The Role of Property Professionals in Building Disaster Resilience

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INTRODUCTION

In July last year a small delegation from the Royal Institution of Chartered Surveyors[1] (RICS) visited Haiti to undertake a review of local construction standards. The review was undertaken in conjunction with PLAN Haiti and had been initiated in response to the collapse of a Haitian school in November 2008, which killed 100 children.

The objective of the mission was to understand how building safety could be improved by promoting the development and implementation of local construction standards, particularly to encourage and design-in effective earthquake resilience. This mission proved to be grimly prescient.

Notwithstanding the scale of the destruction and suffering in Haiti, this is one of an increasing number of natural disasters that have and will continue to inflict huge material and human losses on, invariably, the poorer regions of the world. Whilst not preventable, the impact of many of these disasters could be moderated substantially.

Following the Haiti earthquake, UN Secretary General Ban Ki-moon observed "*We have technologies to build sturdier buildings and to build infrastructures that take into account possible fault lines. We know a great deal about how to work with the natural landscape to ensure that urban settlements are more secure. The problem is that so many parts of the world are not benefiting from this knowledge and these technologies. Disaster risk reduction measures must not be a luxury that only some States can afford.*" (UN News, 2010)

This paper examines the role that the effective planning, design and construction of the built environment plays in creating safer communities, and how the employment of recovery systems can expedite and improve post-disaster recovery. It also considers the increasing incidence of natural disasters and the impact of climate change on the incidence of disasters. There are some useful dimensions of the scale and impact of natural disasters that provide background and context for this paper.

- The past few decades have seen an increase in the number and scale of natural disasters throughout the world. Each year of the past decade an average of 258 million

[1] The RICS is the leading organisation of its kind in the world, representing professionals in property, land, construction and environmental assets. It is an independent, not-for-profit organisation, which acts in the public interest, setting and regulating the highest standards of competence and integrity among its members and providing impartial, authoritative advice on key issues for business, society and governments worldwide.

RICS was founded in London in 1868, and granted a Royal Charter by Queen Victoria in 1881. The Charter requires the Institution "to maintain and promote the usefulness of the profession for the public advantage." This commitment to act in the interests of society in everything it does continues to be its guiding principle today.

The Institution has 100,000 qualified members and over 50,000 students and trainees in some 140 countries.

people have suffered from disaster, a considerable increase on the 74 million a year recorded in the 70s (Christian Aid 2006). In 2008 the number of reported natural disasters was 326 worldwide, with some 236,000 people reported killed, the second-highest number in a decade. The highest recorded number was that arising from the 2004 tsunami, when over 241,000 people died (Rodriguez, Vos, Below, & Guha-Sapir, 2008).

- The loss of life resulting from major disasters disproportionately occurs in less developed countries and whilst the economic impact on such countries can be severe, it is often also felt within developed countries. Out of a survey of 49 low-income countries, 24 face high levels of disaster risk and six are impacted by between two to eight disasters each year (UNDP, 2004). A 6.5 scale earthquake that hit central California in 2003 killed two people. By comparison a 6.6 scale earthquake that hit Iran four days later killed over 40,000 people. Both disasters took place in areas with high-density populations (DFID, 2006).
- The total cost of natural disasters in 2008 was US$181 billion, these costs arising largely from cyclone Nargis, which killed an estimated 38,366 people in Myanmar, and the earthquake in Sichuan China, which killed 87,476. This compares with the estimated cost of hurricane Katrina in 2005 of some $140 billion (Rodriguez, et al., 2008). Damage from hurricane Ike, which hit the USA in 2008, cost US$31.5 billion.
- Nine of the fifteen natural disasters with damage costs exceeding US$1 billion occurred in North America, a further two in Europe, and three in China (Rodriquez et al, 2008). In the past decade 88,671 people died in Europe as a result of 953 disasters, which affected more than 29 million people and created losses amounting to some US$ 269 billion (Guha-Sapir, 2009).
- At least 80,000 people lost their lives and 230,000 houses were seriously damaged in the devastating earthquake that affected Latur in India on 30th September 1993… about 30,000 affected families had to stay in temporary houses for 4 years (MERDP, 1998)
- The effects of natural disasters within developed countries are more acutely felt due to the higher population densities and the economic intensity to which the land is put. Conversely, the loss of life in developing countries tends to be higher. It follows that in highly developed cities there is an enhanced need for disaster resilience.

CLIMATE CHANGE DRIVEN DISASTERS

The increasing frequency of natural disasters around the world, and in particular those attributable to metrological and hydrological events, have been linked to the growing evidence of climate change. Scientists warn of global warming resulting from rising carbon dioxide levels which will bring about widespread changes in weather conditions and the frequency of severe weather events. Carbon dioxide levels in the atmosphere increased at the highest annual rate in the decade to 2005 and are now higher than at any time in the past 650,000 years. Eleven of the last twelve years (1995–2006) rank among the twelve warmest years in the instrumental record of global surface temperatures since 1850 (IPCC, 2007a). Projections are that global temperatures will continue to rise at about 0.2°C per decade. The Copenhagen Accord reached in December 2009 set 2°C as the target limit of global temperature increase maximum. To achieve this target maximum will require very significant reductions in emissions of greenhouse gases by all nations (UNFCCC, 2009). Many predictions are that temperature rises well above this target may well be experienced in coming decades. These temperature rises will result in a continuing rise in sea levels due to melting of ice caps and glaciers and the expansion of the oceans. In the past decade sea levels rose at the rate of 3.1mm per annum and projections are that this trend will continue (IPCC, 2007a, p. 72). The atmosphere will cause temperatures to continue to rise for many decades, even if all emissions were stopped today. An increase of 2°C over pre-industrial levels is broadly agreed to be a critical 'tipping' point, beyond which dangerous climate change becomes increasingly likely. How much the temperature actually rises will largely depend on national and international mitigation efforts in the coming years but most scenarios are bleak (IPCC, 2007b). If emissions are stabilised at 550ppm then global temperatures will increase by 3°c. We will reach this CO_2 level within 30 to 35 years at current rates. If we continue as we are without reducing emissions, within 100 years temperatures will probably rise by 5°C (Stern, 2009)

The effects of predicted climate change will vary from region to region. The most vulnerable industries, settlements and societies will be those located in coastal areas and within flood plains. Many developing countries will be particularly adversely affected and in order to assist in mitigating the effects of climate change and to finance a reduction in emissions from deforestation, the Copenhagen Accord has identified US$30 billion funding from developed nations between 2010 and 2012 to provide for adaptation and mitigation works (UNFCCC, 2009).

IPCC (2007b) acknowledge that some adaptation to climate change is occurring with sea defence projects and water use reduction projects underway, however, further adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions' (IPCC, 2007b, p. 19). The business environment will be significantly impacted by these climate change predictions. The evidence of climate change is, however, giving us an early warning system for the potential for severe weather events and climate-related disasters. We need to take heed of these warnings and instigate measures to mitigate the effects and to reduce the potential for catastrophic change (IFRC, 2009). The United Nations International Strategy for Disaster Reduction (UNISDR) has recognised the need for action to prevent and mitigate the effects of climate change. In 2005, UNISDR recognised that a gap exists between current practices and the actions necessary to meet the challenge of climate change. The UNISDR Hyogo Framework for Action 2005-2015 identified specific gaps particularly in; governance, risk identification, assessment, monitoring and preparedness for effective response and recovery (UNISDR, 2005). In 2008, UNISDR reiterated the need for preparation of mitigation and preparedness strategies for future disaster events and the need to systematically integrate disaster risk reduction and adaptation into national development strategies (UNISDR, 2008). This disaster risk reduction planning process needs to not only be undertaken as a national strategy but must also incorporate all organisations and physical assets that will be vulnerable to climate change disaster events.

The costs of not addressing climate change are difficult to quantify but have been estimated to be in excess of 5% of world gross domestic product. The costs of meeting emission targets has been estimated to be in the range of 1 to 1.5% of world GDP (Stern, 2009) With World Bank figures giving global GDP at around US$60.6 trillion the costs of failure are considerable.

The effect of climate change will be felt in the great many ways in which we use the built and natural environment. The most obvious effect is that of natural disaster, extreme weather events causing flooding, heat stress, drought and fire. However, other, more subtle problems will be faced. Cities will be severely disrupted as temperatures soar due to heat island effects and demand for energy will lead to interruptions in the continuity of supply. Indeed, the longer term security of energy supply is a growing issue in many major cities. The lack of energy security may lead to conflict and shifting populations if extreme climate change predictions become a reality. Governments face the prospect of global reductions in the supply or availability of energy as they struggle to meet CO_2-e emission targets (Bauen, 2006; Huntington & Brown, 2004). As we seek to address the problem of CO_2-e emissions, governments around the world will need to implement schemes to significantly reduce energy use. As drought, flood and fire effect the continuity of food supply there will be mass migration and issues with food security, which may lead to significant increases in conflict. Indeed the early signs of climate change conflict and migration are already evident. In 2008 preliminary research indicates that 20 million individuals were displaced due to sudden onset disasters (Kolmannskog, 2009). This figure is just a very small indicator of the levels which could result from increased conflict and slow onset drought and famine-led disasters.

INCREASING COMMUNITY RESILIENCE THROUGH DISASTER PLANNING IN THE PRE-DISASTER PHASE

Global reaction to climate change is gaining pace and there is increasing recognition that in addition to major efforts to reduce emissions of greenhouse gases, the world also needs to prepare for the adverse effects of the inevitable rise in temperature. Mitigation works to address the effects can be undertaken in many different ways. The effects of rising sea levels present a simple illustration of varying resilience solutions to this significant problem. Resilience does not necessarily mean holding back the water but can address ways of coping with more frequent inundation or diverting the effect away. Resilience is thus the ability to reduce the risks associated with a disaster event, which allows a rapid return to the pre-disaster situation. (Haigh & Amaratunga, 2010). Following the 2004 tsunami many communities were relocated away from the low-lying costal plain, thus significantly reducing the potential for future loss of life and economic destruction. Important civil buildings such as schools and health facilities are strategically located on higher ground and in locations which will be more resilient to extreme weather events.

Perhaps one of the best ways to address community disaster resilience is through the concept of systematically analysing the current building stock and identifying issues of significant vulnerability. This approach was ironically in the early stages of implementation immediately before the 2010 Haiti earthquake. It was widely recognised that building standards in the country were not of the highest quality and as such were extremely vulnerable to earthquake and extreme weather events. An analysis of key community buildings and an identification of the most vulnerable would then have permitted a systematic improvement in the building quality and the eventual provision of disaster-resilient critical municipal buildings. Pre-disaster planning in respect of schools, hospitals and municipal buildings where people can seek refuge in times of disaster events, can significantly contribute to a reduction in the loss of life immediately following a disaster event and aid the recovery of the population to normal economic activity following the event. Examples of providing professional guidance in town planning and location of buildings within a city, together with the establishment of building codes which promote sound construction practices, are key elements that can serve to increase community resilience to disasters

BUILDING BACK BETTER

"*It is crucial that all stakeholders buy into common standards, approaches and methodologies. All recovery processes would greatly benefit from having a single information structure that can collect, analyse, and disseminate information that would have buy-in from local stakeholders, including government, IFCs, NGOs, donors and UN agencies"* (Clinton, 2006)

In most disaster scenarios, and in particular those that occur in developing countries, the question of resilience comes into question as a major contributor to physical damage, injury and loss of life. Usually the issue is how well (or not) the local physical infrastructure and buildings have resisted the impact of the natural disaster and how this could have been ameliorated by better design and construction. Typical disaster impacts, for example earthquake, typhoon, tsunami, flood and fire, usually occur in locations where the risk of such impacts is known and hence local infrastructure and buildings can be located and constructed so as to offer the maximum resilience.

In practice, however, this seldom occurs, and the absence of such an approach is most prevalent in developing countries where the built environment has not been subjected to rigorous planning, design, construction and inspection. Such locations are described as having "man-made latent toxicity" (Keane, 2010). Time and again we see substantial human impacts caused by an inappropriate built environment and yet the opportunity to prevent or at least significantly reduce the risks had arisen during development and construction.

In the weeks and months that follow any major disaster, local communities, government entities and aid agencies contemplate the reconstruction effort. Properly considered and executed, this offers a singular opportunity to build back better – to take account of the disaster risks and vulnerabilities, and respond with communities that are located and constructed accordingly.

The paradox, however, is that at the very time when intense collaboration and effort should be employed in developing the best reconstruction solution, those responsible or even able to contribute are at best focused on too many immediate problems and at worst are incapacitated or missing. The result too is that all too frequently the build-back does reflect best-in-class codes and design, and construction suffers for want of quality materials, good techniques and skilled operatives.

So how can this seemingly inevitable paradox be broken? How can the opportunity be seized to ensure that any future natural impacts have a lower disaster impact, with ensuing improvements in the rates of morbidity, injury and physical destruction?

The Royal Institution of Chartered Surveyors (RICS) established its Major Disaster Commission in the wake of the Indian Ocean tsunami in 2004. One of the objectives of the commission was to consider how the experience and knowledge of the Institution's members could be engaged to draw up potential solutions to this paradox. After all, these members in their many guises and business daily plan, design and implement the construction of the built environment from singular building to whole cities (Warren & Matthews, 2008).

The Commission engaged with a number of industry professionals and the Max Lock Centre, University of Westminster, London, to evaluate this problem. The results (Lloyd-Jones, 2006) suggested that the problem is seldom (or at least not uniquely) attributable to a lack of funding, but arises from issues related to the ability of local institutions to function effectively and a lack of any framework for planning and implementation of wide-scale reconstruction. Typical issues that were identified include the following.

- Impaired government and leadership capability – in many cases this is lost or incapacitated during the disaster and what remains is unable to operate effectively.
    a. Poor management and coordination – despite huge improvements in emergency responses to natural disasters, permanent reconstruction is often inefficiently managed, uncoordinated and slow to get off the ground.
- No overall geophysical plan – of the land and built environment that remains post-disaster and the issues surrounding this such as condition, stability, and spatial location.
- No overall plan for reconstruction - a considered and effective plan for the new community and reconstruction, taking account of mitigations to risks and vulnerabilities.
- Land ownership difficulties – many affected or displaced landowners simply have no idea what they owned or where the boundaries were. This is compounded by poor or non-existent ownership records and title rights.
- Ineffective supply chain – impaired access to construction materials and plant, and skilled industry professionals and labour, creates a supply-side bottleneck. This hampers efficient reconstruction and creates an environment where black market practices and fraud can flourish.
- Damaged and depleted infrastructure – the lack of infrastructure services such as utilities, communications and transportation greatly inhibits effective planning and construction.
- Skills shortage – the role of most aid agencies is focussed on either immediate post-disaster aid and recovery, or humanitarian relief in the longer term. Few agencies focus on the matter of reconstruction and most are simply not structured or skilled to provide any meaningful contribution to a build-back-better effort.

The RICS and the Max Lock Centre responded to these findings with the report "Mind the Gap" (Lloyd-Jones, 2006). The objective of this was to raise awareness of the issues of reconstruction and the impediments of building back better, referred to in the report as the post-disaster gap.

In parallel, the RICS was undertaking more fundamental research with the University of Salford, School of the Built Environment, to evaluate its hypothesis that utilising the programme management techniques regularly employed in major construction projects could yield a project protocol for disaster re-construction. The ambition was to see if a roadmap for re-construction could be developed based on best practice from both civil construction and the humanitarian aid community. The result of this work was the publication in 2009 of the Generic Disaster Management and Reconstruction Protocol (Fleming, Lee, & Kagioglou, 2009). This protocol is based on seven key principles and a process flowchart or map that links nine distinct phases of the disaster preparedness and recovery process. The seven key principles are:

Being Prepared
Encouraging preparedness towards disaster risks

Taking a whole project view
The process covers the whole lifecycle of a disaster, from preparedness through to reconstruction. This ensures that issues such as operations and maintenance are considered at the front end of the process;

Having a clear planning framework
Drawing from the 'stage-gate' approach of programme management principles, a phase review process is adopted which applies a consistent planning and review procedure throughout the project life;

A consistent process
The protocol's generic properties allow for the consistent application of the phase review process across different projects and supply chain participants. This, together with the adoption of an effective approach to performance measurement, evaluation and control, facilitates continuous improvement;

Process flexibility
The protocol enables the alignment of the project process with existing business and operational processes. The flexibility of the protocol ensures that customised, specific process protocols can be created to manage projects, generating team buy-in to the process. At the same time it instils more collaborative and less adversarial practices as a result of the application of the customised process;

Stakeholder involvement and teamwork
Project success relies upon the right people having the right information at the right time, and doing the right things. The pro-active resourcing of project phases though the adoption of the stakeholder views and standardised project deliverables should ensure that appropriate participants are identified and consulted earlier in the process than is traditionally the case;

Coordination
The need for effective coordination between the project team members is paramount. The team leader or focal point will need to be assigned with delegated authority to coordinate the participants and activities of each phase for the production of the project deliverables;

Feedback
The knowledge generated in the project though its monitoring and evaluation system in terms of successes and failures, if captures, can offer important lessons for the future.

The nine phases are used to guide the disaster recovery process from preparedness and hence greater resilience, through reconstruction planning, the construction phase, to post-construction review. Within each phase there are “activity zones” that provide descriptions of best practice activities involved in each phase. Together, the various components of the protocol provide an infinitely flexible and adaptable process for delivering pre-disaster preparedness measures and post-disaster reconstruction activity.

Phase zero	Disaster Preparedness
Phase one	Pre-event planning
Phase two	Initial assessment
Phase three	Review and prioritisation
Phase four	Detailed assessment
Phase five	Reconstruction strategy
Phase six	Reconstruction information
Phase seven	Reconstruction works
Phase eight	Ongoing review

The protocol is now undergoing testing and verification by RICS members and the University of Salford.

THE ROLE OF THE PROPERTY SURVEYING PROFESSIONS IN DISASTER MITIGATION

In any post-disaster scenario there are three distinct and commonly identified phases (Max Lock Centre, RICS etc al, 2006)) that can be used to characterise the progression of events and activities, and which provide a framework for analysing the drivers for disaster impacts and routes to recovery. This approach is also helpful in understanding the role of various agencies in mitigating these impacts, providing humanitarian relief and promoting longer-term re-construction and recovery.

1. The first phase is that of *emergency or humanitarian relief* immediately following the disaster. This can last from a few days to weeks or months depending upon the nature and scale of the disaster, and local conditions.
2. The second phase is a *transition period* where the immediate relief work winds down, local or central institutions recover, and long-term planning for reconstruction and recovery takes place. Or should.

3. The third phase is *reconstruction and recovery* where physical infrastructure and the build environment are reconstructed and the social, economic and political systems are re-built.

Taking a broader view of disaster cycles suggests that in many disaster-prevalent areas of the world there is a fourth phase which is in fact the status quo continuum that exist before any disaster strikes. In some areas this is little more than a period of calm between known or likely episodes of natural disaster impacts – such as the hurricane season in southern USA, or the monsoons in South Asia, whereas in others it is a more or less unbroken continuity. Auckland, New Zealand, is built on an area of intense historical volcanic activity – there are some 50 volcanoes within the city boundary, the youngest being only 600 years old – and so it is not a matter of if there will be further volcanic activity, but when. In developed economies this pre-disaster or continuity period is used to plan for and mitigate any likely disaster episodes, and disaster recovery plans are developed and put into practice, disaster-resistant build environment is planned and constructed against appropriate building codes. However, in less developed countries this level of preparedness and planning seldom occurs, indeed in many parts of the developing world it does not occur at all, as has been seen with the recent disaster in Haiti.

The research carried out by the Max Lock Centre and RICS suggests that there is frequently a disconnection – a "gap" – between phases 1 and 3; that the transition phase does not occur effectively or at all. This research further contends that once the immediate aid and recovery effort has wound down, there is a period during which considerable levels of planning and preparation have to be undertaken to implement the third, reconstruction phase, but seldom is carried out effectively. It follows that this gap is a critical factor in impeding recovery, as is witnessed in many disaster scenarios where survivors remain in makeshift accommodation and the built environment remains in a state of ruin for many months or years and only then to be re-built to standards no better than before. So what can be done to close this gap and materially improve the speed and effectiveness of the reconstruction and recovery phase?

This paper argues that in the spectrum of agencies and professionals engaged with disaster mitigation and relief there is a valuable and complementary role for built environment professionals – surveyors, architects, engineers, planners and the like. The built environment is a major factor in any disaster and the impacts arising there from on the affected population and economy. It can be seen that there is also a correlation between the quality and condition of the built environment and the severity of any impacts. Put simply, the poorer the built environment the greater the likelihood and severity of the arising impacts. The role of built environment professionals in disaster mitigation and in disaster recovery and building-back-better is instrumental – these professionals have the skills and knowledge to ensure that the built environment is designed and constructed so as to maximise disaster resilience, whether it be in the pre-disaster or recovery phase.

The question that seems to arise in many post-disaster scenarios is how best to integrate the activities of the built environment professions with those of the relief professions, governmental institutions and the like. Analysis of the three disaster phases suggests an approach, which the RICS is developing and promoting with aid and governmental agencies.

The objective is to test the Project Protocol approach and promote the involvement of built environment professionals with these agencies to create a more seamless solution.

In the foreseeable future, however, in most low-income developing countries, professional skills and expertise in the built environment will remain a scarce resource, particularly in more remote regions (Max Lock Centre, 2006). It follows that built environment professionals world-wide must be engaged in disaster mitigation and recovery work to work alongside other agencies in the field. This is not a simple implant approach – particularly in the wake of a major disaster – as additional skills and training are required to ensure that such professionals can be effective and safe. But experience to date (RedR, RICS and others) suggests that this is achievable, and desirable.

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