respond appropriately to threatening conditions and their aftermath [8].

3 Article 21 of the UN universal declaration of human rights promotes the concept of housing as a right of all peoples [23].
economical expectations; in essence provide a starting point from where they will rebuild their lives [24].

4. Hazard risk and appropriate mitigation

4.1 Lessons learnt

As discussed above, the demographic distribution of hazard risk tends to be inequitable because geographical locations are frequently related to residents’ demographic traits. This pattern is very common in developing countries where residents cannot afford homes in geographically safe areas [25].

As the incidents of natural disasters increase, it is imperative that NGO’s and other agencies involved in disaster relief manage risk by learn as much as possible from each disaster recovery and reconstruction process they are involved with; both successes and failures [26]. NGO’s play important roles in different stages of the ‘disaster cycle’ and different elements are attributed to its successful operation. For example, technical skills are important for rescue, whilst coordination is essential relief activities. These require different knowledge skills, competencies and attributes.

The disaster recovery period is a time with immense potential for confusion and conflict [27]. A successful NGO intervention should exhibit sustainability principles, working flexibly with local people and include multi-stakeholder cooperation [28]. Indeed, post disaster recovery processes can be used as a catalyst for sustainable development [18] [29]; upgrading livelihoods and living conditions leading to the potential revitalisation of local economies. However, post disaster rehabilitation projects have not always been effective [28], because they have not always taken a sustainable development approach.

Whilst structural/physical risk reduction initiatives, such as conventional and traditional engineering or planning which can easily create false security, are decreasingly seen as the solution, few alternative strategies are being developed to replace them [30]. Previous disasters must hold valuable lessons for those designing new buildings, and this tacit, implicit and explicit knowledge should be exploited. Detailed surveys of damage, particularly of smaller domestic buildings, can yield valuable information on areas where there is little research; for example how buildings perform compositely in a tsunami or earthquake, including the interaction between non-structural and structural elements [17]. Cross-disciplinary hazard risk-based management strategies to meet the challenges of climate change, together with design guidelines that account for both historical local climate conditions and scenarios for future changes, should be an important step forwards a more active and dynamic way of ensuring a high-quality construction process and sustainable development result [31].

---

4 Research undertaken by Wu and Lindell [27] demonstrates that having a pre-impact recovery plan in regions of high risk appear to increase the speed of housing reconstruction following a disaster event.
4.2 Disaster risk management strategies

There is a clear role for disaster risk management as a response to future climate change, and there is no better time to implement it than when reconstructing post disaster. Any disaster risk management strategy must encompass political social, economic, cultural and engineering issues [17]. Where disaster risk reduction and climate change mitigation can be incorporated into development plans, sustainable development can be realised [11]. However, whilst risk reduction is becoming increasingly recognised as a key challenge for development, very little work has been undertaken to date to identify how this can be done [32]. It has been suggested that “…the need to work on disaster risk has tended to ‘fall between the cracks’ of the grander framework of development cooperation and emergency relief.” [33, pp186]. Indeed, there is evidence that risk reduction and planning are two marginalised activities within international aid organisations; hindering interest in a more integrated approach [30].

Consequently, there is a general consensus that disaster management should shift its focus from response and recovery to sustainable hazard mitigation [34] [35]. Hazard mitigation and planning should therefore be considered as more than an auxiliary issue and disaster risk reduction needs to be incorporated into the construction management process.

4.3 Construction project management and sustainability

The construction management decision-making process requires an in-depth integrated understanding of how to avoid and mitigate the effects of natural disasters. In order to be effective, resilience needs to be systematically ‘built in’ to the planning and design process and not simply added on as an afterthought [36]. It is therefore necessary to increase the participation of NGO’s and the affected community within the construction process [37]. If mitigation strategies are to be successful, they must incorporate public participation at the local decision-making level. This will increase the likelihood that the solutions provided can be sustained [35].

The existing concepts of sustainability and sustainable development by definition have a focus on the medium to long term processes but need revision to include the implications of extreme events, regardless of whether these are natural or anthropological. In particular, those working on issues of preparing for climate change need to be informed by the body of established knowledge on natural hazards [13].

Mitigation of natural disaster within the context of sustainability requires changes and adjustments in the ways human settlements are planned, built and managed. Resources, technologies and organisational processes should be inextricably linked to the quality of the environment and to meeting people’s needs. In this way, mitigation approaches can combat the real causes of

---

5 Wamsler [30] undertook a study to determine the underlying reasons for the lack of integration of planning and risk reduction within international aid organisations. The study differentiates between people working within the field of development and those employed in the areas of disasters. It is suggested that these two groups lack the appropriate knowledge and adequate institutional structures required to effectively support their contribution to risk reduction and to co-ordinate their efforts.
vulnerability, and prevent and counteract the unnecessary creation of environmental and socio-environmental problems. Such an approach could have productive and lasting results, which would lead to continuity between mitigation and the sustainable development of human settlements [34]. This may only be achieved through appropriate housing design; activities that strengthen physical conditions, increasing self-reliance and community participation; and institutional reform at different levels to increase cooperation, awareness and effectiveness [34]. By supporting reconstruction programmes that promote community-based approaches to disaster mitigation, resources within the community and neighbouring areas could be exploited, which in turn would build capacity thus reducing vulnerability [38].

5. Sustainable Strategies

5.1 An appropriate response

Reconstruction programmes can experience challenges on unparalleled scales; examples include the aftermath of the Tsunami in Sri Lanka and the earthquake that devastated northern Pakistan (both in 2005), where a lack of strategic and professional expertise, coupled with a shortage of skilled labour and materials [39] [40], made it extremely difficult to supply permanent homes. There was widespread public criticism of the Sri Lankan government from the Western World and many organisations and individuals who had donated money; frustrated that one year on their money had not been spent and was not reaching the people. This criticism did not take into account the fact that an appropriate response and thus sustainable solution requires extensive and thorough knowledge transfer and management; and without appropriate and structured decision making processes in place, with pressured time constraints, significant mistakes can be made [39].

An appropriate response when reconstructing housing environments following a disaster is one that delivers solutions that optimise the design (its functionality and configuration) and manufacture (materials) of the build in terms of ecology, economy and social needs [37], for a sustainable solution is to be found. All too often reconstruction responses are driven by technology, limiting wider engagement with cultural and social issues [13]. These solutions must meet the basic needs of shelter and aliment. Adequate does not mean basic, as well as being long-lasting they need to be socially sustainable and meet the local peoples’ cultural needs [12]. It is necessary to remember that every country, region even, may have its own cultural and socio-economic setting [29]. The housing must meet physical needs (functionality and configuration), but it also has to meet economic and technological (including practical building systems and building materials), as well as social and aesthetic needs (thus respecting the culture of the affected population) on a local scale [24]; if it is going to deliver sustainability. Local knowledge is essential to fulfilling these requirements and NGO’s can play an important role as the interface between the people and government, by communicating people’s needs and priorities to the government [28].

With this approach to decision making, end user satisfaction, environmental protection and disaster mitigation can be provided and achieved [41]. However this is not always the case as the decision making process is both complicated and fractious. Learning from the experiences of successful and
not so successful projects could help with future project decision making processes, but very little is published that relates to the longer-term outcome of relief and reconstruction programmes; despite the sizeable amounts of (international aid) money involved [42].

5.2 End users and stakeholders

The design and implementation of any post-disaster housing reconstruction programme must find a balance between affordability, technical feasibility and quality of life. It must also recognise the end users as active stakeholders, aware and conscious of their own needs and wants, rather than as passive recipients, who need to be educated [43]. Freeman [2] and Schildermann [44] argue that governments and agencies need to actively engage end users, building on existing skills and capabilities within local communities, rather than rushing in to ‘reconstruct’ for them. Nowadays, the managers of most reconstruction projects claim that their projects are participatory, but the extent and nature of such participation is not always apparent [42]. Large, centrally planned and contractor-built housing is still the standard approach to post-disaster reconstruction [10] and whilst community participation may be widely encouraged by NGO’s, policy makers, and scholars, very little knowledge exists about how this is applied at the project level and despite often good intentions, this level of participation is rarely obtained and the capabilities of the users are often significantly wasted [45].

Indeed, Davidson et al. [45] examined a number of post disaster reconstruction projects to analyse community participation. They determined that, in the majority of cases, community participation does not occur; demonstrating a significant gap between theory and practice. Where community participation is known to take place, up front involvement is more successful than when community participation is introduced to the later stages of reconstruction projects.

However Architects without Frontiers (AWF), a small organisation specialising in developing strategies which contribute effectively to the regeneration of communities and addressing underlying social or political issues, has demonstrates some success in this area. Critical to the process has been working closely with locals, educating and training them in the skills being provided, thus fostering self sufficiency [46].

5.3 Technological solutions

Despite the fact that a top-down, technology-driven, end-product approach is decreasingly seen as the solution [30], it remains dominant in post-disaster reconstruction, with the exception of a few isolated and relatively small-scale NGO projects [42] such as the work of AWF [46] and the Catholic Relief Services (CRS) [12].

Unfortunately, in a majority of incidences external technical consultants exercise considerable influence over technology choice. Indigenous building knowledge is often devalued by outsiders and indeed by local people themselves, who prize ‘modern’ building styles as symbols of development, and believe that they are more secure against natural hazards [42]. These beliefs are not unfounded as, for example, only steel and concrete technologies can actually
withstand the forces involved in e.g. a tsunami, however these materials are not a sustainable option for the majority of people affected [47]. As a result post-disaster humanitarian assistance can increase vulnerability in the medium-long term [48] when what is built cannot be sustained.

For any reconstruction project to be sustainable, the building technologies need to be appropriate to local needs, resources and cultures. Indigenous technology, in its most advanced form, is the only technology that can sustainably rebuild devastated settlements [47]. Indigenous technology is particularly valuable for sustaining livelihoods because local skills and labour can be utilised during the reconstruction process. Indeed indigenous building technologies are well adapted to hazards. For example, certain timbers and bamboo structure resist earthquakes well because they are flexible. Despite the fact that traditional building technologies are capable of mitigating the effects of hazards if built appropriately, they have frequently been dismissed as inadequate and replaced with concrete based technologies, constructed by outsiders [22]. Marginalising local labour in this way can actually increase vulnerability to future hazards, as once the reconstruction project is over and the imported labour have left, the skills needed to extend, modify and repair houses using the new technologies are lacking, and in many instances the local people revert to traditional methods which can result in dangerous hybrid structures [42]. This is not to say solutions cannot and should not be adaptive or innovative; but these adaptations or innovations, which may originate elsewhere, must be guided by local knowledge and conditions. Also, when local people are involved in the reconstruction process, these approaches are more likely to be broadly accepted and to endure [26].

Indeed sustainability can only be achieved by using local resources (materials and labour) and cultivating skills and knowledge, thus creating micro-economies for those trying to get on with their lives post-disaster [47]. For example, following the earthquake of 2005 that devastated Northern Pakistan, CSR undertook to rebuild some of the most remote and neglected villages there. Reconstruction of permanent housing had been neglected because there was not sufficient expertise amongst those organising the relief effort [12] CRS found that the most effective way to rebuild housing that was safe, adequate and durable was to assist (through provision of materials and skills) local people to build permanent housing with materials they were familiar with. Indeed CRS’s overriding aim is to train local people with the skills and knowledge necessary to do the job the next time [40].

When considering the additional burden of building for unpredictable changes in climate, it has been suggested that housing with a higher climatic safety level than considered necessary under the climate regime of today be adopted. However with limited funds this approach may not be considered cost effective, although weighing cost and benefit in this context is certainly not straightforward and introduces new challenges [31]. If there is a clear strategy for sustainable development post-disaster, climate change risk and adaptation must be considered and may in fact inform and contribute to an improvement of previous strategies.
5.4 Organisational and management issues

In regions where natural hazards are more frequent, it may not be possible to reconcile every risk [10], particularly risk associated with climate change. Ultimately, the success of any project hinges on co-ordination (organisational and managerial), both at local and regional levels, within and between organisations. Project leadership is also an important issue in any community-based activity and vital in post-disaster reconstruction [29]. Johnson et al. [49] undertook a study of post-disaster environments which demonstrated that the performance of housing reconstruction projects was directly related to the design and management of the project team itself; highlighting the importance of studying decision making in project teams and analysing organisational processes for best practice.

In the past concerns have been expressed that organisations with the necessary available expertise to provide assistance are not necessarily matched up with the expert bodies capable of delivering where help is needed and lack of co-ordination has been blamed [50]. The development of more integrated, interdisciplinary projects is restricted by competition for limited funding and by donors’ separate budget lines for emergency relief and redevelopment. There are reports of tension between disaster specialists, development workers and urban planners, and the incompatibility that ensues impedes the establishment of more integrated projects, much needed if a sustainable solution is to be found [30].

6. In conclusion

There are large uncertainties associated with the future performance of the built environment due to changes in regional and local scale climatic conditions. Up until now major natural disasters have been regarded as individual, one-time, localised events, as opposed to regional and potentially frequent. Until the scale, complexity and potential size of these hazards are examined, adequate responses will not always be developed, much less implemented [8].

To secure a reduction in losses to natural disasters, the meeting of the UN’s Millennium Development Goals [51], widen human development objectives, and implement successful responses to climate change, it is necessary to undertake a more integrated approach to disaster relief reconstruction [11]. To ensure that every house that is reconstructed following a disaster will work with or withstand future potential disasters, there needs to be an understanding and awareness of potential future risks (including climate change mitigation) alongside the development of strategies to survive or combat them. In order to develop these adaptation strategies, effective ways must be found to strengthen capacity [31] of all those involved. One way of doing this is through the study of current best practice. Meeting the challenge of creating sustainable and self-replicable approaches, approaches that enable large numbers of poor and vulnerable people who need safe, affordable housing to achieve this is the aim of organisation working towards sustainable development. Understanding best practice and how to replicate it, is the first step in achieving this goal.
7. Ongoing research

This study of the literature reveals that it is both prudent and necessary to establish to what extent local knowledge and technical and scientific information is exchanged between the different stakeholders (which includes the end users) and what is encouraging or constraining locally adapted solutions [31], particularly with respect to design, technology and materiality but also construction and building maintenance, in post-disaster housing reconstruction.

Research is currently being undertaken to capture tacit, implicit and explicit knowledge and map the practices of leading aid agencies (NGOs and charities) currently undertaking post-disaster housing reconstruction projects, to understand decision making practices that are working towards sustainable solutions and demonstrate best practice. The results of this research will be published at a later date.

References


