

*4th International i-Rec Conference*  
**Building resilience**  
*achieving effective post-disaster reconstruction*



i-Rec 2008

## Collected Papers

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## **Quick Deployment Disaster Shelters: Building Community Through Design**

**Rodney Adank<sup>1\*</sup>**, Jake Snowdon<sup>1</sup>

<sup>1</sup>*Massey University*

**Full Paper:** [PostDfinal00026.pdf](#)

By understanding the experience of disaster victims, we can design product solutions that mitigate the effects and speed the pace of disaster recovery. In major disasters temporary tent shelters, can become semi permanent and need to provide protection from the elements, a refuge, comfort, security, and a sense of community. UNITE: is an innovative tent designed for disasters. Its hard shell container provides lockable storage within the tent when erected. Pictograms, colour coding and simple twist and lock mechanisms allow easy construction by one person on solid or soft ground providing a 12 sq m footprint, or zipped together for family accommodation. The design eliminates the trip hazard of protruding guy ropes. The roof design allows for clearing of ash and snow loads and the ability to collect and store rainwater. Replaceable ground sheets provide a fresh unused floor for each deployment. An identity pack for each tent makes it easier to identify and locate people from a group within the shelter community. UNITE was developed through an iterative design process. Initial research fueled idea generation producing 320 concepts. These were grouped by subject matter into eleven distinct areas. Groups were screened against developed criteria, combined and developed through critique and focused prototype testing. The Unite design takes into account the storage, deployment and refreshment of the product through out its life cycle. Unite provides shelter that aids recover from disasters by facilitating community and empowering disaster survivors.

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## **Challenges of Post-Disaster Housing Reconstruction: The Asian Context**

**Iftekhar Ahmed**

*The University of Melbourne*

**Full Paper:** [Ahmed.pdf](#)

Asia is the most disaster-prone continent and the predominantly low-income communities in many countries are highly vulnerable to the impact of hazards. Various development and humanitarian agencies implement post-disaster housing reconstruction projects to assist affected communities to recover from the effects of disasters. In this paper post-disaster housing reconstruction projects in several Asian countries including Vietnam, Bangladesh and Indonesia will be discussed, based on the author's experience.

Tremendous challenges remain in matching these reconstruction projects to the needs and aspirations of communities both in terms of quantity and quality. Various questions arise: Do the projects manage to reduce future disaster risk and offer lessons for mainstreaming into policy and practice? Or is risk re-created so that resource deployment is recurrent and communities remain dependent on such external assistance? How are challenges that arise in the course of project implementation addressed? How sustainable are the houses built in such projects? In this paper questions such as these will be addressed and findings of current research and evaluations will be presented.

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## **Lessons Learned from Canada: The imperative to build a culture of preparedness for health care providers as first responders**

**Carol Amaratunga<sup>1\*</sup>**,

<sup>1</sup>*University of Ottawa,*

NOTE: This report is a condensed version of a more comprehensive project report:

Amaratunga, C., Carter, M., O'Sullivan, T., Thille, P., Phillips, K.P. & Saunder, R. (2008). Caring about Nurses in Public Health Emergencies: Enhancing Capacity for Gender-based Support Mechanisms in Emergency Preparedness Planning. Ottawa: Canadian Policy Research Networks. Available for download at <http://www.cprn.org/>

**Full Paper:** [postdfinal00003.pdf](#)

The inclusion of health care providers in stakeholder participation for disaster planning and policy, particularly post event recovery and reconstruction following bio events is relatively recent. This paper reflects upon the lessons learned from the 2003 SARS outbreaks in Canada with respect to the future preparedness of front line

health care providers. The research study examined the response to SARS as a proxy for infectious disease events. Funded by the CRTI program of Canada, this presentation provides critical data analysis using empirical findings and post disaster policy recommendations from a 3.5 year study of 1500 health care providers in Canada.

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## **Post Disaster Reconstruction Challenges: Case Studies from Sri Lanka**

Dilanthi Amaratunga<sup>1</sup>

University of Salford, UK

### **No Full Paper available**

Sri Lanka is a small island situated close to southern tip of India, near the equator. It is a developing country with a population of 20 million. Before the Indian Ocean Tsunami, Sri Lanka was known to be a safe haven, where outrages of nature scarcely occurred, except for occasional floods and landslides. However, the Tsunami affected 75% of the coastline of Sri Lanka. It also resulted in the destruction of more than 100,000 houses (UNEP, 2005). The destruction of houses also resulted in discontinuance of several livelihoods such as fishing, farming, tourism and handicrafts-related activities. In addition to commercial and non-commercial property damage, the number of deaths apportioned to the Indian Ocean Tsunami is estimated to be in excess of 130,000 with at least 31,000 of those in Sri Lanka (BBC, 2005). Among other reasons, a lack of awareness of the nature of a tsunami among the Sri Lankan public, was identified as a major reason behind the high death toll (Karim 2004). Indeed, the term Tsunami was heard by most of the ordinary Sri Lankans only after this devastation.

During the immediate relief stage, Sri Lanka has received humanitarian relief aid from donors all over the world. This aid was in the form of financial assistance, equipment and materials, and human resources for rescue and relief missions. While most of the aid was aimed at providing immediate relief to victims, some of the funds were aimed at long term recovery attempts, including reconstruction of houses and infrastructure.

Four years on, Sri Lanka is yet to recover fully from the devastation of the December 2004 tsunami. After a successful immediate relief phase (Weerakoon & Jayasooriya, 2007), Sri Lanka went through a challenging transitional period between immediate relief and the medium and long term recovery. The Sri Lankan government started the long term recovery programmes with optimism and expectations for speedy recovery. The government planned for post-tsunami recovery programmes to be completed within 3-5 years (UNDP, 2006). Other optimistic pronouncements were made at a political level, with all permanent housing to be complete within a year after the devastation. In reality, this target has not been met after 3 years. The pace of recovery for large scale infrastructure projects has been slow, with an estimated 50 per cent of construction projects failing to commence by the end 2006. By the end of 2006, 134 of 182 damaged schools were meant to be in various stages of construction; however, by the end of 2005, construction work had started only in 18 schools (GOSL, 2005). Similarly, within the health sector, only 55 of 102 damaged buildings were completed by June 2006 (RADA 2006; & Jayasooriya 2007). It is evident that there is a mismatch between the intentions of the Sri Lankan government and the actual progress of the post tsunami recovery programmes in Sri Lanka. In this context, this key note focuses on some of the challenges Sri Lanka faces in ensuring the success of post tsunami recovery attempts.

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## **Enhancing the capacity of Sri Lankan higher education institutions to meet post disaster recovery challenges**

Kaushal Keraminiyage<sup>1</sup>, Dilanthi Amaratunga<sup>1\*</sup>, Richard Haigh<sup>1</sup>

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Full Paper: [AmaratungaD2.pdf](#)

Sri Lanka is one of the worst affected countries from the December 2004 tsunami. Despite large number of relief programmes initiated within Sri Lanka, the argument is that the country is yet to recover from the devastation. Among many other reasons, lack of intellectual capacities related to post disaster recovery challenges has been identified as a major reason behind the largely unsuccessful recovery attempts. These capacity gaps can be traced back to the fact that disaster management related disciplines have not been implemented sufficiently within Sri Lankan higher education institutions. Being more specific, none of the Sri Lankan higher education institutions possess a curricular which has the ability to produce disaster management expertise within the country. Addressing this issue, international collaborative research project titled EURASIA (the European and Asian Infrastructure Advantage) was initiated aiming at developing a joint curriculum for built environment associated disaster management through an international collaboration between five European and Asian Built Environment educational institutions. In this context, the primary objective of this paper is to discuss the development of a joint curricular by comparing and assessing the needs and barriers of both the continents. This paper will discuss

the details of a specific framework that has been developed to assess the compatibility of a module, a collection of modules or a programme within a specific institution. Further, the paper will also discuss the methodology adopted for the development of the joint curriculum. Further, the outcomes of the compatibility assessments and skills audits which have been conducted as part of the joint curriculum development will also be discussed with a special emphasis on the analysis of the applicability of the joint curriculum within context of post tsunami Sri Lanka. It is intended that this paper will initiate a rich debate about the role of higher educational programmes and capability building associated with post disaster recovery strategies within the context of a developing country setting.

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### **Disaster risk reduction strategies and post-disaster infrastructure reconstruction**

R.S. Palliyaguru<sup>1</sup>, D. Amaratunga<sup>1</sup>, R. Haigh<sup>1</sup>,  
University of Salford

Full Paper: [postdfinal00072.pdf](#)

World's vulnerability to natural disasters has increased over the last few years. Hence, mainstreaming disaster risk reduction into constructed facilities has taken up an important role in the whole of the disaster management cycle. This paper aims to study the importance of mainstreaming disaster risk reduction in to post-disaster infrastructure reconstruction and the initiatives taken by the relevant bodies in order to minimize the future natural risks in reconstruction of infrastructure. Reconstruction serves to reinforce the society or sometimes even increase the vulnerability of the society. Therefore, investment in the physical infrastructure for disaster management is essential as it can result in reduced loss of lives in case of a disaster, do withstand disasters, reduces the risk of failure and thus contributes to disaster reduction and prevention. However, infrastructure reconstruction programs should aim to change the vulnerable conditions for the development of the country. It is well identified that all critical infrastructure facilities must be designed to a given level of safety from disaster impact. Moreover, such guidelines must be provided to designers and adequate monitoring system be in place. Thus, the routine reconstruction of infrastructure should, for example, incorporate design features that protect them from known hazards. The research reveals strategies used in general and in specific to the infrastructure sectors in addressing the above issues. A comprehensive literature review was carried out on the present situation with regard to above-mentioned measures. This research expects to strengthen the infrastructure reconstruction process by reporting the practical measures taken in reduction of future risks in the post-tsunami infrastructure reconstruction of Sri Lanka.

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### **The role of NGOs in the context of post disaster housing in Turkey**

**Hakan Arslan<sup>1\*</sup>**, Alper Ünlü<sup>1</sup>  
<sup>1</sup>*Istanbul Technical University*

Full Paper: [postdfinal00015.pdf](#)

Disasters had great affects on the region and community that they occurred both physically, socially, economically and psychologically. The community sometimes use most of its capacity to overcome the situation and sustain their predisaster daily life. The most important problem revealed after the emergency phase is especially to meet the shelter needs of the disaster affected population. After 1999 Earthquakes in Turkey during the rehabilitation phase temporary houses were built for the victims in a short time to 1–2 year period basis which were planned by the central government. The time extended to 3 year and beyond because of the permanent housing site expropriation problems. At the end of the 2002 the home owners moved to their permanent houses. Eventough some of the temporary housing sites were demolished some are still in use. Most of the users of these houses were renters and low income families. This situation clearly shows the lack of organization for the renters and low income families after the earthquake. This study tries to analyze the role of the NGO's established after the earthquake in order to defense the rights of the renters and low income families tenure in Turkey. The local associations' (Earthquake victims association, Beyciler association, etc.) roles are evaluated according to their relation with central and local government and their location in the national organizational scheme. Overall the actual position of these NGO's stated in 8 year reconstruction process after the earthquake. The weak and strong part of these organizations and their sustainability processes are evaluated for long term as well. This study share the post disaster housing reconstruction experiences in a case study and give planning and organisational cues and tools for future reconstruction activities.

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## **Pre-Event recovery planning for land use**

**Wendy Saunders<sup>1\*</sup>, Julia Becker<sup>1\*</sup>**, Lesley Hopkins<sup>2</sup>, Kim Wright<sup>1</sup>

<sup>1</sup>*GNS Science*, <sup>2</sup>*Beca Carter Hollings Ltd*

Full Paper: [Postdfinal0009.pdf](#)

The objective of this presentation is to present research that addresses the issue of recovery after a disaster, and presents a methodology for pre-event recovery planning for land-use in New Zealand. Even though recovery is something that happens after a disaster, it is important to consider community recovery issues before an event occurs. By considering issues and solutions before an event occurs, the process of recovery can be greatly improved, resulting in coordinated, efficient and targeted reinstatement of affected areas. The research focuses on how land, or a particular land-use, may be affected by a hazard event, and provides a methodology for how it may be 'recovered' or used afterwards. The pre-event land-use recovery methodology is based on the process followed for the Australia/New Zealand Risk Management Standard (4360:2004), and focuses on using existing legislative frameworks and processes already available in New Zealand. The methodology is presented in the form of a flow chart allowing users to follow a comprehensive set of steps in completing the process of planning for land-use recovery. Although aimed primarily at local authority land-use planners who deal with land-use issues on a daily basis, the methodology will also be useful for a range of people in professions who may be involved with recovery, including civil defence emergency management (e.g. recovery managers); resource, insurance and risk managers; land owners; developers; and the construction industry.

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## **Uplift and damage due to the $M_w$ 8.7 Nias Earthquake on 28 March 2005**

**Richmond Beetham<sup>1</sup>**, Bill Sinclair<sup>2</sup>

<sup>1</sup>*GNS Science*, <sup>2</sup>*PT Consultex, Jakarta*

Full Paper: [BeethamR.pdf](#)

The  $M_w$  8.7 Nias Earthquake was caused by rupture along the Indian/Australian - EurAsian plate subduction zone interface beneath Nias Island, 110 km to the west of North Sumatra. The Nias Earthquake occurred immediately to the south of the large segment of the subduction zone interface which ruptured in the great Aceh Earthquake 3 months earlier. In this region the convergence rate of the two tectonic plates is ~60mm/year and the previous rupture of the plate interface beneath Nias occurred in 1861 with a ~ $M_{8.5}$  earthquake. The Great Nias Earthquake of 2005 uplifted the entire 110 km long western coastline of Nias by approximately 2m, while the adjacent coastline 40 to 50 km to the east is not significantly changed. The uplift is clearly marked by raised beaches and exposed coral reefs. Coral limestones up to 200m elevation around the perimeter of the island indicate a cumulative trend of tectonic uplift of Nias in the recent geological past. The earthquake caused a long duration (2 to 3 minutes) of very strong (MM Intensity 9 to 10) shaking on the island and a tsunami. There was extensive and major damage to buildings and infrastructure throughout the island. However, well built, earthquake resistant designed structures survived without damage. It is notable that the unique traditional timber construction Nias houses were undamaged. This paper/presentation places the earthquake in an historical and tectonic framework and gives illustrated examples of uplift and damage on Nias. The observations were made while the author has been working as a technical advisor for the UNDP and BRR on Nias for nine months in 2006 and 2007. The assistance of these organisations is gratefully acknowledged.

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## **A proactive multi-stakeholder approach to attaining resilience in the UK**

**Lee Boshier<sup>1\*</sup>**, Andy Dainty<sup>1</sup>, Patricia Carrillo<sup>1</sup>, Jacqueline Glass<sup>1</sup>, Andrew Price<sup>1</sup>

<sup>1</sup>*Loughborough University*

Full Paper: [postdFinal00013.pdf](#)

Designing and constructing resilient built assets requires an in-depth understanding of the expertise and knowledge on avoiding and mitigating the effects of disasters in order to secure a safe and sustainable future. For that reason, professionals involved with the construction industry, and the expertise they can offer, need to understand the principles of, and become more involved with Disaster Risk Management (DRM) if lessons are to be learnt from the past and a resilient built environment created for future generations. However, research conducted in the UK has found that there is a lack of guidance and awareness, and poor involvement in DRM activities by key construction stakeholders. In light of these findings, the ongoing PRE-EMPT Project is developing a protocol to support the structured integration of DRM strategies into the construction sector's decision-making processes. Early research findings from questionnaires, interviews and workshops are presented

and the roles that PRE-EMPT could play in developing, during pre- and post-disaster (re)construction, a more resilient built environment in the UK (and elsewhere) are discussed.

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## **A critical analysis of The Livelihood Rehabilitation Strategy Implemented after the 2005 Pakistan Earthquake**

**Abdul Rehman Cheema**<sup>1\*</sup>, Regina Scheyvens<sup>1</sup>, Muhammad Imran<sup>1</sup>  
<sup>1</sup>*Massey University*

Full Paper: [CheemaAR.pdf](#)

The objective of this research paper is to conduct a desktop study to analyse the institutional arrangements and mechanisms of community partnership for addressing poverty and vulnerability which were put in place in the Pakistan Livelihood Rehabilitation Strategy. This comprises the first stage in a PhD research project which seeks to investigate the evolution, development and implementation of disaster management system in Pakistan within the broad framework of good governance and sustainable development.

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## **Post disaster housing: adding insult to injury**

**Eve Coles**<sup>1\*</sup>, Lucy Easthope<sup>2</sup>  
<sup>1</sup>*University of Leeds*, <sup>2</sup>*University of Hertfordshire*

**No full paper available**

An analysis of an ongoing UK case study (flooding in South Yorkshire) which draws on the national experiences of post flood recovery in the UK between 2000-2007 and international lessons learned from Hurricane Katrina and previous research in this field e.g. the work of Kai Erikson. Concepts of expectation and resilience will be analysed and will draw on ongoing research into these specific areas by the authors. Specific practical issues that will be examined include the use and siting of caravan parks, the allocation of housing funds, rent payments, duration of stay, and the psychosocial impact on communities. A further aspect that will be examined is the hampering of long term recovery by the lack of tradespeople able to repair homes, and the incidents of fraudulent activity relating to this.

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## **From Gujarat to Tamil Nadu: owner-driven vs. agency-driven housing reconstruction in India**

**Jennifer Duyn Barenstein**<sup>1\*</sup>,  
<sup>1</sup>*World Habitat Research Unit*

Full Paper: [postdFinal00087.pdf](#)

Approaches towards housing reconstruction after a disaster mainly differ in terms of responsibilities given to the people themselves in the construction process. The earthquake that hit Gujarat in January 2001 affected over one million houses of which 344,000 were fully damaged. In Gujarat communities could choose between owner-driven reconstruction with financial and technical assistance from the government and having their villages reconstructed by NGOs. Given the choice 87% of the people opted for reconstructing their houses on their own. After the tsunami hit coastal Tamil Nadu it appeared initially that the State government would adopt a similar reconstruction policy. However, due to unprecedented availability of private donations, the government eventually limited its role to coordination and monitoring by delegating reconstruction to NGOs. Community participation was kept at a minimum as most NGOs adopted a contractor-driven approach. Based on research funded by the Swiss National Science Foundation and the Swiss Agency for Development Cooperation, the paper examines some of the causes and consequences of different housing reconstruction approaches and outcomes in Gujarat and Tamil Nadu. It presents the findings of a survey carried out in Gujarat that shows that owner-driven reconstruction in Gujarat was the most cost- and time-effective approach and met with the highest level of citizens' satisfaction. The research also proved that in general, thanks to good technical guidance and enforcement of building codes, people who opted for owner-built reconstruction became more resilient to future disasters, without having to renounce to local housing culture and building materials. The paper further presents the preliminary findings of ongoing research on housing reconstruction in coastal Tamil Nadu focusing on social and environmental consequences of contractor-driven reconstruction. It was found that Tamil Nadu's

reconstruction policy and practices led to a massive replacement of culturally and environmentally appropriate vernacular houses through RCC houses and to large scale cutting of trees to clear the ground for contractors to build new settlements. Such practices may be considered as negative side-effects of contractor-driven reconstruction and may enhance people's vulnerability.

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## **The application of a prescriptive framework for recovery: The UK experience**

**Lucy Easthope<sup>1</sup>**

<sup>1</sup>*University of Hertfordshire*

### **No Full Paper available**

The author is both a Senior Lecturer in emergency management and an active practitioner in the field. She is currently undertaking research which examines the recovery process after severe flooding in Doncaster, UK in 2007. The UK government is developing a national recovery template and this will be evaluated against the human aspects of rebuilding a community. The researcher has a legal background and the legal aspects of this work provide an analytical framework; an analysis of legal duty versus suggested best practice and the impact that this has on standardisation. Objective: This presentation will highlight the work of an ongoing, longitudinal study focussed upon recovery after disaster. Results: The research within Doncaster is in the very early stages although one of the aims of the presentation would be to provide an exposition of the national recovery working template and this is already underway. Methodology: The study involves a review of the government material plus active research with a local community over a period of four years. Impact: The research will have an impact on the reconstruction field for a number of reasons: Presentation of a very current case study Evaluation of legal duty versus best practice and how this affects compliance and understanding Examination of the concept of resilience Expectation of Recovery: The Recovery Template measured against the experiences of people within a community. Issues of 'one size fits all' etc

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## **Can houses learn?**

**Vicky Feng<sup>1\*</sup>**, Anna Russell<sup>2</sup>, Regan Potangaroa<sup>2</sup>,

<sup>1</sup>*de Lisle Jenkins Architects Ltd*, <sup>2</sup>*UNITEC*

### **Full Paper: [postdfinal00056.pdf](#)**

Can Houses Learn is a study of housing provided for Asian Tsunami victims in Tamil Nadu in Southern India based on the approach of Stewart Brand and his book 'How Buildings Learn' (Brand,1994). Brand charts the evolution of buildings over several generations of owners and in a similar vein (but over a shorter time span of between 6 months to 2 years) this study reviews the changes that 109+ beneficiaries from 9 different villages along the coast of Tamil Nadu in southern India made to the houses they were provided with and asks 'can houses learn'. It is an intriguing study as it maps the paths taken by different families from essentially the same starting point. These changes are linked to the demographics of the family, their income and occupancy period, and from that it draws it's conclusions. Such conclusions are relevant for other shelter programs and specifically for those using a 'core' house approach where the house is designed with the expectation that it will be modified by beneficiaries in the future as resources and money became available. The idea of this study is that once these correlations between house modifications and family demographics, income levels and occupancy are identified, they will generate more informed house designs with an enhanced adaptive 'core' quality.

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## **Enhancing the reconstruction process for highway networks: opportunities and challenges for decision support systems**

Sonia Giovinazzi<sup>1</sup>, **Frederico Ferreira<sup>1\*</sup>**, André Dantas<sup>1</sup>, Erica Seville<sup>1</sup>

<sup>1</sup>*University of Canterbury*

### **Full Paper: [postdfinal00065.pdf](#)**

The use of Information Technology to support the response, recovery and reconstruction management and decision making after crisis events has become increasingly widespread. Combining the use of traffic and damage scenario analyses, GIS-based tools have been proposed to enhance the reconstruction process for the road networks. These tools intend to predict the traffic flows and the economic losses after the crisis event and determine alternative repair-sequences for the damaged road components. The final aim is to increase the situation awareness of the decision makers and to create a consequence-based decision making framework where

the prioritisation of the repair-sequences and the allocation of the available funds and resources could be optimised. After a critical overview of the existing alternative methods and tools supporting reconstruction process for road-networks, this paper aims to highlight the opportunities and challenges for conceiving “new generation” decision support systems. More effective and comprehensive performance metrics, in addition to the traffic flows and the economic losses, for assessing the efficacy of alternative decisions within a consequence-based framework, will be explored. Firstly, real study cases will be analysed in order to identify the driving criteria that have ruled the repair/reconstruction process for highway networks after crises events. Secondly, the problem of achieving an effective reconstruction process for highway networks will be faced according to a wider perspective. On one hand, focus will be given on the community reliance on road network for attaining a resilient reconstruction. On the other hand, the key inter-dependencies between the road-network and other organisations will be analysed and discussed.

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### **Learning from Hurricane Katrina: the case for structural insulated panel systems**

Jacqueline McIntosh<sup>1</sup>, Matthew Fraser\*

<sup>1</sup>Victoria University of Wellington

Full Paper: [postdfinal00011.pdf](#)

In the face of growing public awareness and concern for global warming and climate change combined with new information regarding the impact of building on the environment, there has been both a greater appreciation of the need for post-disaster reconstruction as well as a resurgence of interest in sustainability and green building. A relatively new building component, Structural Insulated Panel systems (SIPs) have been identified as a ‘green’ environmentally sustainable product. They have proven particularly well suited to withstanding structural events such as earthquakes, hurricanes, or record snowfalls but also have the added potential for timely deployment and rapid reconstruction in the face of civil disaster. Most recently following Hurricane Katrina the USA Federal Emergency Management Agency (FEMA) dispatched 25,000 Building America Structural Insulated Panel (BASIP) homes for temporary housing (Schwind 2006). In many respects, SIPs appear to be the ideal solution for sustainable construction for New Zealand, a country prone to earthquakes, high wind and extreme weather conditions; one with a relatively unskilled construction labour force and a desire for more sustainable housing. Yet, SIPs currently do not exist in New Zealand. This paper reviews the characteristics of SIPs, then evaluates their performance most recently following Hurricane Katrina to identify challenges and opportunities to provide a framework and some options for further research and design for their application in New Zealand.

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### **An overview of the reconstruction program after the earthquake of Bam, Iran. Part ii: after 3 years**

Mehran Gharaati<sup>1</sup>\*, Colin Davidson<sup>2</sup>

<sup>1</sup>McGill University, <sup>2</sup>University of Montreal

Full Paper: [postdfinal00020.pdf](#)

This paper is a continuation from the earlier report on the same subject submitted to the i-Rec 2006 conference. The paper reviews the approach taken for the reconstruction of the city of Bam, Iran. The study depicts the outcome that has been achieved over the last 3 years and discusses the current stage of the reconstruction process. While the previous report –conducted a year after the disaster- studied the pre-earthquake building techniques as well as the proposed techniques for the reconstruction, this paper will review the construction techniques that are chosen by the citizens in the practice. The paper stresses the importance of transferring the appropriate knowledge to the locals. Objectives: The paper studies the technical and socio-cultural changes resulting from the reconstruction program. Methodology: The method employed is mainly field observations conducted by the author, and the information collected from the key players and authorities of the program, including the locals. Impact: The time-scales at which this study and its precedent were conducted are critical. The first report was done a year after the earthquake, when the reconstruction program was just started. This study was conducted just before the official termination of the program. While the reconstruction will continue by the citizens with no aid or much control from the officials, the study can illustrate the changes and impacts caused by formal interventions, and further studies can be done, investigating the changes after the official reconstruction program is over.

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### **Waterfront Planning: a window of opportunities for post-disaster reconstruction**

Oriana Giovinazzi<sup>1</sup>\*, Sonia Giovinazzi

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Full Paper: [postdfinal00064.pdf](#)

Waterfronts, where the land meets the ocean, sea, lake, river or canal, are unique, finite resources representing, often, the best opportunity for community enhancement and enrichment. The waterfront redevelopment has represented an invaluable occasion for many cities around the world to delineate and enhance their socio-economical role both at national and international level. On the other hand, waterfronts are highly risk-prone areas. Water-related disasters, like hurricanes, tsunamis, river flooding, sea-storms have affected waterfront areas causing huge economic losses and affected millions of people in the last decades. Unfortunately, these devastating scenarios seem to be realistic warnings for the future, due to the impact of climate change and global warming. In this paper, study cases including both redevelopment and post-disaster reconstruction of waterfronts will be analysed, in order to provide an overview of lesson learnt and best practices. The opportunities missed and got to initiate social-economical development, to enhance the resilience of the community and to reduce the risk, while reconstructing waterfront areas after disasters, will be investigated. The planning strategies adopted, the economical feasibility and the sustainability of the projects over the long run will be furthermore examined. Finally, the paper will consider if and how the projects have respected and incorporated the historic and cultural features of the community and of the natural and man-made surroundings.

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### **Analysis of an effective reconstruction process after the 2002 Molise earthquake in Italy**

**Sonia Giovinazzi<sup>1\*</sup>**, Stefano Podestà<sup>2</sup>

<sup>1</sup>*University of Canterbury*, <sup>2</sup>*University of Genoa, Italy*

Full Paper: [postdfinal00063.pdf](#)

On the 31st October 2002 the Molise Region in Italy was struck by a relatively moderate magnitude earthquake (Mw=5.7). Nonetheless, the earthquake caused a severe level of damage in several villages and towns. In particular, the death of 27 children, due to the collapse of a primary school, hit profoundly the public opinion. This paper will present and discuss the comprehensive and coordinated regulatory, policy and technical framework that has allowed in Molise an effective reconstruction process, in the aftermath of the 2002 earthquake. From a regulatory point of view, focus will be given to the lessons learnt about the proactive simplification of the existing legislation and about the definition of specific criteria and guidelines for the reconstruction of buildings and infrastructure systems. The policy processes that have ruled the fund allocation for the repair/reconstruction will be discussed both for public and residential buildings. For the former, technical-scientific criteria have ruled the identifications of priorities, while, for the latter, the damage experienced by the buildings and the social needs of the inhabitants have prioritised the allocations of funds. Regarding the technical issues, the protocol, guidelines and best-practices adopted from the preliminary to the executive design will be described in order to highlight how they have assisted the stakeholders and the practitioners in avoiding technical mistakes, usually induced by the “reconstruction anxiety”. The approaches adopted for the quantification of the costs and of the resources required for the reconstruction will be, moreover, introduced and discussed.

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### **From the Outside Looking In: Post-Katrina recovery lessons for building sustainable, hazard-resilient communities**

**Bruce Glavovic<sup>1</sup>**

<sup>1</sup>*Massey University*

Full Paper: [GlavovicB.pdf](#)

The consequences of living in hazard-prone areas were brought home by graphic television coverage of the catastrophic hurricanes that devastated the Gulf coast of the USA in 2005. We need to learn to mitigate hazard impacts, and build more sustainable and hazard-resilient communities. This paper will assess recovery efforts and lessons learned over the last two years of efforts to rebuild the Gulf coast, and New Orleans in particular, in the aftermath of Hurricanes Katrina and Rita. Personal observations and interviews with planners, academics and others involved in recovery efforts inform this analysis. Insights will also be drawn from diverse literatures, including coastal management, natural hazards planning, collaborative planning, sustainable communities, sustainable livelihoods, ecological economics, environmental governance, adaptive management and co-management to develop a conceptual framework and outline substantive and process principles to guide action for building sustainable, hazard-resilient communities. Key opportunities and challenges for translating these principles into practical reality will be explored. This analysis demonstrates that building sustainable, hazard-

resilient communities will remain elusive unless 'business as usual' is confronted by a transformational process of developmental planning: Sustainable, hazard-resilient coastal communities are founded upon robust 'critical infrastructure' (including ecological, political, social, livelihood and physical dimensions) that is secured by planning and decision-making processes that enable coastal communities to build 'layers of resilience' to overcome 'waves of adversity'.

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## **Development of urban planning strategies and architectural conformity - a new university curricula in reducing the risk to disasters**

**Cristina Gociman<sup>1</sup>**, Elena Dinu<sup>1</sup>

<sup>1</sup>*University of Architecture and Urbanism, Bucharest*

Full Paper: [postdfinal00083.pdf](#)

Activation of all educational components, by relation between formal teaching (school), non-formal (extra school) and informal (direct experience) in promoting the risk reduction to disasters methods for creating a unitary and coherent logistic support in transmission of the information and coordinated intervention, becomes a non-structural method of reducing the risk. The proposal of development of some university specializations (master) regarding the management of reducing the risk to disasters by architecture and urbanism strategies is of strict opportunity.

Curricular components

- 1) Connection between the subject theory and history of architecture and urbanism and the management of risk reduction, by implementing the concept of secure habitual patrimony.
  - 2) Investigation of the risk exposal of the architecture objects, of proximities, of the urban sector, of locality and territory (hazard carting, exposed elements, vulnerability, and risk).
  - 3) Zoning of the locality territory on criteria for protection to disaster, in securities areas, sizing of area according to the risk class and especially to the possible number of affected people, capable of being evacuated towards a given point, named security node, energetically independent and utilitarian, where the emergency habitation, medical and social assistance, alternate communications system is ensured; this contributes to a decrease of the intervention costs.
  - 4) Building-up of a poly-nuclear system of space security centers, able to relocate the affected population after disasters' occurrence, named support system of emergency habitat.
  - 5) Identification of post-disaster reconstruction opportunities generated by the system of the emergency habitat, having as support, the specific components of patrimony habitat.
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## **Lessons learned after 1998 and 2004 earthquake in Posočje region**

**Samo Gostič<sup>1\*</sup>**, Blaz Dolinsek<sup>1</sup>

<sup>1</sup>*Building and Civil Engineering Institute ZRMK*

Full Paper: [GosticS.pdf](#)

The objective of this article is to share some information about lessons learned during reconstruction of Posočje region after earthquakes in 1998 and again in 2004. Both earthquakes were moderate (M 5.6 and M 4.9) and luckily haven't claim death victims. But the extent of damage to the buildings and infrastructure was great. More than 3000 buildings were reported damaged after the 1998 earthquake and about 1800 buildings in 2004. Some of the reconstructed buildings were damaged again and that raise questions in public about reconstruction efficiency. Because the Posočje region is underdeveloped but tourist attractive region of Slovenia, the government in 1998 set up a grant scheme to help residents reconstruct their houses. The height of the grant depends on damage, public interest (ie. cultural heritage) for particular building and financial possibilities of the owner. For management of the reconstruction projects the government set up a Technical Office. The tasks of the Office are from damage assessment and performing quick cost estimates to managing reconstruction projects (from design, construction and supervision) to accountancy. After analysis of the earthquake 2004 damage (specially damaged reconstructed buildings), some shift of renewal goals were made. The necessity of the Office remained and there were no big differences in recommended reconstruction techniques. But there were changes to grant schema - the split of costs between owner, insurance companies and government and about threshold when building is better to be replaced instead of reconstructed. Reconstructions have to be designed now according to Eurocodes (after 1998 that was not necessary due to 'natural disaster remedy'). Together with more strict control of works we consider that the reconstruction effort will prove successful when (if) another earthquake happens.

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## **Nature: the natural choice in reconstruction scenarios**

**Tiffany Green\***

University of New England

Full Paper: [postdfinal00074.pdf](#)

Conflict and natural disasters have devastating impacts on civilians. The psycho-social state of individuals in conflict and disaster settings is clearly identified as a key issue by most relevant stake holders, however intervention efforts continue to focus on quantifiable assistance. The unattainability of Western psychotherapeutic techniques in post conflict and reconstruction settings - due to a lack of trained professionals and the scope of those requiring treatment - requires the implementation of alternative forms of therapy. Within academic fields little previous emphasis has been placed on the use of nature as a tool for peace-building and reconstruction. Ecotherapy - essentially access to and interaction with nature with the aim of improving psychosocial wellbeing - has proven psycho-social benefits and is well recognised and implemented in Western countries in various spheres (Berman and Anton 1988; Griffin 1995; Hyer, Boyd et al. 1996; Kweon 1998; Frumkin 2001; Gorrell 2001; Arlington and Johnson 2002; Matthews 2002; Davis -Berman and Berman 2005; Maathai 2006; Greene unpublished) . The diversity of options for the application of nature therapy is of primary relevance to the field, as it may be applied in various forms in any number of contextual settings. Consequently, the creation of green spaces as part of the reconstruction process should be an initial priority. Green spaces, such as parks and gardens, provide citizens with the opportunity to benefit from ecotherapy, thus promoting healing and psycho-social wellbeing, as well as a safe area for children to play. When constructed with community participation, green spaces create a sense of ownership and empowerment, as well as addressing environmental issues. Given the opportunity to re-invent urban areas, reconstruction efforts should mirror steps being taken in most developed cities to create greener, citizen-friendly environments.

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## **Rebuilding Sustainable Livelihoods through asset development and value chain development**

Punyavan Vishaka Hidellage<sup>1\*</sup>, **Jayantha Gunasekera<sup>1\*</sup>**

<sup>1</sup>*Practical Action*

Full Paper: [postdfinal00062.pdf](#)

**Objective:** To link post disaster reconstruction to sustainable livelihood development **Approach:** Rebuilding was considered as an opportunity for sustainable development. This includes revival and development of sustainable livelihoods. Practical Action translated its policy framework on Disaster Resistant Sustainable Livelihood approach to practice at community level in post tsunami programme in South and East of Sri Lanka. This demonstrated how reconstruction can be effectively used to build a strong base for sustainable livelihood revival. **Results:** A comprehensive disaster risk reduction strategy for the village produced. A platform to negotiate best use of infrastructure and livelihood related investment created at community level. Attention was on local infrastructure priorities. Demonstration of disaster resistant infrastructure concepts that have structural and non structural components. Income injected into communities by participating as skilled or unskilled labour in reconstruction of community infrastructure. Increased knowledge, skills and capacity for sustainable management village resources and livelihoods improvement **Methodology:** A process of village society strengthening/formation facilitated. Village leaders given relevant skills and their capacity built to carry out comprehensive analysis of their problems, suggesting solutions, develop plan, negotiate etc. through this process. Formulated plans with participation communities and other key stakeholders to reconstruct the village. Prioritised common infrastructure that strengthen livelihoods of communities in the village. Helped communities to negotiate with the stakeholders and to direct their investment on identified priorities in reconstruction with community participation.

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## **Impact Analysis of Natural Calamities on Infrastructure and Industries**

Eun Ho (Daniel) Oh<sup>1</sup>, **Makarand (Mark) Hastak<sup>1\*</sup>**

<sup>1</sup>*Construction Engineering & Management in Civil Engineering, Purdue University*

Full Paper: [postdfinal00017.pdf](#)

Hurricane Katrina was recorded as the most destructive natural calamity in U.S. history. It has exposed significant flaws in Federal, State, and local preparedness with \$96 Billion of the estimated loss upon overall industry areas such as housing, food, oil, electricity, communication, health care, retail, entertainment etc. Many reports say that this tragedy was mainly caused by overlooking the impact of Katrina and inappropriate reactions of related emergency agencies. More fundamentally, there was lack of both understanding of the natural disaster impacts and preparedness of public agencies and industries based on the nature of impacts. Therefore research is needed to understand, the direct and indirect impacts of hurricane and other natural calamities on infrastructure and industries. This paper will present the analysis of disaster impacts and correlations on infrastructure and industries. The analysis is based on Analytic Hierarchy Process comprising of impact factors: direct/indirect impacts, social/environmental/economic impacts, and correlations of infrastructure, industries and interagency. Also this paper will discuss case studies and surveys conducted for establishing the model.

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### **The role of urban change hierarchies in post-disaster recovery management.**

**John Hewitt<sup>1\*</sup>**, Regan Potangaroa<sup>1</sup>, Suzanne Wilkinson<sup>2</sup>

<sup>1</sup>*School of Architecture (ScALA), Unitec New Zealand,* <sup>2</sup>*Dept. of Civil & Environmental Engineering, Faculty of Engineering, The University of Auckland*

Full Paper: [HewittJ.pdf](#)

Despite a consensus within the multi-agency disaster management community that a collaborative and coordinated approach to post-disaster recovery is necessary, little agreement exists regarding its means of achievement. This paper examines the proposition that Habraken's (1998) theory of a hierarchical control model of urban change provides a sound basis for the development of such an approach. Habraken (1998) identifies 'levels' within the physical structure of the urban environment, assembles them into a hierarchy and peoples them with agents of change. Both built form and human agency exert control over the process of change, with the degree of control corresponding to their position within the hierarchy. The aftermath of a natural disaster is an extreme example of the collapse of the hierarchy into a single level. The paper explores the relevance of this model, which is based on the assumption of continuing incremental change, in the very different context of post-disaster recovery. Preliminary testing, by a pilot study, of the proposition has been completed. This took the form of a survey of survivors of the 2004 Asian tsunami, based on a questionnaire incorporating Habraken's hierarchical model. The respondents, who could not be expected to have prior knowledge of theoretical constructs of urban form, were asked to prioritize the levels of the hierarchy they wished to see as the focus of recovery activity. The results indicate a high level of correspondence between the phases of the post-disaster reconstruction process and the levels of the urban hierarchy. Evidence suggests, however, that the potential of such correspondences to actively influence the setting of priorities has not yet been realized. The paper concludes with an assessment of ways in which this potential may be further explored and communicated.

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### **Adapting Strategies to meet needs in post-disaster reconstruction**

**Vishaka Hidellage<sup>1\*</sup>**, Vasant Pullenayegem<sup>1</sup>

<sup>1</sup>*Practical Action*

Full Paper: [postdfinal00046.pdf](#)

Objective: To make knowledge and skills available to improve quality standards of post tsunami reconstruction in Sri Lanka Results: Cost effective and environmentally friendly technologies were promoted through the demonstration and making relevant skills and knowledge available. Guidelines to follow in construction for assuring quality and effective maintenance produced in local languages. The Need: Reconstruction requires building a large number of houses within a shortest possible time using available limited resources. Practical Action discerned early in the rebuilding phase that there was dire need to:

- ensure construction quality
- have competent construction tradesmen
- minimize use of construction material

use construction technology that is readily replicable

Approach and Outcomes: Houses constructed in the East (108) and the South (60) demonstrated cost-effective technologies (for walls and roof) which minimized use of sand, cement, and costly finishes and provided hands on training to over 300 local masons. It began with just 2 houses in July 2005 and later expanded to a rigorous

training programme with the Vocational Training Authority of Sri Lanka. The two documents of process guidelines that clearly explained essential construction standards in an easy-to-understand format in Sinhala and Tamil languages, and guidelines on house maintenance were aimed at improving quality and sustainability of reconstruction. Knowledge and resources made available gained wide acceptance among a cross section of stakeholders in rebuilding. Eg. In 2007 French Red Cross commenced the building of over 120 houses with training provided by Practical Action

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### **Disposal of debris following urban earthquakes: guiding the development comprehensive pre-event plans**

**David Johnston<sup>1\*</sup>, Laurence Dolan<sup>3</sup>, Wendy Saunders<sup>1</sup>, Bruce Glavovic<sup>2</sup>**

<sup>1</sup>*GNS Science*, <sup>2</sup>*Massey University*, <sup>3</sup>*University of Auckland*

Full Paper: [postdfinal00021.pdf](#)

At the time of natural disasters the immediate concern is for the safety and wellbeing of the affected population. However, once the immediate threats to people have passed, or are being managed, it is necessary to remove debris as quickly as possible to allow communities to rebuild. Disaster events can generate large quantities of debris and the management of this debris can present a major challenge. Recent overseas earthquakes have highlighted range of debris management issues within a post-earthquake recovery context. Having guidelines and procedures in place for the management of disaster debris assists in the timely and efficient removal of debris, followed by appropriate recycling and/or disposal to appropriate locations. An inefficient or poorly planned response can impose additional social, economic and environmental burden on an already impacted community. In recent years many New Zealand councils have had experience with flooding events and have developed experience managing debris removal. The issue of disaster debris removal has been raised in recovery planning of most CDEM groups. Our research has addressed: (1) the type and volume of earthquake debris; (2) strategies for debris collection; (3) temporary storage and staging area, (4) recycling and disposal optimisation; (5) identification of and/or issues for development of suitable disposal sites; (6) hazardous waste identification and handling; (7) effective project management in a post-disaster environment, linked to CDEM recovery plans; (8) mutual aid arrangements; (9) coordination and dissemination of public information; and (10) land-use planning issues and instruments in Regional and District Plans.

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### **Partnership approach for better health care provision on post-earthquake area in Indonesia: the case of Gunungsitoli Hospital Revitalization on Nias islands**

**Astrid Kartika<sup>1</sup>**

<sup>1</sup>*Rehabilitation and Reconstruction Agency for Aceh and Nias*

Full Paper: [KartikaA.pdf](#)

Background: Gunungsitoli Hospital was one of the major health facilities on Nias Islands, Northern Sumatera, Indonesia, was heavily damaged by the 28th March 2006 earthquake. More than 50 % of hospital complex was damaged. Aftermath of the earthquake, such as loss of equipments, and medical workers killed or fled out the islands has turned the health service to worse condition. The Aceh-Nias Rehabilitation and Reconstruction Agency or commonly abbreviated as the BRR NAD-Nias has been coordinating the revitalization of the hospital through a partnership approach. Objective: The concept of partnership was chosen as collaborative efforts of providing resources, funding and program implementation involving local government, the BRR, international agencies and donors which are essential to ensure the sustainability of the program. The objective is to ensure the sustainability of the Gunungsitoli hospital revitalization. Results: After 2 years since the partnership was initiated, the BRR and the local government have successfully engaged various donors and partners to work together in revitalizing the hospital. Three out of four construction phases of the program have been fulfilled. To support and strengthen the institution, capacity building programs are currently being implemented under partnerships with universities in Indonesia. Methodology: This paper is based on empirical hands-on experience of providing assistance to the BRR NAD-Nias in coordinating the revitalization effort. The method employed is a qualitative secondary data collection as well as records from notes and field experiences. Impact: Better level of health status of Nias' people by providing a better provision of hospital services.

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## **Sustainable post-disaster reconstruction projects in remote locations - Darfur revisited**

**Linda Kestle<sup>1\*</sup>**, Regan Potangaroa<sup>1</sup>

<sup>1</sup>*Unitec*

Full Paper: [postdfinal00077.pdf](#)

Reconstruction projects, such as those conducted in Sudan since 2004, need an effective multidisciplinary planning and management framework, capable of responding to transitional and long-term reconstruction requirements. A preliminary multi-disciplinary framework that design managers can use to develop better management and design practices, in the context of humanitarian aid and reconstruction projects in remote locations, was discussed in a previous paper (Kestle & Potangaroa, 2006). The paper analysed part of the Sudanese case study data collected from semi-structured interviews with key design decision-makers working in West Darfur, Sudan. This paper builds on the Kestle & Potangaroa paper (2006) using further data collected in 2004 from seventeen participants' perspectives, and reviews the realities of managing the pre-planning and operational stages of the UN Sudanese Humanitarian Aid Project in West Darfur. The findings offer an independent perspective under the headings of the management of the logistics, camps, communications, and stakeholders, at the pre-planning and operations stages of the West Darfur project. The findings also offer a range of suggestions, by the participants, for managing future Humanitarian Aid projects, and particularly those in remote locations.

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## **Regional riskscape: A Multihazard Loss Modelling Tool**

**Andrew King<sup>1\*</sup>**, Rob Bell<sup>2</sup>, Stefan Reese<sup>2</sup>, Iain Matcham<sup>1</sup>, David Heron<sup>1</sup>, Roddy Henderson<sup>2</sup>, Jim Cousins<sup>1</sup>, Robin Pringle<sup>1</sup>, Jochen Schmidt<sup>2</sup>

<sup>1</sup>*GNS Science*, <sup>2</sup>*NIWA*

Full Paper: [postdfinal00035.pdf](#)

New Zealand has experienced community damage from every conceivable natural hazard. Events such as earthquake (both shaking and fault rupture), volcanic activity (both near-field and distal ash deposition), tsunami, flooding, storm (wind, snow/ice and tidal surge) and landslide. Damage to buildings and inventory along with personal injury and loss of life have resulted. While advances have been made over the past few decades in understanding many of these phenomena, only recently has sufficient knowledge been acquired to enable some rational probabilistic models to be developed to quantify the recurrence of some of these hazards and, through an appreciation of the fragility of the current inventory, to ascertain the community risk. The path towards the development of RiskScape New Zealand is subject of this paper. RiskScape New Zealand is a national multi-hazard impact model that presents relative risks and community exposure to a range of natural hazards. The prototype currently under development will consider the impact of five of the most commonly encountered natural hazard (including earthquakes and tsunami) on three representative New Zealand communities. The model evolution recognizes the conflict between the GIS presentational environment expected by typically non-technical end users (such as emergency management officials and community planners) and the need for a computationally efficient environment that will ensure processing time for large inventory datasets remains acceptably short. The development of RiskScape New Zealand model has been underway for three years of its four year proof-of-concept phase. The framework, the range of natural hazards and the communities targeted for the prototype study have been finalized. Classification of the inventory datasets into their various fragility subsets is underway. The linkages between damage state and repair/disruption are being developed for each of the hazards within the study, within initial focus on earthquake, tsunami and flooding.

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## **Community Housing in Post Disaster Area on Nias islands, Indonesia: Responding To Community Needs**

**Heracles Lang<sup>1</sup>**

<sup>1</sup>*Rehabilitation and Reconstruction Agency for Aceh and Nias*

Full Paper: [postdfinal00051.pdf](#)

While the loss of life due to 26 December 2004 Tsunami was not so high in Nias islands compared to Aceh, the destruction of housing and communal buildings by the 28 March 2005 earthquake was widespread some are hidden in villages up on the mountainous areas. These remote settlements have inadequate sanitation and access to clean water. The results are ideal breeding grounds for the vectors of diseases such as malaria, cholera, dysentery and other intestinal diseases. Objective of the study is to learn from community participation in providing their own settlements with sound environment for healthier life. The idea is to measure satisfactory level of the community especially those from the vulnerable groups in comparison to their previous living

environment. The result is yet to be defined after the pilot project implementation of community housing is handed over in December 2007. The beneficiaries of 515 households are currently constructing their own homes in 7 villages. This study employs a variety of observational strategies that will not only meet triangulation protocols but also a heightened understanding of particular communities' views on the general level of suitability of housing, and their level of participation in decision making. The research will contribute to housing policy in post emergency situation by way of engaging communities in the process that will lead to better targeted approach to satisfy the housing needs of the community while providing them with on hands knowledge of healthy environment and safe construction methods.

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### **Myths and realities of prefabrication for post-disaster reconstruction.**

Colin Davidson<sup>1</sup>, Cassidy Johnson<sup>2</sup>, **Gonzalo Lizarralde**<sup>1\*</sup>

<sup>1</sup>University of Montreal, <sup>2</sup>University College, London

Full paper: [postdfinal00004.pdf](#)

Prefabrication is usually associated with one of the two prevailing dogmas about reconstruction, the 'top-down approach', based on a narrow view of prefabrication associated with high-tech, productivity-based initiatives. 'Prefabrication' literally means carrying out work earlier (typically moving it from the site to a sheltered place), aiming for a better use of resources and improved control, and avoiding skill-requiring operations on site - all in the interest of speed. All building work uses materials (like sand, concrete, earth, formed on site) and components (units like bricks, sections like joists or assemblies like windows, necessarily prefabricated). In the context of high-tech environments prefabrication involves factories, novel materials and stable organizations, but this is not necessarily the case. In an attempt to look beyond this perceived view prefabrication, we look at the root problems of reconstruction: (i) huge and disorganized demand, which must be met rapidly; (ii) few available traditional building enterprises; (iii) lack of craftsmanship; (iv) risk of price gouging, to name a few. On the other hand, many people (the survivors) are willing to intervene, if only they knew how. The question then is: how can this human resource be supported to perform better? A form of prefabrication can be envisaged, which uses familiar materials and avoids skilled operations, and which is based on a multiplication of resources such as small-scale local entrepreneurs. There would then be a dispersion of sources, avoiding the habitual bottlenecks. Preparing for a decentralized, low-tech, home-grown prefabrication capability of this sort may be the best strategy for disaster preparedness.

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### **The challenge of low-cost housing for disaster prevention in small municipalities**

**Gonzalo Lizarralde**<sup>1</sup>

<sup>1</sup>Université de Montréal

Full Paper: [postdfinal00005.pdf](#)

Small municipalities in developing countries often find that procuring new low cost housing to relocate families living in risk-prone areas is largely constrained by political, economical and social difficulties. Acquiring safe land, matching public and private resources, encouraging individual savings, selecting, evaluating and approving beneficiaries and choosing minimum standards are some of the major barriers in the process of housing delivery. A recent initiative in Colombia, in which 103 families were relocated from disaster-prone areas into a 1260-unit project of low-income housing, illustrates a convenient way of planning, procuring and building housing for disaster prevention. In this model, an efficient public-private partnership between a small municipality and private companies that administer social benefits for employees was created. The partnership managed to successfully channel public subsidies and administrative means to use public funds and transform them into core-houses, ultimately transferring them to an ongoing process of construction administered by individual beneficiaries. Some mistakes were made in the urban and architectural designs. However, the strategies used might set up an example for future municipality-based initiatives of disaster prevention in developing countries.

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### **A Structured Approach for Developing an Effective Emergency Preparedness and Disaster Response Plan for Contractors**

Rizwan U. Farooqui<sup>1</sup>, **Sarosh H. Lodi**<sup>\*2</sup>

<sup>1</sup>Florida International University, <sup>2</sup>NED University of Engineering and Technology

Full Paper: [postdfinal00089.pdf](#)

The recent rash of natural disasters has taught many valuable lessons. Unfortunately, the need for preparedness is greater than ever before, given the increasing frequency and worsening intensity of weather-related storms and the escalation of technological threats. Contractors are frequently among the first responders to major disasters and emergencies. No geographic area is immune or protected from the threat of emergencies and disasters; however, prepared contractors can recover from potentially crippling disasters, earn more work as a result of their preparation, and contribute to their communities in times of crisis.

Although a good business practice and a requirement under state/ federal occupational safety and health regulations in the United States, in reality, most contractors do not have a well-prepared disaster response plan. Emphasizing the need and benefits of a well written, comprehensive and tested emergency preparedness and disaster response plan, within this research, a structured approach is proposed for preparing an effective emergency preparedness plan. This research has provided a mechanism to evaluate a company's emergency preparedness and create policies to ensure business continuity after a disaster. It is suggested that company factors about business continuity, insurance coverage, IT considerations and communications continuity should be defined and stored because the link between a source and consequence is mainly determined by these factors. Lessons learnt with respect to those rather controllable factors may result in better management of emergency risks in the forthcoming projects. The major benefit of the proposed approach is not the development of a fit-for-all emergency preparedness plan but rather a dynamic, customizable, strengths and weaknesses based emergency preparedness plan.

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### **A disturbance ecology approach to post-cyclone reconstruction in Pacific Island settlements**

**Jacqueline Margetts<sup>1\*</sup>, Rod Barnett<sup>1</sup>,**

<sup>1</sup>UNITEC

Full Paper: [postdfinal00075.pdf](#)

There has been much discussion about system resilience with respect to natural hazard management as a measure for managing environmental risk. Resilience is a function of the capacity of a system to adapt to disturbance and recover in such a way as to minimize future disturbance. This paper discusses a disturbance ecology approach to post-cyclone reconstruction in Pacific Islands. It investigates the proposition that the recovery of urban environments after disaster can be enhanced by the development of adaptive infrastructures using the natural model of tropical forest system recovery. It suggests that the natural forest sequence of colonization, succession and disturbance may provide directions for the development of integrated protective measures in Pacific Island settlements subject to cyclonic damage. Tropical forests, like many complex adaptive systems, require disturbance in order to maintain vigour and health. The recovery of vegetation on Niue after Cyclone Heta in 2004, for example, was rapid and the new flora robust (although this will change over time). The urban infrastructure of the capital Alofi three years later, however, is still struggling with the usual post-cyclone reconstruction difficulties. Our research has explored the use of a multi-agent simulation (MAS) computer modeling environment to model tropical forest recovery and apply the emergent patterns of recovery to Pacific Island settlement planning. The paper reports on progress so far and outlines some of the problems and possibilities associated with this project.

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### **Home in Muzaffarabad: The Building of Ambor Colony**

Ian MacBurnie<sup>1\*</sup>,  
*Ryerson University*<sup>1</sup>

**No full paper available**

In October, 2005, an earthquake struck the Kashmir region of north-eastern Pakistan. Tens of thousands of lives were lost, over two million were rendered homeless. Responding to this humanitarian crisis, Ryerson University's Department of Architectural Science (Toronto) teamed up with a group of earthquake-displaced families, two New York-based fundraisers, and two, award-winning architectural practices to design and realize a new, more sustainable community featuring twenty-eight, earthquake-resistant, minimal, live-work dwelling units. Having completed an elective course that focused on disaster-relief housing, and having undertaken a series of design charrettes with the two architectural practices, four undergraduate architecture students were selected to travel with their professor to Kashmir during August, 2007 to realize the first, prototype dwelling; the group also included a student filmmaker. Working hand-in-hand with representatives of the displaced families, an internationally-respected NGO, and the Pakistani agency created to oversee the region's reconstruction, the

team prepared the site for construction and completed the first house from an array of locally-sourced materials in the short span of eighteen days.

To be presented jointly by the faculty member and one of the participating students and highlighting a five-minute trailer of the film, this presentation provides an overview of the project's origins and overall management, the scope, content, and outcomes of the Minimal Housing course, the nature of the partnership between the Department and the two architectural practices, the experience of fundraising, and the trials and tribulations of building the first house. The presentation concludes by considering the next phase of the work.

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## **Habitability of Homes after a Disaster**

**David Middleton**

*NZ Earthquake Commission*

Full Paper: [MiddletonD.pdf](#)

Following disaster, keeping families in their homes, or at least in their communities, is preferable to the alternative of evacuating them. As well as reducing temporary accommodation and evacuation demands, this focus minimises the stress and trauma for the family. Communities need people in order to commence the recovery phase - children to go back to schools, shoppers to engage retailers and employees to staff factories and offices – and people need to be part of the community during rebuilding in order to retain a psychological connection.

In New Zealand, reliance on insurance payouts (or charity for the minority not insured) and the efforts of various agencies to extend benefit programmes not specifically designed for disaster relief (or to design ad hoc disaster relief benefits) does not facilitate concentration on those most drastically affected – people driven from their homes.

Identifying dangerous or insanitary homes following a disaster, applying temporary or rough repairs and keeping families in their homes, or returning them there as soon as possible, seems a sufficiently important element of disaster response and recovery to warrant a special focus by a national body with plans and resources to act but at present there is no such focus and no such body.

The Earthquake Commission, with its financial and human resources, could be transformed by a change to its legislation into a Natural Disaster Commission with the focus described above, thereby finally replacing its 1940's era model with one that better meet the needs of today's New Zealand families

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## **Deconstruction of Urban Spaces in Saudi Arabia**

**Yousef Neyazi<sup>1</sup>**

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Full Paper: [postdfinal00085.pdf](#)

Space is formed by people who live in. They shaped it as they need and with regard to culture they have. Yet, structures of houses, neighbourhoods, and cities differ from one society to another. In some even in one country different urban forms of space exist with different cultures to each region, territory, or city. Saudi Arabia is the centre of Islamic countries, and has the two Holy Islamic Mosques. In the past it had various traditional forms of urban patterns, but now days, it has almost the same form 'cities became the same and local identity been lost in most'. The disaster here is when urban heritage is demolished, buried, and developments became unrelated to residents. This paper aims to show the traditional forms of urban forms in Saudi Arabia, transformed, and how it been generalized to contemporary urban form. At last it gives some policy proposals for reconstruction of contemporary urban form to with regard to traditional forms in each hierarchy of space and each region, territory, and city. The paper's approach is divided to three parts. The first is a historical background about the urban change and transformation in the Saudi traditional urban forms. This part shows the causes of that change and transformation from traditional urban forms to contemporary ones which are partly been assumed as temporary. The second is about effects of contemporary urban form with regards to spatial, social and economic approaches. The last part is proposals for the Planning authorities in Saudi Arabia to change the current urban policies in term of urban regulations. These regulations will enhance reconstruct space in dwellings, neighbourhoods, and cities. Such change of policy will reconstruct cities with controlled developments with regard to actual needs of population in terms of space and with regard to their social and economic characteristics.

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## **The DASS42 Plus**

**Regan Potangaroa<sup>1\*</sup>, Aditi Ghosh<sup>2</sup>**

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Full Paper: [PotangaroaR.pdf](#)

Earlier work by Potangaroa established the usefulness of the DASS42 quality of life tool in humanitarian housing projects (Potangaroa, 2006). And in this paper, the application of the DASS42 tool from the perspective of a program manager (shelter) is considered. Such managers have the difficult task of coordinating field teams, reviewing their area reports, measuring progress against pre-set indicators and then deciding (based on both tangible and intangible inputs) what the next step should be. If that was not hard enough they are then required to justify their decisions to their immediate superiors and ultimately to the national agency for which they work. In response, program managers have tended to stay with accepted, essentially quantitative indicators with extensive use of narrative (where programs were intended to have a significant social component) to support and verify the positive nature of the qualitative issues involved. But such an approach becomes problematic when dealing with differences of geography, culture, program and the added dimension of extra communities. This paper outlines the use of the DASS42 in such situations as an interpretive tool when coupled together with this quantitatively based data. Instead of interpreting the quantitative data to ascertain whether people are “better off”, “happier” with an increase in their quality of life, if that is taken from the DASS42 tool and the quantitative data interrogated from that view point then suddenly the quantitative data takes on a new perspective. This represents a significant step forward for program managers, for agencies and for donors.

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## **Socially embedded relationships of firms: An aid to recovery in a vulnerable community?**

**Felicity Powell<sup>1\*</sup>**

<sup>1</sup>Opus International Consultants

Full Paper: [PowellF.pdf](#)

The socially embedded relationships between businesses are amongst the most important drivers of clustering behaviour of firms, which is an activity that has been encouraged by local and central governments in New Zealand since the mid 1990s, seeking to improve the country’s economic growth and competitiveness. In the event of a large earthquake in Wellington, relocation of businesses, with consequent fragmentation of clusters, would be a major threat to business and community recovery but socially embedded relationships may make firms more resilient. The key research question of this programme is whether different types and intensities of social relationships are associated with variations in the likely locational behaviour of businesses in a post-disaster scenario. The different forms of socially embedded ties between firms in two industry clusters identified as being significant to the future prosperity of the city, namely earthquake engineering and film and television, will be examined. The methodology to be used in this research project will include a questionnaire survey directed to the owner-managers of firms in the two clusters. Following the survey, in-depth interviews will be undertaken with a sample of survey respondents identified as being representative cases, allowing participants the opportunity to elaborate their responses. The analysis will then establish the validity of the research hypothesis. This paper will present the provisional results of the research currently in progress and which is intended to be completed by the end of 2007. The conclusions of this research will contribute to the cumulative knowledge on business and community resiliency.

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## **The barriers to resilient reinstatement of flood damaged homes: a review of the literature**

**David Proverbs<sup>1\*</sup>, Jessica Lamond<sup>1</sup>**

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Full Paper: [postdfinal00045.pdf](#)

The current debate about flood management in the UK involves the notion of making space for water, recognising the fact that it is impractical to defend large floodplains to a standard which excludes any possibility of flooding. Coupled with development controls to discourage new building in the floodplain is the desire to encourage inhabitants of the floodplain to render themselves less vulnerable to flood damage by building resilience into their homes. Advice on resilience is available via flood forums and insurers but historically take up has been low. In a bid to increase the installation of individual flood protection measures there are nascent grant schemes underway or proposed in England and Wales. A review of the international literature relating to flood proofing of homes and the attitudes of floodplain residents reveals that there are many barriers to overcome in encouraging the installation of resilient measures. Financial concerns are of course a primary factor, the presence of almost universal flood insurance cover for UK residents detracts from motivation to take individual

responsibility. However it emerges from this review that other considerations should not be disregarded. Any proposed scheme must contend with the preference for community measures, informational barriers, emotional constraints, aesthetic considerations and timing issues. It is proposed that provision of finance for resilient schemes would be most effective if incorporated within the reinstatement process in order to minimise cost, distress and disruption to the home owner.

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## **The Role of Private Insurance Companies in Achieving Effective Reinstatement of UK Homes after Flooding**

**David Proverbs**

<sup>1</sup>*University of Wolverhampton*

Full Paper: [Proverb keynote.pdf](#)

Finance for the reinstatement of UK homes after flooding is provided primarily by private insurance companies, backed by reinsurers in the case of major events. Government funds are directed to flood defence and flood management on a community scale. The role of the private insurance company is therefore viewed as highly important by flood victims in restoring their home and normal lives. However, insurance against flood damage also has a wider role in providing a guarantee of the long term viability of floodplain property. Furthermore, insurance schemes can encourage responsible property management and resilient behaviour. The sustainability of these roles in the context of the commercial realities facing private insurance companies has been re-examined in the light of recent increases in the frequency of flood events in the UK. Insurance companies were much criticised for their handling of flood restoration in 1990 and 1998. Subsequent research revealed large differences in performances and that loss adjusters often recommended low cost rather than most effective reinstatement procedures. Repair standards have been developed and guidelines issued by government and damage management bodies. Further research into the experience of flood victims shows that the stress of displacement from home and loss of personal possessions can add greatly to their suffering and this can be allayed by feeling confident in their insurer. The cost and availability of insurance is an issue for flood victims but also those at risk of flooding. Despite the much publicised debate however, recent research reveals that insurers are continuing to provide insurance cover at an affordable rate to most at risk populations and that most victims are fairly satisfied with their eventual restoration. The competition inherent in the market ensuring that by shopping around a policy can be found. However the ability of home owners to switch insurers also mitigates against the aim of reducing future claims by adapting homes for flooding.

## **A Balancing Act: An assessment of the environmental sustainability of permanent housing constructed by the international development community in post-disaster Aceh.**

**R. M. Roseberry<sup>1\*</sup>**

<sup>1</sup>*University of Sussex*

Full paper: [postdfinal00057.pdf](#)

Building permanent houses for entire communities that have suffered natural and human-induced disasters poses numerous challenges. Balancing environmental sustainability among a complex array of other issues is critical, however, if the communities for whom housing is intended are to remain resilient from future disasters, secure profitable livelihoods, and maintain safe and steady water supplies. The case of Aceh, Indonesia, whose coastal communities suffered severe impacts from the Indian Ocean Tsunami in 2004 is particularly relevant given the magnitude of the disaster, and the scale of the international response. After two and a half years of reconstruction efforts, the direct impacts of construction on the environment, particularly with respect to timber and other locally-sourced building materials needed to construct some hundred thousand houses are becoming clear, and the indirect impacts of the relocation sites and roads needed to access them are starting to be revealed. The concepts of sustainable development and sustainable construction are nebulous terms, open to many different interpretations. Through research and field interviews, involving a diverse group of stakeholders, this paper examines what various INGOs consider sustainable in reference to permanent houses being built in post-tsunami Aceh, while trying to uncover why the concept of sustainability within the INGO community has lost its initial ties to the environment. This paper also provides practical recommendations for the international development community to mainstream environmental issues into the various aspects of sustainable construction.

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## **Towards a national policy framework for post-disaster reconstruction in New Zealand**

**James Olabode Bamidele Rotimi<sup>1\*</sup>, Suzanne Wilkinson<sup>2</sup>, Dean Myburgh<sup>3</sup>**

Full Paper: [RotimiJ.pdf](#)

The study presents an on-going research initiative to determine the effects that the implementation of the Building Act 2004 will have on post-disaster reconstruction programmes in New Zealand. Particularly in large-scale disaster events with sudden-onsets the provisions of this Act and other legislative provisions need to be supportive and enabling so as to facilitate speedy reconstruction and reinstatements. A survey of building control officers and other disaster practitioners in New Zealand was undertaken and their responses analysed quantitatively. The results indicate that there remain challenges to meeting reconstruction objectives both efficiently and effectively under the new Building Act regime. Prevalent amongst the matters raised were those of procedural constraints as a result of higher consenting standards; legal liability of consent authorities and other logistic considerations. Considerable attention is required to implement the Building Act and other legislation during the two overlapping phases of response and recovery. The desire is to create the best possible conditions that will encourage rapid rebuilding of lives and communities after large-scale disasters in New Zealand.

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### **Houses or Homes? The Patterns of Design**

**Anna Russell<sup>1\*</sup>**, Zhi Min Feng<sup>2</sup>, Regan Potangaroa<sup>1</sup>

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Full Paper: [postdfinal00050.pdf](#)

'We provide houses but what people want are homes' (Marcus, 1996). Given that, how does the house design assist or facilitate this transformation in humanitarian situations? Jacobsen et al (2002) states that there are 10 essential patterns for houses to be homes and for design to be 'enduring', which are as follows:

Inhabiting the site

- Creating rooms, outside and in
- Sheltering roof
- Capturing light
- Parts in proportion
- The flow through rooms
- Private edges, common core
- Refuge and outlook
- Places in between
- Composing with materials

Jacobsen continues that "patterns are a designers rules of thumb, the intuitive principles, often unspoken, that guide design work". These 10 patterns are tested and used to explore how humanitarian houses become homes in this paper. The modifications made to 109 new houses, provided as aid to those affected by the 2004 tsunami, in Tamil Nadu in Southern India are studied. The modifications were initiated and funded by the home owner subsequent to hand over by donor agencies. The design standards set by the Government meant that the 4 different designs encountered in the sample were slight variations on one model (not uncommon in humanitarian situations). Photographic records and inspection tables were compiled mapping the occurrence of these 10 patterns in the modifications. Results suggest that not all of the patterns were relevant, and modifications were concentrated in two main areas of the houses. How these people, who are essentially fishing based (and characterised as poor by locals), made their houses homes is explored using Jacobsen's text as a criteria to look at the idea of home.

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### **It Would Never Work from the Distance: Localizing Post-Disaster Recovery in Nias Islands, Indonesia**

**William Sabandar<sup>1</sup>**

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**No full paper available**

The Government of Indonesia with the support of the international community established a national reconstruction agency following the Indian Ocean tsunami on 26 December 2004 that badly devastated the region of Aceh and Nias, North Sumatra, Indonesia. The Rehabilitation and Reconstruction Agency of Aceh and Nias (BRR) is mandated to coordinate the whole reconstruction process engaging international donors, NGOs, central and local government, and to implement reconstruction budget allocated through the national budget mechanism. In implementing its mandate, BRR, although based in Banda Aceh, the capital of Aceh Province, reaches the targeted field and beneficiaries through its regional and district offices located in 25 districts. This

strategy enables the agency to be closer with the needs and challenge of the reconstruction. This paper examines the role of BRR in coordinating and managing the recovery process. It focuses on how the agency decided to decentralize the recovery activities from the national to the regional and local level. It analyzes the effectiveness of the decentralization strategy on addressing reconstruction challenges and needs. The case of the poor archipelago of Nias, a region under BRR operation, is presented to put the analysis in context. The paper highlights the importance of bringing the process of management and coordination of recovery activities down to the local level. It concludes that managing reconstruction at the local level have better results in: (i) understanding on needs and challenges of recovery (ii) coordination with local government and other recovery stakeholders, (iii) compliance with financial management, (iv) participation of local community, (v) institutionalization of disaster risk reduction, and (vi) assurance of effective local governance after BRR completes its operation in 2009.

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### **Building Design Information and Requirements for Crowd Safety During Disasters**

Aysu Sagun<sup>1\*</sup>, Dino Bouchlaghem<sup>1</sup>, Chimay J. Anumba<sup>2</sup>

<sup>1</sup>Loughborough University, <sup>2</sup>Pennsylvania State University

Full Paper: [postdfinal00040.pdf](#)

Building design requires the consideration of interaction of people with each other and the space. It is essential to include dynamic data that reveal information on movements and behaviours of the people in building design process in addition to the static data that identify shape and dimensions based on numbers of occupants and objects within the space. In public buildings, ensuring the safety and the security of the occupants is even more challenging, especially during emergency situations and disasters because speedy and safe evacuations of large crowds from densely populated areas is necessary. The research described in this paper seeks to establish the scope for enhancing safety of building occupants through the improved design of the built environment to better cope with extreme events, focusing on design information that can be revealed from crowd behaviour in emergency situations. Within this concept, critical safety issues are studied such as way finding, crowd flow, control, management and communication. This paper highlights the lack of dynamic information in building design, the limitations in the use of crowd modelling techniques and their potential in improving designs for the safety of users in large public spaces during emergency events. The paper is based on an extensive literature review and interviews with safety, security and building design experts. It identifies the requirements for building design with regard to crowd safety during emergencies. These are expected to have an impact on the development of design guidelines, codes and standards for public buildings such as airports and train stations.

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### **The Shelter Challenge: Promoting Collaboration, Supporting Innovation**

David Saunders

*International Federation of Red Cross & Red Crescent Societies*

**No full paper available**

The emerging trends of climate change, urbanisation and increasing social and economic marginalisation are leading to increased shelter risks for vulnerable populations. Analysis indicates that hydro-meteorological disasters such as floods and cyclones are increasing in frequency, typically in the form small and medium scale events compounded by changing seasonal weather patterns.

In 2007, the extensive flooding, cyclones, hurricanes and earthquakes saw large scale loss and damage to housing across Asia and the Pacific, East South and West Africa, and Central and South America. In South Asia alone, the homes of over 66 million people were damaged and destroyed as a result of significant and sustained flooding. Although many of these affected households did receive shelter assistance from national or international actors, the majority received little or no assistance, sought temporary shelter solutions with extended family members or the wider community, and are now incrementally rebuilding their homes with their own resources and with limited awareness of disaster-resistant building techniques. This multi-country disaster should be seen in the context of the experiences of the Red Cross and Red Crescent Societies who responded to 528 disasters in 2007, of which only 28 were the basis of international appeals for assistance. The majority of natural disasters do not receive international attention, and rely on national-level responders and resources.

The shelter challenge this reality presents is how to reduce the increasing shelter risks and to address the need for safe, adequate and durable shelter given the scale of the *additional* caseload of households with new shelter needs generated *every* year.

Recognising that the need for adequate shelter can be generated by both natural disasters and social and economic factors, collaboration between the disaster relief and housing development sectors is critical to ensure

the requiring pooling of resources and expertise. To address the scale of need, and the inability of the shelter and housing sectors to meet this need to date, innovation in strategic thinking as well as practical action and technical solutions is required. In keeping with its commitment to taking on a leadership role in the provision of emergency shelter, the International Federation of the Red Cross and Red Crescent Societies is promoting collaboration and supporting innovation in the shelter sector through a range of activities at global, regional and national level. The International Federation is looking to work with and support appropriate networks to enable the shelter sector to better meet the increasing sector challenges.

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## **Urban Design and Natural Hazard Mitigation**

**Wendy Saunders<sup>1</sup>**

<sup>1</sup>*GNS Science*

Full Paper: [postdfinal00066.pdf](#)

Custodianship is one of the seven ‘Cs’ of key urban design qualities outlined in the NZ Urban Design Protocol. Included in the Protocol is the statement that quality urban design ‘avoids or mitigates the effects of natural and man-made hazards’. But how do developers achieve this, while balancing their other design requirements? Numerous natural hazards, such as landslides, erosion, coastal hazards and earthquakes, have the potential to affect subdivision design. While it is up to the developer and territorial authority as to how they are managed (if at all), there are some successful design principles that can be incorporated. This paper presents good practice case studies of urban design that have included natural hazard mitigation. Case studies include Totara Park in Upper Hutt, which is crossed by the Wellington Fault; Tora on the Wairarapa coast, where tsunami hazard can be taken into account while providing additional recreational activities; and an international example from Japan where urban design incorporates mitigation of volcanic ash fall. The aim of this paper is to provide practitioners with ideas on how natural hazard mitigation measures can be designed to meet the needs of the community, local government, and the developer.

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## **The Senses Workshop**

**Alfonso Solano<sup>1</sup>**

<sup>1</sup>*Universidad Javeriana*

Full Paper: [postdfinal00090.pdf](#)

The senses workshop is a pedagogical, educational, and formative research proposal that puts in practice a new way to approach the architectonic and urban space. It begins with the use of each sense in a separate way, and thereafter with all senses in a simultaneous way. It proposes a project methodology which is based on the sensorial design and in the conscious sensorial experience as well. Its methodology is an experimental and exploratory one which is permanently constructed from the questions that arise in its own dynamics and in the intuition of new opportunities which are born directly from the action as well. The workshop proposes as a base of its work a hypothesis which is developed in the following sequence: sensation, perception, feeling and behavior. A good or pleasant sensation leads to a good perception, which leads as well to a good state of mind or a good feeling which finally it is translated in a good behavior. Equally, an unpleasant sensation will trigger a negative sequence.

- Sensation
- Perception
- Feeling
- Behavior

In this way, the workshop develops the objective of being conscious of the sensorial potential of the architect, designer or any other person involved into the habitat's planning and development. Also, shows its great social responsibility and frames it in the connatural ethics to these disciplines. The workshop has taken place more than 27 times in Colombia as well as in several countries. In our School of Architecture and Design in Colombia, we present two different experiences when preparing after a disaster, in which students of both programs have been involved. The first experience took place in Cupica, a small town in the Colombian Pacific coast, which was destroyed by an avalanche. After the disaster, the inhabitants were placed in a spontaneous settlement and later the government built for them an inadequate dwelling. By the application of the senses workshop's methodology it was produced a development plan for the community. The second experience took place in Mompox, (which has been declared patrimony of humanity by the UNESCO), a small city placed in an island formed in the Magdalena River. The region, remain flooded a great part of the year, due to the overflowing of the river. This fact puts in great danger the inhabitants and there's almost no solution for this

circumstance of the environment. Some projects were developed, applying the senses workshop methodology, proposing solutions for the circumstances exposed above.

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### **Drivers of recovery: Tsunami Reconstruction in Aceh, Indonesia, Three Years On.**

**Craig Thorburn<sup>1</sup>**

<sup>1</sup>*Monash University*

Full Paper: [postdfinal00036.pdf](#)

While Aceh-focused post-natural disaster reconstruction related social research has tended to focus on evaluating and assessing initial responses to the tsunami, less attention has been directed to evaluating longer-term post-crisis responses, particularly those that engage local village human resources, the foundation upon which successful reconstruction/recovery processes are built. The Communities Assistance Research Project (ACARP) undertook a qualitative analysis of the engagement between local communities and national/international donors, governments and NGOs in the post-disaster rehabilitation-reconstruction process following the devastating effects of the 2004 Indian Ocean earthquake and tsunami. The research focused upon identifying which inputs and approaches best enabled the re-establishment of local communities, consequent to organic and external human and resource mobilization. ACARP examined why some communities appear to have recovered more successfully than others, particularly given similar levels of government and donor inputs. Specific research questions focused upon identifying village-level resources and approaches that most effectively facilitated the re-emergence of local governance structures, micro economies, livelihoods and community wellbeing. The two authors were involved in the design and implementation of the ACARP project and will present the results of their research. ACARP was a multi-donor funded project initiated by the Australia Indonesia Partnership for Reconstruction and Development (AIPRD), AusAID.

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### **Reducing Risk and Vulnerability – An Environment and Humanitarian Reconstruction Partnership**

**Anita van Breda<sup>1\*</sup>, Robert Laprade<sup>2</sup>**

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Full paper: [postdfinal00059.pdf](#)

The humanitarian aid community performs vital functions on a scale of global significance. During the period from 1996 to 2005, more than 2.5 billion people were affected by over 6,400 natural and technological disasters. Given the sheer scale of the international aid response, humanitarian aid organizations have a tremendous opportunity and responsibility to rebuild communities that are healthier, stronger, and more resilient to future threats by minimizing any negative effects their rebuilding efforts may have on the environment. In response to the 2004 Indian Ocean earthquakes and tsunami, World Wildlife Fund and the American Red Cross jointly established an innovative five-year partnership to ensure that post-tsunami recovery and reconstruction activities reduce beneficiary risk and vulnerability by maintaining healthy ecosystems. WWF is advising the American Red Cross and their partners on better practices for rebuilding communities with a commitment to long-term recovery success. WWF is providing guidance and training to help American Red Cross staff in the field address environmental issues as they develop projects to help communities recover. This paper will discuss how the environment and humanitarian aid sector can successfully partner, as well as tools, techniques, and training for integrating environment management into reconstruction. With examples from Indonesia, Maldives, Sri Lanka, and Thailand, this paper will discuss reconstruction activities involving water and sanitation, shelter, livelihoods and disaster risk reduction.

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### **The role of property construction professionals in major disaster management**

**Clive Warren<sup>1\*</sup>, Graham Matthews<sup>2</sup>**

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Full Paper: [postdfinal00084.pdf](#)

This paper will report on the work of the RICS Major Disaster Management Commission (MDMC) in identifying the apparent gap between humanitarian disaster relief and the reestablishment of normal living conditions post disaster. It is clear from numerous examples world wide that the aid community is very efficient at mobilising humanitarian aid immediately following a significant natural disaster. What has become apparent through a detailed gap analysis is that in the period post disaster the reconstruction of essential services, and buildings is much less efficiently addressed. The skills of Chartered Surveyors in construction, geomatics,

property and project management are uniquely able to fill the knowledge gap of aid organisations and ensure a faster and more organised return to normal life. The ability to establishing property special data and title, determining the safety of damaged structures and in establishing risk management strategies to ensure business continuity of essential services all help to build back a better built environment than prior to the disaster. The establishment of a global aid advisory service to promote a 'build back better' agenda is beginning to gain significant international recognition and the paper reports on the steps taken to establish an international network of specialists. The development of future strategies to work with humanitarian agencies and charities such as Build Aid will form a significant part implementation program moving forward.

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## **Post-Disaster Resource Availability following a Wellington Earthquake: Aggregates, Concrete and Cement**

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Full Paper: [postdfinal00094.pdf](#)

The increased occurrence of natural disasters over the years have led to greater awareness of their impacts and the need to be prepared. New Zealand has encountered tsunamis, earthquakes and recent floods. Because of its geographical location, New Zealand is vulnerable to environmental risks. Disaster preparedness has become a focus in New Zealand and within disaster preparedness is post-disaster reconstruction planning. This paper evaluates the availability of resources for post-disaster reconstruction of the Wellington State Highway, with a focus on aggregates, cement and concrete. A benchmark of the resources required for reinstatement of the state highways was established using a resource estimation method. The results indicated that post-disaster reconstruction of the Wellington state highway is likely to be constrained by the limitations on construction resources in New Zealand such as aggregates, cement and concrete. This paper shows what alternative arrangements can be made given any shortages of these resources in a post-disaster environment.

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## **Lessons from Kobe on the Seismic Resilience of Long-Span Bridges**

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Full Paper: [postdfinal00018.pdf](#)

Experience with the performance of new long-span steel bridges during the 1995 Kobe earthquake demonstrated that even new bridges can have vulnerabilities that will affect the resilience of the highway network. This paper looks at three major bridges, all designed to what was arguably the most modern seismic bridge standards in the world at the time (1990's): the Higashi-Kobe Bridge, the Rokko Island Bridge, and the Nishinomiya Port Bridge. Although the damage to these three bridges was not catastrophic, it was of sufficient extent that one could not claim that they had the level of seismic resilience that would be expected for such major modern transportation structures. Failures in all three bridges severely affected the economic climate and the reconstruction efforts in the Kobe region for many months. This paper presents a number of lessons learned from field investigations of the damage and the repair of these bridges, including the impact on the transportation system in the Kobe area, the techniques necessary to affect repair and reconstruction efforts, and on the (rather extensive) time to bring the bridges back into service. These lessons are used to reflect on the positive and negative aspects of the resilience of the Kobe bridge system, and in the ways these lessons can be used for examining similar major transportation lifelines for reducing their seismic vulnerability in the future.

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