



# University of HUDDERSFIELD

## University of Huddersfield Repository

Hall, Martin, Amaratunga, Dilanthi, Haigh, Richard, Ingirige, Bingunath, Keraminiyage, Kaushal, Kulatunga, Udayangani and Pathirage, Chaminda

Building resilience 2013: Individual, institutional and societal coping strategies to address the challenges associated with disaster risk: book of abstracts

### Original Citation

Hall, Martin, Amaratunga, Dilanthi, Haigh, Richard, Ingirige, Bingunath, Keraminiyage, Kaushal, Kulatunga, Udayangani and Pathirage, Chaminda (2013) Building resilience 2013: Individual, institutional and societal coping strategies to address the challenges associated with disaster risk: book of abstracts. University of Salford, Salford, UK. ISBN 978--1--907842--43--6

This version is available at <http://eprints.hud.ac.uk/id/eprint/25494/>

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: [E.mailbox@hud.ac.uk](mailto:E.mailbox@hud.ac.uk).

<http://eprints.hud.ac.uk/>

# BUILDING RESILIENCE 2013

*Individual, institutional and societal coping strategies to  
address the challenges associated with disaster risk*

## Book of Abstracts

*Edited by*

Professor Martin Hall, Professor Dilanthi Amaratunga, Professor Richard Haigh, Dr Bingu Ingirige,  
Dr Kaushal Keraminiyage, Dr Udayangani Kulatunga, Dr Chaminda Pathirage

September 2013

Professor Martin Hall, Professor Dilanthi Amaratunga, Professor Richard Haigh, Dr Bingu Ingirige,  
Dr Kaushal Keraminiyage, Dr Udayangani Kulatunga, Dr Chaminda Pathirage (*edited by*)  
Building Resilience 2013  
Book of Abstracts

ISBN 978-1-907842-43-6  
© University of Salford 2013

All rights reserved. No part of this publication may be reproduced, stored and transmitted in any form, or by any means without prior written permission from the editors.

The views expressed in the papers are of the individual authors. The editors are not liable to anyone for any loss or damage caused by any error or omission in the papers, whether such error or omission is the result of negligence or any other cause. All and such liability is disclaimed.

The reader should verify the applicability of the information to particular situations and check the references prior to any reliance thereupon. Since the information contained in the book is multidisciplinary, international and professional in nature, the reader is urged to consult with an appropriate licensed professional prior to taking any action or making any interpretation that is within the realm of a licensed professional practice.

Copies may be ordered by contacting:

Professor Dilanthi Amaratunga  
Centre for Disaster Resilience  
School of the Built Environment  
Maxwell Building 4th Floor  
The University of Salford  
The Crescent  
Salford M5 4WT  
UK

Enquiries:

Tel: +44 (0)161 295 4600

Fax: +44(0)161 295 5011

E: [r.d.amaratunga@salford.ac.uk](mailto:r.d.amaratunga@salford.ac.uk)

# Contents

Preface	iii
About the Editors	vii
Acknowledgements	ix
Conference Organisation	xi
<i>Organising Committee</i>	<i>xi</i>
<i>Local Organisers and Hosts</i>	<i>xii</i>
<i>International Scientific Committee</i>	<i>xii</i>
<i>Centre for Disaster Resilience, University of Salford, UK</i>	<i>xiv</i>
Partners	xv
Keynote Speakers	xix
Special Features, Events and Workshops	xxix
<i>UNISDR 'Making Cities Resilient' Campaign</i>	<i>xxix</i>
<i>UN Global Assessment Report 2013</i>	<i>xxxii</i>
<i>Consultation of Local Governments towards Post 2015 Framework for DRR (Hyogo Framework for Action 2 - HFA2)</i>	<i>xxxvii</i>
<i>ANDROID Disaster Resilience Network</i>	<i>xli</i>
<i>CASCADE: Collaborative Action towards Societal Challenges through Awareness, Development, and Education</i>	<i>xlili</i>
<i>CEREBELLA: Community Engagement for Risk Erosion in Bangladesh to Enhance Lifelong Learning</i>	<i>xlvi</i>
<i>Conflict Prevention through Infrastructure Reconstruction</i>	<i>li</i>
Awards	lv
Special Issue of the International Journal of Disaster Resilience in the Built Environment	lv
General Information	lvii
Abstracts	1
Introduction	3
Index of Authors	91



## Preface

This book contains the abstracts of keynotes and papers submitted to, double blind peer reviewed, and accepted for the International Conference on Building Resilience 2013, 17<sup>th</sup> – 19<sup>th</sup> August at Heritage Ahungalla, Sri Lanka.

The Conference is organised by: the Centre for Disaster Resilience, University of Salford, UK; the Royal Melbourne Institute of Technology (RMIT) University, Australia; and, the Queensland University of Technology (QUT), Australia. The local hosts are: the University of Colombo, Sri Lanka; the University of Moratuwa, Sri Lanka; and, the University of Peradeniya, Sri Lanka. The Conference is organised in support of the UNISDR 'Making Cities Resilient' campaign and in association with our partners: the Federation of Sri Lankan Government Authorities; the ANDROID Disaster Resilience Network; the Disaster Management Center, Ministry of Disaster Management; the British High Commission, Colombo; the Southern Provisional Council, Sri Lanka; the United Nations Development Programme (UNDP) Sri Lanka; the United Nations International Strategy for Disaster Risk Reduction (UNISDR); the Asian Disaster Preparedness Center (ADPC); CEREBELLA Community Engagement for Disaster Risk Management; the Royal Institution of Chartered Surveyors (RICS) UK, Disaster Management Commission; and the International Journal of Disaster Resilience in the Built Environment, Emerald Publishing

Communities around the world are faced with the threat of disasters on a daily basis. National governments, local government associations, international, regional and civil society organisations, donors, the private sector, academia and professional associations as well as every citizen needs to be engaged in reducing their risk to disasters. All these stakeholders must play their part in contributing to building disaster resilient communities. The 2013 International Conference on Building Resilience encourages debate on individual, institutional and societal coping strategies to address the challenges associated with disaster risk. Key themes include:

*How can we increase community engagement towards increasing societal resilience?*

- Urban risk reduction
- Making cities resilient
- Sustainability and community resilience
- Achievable resilience
- Role of the community in the reconstruction process

*How can national and local governments be empowered to incorporate disaster risk in their development plans?*

- Trends and models in capacity development
- Scale of needs
- Challenges in bringing capacities up to scale
- Role of DRR networks in the context of supporting local capacity development
- Capacity development in making cities resilient
- Entry points of DRR in development planning

*How can we promote inclusive development to increase resilience?*

- Multi stakeholder perspective
- Resilience and sustainable development
- Gender considerations
- Conflict sensitive reconstruction
- DRR in reconstruction and sustainability

*How can we facilitate evidence-based policy?*

- Knowledge for policy and society
- Improved science-based policy decision making in disaster risk reduction
- Knowledge platforms, networking and uptake of research results
- Shaping immediate relief action in line with the goals of development co-operation in post crisis / post conflict societies

*How can we create public private partnerships to address disaster risk?*

- Partnership models
- Procurement strategies
- Financial models
- Investment decisions in the private sector and levels of disaster risk
- increasing disaster losses and consideration of disaster risk in investment decision making

*How can we manage disaster risk in development planning?*

- Role of the national government in setting policy and creating an enabling environment
- Incorporating DRR in city development planning
- Project management for reconstruction
- Long term reconstruction strategies and sustainability

*What will be the role of the built environment professions in addressing disaster risk?*

- Interdependency of expertise
- Rebranding disaster risk reduction
- What expertise to use and when
- Professional institutions and their role

*How can we promote social transformation through post disaster reconstruction?*

- Livelihoods and micro-enterprise development
- Housing and infrastructure
- Social cohesion
- Mainstreaming social transformation into recovery projects
- Promoting community capacities for social transformation

This event builds upon the successful 2011 International Conference on Building Resilience, which was held in Dambulla, Sri Lanka. The 2011 Conference was held in association with the launch of The Making Cities Resilient: 'My City is getting ready!' campaign, which addresses issues of local governance and urban risk. This 2013 Conference further supports the campaign focus areas up to 2015, including city-to-city learning and capacity building, and an emphasis on partnerships.

The Conference also incorporates the National Launch of the UN Global Assessment Report 2013 and consultation on the Post-2015 Framework on Disaster Risk Reduction (HFA2 - Framework of Action).

The UN Global Assessment Report 2013 - Creating Shared Value: the Business Case for Disaster Risk Reduction, is the UN flagship publication on global disaster risk and disaster risk management. The third edition of this biennial publication, the 2013 report, titled "Creating Shared Value: the Business Case for Disaster Risk Reduction" presents a new body of evidence that highlights how the transformation of the global economy over the last forty years has led rapid

increases in disaster risk in low, medium and high income countries, affecting businesses and societies.

The Sri Lanka Southern Province consultation on the Post-2015 Framework on DRR (HFA2) is also being held as part of the International Conference of Building Resilience 2013. The objectives of the consultation are to share experiences and perceptions among Southern Provincial based Local Authorities and other stakeholders on the main components and substantive issues in need of further action, which can be included in the post-2015 Framework for disaster risk reduction. The session seeks to identify regional priorities for the new framework and thus provide preliminary recommendations for the post-2015 Framework for disaster risk reduction.

The Conference organisers are also delighted to welcome five keynote addresses by leading academics and practitioners: Professor Martin Hall, Vice Chancellor, University of Salford, UK; Vinod Thomas, Director General of Independent Evaluation, Asian Development Bank; Professor Sarath Abayakoon, Former Vice Chancellor, University of Peradeniya, Sri Lanka.; Dan Lewis, Chief of Urban Risk Reduction, UN-Habitat, Kenya; and, Professor Samantha Hettierachichi, University of Moratuwa, Sri Lanka. These keynote addresses provide a local and global perspective and vision for disaster resilience research.

Further contributions to the Conference are made by members of the research community and practice that address disaster risk and the need to develop resilience from diverse perspectives, as demonstrated by the range of subjects tackled by authors. The abstracts are a brief summary of the full research articles that can be found in the USB Drive that accompany this book. All abstracts and full papers were reviewed in their entirety, prior to publication, by the International Scientific Committee comprising independent, qualified experts. The Editors would like to extend their sincere gratitude to all the authors of the published contributions for their excellent work and participation at the International Conference on Building Resilience 2013.

The conference is being held in Sri Lanka, an island situated in the Indian Ocean, at the base of the Indian Sub-Continent. It is a multi-ethnic, multi-religious country with a diverse and rich culture. Sri Lanka was severely affected by the tsunami on 26 December 2004, which killed some 40,000 people and displaced 400 - 500 thousand people along two thirds of the north-east, south and south-west coastline. Half the fishing fleet was destroyed, and a quarter of hotels in the affected areas sustained serious damage. Conflict has also featured significantly in Sri Lanka's recent history and social development, most notably in the North and East of the country. While the war came to an end with the military defeat of the LTTE in May 2009, over 100,000 are estimated to have been killed and over a million displaced. Income levels and human development indicators for these areas are among the lowest in Sri Lanka. It is our hope that Sri Lanka will benefit greatly from the research and activities associated with the Conference, and that the country provides an appropriate backdrop for tackling challenging questions about how to develop disaster resilient communities.





## About the Editors

*Martin Hall* is the Vice Chancellor of the University of Salford. He is also Professor Emeritus, University of Cape Town, where he is affiliated with the Graduate School of Business. Previously Professor of Historical Archaeology, he was inaugural Dean of Higher Education Development and then Deputy Vice-Chancellor at UCT (from 1999 to 2008). He is a past-President of the World Archaeological Congress and is a Fellow of the Royal Society of South Africa and of the University of Cape Town. He is an accredited mediator with the Africa Centre for Dispute Settlement. He has written extensively on pre-colonial history in Southern Africa, on the historical archaeology of colonialism, on contemporary public culture and on issues in higher education. Recent publications include "Identity, memory and counter-memory: the archaeology of an urban landscape" (Journal of Material Culture 11(1-2): 189-209, 2006), Historical Archaeology (edited with Stephen Silliman; Oxford, Blackwell, 2006), Desire Lines: Space, Memory and Identity in the Post-Apartheid City (edited with Noeleen Murray and Nick Shepherd; London, Routledge, 2007), "Transformation and continuity in the university in Africa" (Social Dynamics 33(1):181-198, 2007), "Stitch Wise: Strategic Knowledge Management for Pro-Poor Enterprise on South Africa's Goldfields" (in The Business of Sustainable Development in Africa: Human Rights, Partnerships, and Alternative Business Models, 2008), and The Next Twenty Five Years? Affirmative Action and Higher Education in the United States and South Africa, edited with Marvin Krislov and David L. Featherman, University of Michigan Press, 2009. A full list of publications, as well as current work, is available at [www.salford.ac.uk/vc](http://www.salford.ac.uk/vc).

*Dilanthi Amaratunga* is Professor of Disaster Management at the School of the Built Environment, University of Salford, UK where she leads the University's Centre for Disaster Resilience, responsible for supporting research on disaster management portfolios. She is also the Associate Head of School for International at the School of the Built Environment. Her research interests include post disaster reconstruction including conflict mitigation, gender and projection; capability and capacity building in managing disasters; socio-economic measures for conflict-affected reconstruction; and, women in construction. An interdisciplinary background in Quantity Surveying, Facilities and Business Continuity Management, Education and Training, Gender and Disasters, and Disaster Mitigation and Reconstruction provides her the opportunities to work across a broader disaster management research agenda including developing partnerships with international research teams, government, NGOs and communities. She is the Co-Editor of the International Journal of Disaster Resilience in the Built Environment, the only journal to promote research and scholarly activity that examines the role of building and construction to anticipate and respond to unexpected events that damage or destroy the built environment. She is also an Advisory Panel member of the UNISDR Making Cities Resilient Campaign. Her profile is available at [www.dilanthiamaratunga.net](http://www.dilanthiamaratunga.net).

*Richard Haigh* is a Professor at the Centre for Disaster Resilience, Joint Editor of the International Journal of Disaster Resilience in the Built Environment, and Co-Chair of the International Conference on Building Resilience series. His research interests include the conceptual understanding of resilience, the reintegration and rehabilitation of conflict-affected communities in Sri Lanka, and engagement of the private sector in the development of societal resilience. Richard is Principal Investigator of ANDROID (Academic Network for Disaster Resilience to Optimise Educational Development), a partnership of 67 institutions across 31 countries committed to promote co-operation and innovation to increase society's resilience to disasters of human and natural origin. Richard was also Principal Investigator of Conflict Prevention through Infrastructure Reconstruction, a 12-month intervention to enhance the capacity of local stakeholders to deliver conflict sensitive infrastructure reconstruction programmes within the North and East of Sri Lanka, and thereby to help prevent future conflict in the region. The project was funded by the UK Foreign and Commonwealth Office through the British High Commission in Colombo. Richard has published over 25 peer reviewed journal articles, 1 edited book, 7 book chapters, and 13 reports for a variety of stakeholders. A full list of Richard's publications, projects, and national and international activities can be found at [www.richardhaigh.info](http://www.richardhaigh.info).

*Dr. Bingu Ingirige* is a Senior Lecturer at the school of the Built Environment. His main research interests are in the area of flood adaptation and community resilience against extreme weather. He has been the co-investigator of the EPSRC funded Community Resilience to Extreme Weather (CREW) project, where he led a work package on SME adaptation and coping measures against extreme weather events. As part of the CREW project, his research team under his leadership conducted surveys, interviews and case studies with small businesses in London on measures of property level protection and business continuity. He was also the principal investigator for the RICS Education trust funded project where he focused on the small market township of Cockermouth in Cumbria in their recovery after the 2009 catastrophic flood event. He has published well over 50 conference, journal and other industry reports in the areas of SME capacity building, knowledge transfer, post disaster reconstruction and rehabilitation, community development, disaster management, resilience and adaptive capacities of SMEs. He currently supervises PhD students in the above areas of research and he serves in the Editorial Board of the International Journal of Disaster Resilience in the Built Environment (IJDRBE).

*Dr Kaushal Keraminiyage* is a Lecturer at the University of Salford, UK teaching on both undergraduate and postgraduate courses. He is also the programme director for the BSc (Quantity Surveying) programme. His research interests are collaborative environments for construction education and research, building capacities of construction Higher Education Institutions through ICT enabled collaborations, ICT for the Built Environment in disaster management contexts, energy conscious construction through process / ICT co-maturation and Virtual Learning and Research Environments for the Built Environment. Kaushal's publication profile includes edited books, book chapters, journals papers, various reports and international conference papers and presentations. He is a member of the Editorial Board of the International Journal of Disaster Resilience in the Built Environment and he has facilitated a number of international research workshops and served as an organising committee member in a number of international conferences.

*Dr Udayangani Kulatunga* has over 10 years experience in teaching and research in the UK and Sri Lanka. She completed her PhD in 2008 at the University of Salford and is currently attached to the same university as a Senior Lecturer. Udayangani is also the programme leader for the affiliated BSc (Hons) Quantity Surveying degree programme delivered in Sri Lanka. Her research portfolio has two distinct research domains: performance measurement, where her PhD was based, and disaster management, where her post doctoral studies are based. Udayangani is an active member of the Centre for Disaster Resilience at the University of Salford where she leads the community based disaster management research theme. Her research output is demonstrated by the number of publications done in both journals and international conferences. Udayangani's international presence is demonstrated by her role as a guest editor in journal special issues, membership of scientific committees and experiences as a conference chair.

*Dr Chaminda Pathirage* is a Senior Lecturer at the School of the Built Environment, University of Salford, UK. He is also the Programme Director for MSc Project Management in Construction degree programme since 2009. Having worked in several RICS (Royal Institution of Chartered Surveyors) funded research projects on good practices in disaster context, Chaminda has developed his specific research interest on exploring the role of knowledge management in the disaster management cycle. He leads the research theme 'Knowledge Management for Disaster Resilience' at the Centre for Disaster Resilience, at University of Salford. Currently Chaminda is leading a strategic partnership between the Institute of Disaster Management & Vulnerability Studies at University of Dhaka, Bangladesh and Centre for Disaster Resilience on research collaborations. He is also an Editorial Advisory Board member of the International Journal of Disaster Resilience in the Built Environment and an Editorial Review Board Member of International Journal of Knowledge-Based Organizations. With over 11 years of research and teaching experience, Chaminda has published several book chapters, research reports, journal papers and international conference papers and has facilitated a number of research workshops in International conferences.

## Acknowledgements

As Chairs of the International Conference on Building Resilience 2013 we are delighted to have the opportunity to hold this conference.

The Local Organising Committee met regularly and together we made an array of, hopefully better, key decisions! All involved have provided a willing source of on-going support and guidance that is very much appreciated. Our thanks go to the International Scientific Committee members who made extensive efforts in reviewing papers to tight time scales in ensuring the high quality of the conference. We also thank the keynote speakers for their willingness to stimulate invaluable discussions and debate around the conference theme. We also thank session chairs for agreeing to ensure the conference is as challenging, exciting and rewarding as possible.

We have received exceptional help and support from a number of people, organisations and bodies in the work for this conference. We would particularly like to acknowledge the support of Professor Martin Hall, Vice Chancellor of the University of Salford, and Professor Mike Kagioglou, Head of the School of the Built Environment at the University of Salford. In addition to funding by means of a sponsorship, the School of the Built Environment at the University of Salford provided unwavering backing and encouragement.

Organisations that have acted at conference partners are especially thanked. The efforts involved with a conference of this scale are significant and it would not have been possible to organise this conference without assistance. We particularly thank: University of Salford and its School of the Built Environment; Federation of Sri Lankan Local Government Authorities; British High Commission, Sri Lanka; International Journal of Disaster Resilience in the Built Environment and Emerald Publishing; Royal Melbourne Institute of Technology (RMIT) University, Australia; Queensland University of Technology (QUT), Australia; University of Colombo, Sri Lanka; University of Moratuwa, Sri Lanka; University of Peradeniya, Sri Lanka; UNDP Sri Lanka; UNISDR; Asian Disaster Preparedness Center, Thailand; Royal Institution of Chartered Surveyors (RICS); and, Disaster Management Center, Ministry of Disaster Management. Professor Charles Egbu deserves special thanks for facilitating sponsorships for the Centre for Disaster Resilience and also for several postgraduate research students.

The International Conference on Building Resilience 2013 is being held in conjunction with ANDROID (Academic Network for Disaster Resilience to Optimise Educational Development), which aims to promote co-operation and innovation among European higher education institutions to increase society's resilience to disasters of human and natural origin – such as earthquakes or the damage caused by on-going wars. ANDROID is an EU funded research project which aims to modernise higher education institutions through governance reforms. The University of Salford in the United Kingdom leads this project in partnership with 64 European higher education institutions and three institutions from Australia, Canada and Sri-Lanka.

Accordingly, we acknowledge the financial support of the European Commission and the Lifelong Learning Programme of the European Union in facilitating the dissemination and exploitation of the research outcomes through various means including keynotes, presentations, publications, marketing and workshops in conjunction with the conference activities.

Most of all, we want to thank our colleagues who worked very hard for the professional undertaking of the work involved in the tasks that are so often unseen and unrewarded for a conference of this scale. We thank Dr Kaushal Keraminiyage for all his efforts on the development and management of the conference database, Dr Chaminda Pathirage for being so careful with finances during these difficult times and also for managing the registration process, Dr Bingu Ingirige for his help in the management of the paper review process, and Dr Udayangani Kulatunga, Dr Menaha Thayaparan and Chamindi Malalgoda for being there whenever we needed help. We also thank Andrew Crozier, Matt Blundell and Jon Donohue for their excellent support with university finances.

## International Conference on Building Resilience 2013

Finally, we would not have been able to make this event without the support of our Events Manager based in Sri Lanka, Aitken Spence Conventions and Exhibitions. Ziyen Ameen & Nadeeka Leeniyagoda deserve special thanks from us for the professional way in which they have managed the complex accommodation arrangements for delegates, all internal transport, printing assignments, and coordination of our suppliers in Sri Lanka.

## Conference Organisation

### Organised by

Centre for Disaster Resilience, University of Salford, UK  
Royal Melbourne Institute of Technology (RMIT) University, Australia  
Queensland University of Technology (QUT), Australia

### Local hosts

University of Colombo, Sri Lanka  
University of Moratuwa, Sri Lanka  
University of Peradeniya, Sri Lanka

### In Support of

UNISDR 'Making Cities Resilient' campaign

### Partners

Federation of Sri Lankan Government Authorities  
ANDROID Disaster Resilience Network  
Disaster Management Center, Ministry of Disaster Management  
British High Commission, Colombo  
Southern Provisional Council, Sri Lanka  
United Nations Development Programme (UNDP) Sri Lanka  
United Nations International Strategy for Disaster Risk Reduction (UNISDR)  
Asian Disaster Preparedness Center (ADPC)  
CEREBELLA Community Engagement for Disaster Risk Management  
Royal Institution of Chartered Surveyors (RICS) UK, Disaster Management Commission  
International Journal of Disaster Resilience in the Built Environment, Emerald Publishing

### Conference co-chairs

Professor Martin Hall, University of Salford, UK  
Professor Dilanthi Amaratunga, University of Salford, UK  
Professor Richard Haigh, University of Salford, UK

### Publication and technical directors

Dr Bingunath Ingirige, University of Salford, UK  
Dr Kaushal Keraminiyage, University of Salford, UK  
Dr Chaminda Pathirage, University of Salford, UK

### Organising committee

Professor Dilanthi Amaratunga, University of Salford, UK  
Professor Richard Haigh, University of Salford, UK  
Dr Kaushal Keraminiyage, University of Salford, UK  
Dr Chaminda Pathirage, University of Salford, UK  
Dr Udayangani Kulatunga, University of Salford, UK  
Dr Bingunath Ingirige, University of Salford, UK  
Mr Mohan Siriwardena, University of Salford, UK  
Dr Menaha Thayaparan, University of Salford, UK  
Professor John Fein, RMIT, Australia

Dr Judy Lawry, RMIT, Australia  
Professor Ashantha Goonetilleke, QUT, Australia

### Local organisers and hosts

Ms Hemanthi Goonasekera, Federation of Sri Lankan Government Authorities  
Professor Samantha Hettiarachchi, University of Moratuwa, Sri Lanka  
Professor Siri Hettige, SPARC, University of Colombo, Sri Lanka  
Ms Shayani Weeresinghe, University of Moratuwa, Sri Lanka

### International scientific committee

Professor Vasantha Abeysekera, University of Southern Queensland, Australia  
Dr Nabil Achour, Loughborough University, UK  
Professor Carol Amaratunga, Justice Institute of British Columbia, Canada  
Susith Arambepola, ADPC, Thailand  
David Baldry, University of Salford, UK  
Professor Dr Audrius Banaitis, Vilnius Gediminas Technical University, Lithuania  
Professor Saman Bandara, University of Moratuwa, Sri Lanka  
Professor Peter Barrett, University of Salford, UK  
Dr Esther Charleworth, RMIT, Australia  
Dr Paul Chynoweth, University of Salford, UK  
Professor Andrew Dainty, Loughborough University, UK  
Professor Ranjith Dissanayake, University of Peradeniya, Sri Lanka  
Professor Aguinaldo dos Santos, Federal University of Parana, Brazil  
Professor Peter Fairbrother, RMIT, Australia  
Professor John Fein, RMIT, Australia  
Dr Nirodha Fernando, University of Moratuwa, Sri Lanka  
Dr Nishara Fernando, University of Colombo, Sri Lanka  
Dr G P Ganapathy, Centre for Disaster Mitigation and Management, VIT University, India  
Dr Anil Gupta, National Institute of Disaster Management, India  
Professor Shahid Akhtar Hossain, University of Dhaka, Bangladesh  
Dr Jessica Lamond, University of West of England  
Dr Judy Lawry, RMIT, Australia  
Professor Makarand Hastak, Purdue University, USA  
Graham Matthews, New Zealand  
Professor Samantha Hettiarachchi, University of Moratuwa, Sri Lanka  
Professor Siri Hettige, University of Colombo, Sri Lanka  
John Hewitt, UNITEC, New Zealand  
Dr Bingu Ingirige, University of Salford, UK  
Professor Wes Janz, Ball State University, USA  
Suranga Jayasena, University of Moratuwa, Sri Lanka  
Professor Keith Jones, University of Greenwich  
Professor Mike Kagioglou, University of Salford, UK  
Professor Arturas Kaklauskas, Vilnius Gediminas Technical University, Lithuania  
Shailesh Kataria, RICS Disaster Management Commission, UK  
Dr Kaushal Keraminiyage, The University of Salford, UK  
Dr Udayangani Kulatunga, The University of Salford, UK  
Professor Irene Lill, Tallin University of Technology, Estonia  
Dr Jamie MacKee, University of Newcastle, Australia  
Dr Ananda Mallawathanthri, United Nations Development Programme, Sri Lanka  
Dr Martina McGuinness, University of Sheffield, UK  
Dr Martin Mulligan, RMIT, Australia  
Dr Yaso Nataraja, RMIT, Australia  
Rita Newton, University of Salford, UK

International Conference on Building Resilience 2013

Dr Roshani Palliyaguru, Heriot-Watt University, UK  
Dr Chaminda Pathirage, University of Salford, UK  
Professor Srinath Perera, Northumbria University, UK  
Dr Regan Potangaroa, Unitec, New Zealand  
Professor David Proverbs, University of West of England, UK  
Professor Rammez Rameezdeen, Universtity of South Australia, Australia  
Professor Les Ruddock, University of Salford, UK  
Dr Sepani Senaratne, University of Moratuwa, Sri Lanka  
Professor Martin Sexton, University of Reading, UK  
Dr Robby Soetanto, Loughborough University.  
Assoc Professor Sujeeva Setunge, RMIT, Australia  
Professor Clive Warren, University of Queensland, Australia  
Professor Suzanne Wilkinson, University of Auckland, New Zealand  
Professor Edmundas Zavadskas, Vilnius Gediminas Technical University, Lithuania



## Centre for Disaster Resilience, University of Salford, UK

The University of Salford's Centre for Disaster Resilience is a multi-disciplinary centre committed to improving the ability of countries and communities to plan for, and recover from, natural and man-made disasters. Our research has developed an understanding to how physical infrastructure reconstruction affects social cohesion among people affected by disaster.

The recommendations from our research have improved how communities recover and have strengthened the chance of lasting stability across the world. The Centre is instrumental in developing a world in which governments, authorities, businesses, communities and individuals work together to create a society, which is able to withstand the effects of unforeseen events and threats.

Our vision is for a built environment that has the capacity to stand firm or adapt to reduce people's vulnerability to hazard and which can enable society to continue to function economically and socially when hazards occur.

We provide strategic advice and practical guidance based on rigorous research, informed by industry and community members. We work with key stakeholders to design, develop and manage buildings, spaces and places in a way which is sensitive to context.

We have a world-wide network of partners from policy, government, industry and academia who support our work.

The Centre for Disaster Resilience is part of the School of the Built Environment at the University of Salford, the highest-rated built environment research institute in the UK.

**[www.disaster-resilience.salford.ac.uk](http://www.disaster-resilience.salford.ac.uk)**

## Partners

We are very grateful for the generous support of our partner organisations:

University of Salford, UK



Salford is an ambitious University ([www.salford.ac.uk](http://www.salford.ac.uk)), with our 20,000 students contributing enormously to the local economy and our expertise transforming individuals and communities through excellent teaching, research, innovation and engagement.

We are leading in areas, including health, energy, media and the built environment and have completed impressive work with business and industry partners.

Salford has an international reputation as a research-informed institution that creates and applies new ideas, turning them into opportunities to benefit individuals and the knowledge economy, via a portfolio of over £20 million across research and enterprise.

- Upper quartile of all universities for EPSRC value of grants held
- Largest non-medical health school in the UK
- Global partnerships with Cambridge, Carnegie Mellon, RMIT, Adobe, Avid, BBC and BT
- Ranked 48 out of 158 universities in the Research Fortnight power ranking tables (2008), placing us in the top third of UK Universities.

School of the Built Environment, University of Salford, UK

The School of the Built Environment ([www.salford.ac.uk/built-environment](http://www.salford.ac.uk/built-environment)) is a world leading, professionally accredited and life-long learning community of scholars of global reach, working in unison with learners across all levels of study and research, and lifelong learning professionals and organisations committed in making a difference to the sector. With very high employability successes and one of the largest global cohorts of PhD students, many of our graduates are already making a difference in industry and also in academia, by holding leadership positions in organisations and academic institutions across the world.

The School has been leading the research agenda in the built environment for more than 20 years, continuously rated top in the national Research Assessment Exercises.

We provide Continuous Professional Development (CPD) opportunities and we work closely with professional institutions such as RIBA, CIAT, CIOB and RICS in the provision of CPD and professional training in general. In addition we provide consultancy services of high value across a variety of sectors such as health, education, infrastructure, the public and the private sectors.

United Nations Development Programme Sri Lanka



The United Nations Development Programme (UNDP) is the UN's global development network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. It is present in 166 countries working with them on their own solutions to global and national development challenges. As they develop local capacity, they draw on the people of UNDP and its wide range of partners.

UNDP began operations in Sri Lanka in 1967. UNDP's overarching goal is to support the country in the attainment of the Millennium Development Goals and the reduction of poverty. UNDP pursues this goal by working closely with the Government of Sri Lanka and supporting its agenda and objectives as captured within the framework of the United Nations Development Assistance Framework (UNDAF) and in line with the government's national development strategy, set out in the 'Mahinda Chinthana: Vision for a New Sri Lanka'.

Disaster Management Center, Ministry of Disaster Management



In July 2005, the Sri Lanka Disaster Management Act No.13 of 2005 was enacted which provides the legal basis for instituting a disaster risk management system in the country. The National Council for Disaster Management (NCDM) is a high-level inter-ministerial body. The chairman and vice chairman of the NCDM are H.E. the President and Hon Prime Minister respectively. Other members are Leader of the Opposition, Ministers in charge of 20 selected subject areas, Provincial Council Chief Ministers and five members of the Opposition. The Act also provides for establishing the Disaster Management Centre (DMC) under the Council to be the apex body for the purpose of planning, co-coordinating and implementing of certain natural and other forms of disasters.

Federation of Sri Lankan Government Authorities



The Federation of Sri Lankan Government Authorities is the National Local Govt. Association representing the interest of 335 Municipalities, Urban Councils, and Pradeshiya Sabhas of Sri Lanka. The Federation serves as a unifying body for local authorities in Sri Lanka to empower and equip them to serve their citizens and their localities better, through Capacity Building, Resource Mobilization, Advocacy and Lobbying, and Building Networks locally, nationally and internationally.

FSLGA is an affiliated body of the Commonwealth Local Government Forum (CLGF), the International City & County Managers Association (ICMA) and the United Cities and Local Government (UCLG).

International Journal of  
Disaster Resilience in the  
Built Environment



Launched in 2010, the International Journal of Disaster Resilience in the Built Environment is the only journal to promote research and scholarly activity that examines the role of building and construction to anticipate and respond to unexpected events that damage or destroys the built environment, and reflects construction's on-going responsibility toward built environment's users. The journal is designed for researchers and academics, policy makers and other professionals working with, or who anticipate having, disaster prevention, mitigation, response and reconstruction responsibilities, and who wish to improve their working knowledge of both theory and practice.

Royal Institution of Chartered  
Surveyors (RICS) UK, Disaster  
Management Commission



The Royal Institution of Chartered Surveyors (RICS) was founded in London in 1868, and granted a Royal Charter by Queen Victoria in 1881. It provides the world's leading professional qualification in land, property, construction and the associated environmental issues. Commitment to act in the interests of society remains RICS' guiding principle, and the RICS President's Disaster Management Commission was set up in 2005 to continue to deliver on that commitment. Commission aims to bring the skills and knowledge of RICS and other built environment professionals to strengthen capacity of vulnerable communities to reduce disaster risks and improve post-disaster recovery. BuildAction is an initiative of the Commission that places surveying and other built environment professionals on a pro bono basis with NGOs and humanitarian agencies to provide assistance to projects, in circumstances where it would otherwise not be available.

British High Commission,  
Colombo



Foreign &  
Commonwealth  
Office

The British High Commission Colombo represents the British Government in its relations with Sri Lanka and Maldives, promoting British interests in the two countries.



## Keynote Speakers



### Professor Martin Hall

*Vice Chancellor, University of Salford, UK*

Martin Hall is the Vice Chancellor of the University of Salford. He is also Professor Emeritus, University of Cape Town, where he is affiliated with the Graduate School of Business. Previously Professor of Historical Archaeology, he was inaugural Dean of Higher Education Development and then Deputy Vice-Chancellor at UCT (from 1999 to 2008). He is a past-President of the World Archaeological Congress and is a Fellow of the Royal Society of South Africa and of the University of Cape Town. He is an accredited mediator with the Africa Centre for Dispute Settlement.

He has written extensively on pre-colonial history in Southern Africa, on the historical archaeology of colonialism, on contemporary public culture and on issues in higher education. Recent publications include "Identity, memory and counter-memory: the archaeology of an urban landscape" (*Journal of Material Culture* 11(1-2): 189-209, 2006), *Historical Archaeology* (edited with Stephen Silliman; Oxford, Blackwell, 2006), *Desire Lines: Space, Memory and Identity in the Post-Apartheid City* (edited with Noeleen Murray and Nick Shepherd; London, Routledge, 2007), "Transformation and continuity in the university in Africa" (*Social Dynamics* 33(1):181-198, 2007), "Stitch Wise: Strategic Knowledge Management for Pro-Poor Enterprise on South Africa's Goldfields" (in *The Business of Sustainable Development in Africa: Human Rights, Partnerships, and Alternative Business Models*, 2008), and *The Next Twenty Five Years? Affirmative Action and Higher Education in the United States and South Africa*, edited with Marvin Krislov and David L. Featherman, University of Michigan Press, 2009. A full list of publications, as well as current work, is available at [www.salford.ac.uk/vc](http://www.salford.ac.uk/vc).

### *Pearl and Teardrop: Local Engagement in the Faultlines of Disasters*

Sri Lanka belongs both to its people and to the world: more than 2000 years of continuity in built form, complex infrastructure and accompanying texts; some of the earliest centres of learning in the world; a World Heritage site. Alongside this legacy of aesthetic and engineering genius is the legacy of three decades of bitter civil war and the devastation of the 2004 tsunami and all its consequences for local communities. Sri Lanka can be evoked as either pearl or a teardrop – or as both together. This paradox of beauty with pain is the paradox of all contemporary politics, making Sri Lanka a mirror to the world.

This conference is about the two meanings of "building resilience"; the interplay between physical infrastructure and the social capital that constitutes local communities; the discipline, and

opportunities, of working within the faultlines that are, by definition, the causes and consequences of disasters. The paradox of Sri Lanka – the teardrop and the pearl – is resolved by realizing that beauty and pain are two dimensions of the same set of circumstances. Sri Lanka shows this paradox and its potential in the extreme, and in this mirrors back to aspects of our own condition, wherever we live and work.



## Vinod Thomas

*Director General of Independent Evaluation, Asian Development Bank*

Vinod Thomas is Director General of Independent Evaluation at the Asian Development Bank (ADB). In this capacity he reports to ADB's Board of Directors on the development effectiveness of the work of the organization. This work is intended to assess the accountability of the organization in delivering results while providing lessons of experience to help strengthen those results.

Prior to coming to ADB in August 2011, Vinod was the Director-General and Senior Vice-President of the Independent Evaluation Group at the World Bank Group. He was formerly Country Director for Brazil and Vice-President, a position that he held from October 2001 to July 2005. Before that he was Vice-President of the World Bank Institute, where he led the Institute's efforts to improve its focus, quality, and impact. He joined the World Bank in 1976 and held several positions, including Chief Economist for the East Asia and Pacific region, Director for the World Development Report (on The Challenge of Development), Chief of Trade Policy and Principal Economist for Colombia, and Economist for Bangladesh.

Vinod has a PhD and MA in Economics from the University of Chicago and a BA from St. Stephen's college, Delhi. He has authored numerous books, articles, and reports on macroeconomic, social and environmental issues. His books include *The Quality of Growth*, Oxford University Press, 2000, and the latest (with Xubei Luo), *Multilateral Banks and the Development Process* from Transaction Publishers in 2012. He has taught at Vassar College, New York and the University of Sao Paulo, Brazil, and has addressed numerous professional and academic fora in all regions.

### *Climate-related disasters in Asia and the Pacific*

Natural disasters are on the rise worldwide. There are more and more intense natural disasters—which are defined to cause at least 100 deaths or to affect the basic survival needs of at least 1,000 people—resulting from floods and storms as well as droughts and heat waves. The Asia and the Pacific region has experienced some of the most damaging disasters in recent decades, with alarming consequences for human welfare. At the same time, the climate in the region has been changing. Temperatures have been higher, on average, and also more variable and more extreme. Rainfall has also been more variable and more extreme.

Is there a relationship between these changes in climate and the increase in natural disasters in Asia and the Pacific? This paper considers three main disaster risk factors—rising population exposure, greater population vulnerability, and increasing climate-related hazards—behind the increased frequency of intense natural disasters.

In a regression analysis within a model of disaster risk determination, the most significant association is between the increase in natural disasters and population exposure, represented by



population densities. Population vulnerability also matters, but increasing incomes seem to be associated first with greater and then lesser vulnerability. Finally, there is a notable association between climate-related hazards (greater precipitation linked to floods and storms and especially higher temperature linked to droughts and heat waves) and the frequency of intense natural disasters in Asia and the Pacific and its subregions during 1971–2010.

Along with the scientific association between greenhouse gases and the changes in the climate, the findings in this paper suggest that there is a link between increasing natural disasters in Asia and the Pacific and man-made emissions of greenhouse gases in the atmosphere.



## Professor Sarath Abayakoon

*Former Vice Chancellor, University of Peradeniya, Sri Lanka*

Professor S. B. S. Abayakoon is the Former Vice-Chancellor of University of Peradeniya, Sri Lanka. He was appointed the 20th vice-chancellor of the university in August 2009. Prior to that, he was the Dean of the Faculty of Engineering for four and a half years. He is a Senior professor of Civil Engineering, at Faculty of Engineering, University of Peradeniya.

Prof. Abayakoon was educated at the St. Sylvester's College, Kandy. Then he entered to the University of Peradeniya faculty of engineering for his higher education and completed the bachelor's degree in civil engineering in 1979 with a First Class Honours degree. He received his post graduate degrees, Master of Applied Science and Doctor of Philosophy, from University of British Columbia, Canada in 1983 and in 1987 respectively.

In 2012, Professor Abayakoon was nominated for the International Socrates Award in the Science Sphere, Euroscience Open Forum, EBA, Oxford, UK, and received the Award for Outstanding Contribution to Education at the World Education Congress, for Leadership and Contribution to Education.

### *Rio +20 - Where is Sri Lanka?*

The change of focus from Millenium Development Goals to Sustatinable Development Goals is being felt across the globe in the policy changes of governments and international forums dedicated for this important area of research and development. Sri Lanka too has included some of the themes that has been suggested by world forums in its new development efforts. An analysis of these efforts will be presented with the aim of directing the country towards expected economic development in the next few decades.





## Dan Lewis

*Chief of Urban Risk Reduction, UN-Habitat, Kenya*

Dan Lewis is the Chief of the Urban Risk Reduction Unit, UN-Habitat, Kenya. He has worked for UN-Habitat since 1997 based in Somalia, Kosovo and Nairobi, and has managed the global portfolio of disaster and conflict related work of the Agency since 2002. As a civil engineer and private consultant, he has worked in urban reconstruction and housing programmes in South Africa and Chile as well as with First Nations communities in his home region on Vancouver Island, Canada since 1987. He is currently leading the development of a new UN-Habitat global programme designing new standards for urban resilience.

### *Protecting Development Gains by Building Resilience*

In an urbanising world, a number of recent catastrophic events have shown stronger impact in urban areas. There is an increasing trend that more urban population will be affected by natural disasters over the next several decades. Urbanization, if properly planned and managed, can bring economic opportunities and prosperity and enhance quality of life. Having said that, such development gains from planned urbanization can only be achieved and sustained with urban resilience – through protecting lives and assets, and ensuring continuity of services.

In order to protect such development gains, it is necessary to explore all possible opportunities to finance resilience building efforts, even through leveraging humanitarian programming in post-crisis settings. In addition, it is important to recognize that cities should do “what they can with what they have” to build resilience.





### **Dr Samantha Hettiarachchi**

*Professor of Civil Engineering, University of Moratuwa, Sri Lanka and Chairman, Working Group on Risk Assessment, UNESCO/IOC/ICG/IOTWS*

Professor S.S.L.Hettiarachchi, Professor of Civil Engineering of the University of Moratuwa, Sri Lanka specialized in Coastal Engineering and obtained his PhD from Imperial College, London. He has represented Sri Lanka on the establishment of the Indian Ocean Tsunami Warning System (IOTWS), under UNESCO/IOC, Paris since its inception in 2005 and is serving as Chairman of Working Group on Risk Assessment for Indian Ocean States for the Inter Governmental Coordination Group for the establishment of the IOTWS (UNESCO/IOC/ICG/IOTWS). As Chairman, Professor Hettiarachchi provided leadership for the preparation of Tsunami Risk Assessment Guidelines for the Indian Ocean (UNESCO/IOC Guideline and Manual No 52). He has also contributed to other UNESCO guidelines on coastal hazards. The Working Group also collaborated with Geo Science Australia to develop the Tsunami Hazard Map for the Indian Ocean. These two powerful tools will contribute to the safety of human life, ecosystems and infrastructure against the tsunami hazard within a multiple hazard coastal framework. Professor Hettiarachchi has also worked with UNDP –Asia Pacific Regional Centre-Bangkok in providing training in Tsunami Risk Assessment for Indian Ocean States.

### ***Initiatives in developing Tsunami Risk Assessment Capability in Indian Ocean States***

The objective of this paper is to highlight the approaches, activities and collaborative efforts undertaken by the Working Group on Risk Assessment of the Indian Ocean Tsunami Warning System for the protection of human life, eco-systems and infrastructure. It also focuses on the efforts to establish a Platform for Tsunami Risk Assessment to collaborate with stakeholders of the other ocean basins having Tsunami Warning Systems as well as with those interested in coastal hazards and risk assessment. The paper will highlight information on number of areas as well as on current initiatives.

#### ***IOTWS and Working Group on Risk Assessment***

In the aftermath of the Indian Ocean Tsunami, the Indian Ocean States decided to establish a tsunami warning system under UNESCO/IOC, Paris. The member states decided that the Indian Ocean Tsunami Warning System (IOTWS) will be a coordinated network of country systems in which each country has the responsibility of identifying the hazard, assessing the risk and issuing the warning to its population. In this respect they will be assisted by Regional Tsunami Service Providers (RTSPs) to be established in some of the Indian Ocean Countries. India, Indonesia and Australia are such service providers. The IOTWS is being established via working groups of which one is dedicated to Risk Assessment within a multi hazard framework.

### *Needs assessment*

The Working Group on Risk Assessment conducted a survey of the needs of its membership in late 2005 and it was evident that there was a strong demand to develop uniform guidelines on Tsunami Risk Assessment and a clear understanding of the Tsunami Hazard. It was requested that the said guidelines should be developed in full consultation with the member states considering the existing inherent knowledge base. In addition it was requested that Training Programmes be implemented for capacity building in tsunami risk assessment and mitigation for the benefit of the member states.

### *Approach adopted by the Working Group*

The Working Group adopted a three pronged approach to achieve its tasks

- 1) The Indian Ocean Tsunami Hazard Map was prepared by Geo Science Australia as a working group activity. This was based on probabilistic tsunami hazard modeling, with funding from Aus-AID, and in full consultation with the regional and external experts. Geo Science Australia provided leadership for this activity.
- 2) Tsunami Risk Assessment Guideline was prepared and published as a UNESCO Manual and Guideline No.52. This Guideline was prepared over a two year period having convened several workshops in order to consult the regional and external experts. UNDP, Bangkok, WAPMERR, Dubai and IOTWS provided funding for these activities. Priority was given to the understanding of the existing risk assessment framework in Indian Ocean Countries and to ensure that the Guidelines captured the existing knowledge base of Indian Ocean States.
- 3) Several Seminars and Workshops were held during the preparation of the Tsunami Hazard Map and the Risk Assessment Guideline. After the successful preparation of these two documents a Training Programme comprising a Seminar and Training Workshop was conducted over 9 days in Bangkok in November 2009 to provide training to member states on the use of the Tsunami Hazard Map and the Risk Assessment Guideline.

### *Current initiatives - Revision of the risk assessment guideline and further training*

Recent tsunami events in Samoa, Chile, Indonesia and Japan have focused attention on a number of issues which have to be further investigated. The Working Group has obtained funds from the UNESCAP Tsunami Trust Fund to conduct following activities.

- Revise and expand the guidelines on Tsunami Risk Assessment and Mitigation for the Indian Ocean to take account of new development since they were first published in 2009.
- Conducting a case study to illustrate the use of scenario modeling for long term forecasting and strategic risk assessment, focusing on critical issues relating to the interpretation of the technical warnings and their transformation to a public warning for the benefit of coastal population
- Conducting regional workshops on Tsunami Risk Assessment and Tsunami exercises based on training the trainer approach for long term sustainability of training and education.

### *Vision of the Working Group*

The Working Group is strongly promoting the development of Global Guidelines and the implementation of Tsunami Risk Assessment Case Studies covering member states from different Tsunami Warning Systems. These aspects were discussed at the first meeting of the Global Tsunami Warning Systems held in March 2009 in Paris and the Working Group will work in this direction. The Working Group has established sustainable links, networks and partnerships which have enabled research and development on Tsunami Risk Assessment to continue into the future. The contribution of the Working Group for the protection of humans, ecosystems and infrastructure is very relevant in the context of recent marine earthquakes which have occurred around the world and affecting islands and coastal regions around the world.

## Special Features, Events and Workshops

### UNISDR 'Making Cities Resilient' campaign

The International Conference on Building Resilience 2013 is being held in association with the National Launch of the United Nations International Strategy for Disaster Reduction (UNISDR) *Making Cities Resilient* Campaign. The Making Cities Resilient: 'My City is getting ready!' campaign, launched in May 2010, addresses issues of local governance and urban risk.

UNISDR is working with its partners to raise awareness and commitment for sustainable development practices that will reduce disaster risk and increase the wellbeing and safety of citizens - to invest today for a better tomorrow. Building on previous campaigns focusing on education and the safety of schools and hospitals, ISDR partners launched a new campaign in 2010: Making Cities Resilient. The campaign is seeking to convince city leaders and local governments to commit to a checklist of Ten Essentials for Making Cities Resilient (enclosed herewith in Annex) and to work alongside local activists, grassroots networks and national authorities.

Local government officials are faced with the threat of disasters on a daily basis and need better access to policies and tools to effectively deal with them. The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters offers solutions for local governments and actors to manage and reduce urban risk. Urban risk reduction provides opportunities for capital investments through infrastructure upgrades and improvements, building retrofits for energy efficiency and safety, urban renovation and renewal, cleaner energies, and slum upgrading. Local governments are the closest level of government to citizens and their communities. They play the first role in responding to crises and emergencies. They deliver essential services to their citizens, such as health, education, transport and water services, which need to be made resilient to disasters. Based on the five priorities of the Hyogo framework for Action (HFA), a ten-point checklist for making cities resilient was developed that local governments sign up to. By doing so, local governments commit to implement disaster risk reduction activities along these Ten Essentials. UNISDR and its partners have developed this checklist as a starting point for all those who want to join in the campaign. Equally important is that commitment to these Ten Essentials will empower local governments and other agencies to implement the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, adopted by 168 governments in 2005. Good urban and local governance is the key to this resilience! The vision of the campaign is to achieve resilient, sustainable urban communities. The campaign will urge local governments to take action now to reduce cities' risks to disasters.

*"My City is getting ready"* is a rallying call for all mayors and local governments to make as many cities as possible as resilient as possible. It is also a call for local community groups, citizens, planners, academia and the private sector to join these efforts. While the campaign addresses citizens – those who live in urban areas and who elect the decision makers who can take the necessary steps to make their cities safer – the campaign's principal target groups are mayors and local governments of cities of different sizes, characteristics, locations and risk profiles. Mayors and local governments are the agencies who can take action and make our cities safer. Mobilizing these important actors in the disaster risk reduction process is essential to making cities resilient. The campaign slogan has meaning for everyone. Whatever the city, the message to reduce risk will resonate with all citizens worldwide. For example, Sao Paulo is Getting Ready! Kobe is Getting Ready! Istanbul is Getting Ready! Santa Tecla is getting ready!

The campaign addresses primarily local governments at all levels (cities, towns, townships or villages) based on their responsibilities as first responders to the needs and well-being of the population. The campaign targets towards creating space for citizen participation, sound local/urban governance and accountability. More specifically, the Campaign will target:

- Political leaders (Mayors, city councils)



- Technical local govt functionaries and other experts with an impact on a city's development and safety (planners, city managers in different sectors, building regulators, educators, emergency managers etc)
- Local leaders, community and citizen groups, NGOs and other opinion makers- both as important partners, and targets.
- National authorities, in particular to promote decentralization and in their role of regulation and influence over local policy and risk configuration.
- Other target audiences as appropriate per country or city, including with private sector.

### *2012-2015: From awareness to implementation*

The Making Cities Resilient campaign - My City is Getting Ready - enters its second phase in 2012-2015. Based on the success and stock-taking by partners and participating cities in the first phase (2010-11), the campaign will continue and the focus will shift to more implementation support, city-to-city learning and cooperation, local action planning and monitoring of progress in cities. In addition, continued advocacy will seek to commit more cities and increase the support by national governments to support city resilience and local capacities in large scale, as well as global goals and targets to that extent. Focus areas of this stage of the campaign 2012-2015 include:

- 1) Know More and Commit: Continue to foster awareness and advocacy among local governments with strong emphasis given also to the national level authorities (including national associations of local governments)
- 2) Invest Wisely- Build Safer: Implementation - Capacity building: 2012-2015 will focus on moving the awareness in the already signed-up cities towards implementation:
- 3) Benchmarking and reporting: Local Government Self Assessment Tool and Resilient Cities Report.
- 4) Emphasis on partnerships and UNISDR capacity as a platform and knowledge management hub.

National governments, local government associations, international, regional and civil society organizations, donors, the private sector, academia and professional associations as well as every citizen needs to be engaged in reducing their risk to disasters. All these stakeholders must play their part in contributing to building disaster resilient cities.

UNISDR has welcomed a proposal that "resilient cities" should be one of ten top global priorities in the post-2015 development agenda. Ms. Wahlström, chief of UNISDR said: "UNISDR has been running the Making Cities Resilient Campaign for three years now and our experience of working closely with both capital cities and small municipalities tells us that urban resilience needs to be at the top of the global development agenda. Many Mayors and local governments around the world are leading the way in reducing risk." Under this goal, one suggested target is to ensure the integration of "climate and disaster resilience into investments and standards". The world's governments agreed last year at the historic Rio+20 Summit to adopt universally applicable Sustainable Development Goals in 2015. A stand-alone goal on cities will serve to "mobilize and bring together the efforts of multiple actors and stakeholders such as local authorities, national governments, businesses, knowledge institutions and civil society across a range of urban issues such as disaster risk reduction and climate change adaptation", according to the Report. "It is essential that the world rallies around a post-2015 global goal to advance urban resilience and minimize creating new disaster risks and adding to the economic losses caused by increased exposure to natural hazards." From 2011 to 2020 alone, investments in urban development are projected to increase by 67 per cent globally. Much of this new urbanization will unfold in hazard-exposed regions threatening global resilience and sustainability unless governments and businesses start incorporating disaster risks into decision-making.

Accordingly, with the support and recommendation of many partners and participants, and a Mayors Statement made during the 2011 Global Platform for Disaster Risk Reduction, the Making Cities Resilient campaign will carry on beyond 2015.

*Partners of UNISDR 'Making Cities Resilient' campaign: Implementation of the UNISDR World Disaster Reduction Campaign on Making Cities Resilient*

The Centre for Disaster Resilience (CDR) at the University of Salford is an active partner of the Making Cities Resilient campaign, CDR contributes as a main global partner in the campaign, representing academic, technical and expert institutions, and also contributes toward the overall goal - empower local governments with stronger national policies to invest in risk reduction at local level, as part of urban and regional development plans by working with them closely.

The International Conference on Building Resilience 2013 is being held in association with the Making Cities Resilient Campaign 2010-2015. This event will build upon the successful 2011 International Conference on Building Resilience, which was held in association with the launch of *The Making Cities Resilient: 'My City is getting ready!'* campaign, which addresses issues of local governance and urban risk. The 2013 Conference continues to support the campaign focus areas up to and beyond 2015, including city-to-city learning and capacity building, and an emphasis on partnerships.

Further, the Centre for Disaster Resilience, University of Salford, UK is offering its support to the Federation of Sri Lankan Local Govt. Authorities, the National Local Government Association of Sri Lanka with a view to continuing its partnership and contributions to the local government joint action plan to tackle hazard risk in Sri Lanka, which was launched in July 2011. The plan identifies key priority activities that follow the 'Ten Essentials' of the 'Making Cities Resilient' campaign. The action plan will be implemented in coordination with the Ministry of Disaster Management and the Ministry of Local Government & Provincial Council. This is to convene platforms or task forces for collaboration in the regions of Sri Lanka. As part of this action plan, together with Federation of Sri Lankan Local Govt. Authorities, the national local government Association of Sri Lanka, CDR facilitates a workshop as part of the International Conference on Building Resilience 2013, to enhance the technical knowledge required for the Technical office attached to the Local Authorities in Sri Lanka on Disaster Resilient Measures. In addition, CDR:

- Works closely with the local authorities in committing to disaster risk reduction through for example, programmes associated with capacity building, policy dialogues, workshops and other Resilient Cities-related events at global and regional level
- Collaborates in applied research projects on risk management and reduction in local government environments
- Makes its expertise available to local governments and the public at large
- Adapts the science agenda to emphasise this paramount research topic and advance the state-of-the art in risk reduction
- Makes risk knowledge, assessments and risk reduction part of the university curricula for urban planners, architects, engineers, geographers and similar disciplines, as well as a cross disciplinary subject.
- Facilitates consultation of Local Governments towards Post 2015 Framework for DRR (HFA2)

## UN Global Assessment Report 2013

The International Conference on Building Resilience 2013 incorporates the National Launch of the UN Global Assessment Report 2013 - Creating Shared Value: the Business Case for Disaster Risk Reduction.

The Global Assessment Report on Disaster Risk Reduction is the UN flagship publication on global disaster risk and disaster risk management. The third edition of this biennial publication, the 2013 report, titled “Creating Shared Value: the Business Case for Disaster Risk Reduction” presents a new body of evidence that highlights how the transformation of the global economy over the last forty years has led rapid increases in disaster risk in low, medium and high income countries, affecting businesses and societies. The UNISDR 2013 Global Assessment Report on Disaster Risk Reduction (GAR13): Creating Shared Value: the Business Case for Disaster Risk Reduction highlights how the transformation of the global economy over the last 40 years has led to rapid increases in disaster risk in low, medium and high income countries.

The first Global Assessment Report on Disaster Risk Reduction, Risk and Poverty in a Changing Climate (GAR09), as well as the second, Revealing Risk – Redefining Development (GAR11), focused primarily on public policy and the role of national and local governments in disaster risk reduction. The key message of GAR09 was that addressing the underlying risk drivers is critical not only to the achievement of the Hyogo Framework of Action (HFA)<sup>i</sup>, but also the Millennium Development Goals (MDGs) and climate change adaptation. GAR11 built on that evidence to provide guidance to governments on how to effectively manage their disaster risk. GAR09 highlighted how intensive disaster risk is disproportionately concentrated in lower-income countries with weak governance. Within countries, it showed how underlying drivers—such as poor urban governance, vulnerable rural livelihoods and declining ecosystems—concentrate extensive disaster risk in low-income communities and households and drive further the depth and breadth of poverty, undermining development.

Building on the findings of GAR09 and GAR11, this third Global Assessment Report 2013 on Disaster Risk Reduction seeks to fill that gap. It explores why increasing disaster risks represent a growing problem for the economic and business community at different scales. The report examines how paradoxically business investments that aimed to strengthen competitiveness and productivity may have inadvertently contributed to increasing risk.

GAR13 explores how businesses, by investing in disaster risk management, can reduce costs and interruptions represented by disaster losses and impacts; how performance and reputation can also be enhanced by minimising uncertainty and unpredictability; why effectively managing disaster risks should be the hallmark of a competitive, sustainable and resilient business; and why a broader approach to business value creation that also addresses underlying drivers of risk is required.

GAR13 highlights the interdependence of the public and private sectors and why business competitiveness, sustainability and resilience will also depend on governments’ ability to manage disaster risk through effective policies. Governments depend on business investment to generate employment and the wealth required to provide public services. Likewise, businesses depend on reliable public infrastructure and utilities, on efficient urban systems, on an educated and healthy workforce and on a range of ecosystem services. Reducing disaster risks in business and in public investment presents a win-win situation for both.

GAR2013 analyses three key global investment sectors – urban development, agribusiness, and coastal tourism – and reveals that prevailing business models in each sector continue to drive disaster risk.

A new global risk model developed by UNISDR and partners, demonstrates that annual average losses from just earthquakes and cyclonic winds can be expected to be in the range of \$180 billion this century. The report makes a strong case that globalization, the search for lower costs, higher productivity, and just-in-time delivery are driving business into hazard-prone locations with little or no consideration of the consequences on global supply chains.

## Why do disasters challenge business?

The major disasters that struck Japan and Thailand in 2011 and the United States of America in 2012 re-vealed how disasters can impact businesses. Earthquakes, floods and storms can damage exposed and vulnerable factories, offices and other facilities and resources, interrupting and paralysing output and business processes.

But disaster risk does not stop at the factory gate. Businesses depend on infrastructure and urban systems run by utilities and the public sector. Damage to transport and energy networks, ports and airports or to neighbourhoods where employees live interrupts business and imposes additional costs. And in today's globalised world, even businesses in safe locations may be affected by disasters that hit suppliers and partners on the other side of the globe.

Extended insurance coverage may enable businesses to compensate for both direct loss as well as supply chain interruption. But disasters have broader, more pervasive effects on business competitiveness. When business is interrupted, skilled workers may leave, market share may be lost to competitors, relationships with key suppliers and partners may be severed and confidence and reputation may be eroded. Once business is lost, it may never come back.

Businesses, of course, come in many shapes and sizes. And different sizes are exposed to different kinds of risk. Small businesses, for example, that serve local markets are affected directly by localised extensive disasters, as associated with flooding or landslides. And these businesses also depend heavily on local public infrastructure. Destruction of a bridge in a flash flood, for example, may isolate a local smallholder farm, workshop or restaurant from markets and suppliers for days. And many such businesses go bankrupt because they lack the cash flow or reserves to be resilient.

## New GAR13

The previous two editions of the Global Assessment Report were predominantly written for an audience of policy and decision-makers in government departments. GAR09 laid out key recommendations for governments as well as civil society actors engaged in disaster risk management; GAR11 sought to reach beyond this traditional audience and targeted its analysis and findings particularly at finance and planning ministries of national governments.

In expanding its analysis to include and focus on the role of private investment, GAR13 aims at business leaders and private investors, on the one hand, and at local and national regulators, on the other hand. This report seeks to engage businesses in a dialogue on disaster risk management that goes beyond the current emphasis on response and preparedness and instead identifies opportunities for the creation of shared value for business and society.

As with previous Global Assessment Reports on Disaster Risk Reduction, GAR13 has been developed on the basis of original research commissioned to and contributed by a wide range of partners, including academic, scientific and technical organisations, governments and regional organisations, international and non-governmental bodies and most importantly by the private sector on a global scale. This report offers businesses as well as investors for the first time a review of practices that can reduce their risk of disaster loss.

## Key features of GAR13

### *A global assessment of economic disaster risk*

A completely new probabilistic multi-hazard GAR global risk model is being developed in collaboration with scientific and technical partners to replace the earlier model used in GAR09 and GAR11. This major modelling initiative will provide a unique vision of global disaster risk, generating information and metrics for risk-sensitive investment planning for governments and business, as well as for analysts and forecasters. An overview of the methodology is provided in Annex 1 of the online version of GAR13. GAR13 also explores the resilience of national economies

to these risks through a number of different models, indexes and simulations, including the development of hybrid loss exceedance curves, building on the pioneering work in GAR11.

*A more complete estimation of disaster losses*

The number of countries developing national disaster loss databases continues to grow. GAR13 features detailed national disaster loss data from a total of 56 countries, including new data from Djibouti, Ethiopia, Guyana, Honduras, Jamaica, Kenya, Lebanon, Laos, Mali, Nicaragua, Timor Leste, Uganda, Uruguay and a regional database for the Pacific Island nations. A new approach to modelling direct economic losses from these data permits most likely the most complete estimation to date of the real cost of disasters. This approach combines internationally reported economic losses from intensive disasters, as recorded in the EM DAT database, with modelled economic losses in the housing, infrastructure and agriculture sectors from extensive disasters captured in national disaster databases. The detailed methodology and summary of results are available in the online version of GAR13.

*Understanding how businesses manage disaster risk*

A centrepiece of GAR13 is an in-depth analysis of how businesses are currently managing their disaster risks. In partnership with a major consultancy company, workshops were held with 14 global corporations from Asia, Europe and North America to understand current approaches to disaster risk management, challenges and opportunities. Based on an innovative risk management framework, these workshops provide lessons learned and unique insights into how large global businesses assess disaster risks and how this information is used to inform risk management. A survey of about 1,200 businesses in six disasterprone cities in the Americas (Bogota, Kingston, Miami, San Jose, Santiago and Vancouver) provides valuable information on another perspective, in particular, on the capacities of small and mediumsized businesses to manage disaster risks. This survey also examines the enabling environment for private sector involvement in disaster risk reduction.

*Reviewing progress in disaster risk reduction*

Approximately 135 countries are reviewing their progress against the HFA for 2012–2013, and 94 countries have submitted reports that provide unique insights into the implementation of the HFA. Governments have reviewed their progress against each of the priority areas of the HFA, and provided supporting evidence on challenges in critical areas such as public investment and risk assessment. GAR13 highlights these developments, and a fuller analysis of all national reports is presented in Annex 3 of the online version.

In addition, governments in eight countries in Asia and Latin America have provided detailed case studies of their investments in disaster risk reduction and how these are measured. As new investments flood into emerging economies, results reported in these case studies provide useful context. In partnership with a major global social research organisation, 30 senior officials in national finance and planning ministries, regional and international organisations were interviewed, providing additional insight into how policy and decision-makers view the risk landscape.

*A focus on the urban development, tourism and agribusiness sectors*

GAR13 also commissioned research to examine the challenges and opportunities to risk-sensitive business investment in three sectors: urban development; tourism; and agribusiness. These sectors are not only some of the most dynamic in the world economy, but also play a key role in the configuration of disaster risks. In each sector, GAR13 examines the interactions between business and the public sector and the incentives and constraints for disaster risk reduction.

*Finance, insurance and public regulation*

Business investment decisions in these and other sectors are mediated by the availability of finance, insurance pricing as well as public sector regulation and incentives. In partnership with the insurance industry, and through a set of case studies, GAR13 examines the challenges faced in the development of insurance markets that contribute towards risk-sensitive business investment.

It also looks at the role of capital markets and financial institutions in providing incentives or disincentives for risk-sensitive investment.

Public regulation has traditionally been privileged as a means to avoid the externalisation of risks and costs by business investments to the public sector and community. But GAR13 also examines how the incentives provided by countries and cities to attract foreign direct investment (FDI) may actually encourage investment in hazard-prone areas. Further, it seeks to identify examples where it has been recognised that the costs of the resulting shared risks are becoming untenable for both business competitiveness and the sustainability of societies.

#### *Nascent business practices in disaster risk management*

GAR13 also identifies and describes nascent business practices that are starting to positively transform the landscape of disaster risk management. These practices include efforts to strengthen corporate risk management strategies; new approaches to supply chain resilience; initiatives to increase the accessibility and usability of risk information; investors' growing appetite for risk disclosure and transparency; and new opportunities for creating shared value by investing in disaster risk management in partnership with the public sector.

The report also identifies encouraging signs of change. Public-private partnerships in risk management have proven their worth during several disasters, including the 2010 and 2011 earthquakes in Christchurch, New Zealand.

GAR2013 surveys 1,300 small and medium-sized businesses in six disaster-prone cities in the Americas and finds that three-quarters have suffered business disruptions related to damaged or destroyed power, telecommunications and water utilities demonstrating the inter-dependence between the private and public sectors when it comes to disaster risk management. Yet only a minority of the companies surveyed – 14.2 percent in the case of companies with fewer than 100 employees – had even a basic approach to crisis management in the form of business continuity planning.

### The full GR 2013 Report

The full report can be downloaded at:

<http://www.preventionweb.net/english/hyogo/gar/2013/en/home/download.html>

Browse the available material for downloadable versions of selected chapters and sections of the report, all annexes, case studies and background papers

### Contributing papers

The Global Assessment Reports are developed on the basis of a large body of original research commissioned by and contributed to UNISDR by a wide range of partners, including independent scientific institutions, think tanks, UN agencies, governments, non-governmental organisations and businesses. This includes original case studies, analysis and survey results from businesses and governments – all available online at:

[www.preventionweb.net/english/hyogo/gar/2013/en/home/documents.html](http://www.preventionweb.net/english/hyogo/gar/2013/en/home/documents.html)

### Data platform

The global risk analysis presented in the Global Assessment Reports is based on a joint effort by leading scientific institutions, governments, UN agencies and development banks, the private sector and non-governmental organisations. All available data is provided via the interactive Risk Viewer, the national disaster loss database platform DesInventar, and the global risk database Preview: [www.preventionweb.net/english/hyogo/gar/2013/en/home/data-platform.html](http://www.preventionweb.net/english/hyogo/gar/2013/en/home/data-platform.html)



### GAR 2013 Panel discussion

There will be a GAR2013 Panel Discussion as part of the International Conference on Building Resilience 2013

This event provides the opportunity for all interested parties to learn more about the Global Assessment Report and to discuss the application of its main findings. This includes information on economic risk and resilience and results from the current 2011-2013 Hyogo Framework for Action self-assessments undertaken by national governments. Key new findings will be debated and discussed including the role of businesses in disaster risk reduction, incentives for resilient private investments, and public-private partnerships for effective disaster risk management towards and beyond 2015 including current and future business practice and public-private partnerships. There will also be an open floor for questions, answers and discussion.

*Relevance of the Initiative:* Global Assessment Report provides input towards post-2015 including evidence base for consultations towards 2015 and new items (e.g. role of private sector and focus on availability of risk information) for HFA2.

It is expected that this discussion will generate new items in HFA2 for consideration and awareness on the importance of investing in new public private partnerships for joint disaster loss accounting, risk assessment, and investment planning. Another expected outcome is that conference delegates are familiar with the main findings of the 2013 Global Assessment Report and its relevance for disaster risk reduction towards and beyond 2015.

## Consultation of Local Governments towards Post 2015 Framework for DRR (Hyogo Framework for Action 2 - HFA2)

At the World Conference on Disaster Reduction in January 2005, 168 countries adopted the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters. The UN General Assembly endorsed the HFA later that year in 2005. The HFA responds to the need for a comprehensive, integrated, multi-disciplinary approach to identify and implement disaster risk reduction measures.

In December 2012, the UN General Assembly decided to convene the Third World Conference on Disaster Risk Reduction in Japan in early 2015 to review the implementation of the HFA over its 10-year term and develop a post-2015 framework for disaster risk reduction (referred to as Hyogo Framework for Action 2 or HFA2). The UN Office for Disaster Risk Reduction (UNISDR) was requested to serve as the secretariat of the Third World Conference, to facilitate the development of an HFA2, and to coordinate the preparatory activities in consultation with all relevant stakeholders.

The 2009-2011 mid-term review of progress against the HFA reflected substantial reduction in mortality due to natural disasters. However, the Report also highlighted weak capacity in many local governments. Even where countries have developed policies and institutional systems for disaster risk reduction, they are challenged to address risk accumulation on the ground. This consequently challenges governments' ability to accurately account for disaster risk in investment and development decisions.

Hence, it is envisaged that the engagement and feedback of local governments is critical for the effective implementation of risk reduction now and even more in the years to come.

The first phase of the consultations from March 2012 to May 2013 focused on broad substantive issues for the new framework of disaster risk reduction.

The narration below compiles the views expressed by Local Governments and partners for HFA 2 in the first year of consultation. Many Local governments leaders, Mayors, International agencies and community organizations have called for:

- a. the *HFA2 should be designed with local actors in mind as a primary implementer*. This would help them to understand the importance of disaster risk reduction, successful implementation strategies, and how to build their capacities and leverage their existing resources in the most cost effective way.
- b. efforts to *clearly demarcate the responsibilities at the central, provincial, district or municipal levels, and to strengthen the processes of decentralization of responsibilities* including resources to local government, through improved regulation and mechanisms for accessing resources.
- c. HFA2 to ensure that *disaster risk reduction is made a core function of the Local Governments*, with consistent budget allocation and staffing.
- d. *stronger linkages between national and local government – including the alignment of national policies with local needs*.
- e. *greater emphasis on monitoring and accountability instruments to guarantee law enforcement*.
- f. *more support for capacity - building and awareness at the local level for the HFA2*, including further training of local government and communities and ensuring access to available tools and knowledge.
- g. *ensuring community involvement in decision-making processes* and building partnerships with community-based or grassroots associations.
- h. stronger emphasis on *school safety, education, and ensuring children and youth's participation in risk analysis* and resilience-building initiatives.
- i. the urgent need to cultivate a culture of prevention in households, communities, institutions and businesses was re-iterated. This includes the view that *more attention needs to be given to understanding the factors that can influence the way people interpret risk and the conditions that lead people to act on risk information*.



- j. *application of indigenous and traditional knowledge*, cultural values and belief systems in public awareness efforts has also been recommended.
- k. *further collaboration* between communities, local and national governments, NGOs, and the private sector must be consciously nurtured.

Phase I of the consultations (March 2012-May 2013) were conducted at the local, national and sub-regional level inclusive of various thematic areas which concluded with the 4<sup>th</sup> Session of Global Platform held in May 2013. This initial phase focused on broad substantive issues for a new framework. The first phase of the consultations confirmed the high interest of Local Governments in a post- 2015 instrument for disaster risk reduction or a HFA2.

The findings note that climate change exacerbates existing risk factors and calls for measures to mitigate greenhouse gas (GHG) emissions to prevent a generation of further risk, while taking steps to adapt to the new patterns of climate risk and extreme events that are already locked into place. It points to previous calls for adopting a holistic approach that embraces DRR and climate risk management as fundamental for poverty reduction and sustainable development. *Read more:* [http://www.preventionweb.net/files/32535\\_hfasynthesisreportfinal.pdf](http://www.preventionweb.net/files/32535_hfasynthesisreportfinal.pdf)

## Second Phase – HFA2

There is a consensus that the new instrument (*informally referred to as HFA2*) should build on the Hyogo Framework for Action and introduce the innovations necessary to address the challenges of increasing risk over the next 20 to 30 years.

Phase II of the consultations from July 2013 until the 3<sup>rd</sup> World Conference on Disaster Reduction in March 2015, will now focus on the content, indicators and measurement of the draft HFA2.

Under the Making Cities Resilient Campaign, partners and cities are encouraged to organize consultations to feed into the global process in order to ensure that priorities are highlighted in the next framework for disaster risk reduction. Accordingly, the Sri Lanka Southern Province consultation on the Post-2015 Framework on DRR (HFA2) is to be held as part of the International Conference of Building Resilience 2013.

## Objectives of the session

The objectives of the session are to share experiences and perceptions among Southern Provincial based Local Authorities and other stakeholders on the main components and substantive issues in need of further action, which can be included in the post-2015 Framework for disaster risk reduction. The session seeks to identify regional priorities for the new framework and thus provide preliminary recommendations for the post-2015 Framework for disaster risk reduction.

As part of this International Conference of Building Resilience 2013, the session gathers key DRR stakeholders and is a key opportunity to share, discuss and propose activities and approaches, which should be outlined in the new Framework. The session also allows international partners to learn from each other and contrast their own perceptions and priorities with what is proposed elsewhere in the region. Through its broad representation, the meeting will put together an output document summarizing the findings towards a post-2015 Framework for Disaster Risk Reduction. It is the intention of the Centre for Disaster Resilience at the University of Salford that this output document will be complemented by further reports summarizing other local, national, thematic and regional consultations that will take place in the coming two years up to 2015.

## Methodology and agenda

This consultation on the Post-2015 Framework for Disaster Risk Reduction is intended to be based on participatory principles. Given the importance of the topic for DRR this session will allow participants to exchange and define priorities for the region. The session is comprised of a working group session with guiding questions provided and a plenary session to consider and adopt recommendations. The session is followed by questions & answers from the audience. Participants will be guided by general and specific introductory questions, which serve as a reference for plenary discussions and working groups (see below).

In addition, the International Conference on Building Resilience agenda foresees several panels focusing on substantial aspects for resilience building identified in the 2010 Hyogo Framework for Action and 2013 Global Assessment Reports on DRR.

## General guiding questions

*Areas and questions:* Below are the specific areas that consultations of Local Governments need to address. For every area additional questions are provided to assist.

### Area 1: Local Action

*What enables local level action for DRR and resilience building?*

#### Underlying questions:

- a) How important are factors such as leadership, financing, local authority, human/technical capacity and partnerships in enabling local level action?
  - i) How can these factors be strengthened?
- b) How HFA1 has enabled/contributed to successful local level achievements?
  - i) Important factors in success
  - ii) Challenges and how they were overcome

### Area 2: Inclusive development

*How is the integration of DRR, climate change and sustainable development more efficient and effective?*

#### Underlying questions:

- a) What are the instruments available that are/could be used to facilitate integration at local level? (e.g. policies, land use planning, disaster and climate risk information, financing mechanisms)
  - i) How can these instruments be improved?
  - ii) How can these tools be used to address issues such as risk assessments, land-use management, urban planning and safe schools and hospitals?
- b) What are the barriers of integration at the local level?

### Area 3: Governance

*How can decision-making be improved to reduce human and economic exposure systematically?*

#### Underlying questions:

- a) Why is Disaster risk reduction politically not viable? What needs to be done?
- b) How can risk information be strengthened and better used to:
  - i) Land use, urban and spatial planning?
  - ii) Inform public and private investment?

- iii) Improve post disaster reconstruction?
- c) What are the barriers to the translation of risk sensitive land use plans into investments (public and private)?
  - i) How these barriers can be overcome in on going and future urban plans?

#### Area 4: Accountability and Measuring Progress

*How to strengthen accountability for DRR and resilience building?*

##### Underlying questions:

- a) How can we define an accountability framework for DRR?
- b) How can targets be used to support accountability? Suggest possible targets.
- c) How can progress in DRR be measured at local level?
- d) Will quantitative indicators comparing for instance % of GDP lost due to the impact of a disaster or % of populations in hazard zones killed and displaced by disasters annually help measure the progress and impact?
- e) Current indicators are input oriented (measure the actions of the local or national governments) Suggest an indicator which could help measure the impact at local level?
- f) Who needs to be accountable to whom?
  - i) Two way accountability
  - ii) Private sector, various levels of government, land use planning authorities, national and other multi-stakeholder platforms
  - iii) Parliamentarians and their potential role in ensuring accountability.
  - iv) The case for a Risk Reduction Officer or Disaster Risk Ombudsman that would ensure accountability across all sectors in government.

ANDROID

DISASTER  
RESILIENCE  
NETWORK



The International Conference on Building Resilience is being organised in association with ANDROID (Academic Network for Disaster Resilience to Optimise educational Development), an Erasmus academic network that aims to promote co-operation and innovation among European HE to increase society's resilience to disasters of human and natural origin. The network has sixty-seven representatives from thirty-one countries, twenty-eight in the EU, as well as organisations from Australia, Canada and Sri Lanka. The network's teaching and research is concerned with what resilience is, what it means to society, and how societies might achieve greater resilience in the face of increasing threats from natural and human induced hazards.

In order to achieve this aim, ANDROID will: 1) Promote discourse among European applied, human, social and natural scientists to pool their results and findings, discuss methods and develop inter-disciplinary explanations that increase society's resilience to disasters; 2) Describe, analyse, and compare the capacity of European cities and HE to address disaster risk, and thereby reinforce the link between education and society; 3) Build the capacity of HE to address emerging challenges in disaster resilience, strengthen the link between research and teaching, and inform policy development.

- The *ANDROID virtual network* will form a virtual hub for the project. Using Joomla, a free and opensource content management platform, the virtual network will provide a broad range of functionality that will facilitate administration and coordination across partner institutions: collaboration and communication tools; information handling and exchange; project management tools; data collection tools; and, intra-network dissemination.
- The *Doctoral School* will be a fully coordinated, innovative, and international interdisciplinary doctoral teaching and research programme focused on the most salient issues and features shaping society's ability to tackle the challenges posed by natural and human induced hazards. The Doctoral School will provide complementary and innovative research training programmes aimed at honing the students' skill set, and will draw on the wide disciplinary base of the network's partners to promote inter-disciplinary working for doctoral students.
- A *pan-European survey* will identify, collate and disseminate good practices for inter-disciplinary working in research and teaching that explores what resilience is, what it means to society, and how societies might achieve greater resilience in the face of increasing threats from natural and human induced hazards.
- The *inventory of European disaster resilience education* will describe, analyse, and compare disaster resilience related education programmes in order to establish existing capacity among European HEIs to address the threat posed by hazards of natural and human origin.
- A survey will assess the *capacity of local government's public administrators* in European urban areas to address disaster risk.
- The network's *Special Interest Groups (SIGs)*, which represent the particular research and teaching concerns of groups of members, will define a scope and work plan, organise seminars, contribute to the network newsletter, and communicate regularly through the Virtual Network. Each SIG will be expected to contribute to a report on future research directions in disaster resilience research, and the implications for education.
- An *Open Educational Resources (OER) platform* will host digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research.
- A *series of annual conferences* across Europe will bring together Network members, lecturers and researchers in universities and other higher education institutions with an interest in disaster resilience, as well as those in NGOs and policy fields.

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

### Contact the Secretariat

Centre for Disaster Resilience

University of Salford

Salford

Greater Manchester M5 4WT

United Kingdom

tel. +44 (0) 161 295 4600

fax. +44 (0) 161 295 5011

e-mail: [android@disaster-resilience.net](mailto:android@disaster-resilience.net)

website: [www.disaster-resilience.net](http://www.disaster-resilience.net)

## CASCADE - Collaborative Action towards Societal Challenges through Awareness, Development, and Education

Highlighted by the European Commission report (2012) on 'Enhancing and focusing EU international cooperation in research and innovation', global challenges are important drivers for research and innovation. Thus, the EU needs to strengthen its dialogues with international partners to build critical mass for tackling these challenges. However, critical mass is lacking in many cases and the strategy driving the development of the actions is not always clear. This was one of the conclusions of the FP7 interim evaluation, which stated that there needs to be an 'intensification of international cooperation' activities focused on 'engaging with partners outside of Europe on equal terms and in programmes and activities of high mutual interest'. The same report recommended the 'coherent strategic development' of the Union's policy for international cooperation in research and innovation. Therefore, this action will, overall, aim to achieve the main objectives of the European Commission (2012) for International cooperation in research and innovation:

1. Strengthening the Union's excellence and attractiveness in research and innovation as well as its economic and industrial competitiveness by creating win-win situations and cooperating on the basis of mutual benefit; by accessing external sources of knowledge; by facilitating access to new and emerging markets; and by agreeing on common practices for conducting research and exploiting the results;
2. Tackling global societal challenges by developing and deploying effective solutions more rapidly and by optimising the use of research infrastructures;
3. Supporting the EU's external policies through international cooperation in research and innovation as an instrument of soft power and a mechanism for improving relations with key countries and regions.

In this context, the *overall objective* of CASCADE (Collaborative Action towards Societal Challenges through Awareness, Development, and Education) is to prepare ground for a future research programme that targets South Asian Countries and promotes bi-regional coordination of Science & Technology (S&T) cooperation, including priority setting and definition of S&T cooperation policies.

*The specific objectives of CASCADE* are to: compile a regional position paper that identifies global challenges and research priorities; map and develop an inventory of national and regional stakeholders related to global challenges; and, raise awareness on research & innovation priorities for fostering cooperation and towards building mutual understanding on how to address common global societal challenges. CASCADE targets and has the participation of all South Asian countries specified in the call: Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka.

### Objectives of the project

- 1) Identify societal challenges on which to focus the cooperation and justify them in terms of common interest and mutual benefit relevant to the targeted countries in Southern Asia. In this context, following broad Horizon 2020 - The Framework Programme for Research and Innovation will be considered:
  - a) Health, demographic change and wellbeing;
  - b) Food security, sustainable agriculture, marine and maritime research and the bio-economy;
  - c) Secure, clean and efficient energy;
  - d) Smart, green and integrated transport;
  - e) Climate action, resource efficiency and raw materials;
  - f) Inclusive, innovative and secure societies

- 2) Provide up to date analytical evidence on key stakeholders and their competences in Southern Asia
- 3) Support, where relevant, the training and extension of the network of FP Contacts in the region, in particular with the view of increasing awareness about cooperation opportunities offered by Horizon 2020

### S&T objectives and measurable outputs

The overall objective of CASCADE is to prepare ground for a future INCONET programme that targets South Asian Countries and promotes bi-regional coordination of S&T cooperation, including priority setting and definition of S&T cooperation policies.

The specific objectives of CASCADE are to: compile a regional position paper that identifies global challenges and research priorities; map and develop an inventory of national and regional stakeholders related to global challenges; and, raise awareness on research & innovation priorities for fostering cooperation and towards building mutual understanding on how to address common global societal challenges. CASCADE targets and has the participation of all South Asian countries specified in the call: Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka.

The objectives are linked to an interacting set of work packages and measurable / verifiable outputs. In addition to the 3 RTD work packages (WP2 – Identify global challenges relevant to Southern Asia; WP3 – Identify and map stakeholders in Southern Asia; WP4 – Raise awareness of Horizon 2020 and related schemes) and there are 2 further work packages dealing with project management (WP1) and dissemination and exploitation (WP5).

### Participants

<i>Participant no. *</i>	<i>Participant organisation name</i>	<i>Country</i>
1 (Coordinator)	University of Salford (USAL)	UK
2	University of Central Lancashire (UCLAN)	UK
3	Tallinn University of Technology (TUT)	Estonia
4	Vilnius Gediminas Technical University (VGTU)	Lithuania
5	University of Bologna (UNIBO)	Italy
6	Fondation pour la recherche stratégique (FRS)	France
7	Nangarhar University (NU)	Afghanistan
8	Patuakhali Science and Technology University (PSTU)	Bangladesh
9	Royal Institute of Management (RIM)	Bhutan
10	Institute of Engineering, Tribhuvan University (IOE)	Nepal
11	Volunteers for Development Nepal (VFD)	Nepal
12	University of Peshawar (UoP)	Pakistan
13	<i>Local Councils Association of the Punjab (LCAP)</i>	<i>Pakistan</i>
14	University of Moratuwa	Sri Lanka
15	Federation of Sri Lankan Local Govt. Authorities (FSLI)	Sri Lanka
16	Asian Disaster Preparedness Center (ADPC)	Thailand (presence in all targeted countries)
17	ECO CARE (ECO)	Maldives

CASCADE project team:

Professor Dilanthi Amaratunga

Professor Richard Haigh

Centre for Disaster Resilience

University of Salford

Salford, UK

Email: [r.d.g.amaratunga@salford.ac.uk](mailto:r.d.g.amaratunga@salford.ac.uk)



## CEREBELLA: Community Engagement for Risk Erosion in Bangladesh to Enhance Lifelong Advantage

Bangladesh is being identified as a country that is more vulnerable to climate change and subsequent natural disasters like cyclones, floods, storm surges, droughts, and tornadoes. Dense population and poverty has reduced the adaptability of Bangladesh in disastrous situations thus further increasing severity of disasters. Dangerous zones to hazards such as unstable hills, slopes subjecting to landslides, flood plains, coastal areas, cyclone prone areas are selected as settlements by most of the communities in Bangladesh due to lack of alternatives, affordability or because of the livelihood patterns and income source. Lack of education and research on DRR and climate change adaptation affects socio-economic conditions in Bangladesh. Losses created by disasters and climate change in Bangladesh highlight the importance of making communities resilient against them.

Bangladesh is also a country that is vulnerable to climate change and subsequent natural disasters such as cyclones, floods, storm surges, droughts, and tornadoes. Dense population and poverty has reduced the adaptability of Bangladesh to disastrous situations thus further increasing severity of disasters. Dangerous zones to hazards such as unstable hills, slopes subjecting to landslides, flood plains, coastal areas, cyclone prone areas are selected as settlements by most of the communities in Bangladesh due to lack of alternatives, affordability or because of the livelihood patterns and income source. Lack of education and research on Disaster Risk Reduction (DRR) and climate change adaptation affects socio-economic conditions in Bangladesh. Losses created by disasters and climate change in Bangladesh highlight the importance of making communities resilient against them.

### Aim

Within this context, aim of CEREBELLA - Community Engagement for Risk Erosion in Bangladesh to Enhance LifeLong Advantage, a British Council funded project under its INSPIRE scheme is to create long-term sustainable and strategic partnership between Patuakhali Science and Technology University (PSTU) and University of Salford to share skills, knowledge and experience on climate change and disaster management academic learning and research.

### Objectives

CEREBELLA objectives include:

Carryout hazard, vulnerability, risk analysis and develop risk response strategies for disaster risk reduction and climate change adaptation with the engagement of community and local authority of Patuakhali, Bangladesh

Make recommendations for urban safety planning based on disaster risk and climate change impacts of Patuakhali, Bangladesh

Update and develop undergraduate/postgraduate curriculum on disaster risk reduction and climate change adaptation

Facilitate staff exchange and training programmes to enhance capacity of partner institutions to develop knowledge, competencies and international research skills

Further, CEREBELLA promotes the United Nation's disaster resilient city concept by getting the involvement of community in designing and engaging in disaster risk reduction (DRR) and climate change adaptation activities to develop a strong local information base on hazards, vulnerability and risk of community. Patuakhali region is used as a case study to carry out this study as this region is highly affected by disasters and climate change impacts.

## Project activities

This community driven project develops a strong local information base on hazards, vulnerability and risk factors of the community live in Patuakhali region and to develop DRR strategies. Patuakhali, Bangladesh was selected as the case study to carry out this study as this region is significantly affected by disasters and climate change impacts. Consultation with community was carried out to identify their vulnerabilities towards disasters and to identify the main hazards that they are facing. Focus group discussions were too carried out with the community leaders to identify existing DRR strategies whilst evaluating their strengths, weaknesses and future requirements. Data gathered from community and community leaders' discussions were fed into policy makers for their feedback and possible consideration when designing DRR policies.

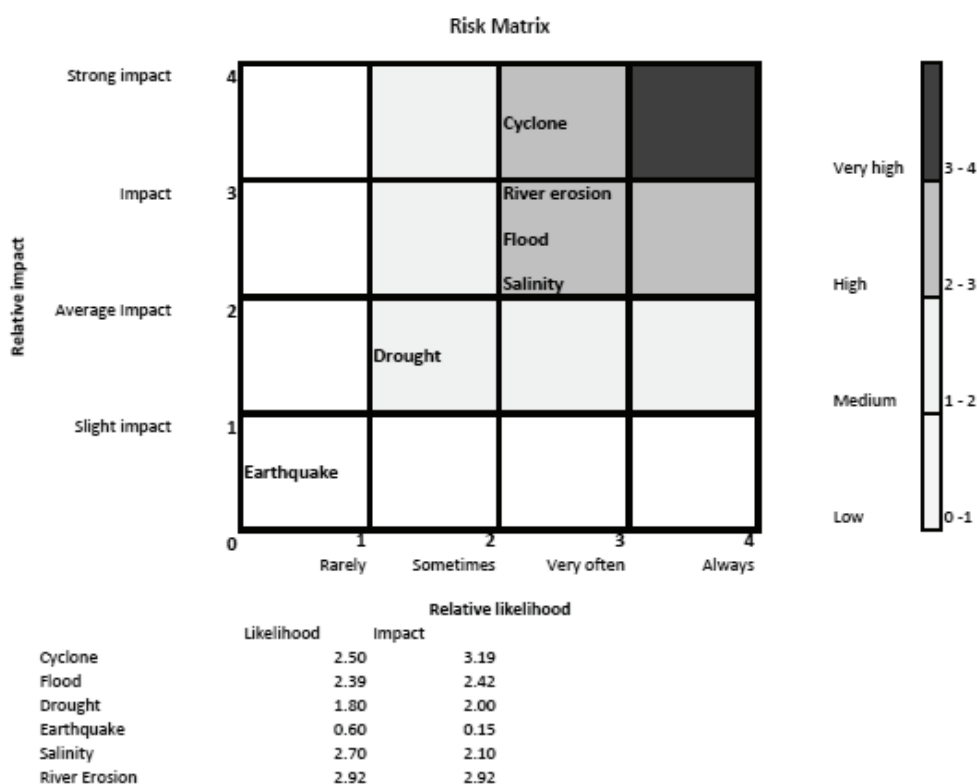
Community identified Cyclones as the main disaster that creates devastating damages and losses to their lives, property and belongings. River erosion, Salinity and Floods were also identified as other disasters that affect socio-economic lives of the community. Identification of river erosion and salinity as hazards that create extensive losses and damages drove the concept of "disasters" towards a new dimension. River erosion and salinity are often neglected in most of the studies and do not attract much international community's attention due to their chronic and gradually developing nature, as opposed rapid devastating events like cyclones. Nevertheless, river erosion and salinity are persistent throughout the year creating enormous damages to human lives (in terms of diseases and health problems), livelihood patters and economy (due to damages to agricultural crops), social issues (due to relocation, etc).

The community vulnerable factors identified from the study include: lack of protective shelter from hazards; cultural factors such as excessive devotion to land and property which the community would not like to leave behind even during disastrous situations; lack of skills for employment other than agriculture and fisheries; isolated and scattered houses and settlement around embankments; poverty; dense population etc.

DRR strategies identified from the study include: construction of all year round cyclone shelters that can be used for other purposes (for schools etc); construction of structurally sound embankments; proper maintenance of cyclone shelters and embankments; locating cyclone shelters in less vulnerable locations; developing safe access routes towards evacuation shelters; pproviding timely warning to at-risk communities via mobile phones; providing training and education on hazards with particular reference to warning systems; and empowerment of women.

## Main findings

### *Hazard and vulnerability of the community in Patuakhali region*



### *Existing risk reduction strategies in Patuakhali region*

- Communities were aware of existing risk reduction strategies
- People felt insecure, when structural protection is not in place
- Existing risk reduction strategies mentioned included Cyclone shelters, River and coastal embankments, Houses constructed with raised floor levels, Early warning system, Training on disasters, how to respond, how to communicate, communication equipments, first-aid etc

### *Local community requirements – Structural and infrastructure*

- Cyclone shelters; multi-purpose, user-friendly and near to local communities (Number of cyclone shelters, proximity inadequate, Better maintenance; Multi-purpose shelters; e.g. school building, community centres; People, especially women, to be made comfortable with using the shelters);
- River and coastal embankments (Structurally sound embankments, proper maintenance, repair and reinstatement; Height and coverage; In some places people live outside the embankment (e.g. NGO housing project outside the embankment); Negative impacts of embankments (water logging, flooding in other places, etc);
- Road infrastructure (Better access to cyclone shelters; General road conditions to and from at risk communities; for ease of evacuation and receive timely warning);
- Permanent houses (Financial assistance);
- Potable water supply (Salinity is a major problem; Drought conditions; Reduced crop production);

- Early warning (Warnings to be provided early (currently provided at the last minute);
- Training and education (How to respond to disaster warning, what to do in a disaster situation; Communication equipments, training on how to use communication equipment)
- Empowerment of women and local communities

Community based DRR methods such as the method used in this study attracts a lot of attention as such methods lead to the identification of exact needs of the affected community rather than trying to implement and enforce exogenous policies and practices. Throughout the study, a proactive community engagement was identified as the research approach empowered the community in taking a leading role in identifying, evaluating and influencing the DRR strategies that would protect themselves from disasters. Due to this reason, outcome of such community driven initiatives in developing DRR strategies are said to be supported by the community, leaving behind any social tension that can be developed between community and policy makers damaging effective DRR activities.

### Anticipated impact

Proactive and systematic engagement with communities in DRR and climate change adaption planning is highlighted as such engagement widens the understanding of communities about DRR measures. Strategies that are developed with community engagement ensure they address livelihood patters, requirements and cultural values of the community. Accordingly, one of the main impacts will be the proper identification of disaster risk and response strategies including:

- 1) Increased awareness and preparedness of local community and authorities towards disaster risk and responses
- 2) Recommendations based on the disaster risk and response planning will influence the policy makers in Patuakhali and Bangladesh
- 3) Findings of this study (based on Patuakhali) can be generalised in the long term to Bangladesh as a whole for better DRR and climate change adaptation
- 4) Capacity enhancement of partner HEIs through development of knowledge, competencies, professional skills, research capabilities
- 5) Curriculum development at partner HEI to provide knowledge base for disaster management and climate change adaption
- 6) Facilitating and building effective and sustainable partnerships based on research and teaching agendas further contributing towards strengthening the UK - Central & South Asia links.

### Summary of project impacts for:

#### *Students*

- Knowledge and experience in facilitating community consultation activities, policy maker discussions in a developing country perspective.
- Enhanced knowledge in DRR strategies in the region.
- Experience of working in an international research context, involving partners from Bangladesh.
- Knowledge exchange with project partners from the Patuakhali Science and Technology University.

In addition, a number of seminars and workshops were conducted by the members of the Salford research team, for the benefit of undergraduate and postgraduate students of the partner

university in Bangladesh, as part of the staff exchange programme under the project. Benefits of these include;

- Knowledge and awareness of disaster risk reduction from a developed country perspective.
- Dissemination of knowledge generated in the project among the students.
- Increased awareness of research methodological issues.

#### *Community*

- Proactive and systematic engagement with communities in DRR and climate change adaptation planning increased awareness and preparedness of local community and authorities towards disaster risk and responses.
- Evaluation of benefits and shortcomings of existing DRR strategies and future requirements of the community influenced local authority in developing appropriate DRR measures within the Patuakhali region.

Findings of the study led NGOs and local authority to further develop education and training facilities particularly at the grass root level and at within education institutions.

#### *University*

- Curriculum development at partner higher education institutions to provide knowledge base for disaster management and climate change adaptation
- Facilitating and building effective and sustainable partnerships based on research and teaching agendas further contributing towards strengthening the UK - Central & South Asia links

#### *Capacity Building*

The International Conference on Building Resilience 2013 incorporates a key programme of training for disaster management personnel from the PSTU region. This programme is led by Dr Udayangani Kulatunga in close collaboration with PSTU in Bangladesh. and also include activities such as:

- Curriculum development and update at both Salford and Patuakhali
- Staff development activities
- Joint publications initiatives
- Collaborative research bidding activities

#### Project team

##### *University of Salford*

Dr Udayangani Kulatunga (Lead)  
Professor Dilanthi Amaratunga  
Professor Richard Haigh  
David Baldry

##### *Patuakhali Science and Technology University (PSTU)*

Professor A.K.M. Mostafa Zaman  
Dr A.K.M. Abdul Ahad Biswas  
Ahmed Parvez  
Md. Nurul Amin  
Md. Shamsuzzoha

The CEREBELLA project is funded by the British Council's INSPIRE strategic partnership.

## Conflict Prevention through Infrastructure Reconstruction

Conflict Prevention through Infrastructure Reconstruction was a one-year programme of research and capacity building that sought to explore the interaction between youth and infrastructure reconstruction programmes in the North and East of Sri Lanka as a means to prevent future conflict in the region.

### Background

While war in the N&E of Sri Lanka has ended, peace, especially sustainable peace, is not so easily forthcoming. Post-conflict reconstruction supports the transition from conflict to peace through the rebuilding of the socio-economic framework of the society. However, there is a need to pay special attention to conflict dynamics that may arise through development work.

Sri Lanka has suffered terribly as a result of ethnic war; 30% of the territory and 15% of the population were devastated by the clashes between the government's armed forces and the Liberation Tigers of Tamil Eelam (LTTE). In 2009, Sri Lanka was at the lead of populations displaced – as a proportion of population – in the South Asian region. Interest in helping to support a lasting resolution to the Sri Lanka conflict has led some to focus efforts on strengthening incentives for peace and reconciliation, including encouraging conflict sensitive approaches and supporting post conflict recovery & reconstruction. Physical infrastructure – broadly defined to include services that are essential ingredients to quality of life and economic activity – has the potential to connect or divide communities. Reconstructing physical infrastructure after a war can help in the peace building process through restoring dignity, providing much needed employment opportunity and promoting conflict sensitive approaches. Any physical reconstruction needs to be tailored to the needs of the affected people, including diverse ethnic groups. Precautions need to be taken to avoid repeating mistakes that occurred during post tsunami reconstruction efforts – lack of consideration of ethnic co-existence and taking steps to avoid any future potential conflicts among the communities. Conflict also tends to deepen gender discrimination and disadvantages faced by women. Similarly, young people, who have been born into and often participated in the war, must overcome persisting inequalities and differential access to opportunities, while the elderly face challenging economic constraints and often require special care.

There is growing recognition that reconstruction requires inter-disciplinary solutions; those professions traditionally involved in reconstruction of infrastructure – the construction industry – must understand the sensitive environment in which they will be operating. Successful transitions to peace require a comprehensive approach and development assistance will play a key role in this process. However, a "mechanical-materialist approach" to reconstruction is incomplete and inadequate insofar as it neglects the dimension of human relationships. Understanding the needs of those living in the region will be vital if reconstruction is to help prevent future conflict.

In summary, persisting inequalities – vertical and horizontal – and differential access to opportunities can increase social tension and may lead back to conflict. Reconstruction programmes must be sensitive to the varying needs of different groups, while also addressing inequalities in access to infrastructure. Infrastructure that connects rather than divides different constituencies must also be identified and prioritised. In order to achieve this, there is a need to explore how different constituents affect the post-conflict reconstruction process, and how development interventions, and cultural contexts may change that role.

### Methodology

It is against this background that the Conflict Prevention through Infrastructure Reconstruction project was initiated. The project is part of a longer term study into the relationship between physical infrastructure reconstruction programmes and social cohesion among conflict affected people in the North and East of Sri Lanka. This phase of the study aimed to provide an insight into

the critical components of adequate infrastructure and to establish how local people are currently engaged in the reconstruction process.

The project was funded by the UK Foreign and Commonwealth Office through the British High Commission in Colombo. It was implemented by an international partnership of UK and Sri Lankan Higher Education Institutions and Sri Lankan Construction Professionals. The University of Salford's Centre for Disaster Resilience worked in partnership with the Social Policy and Analysis Research Centre, University of Colombo; the Department of Sociology, Eastern University; the Department of Sociology, University of Jaffna; and, the Chamber of Construction Industry Sri Lanka. Consequently, the project was able to draw upon a team of academics and professionals who represented the built environment, sociology and archaeology disciplines. The partnership also benefited from having partners who were based in the conflict affected regions of Sri Lanka, where much of the fieldwork was undertaken.

The study used grounded theory with the goal of establishing the relationship between physical infrastructure reconstruction programmes in post-conflict environments and social cohesion among conflict affected people in the region. Empirical data was from districts in the N&E provinces of Sri Lanka. Grounded theory was selected as the situation in these districts was still sensitive. Society was only recently emerging from conflict and therefore it was important not to go with pre-conceived ideas; some conventional theories and concepts may not have been applicable. Semi-structured interviews and focus groups were conducted with community leaders within the target provinces, and with representatives from government, construction industry actors, and local and international NGOs. These were used to gain an insight on what the critical components are in adequate infrastructure, and how local people were engaged in the reconstruction process. Interview and focus group protocols were jointly developed by academics from the fields of built environment, sociology and development. Analysis involved use of a defined coding paradigm to examine causal conditions, phenomena context, intervening conditions, action strategies and consequences in the data. Towards the end of the project and in order to raise awareness of the project findings, a series of seminar events and meetings was held with key stakeholders, including central & local government and the construction industry.

## Research results

A majority of the projects studied were donor funded and state agencies were responsible for implementation. Typically, contractors came from outside the region; they often had their own supplies and workers brought from outside the host community. Many local people felt that they did not have opportunity to engage in construction work, and gain experience and economic benefits from this activity.

In many situations, the beneficiaries belonged to diverse communities with a history of inter-community conflict and tension. The projects had not been planned in such a way as to reduce such conflicts and tensions. Indeed, some projects have reinforced them, rather than reducing them and this was evident in both the North and East. Comparative analysis revealed an improved understanding of how infrastructure reconstruction programmes affect social cohesion, including concerns in infrastructure development surrounding: marginalisation of beneficiaries; segregated infrastructure that reinforces divisions; inadequate consultation with target population; and, a lack of economic opportunities for local people despite large-scale construction activity.

It was apparent that much of the physical infrastructure development has been doing little to strengthen relations among communities. Indeed, it is sometimes exacerbating existing tensions or creating new tensions. Much of the infrastructure development is externally driven and there is inadequate consultation with affected and often vulnerable groups. The resultant infrastructure does not meet the needs of marginalised groups, and can create or heighten tensions within and/or among ethnic / religious groups. Although the reconstruction activity has the potential to contribute to and stimulate the local economy, many local people and small construction firms feel excluded from the construction process and its benefits. They are unable to benefit through jobs



and market access. They also believe that the large overseas or 'external' contractors that are undertaking much of the work in current projects are unfamiliar with and/or unsympathetic to local cultural needs.

In order to increase the likelihood that these findings will be used in practice, an impact plan was written by the research team. Target groups of the project – including key stakeholders and decision makers involved or affected by the reconstruction process – were identified and engaged at an early stage with a view to raising awareness and understanding of how infrastructure can connect and divide communities. This early engagement was intended to contextualise the findings, but also increase the likelihood of the project achieving a tangible impact upon on identified target groups and beneficiaries through obtaining support for sustainable implementation of post-conflict recovery and rehabilitation practices. The impact plan included a clear set of activities that promoted collaboration with a variety of stakeholders throughout the life of the project, rather than merely through dissemination at the end of the project. These activities included stakeholder engagement workshops, non-technical summaries, and direct interaction of the research team with the beneficiaries in local languages. Some other policy influences that are envisaged include the shift of attention among certain government policies: to use much needed infrastructure reconstruction projects as a basis to promote inter-ethnic co-existence among conflict-affected communities. With this goal in mind, a policy briefing was written and communicated to key stakeholders in order to raise awareness of the project findings.

### Conclusion and future work

The project has contributed to the capacity development of local stakeholders to deliver conflict sensitive infrastructure reconstruction programmes within the North and East of Sri Lanka, and thereby will help to prevent future conflict in the region. Engagement of key stakeholders through this project has helped to highlight the concerns, opportunities and challenges among them, but it also suggests that there remains inadequate understanding or monitoring of the socio-economic impact of infrastructure projects. From the results of this study, it is apparent that much of the current physical infrastructure development is doing little to strengthen relations among communities. As such, the scale of the problem is larger than originally understood and there remains an urgent need to further sensitise key stakeholders regarding the principles of socially inclusive and equitable infrastructure development, including donors, national and local authorities, and contractors. There is also a need to develop and institutionalise grievance redress mechanisms for marginalised and vulnerable groups such as ex-combatants, youth, women and disabled, and to monitor and evaluate the social and economic impact of infrastructure development. Finally, there is a clear need to increase market access for the North and East construction industry, including local entrepreneurs and labour.

### Further information

For further information, please contact: Professor Richard Haigh, Principal Investigator, Centre for Disaster Resilience, School of the Built Environment, University of Salford, Salford, Greater Manchester, M5 4WT, UK, E: [r.p.haigh@salford.ac.uk](mailto:r.p.haigh@salford.ac.uk),

Funded by



Foreign &  
Commonwealth  
Office





## Awards

Awards for the Conference are generously donated by Emerald Publishing Limited:

- Best Paper Award sponsored by the International Journal of Disaster Resilience in the Built Environment
- Two Commendation Awards sponsored by the International Journal of Disaster Resilience in the Built Environment

Awards will be presented during the closing ceremony.

## Special Issue of the International Journal of Disaster Resilience in the Built Environment

Authors of selected papers will be invited to submit extended versions of their papers for inclusion in a special issue of the International Journal of Disaster Resilience in the Built Environment. Papers will be short-listed on the recommendation of the International Scientific Committee. The Journal's Editors will then be invited to select invitees for the Special Issue. Further details will be announced at the Conference.



## General Information

### Host country

Sri Lanka is an island situated in the Indian Ocean, at the base of the Indian Sub-Continent, 880 km north of the equator. It is a multi-ethnic, multi-religious country with a diverse and rich culture. It has also been subject to several large scale disasters in recent years, including the 2004 Indian Ocean Tsunami and a civil war spanning several decades. As such, it provides an ideal setting to explore the challenge of creating resilient communities and cities.

*Geography:* Sri Lanka (formerly known as Ceylon) is about half the size of England and lies close to the southern tip of India and near the equator. From the coast, the land rises to a central massif more than 1500 m above sea level. The climate is hot and humid - monsoon from May to September and the north-east monsoon from November to March: rainfall, particularly in the south-west, is heavy.

Sri Lanka was severely affected by the tsunami on 26 December 2004, which killed some 40,000 people and displaced 400 – 500 thousand people along two thirds of the north-east, south and south-west coastline. Half the fishing fleet was destroyed, and a quarter of hotels in the affected areas sustained serious damage.

*Government:* Unicameral Parliament with Executive presidency

*Area:* 25,332 sq miles (65,610 sq km)

*Population:* (2006 est.): 20,222,240 (growth rate: 0.8%); birth rate: 15.5/1000; infant mortality rate: 14.0/1000; life expectancy: 73.4; density per sq mi: 809

*Commercial Capital and largest city (2003 est.):* Colombo

*Legislative and judicial capital:* Sri Jayawardenepura Kotte

*Main exports:* Clothing and textiles, tea, gems, rubber, coconuts

*Languages:* Sinhala 74% (official and national), Tamil 18% (national), other 8%; English is widely spoken and is studied as a compulsory secondary language in school.

*People:* 73.94% Sinhalese, 12.7% Tamil, 7.1% Muslim, 5.5% Hill Tamil, and 1.5% other

*Languages:* Sinhalese, Tamil, English

*Religion(s):* Buddhist (69.3%); Hindu (15.5%); Muslim (7.5%); Christianity (6.9%), other (0.8%)

*Currency:* Rupee, divided into 100 cents

*Literacy rate:* 92% (2003 est.) The highest in South Asia and second highest in Asia.

*Member of Commonwealth of Nations*

*Climate:* Sri Lanka has a pleasant tropical climate: the average temperature of the low lands ranges between 25-30 degrees Celsius.

*GDP:* Sri Lanka's Per Capita GDP is presently US \$1,160 (World Bank, 2006) - the highest in South Asia

### History and Culture

Sri Lanka History is incident full. Being an important trade port and oasis of Nature for sea farers of China, Arabia and Europe of the ancient times. Sri Lanka has a fascinating documented history over 2500 years of Civilization. The most valuable source of knowledge for the legends and historical heritage of Sri Lanka is the Mahavamsa (Great Genealogy or Dynasty), a chronicle compiled in Pali, in the sixth century.

## Special Features

Sri Lanka is one of the first five gem bearing countries in the world (Other four gem bearing countries are Brazil, Myanmar, South Africa and Thailand) The principle gems of Sri Lanka are rubies and sapphires while alexandrite, though not so profuse, is found only in Sri Lanka and in the ural mountains of the former Soviet Union.

## December 2004 Tsunami

Sri Lanka is one of the worst affected countries from the recent Asian Tsunami disaster. At least 40,000 people are known to have died, and thousands more are still missing. The number of homeless people is put at between 800,000 and 1,000,000, from a population of nineteen million. Apart from these direct impacts, the recent Tsunami has influenced the normal lifestyle of the Sri Lankan community through the discontinuance of several livelihoods such as fishing, farming, tourism and handicrafts-related activities. Major infrastructure and facilities have also been destroyed or disrupted, including public and commercial transport services, electricity and water supplies, drainage and sewerage facilities, telecommunication services, and schools. Even though the immediate priorities of the post-Tsunami recovery activities were centred on the provision of basic requirements such as food, shelter and medicines to affected communities, the necessity to recreate public and commercial facilities destroyed during the disaster cannot be ignored when considering long term recovery measures.

Like other affected countries, post-Tsunami rehabilitation in Sri Lanka is operating in a difficult context; among the most important factors is the pre-existence of very high densities of unplanned settlements in the Southern part of Sri Lanka with the majority of construction not observing some of the critical building standards. To add to this, the post-Tsunami rehabilitation operation has been affected due to weak local government institutions with poor response capacities to address the needs of such a magnitude. This is mainly because, before the Tsunami, Sri Lanka was known to be a safe haven where outrages of nature scarcely occurred except for occasional floods and landslides during the rainy seasons.

The responsibility for building capacity in accordance with the latest requirements largely resides within the HE institutions in Sri Lanka. In order to achieve the desired capacity and the expertise for public and commercial facilities re-creation and long term maintenance, teaching, training and research will have to be strengthened. Sri Lankan Institutions who act as joint hosts are located within the Tsunami affected regions.

## Sri Lankan Civil War

Conflict has featured significantly in Sri Lanka's recent history and social development, most recently in the North and East of the country. 30% of the territory and 15% of the population have been devastated by the conflict-related violence caused by the clashes between the government's armed forces and the Liberation Tigers of Tamil Eelam (LTTE). While the war came to an end with the military defeat of the LTTE in May 2009, over 100,000 are estimated to have been killed and over a million displaced. Income levels and human development indicators for these areas are among the lowest in Sri Lanka. The needs assessment document of the government estimates poverty in the Northern Province to be 37%, compared to a national average of 15%.

In Sri Lanka, infrastructure has suffered from damage and neglect during the war and an absence of new investment. The vital role of infrastructure in serving human endeavours means that when elements of it are damaged or destroyed, the ability of society to function – economically and socially – is severely disrupted. Yet, with the cessation of violence, these areas are attracting new populations who are now forced to live without basic services and facilities, exposing themselves, particularly women and children, to health hazards and unhygienic circumstances. Due to migration, displacement and mistrust, communities need to be rebuilt physically, socially and economically. Economic infrastructure is an enabler to economic growth and a prerequisite for social infrastructure. Relative deprivation of basic physical infrastructures is another dimension of

human poverty faced by the North and East populace. Whilst 56% of households in Sri Lanka have electricity, only 30% in the North and East do. The reconstruction of damaged and inadequate physical infrastructure will be essential to reduce poverty and sustain long term conflict transformation in the region. Physical infrastructure has the potential to connect or divide. Peace and development are inter-related, and in war-torn societies a lasting peace is considered inconceivable without addressing the problem of reintegration of people dislocated by war and insecurity. Reconstructing physical infrastructure after a war can help in the peace building process through restoring dignity and promoting conflict sensitive approaches.

## Conference venue

The conference venue is Heritance Ahungalla Hotel in Sri Lanka.

Occupying a most unique site near the Southern city of Galle, the Geoffrey Bawa designed Heitance Ahungalla is surrounded by best beaches, lakes and forests, and is home to a variety of indigenous birds and wildlife.

Geoffrey Bawa is Sri Lanka's most prolific and influential architect. His work has had tremendous impact upon architecture throughout Asia and is unanimously acclaimed by connoisseurs of architecture worldwide. Highly personal in his approach, evoking the pleasures of the senses that go hand in hand with the climate, landscape, and culture of ancient Ceylon, Bawa brings together an appreciation of the Western humanist tradition in architecture with needs and lifestyles of his own country. Although Bawa came to practice at the age of 38, his buildings over the last 25 or more years are widely acclaimed in Sri Lanka. The intense devotion he brings to composing his architecture in an intimate relationship with nature is witnessed by his attention to landscape and vegetation, the crucial setting for his architecture. His sensitivity to environment is reflected in his careful attention to the sequencing of space, the creation of vistas, courtyards, and walkways, the use of materials and treatment of details.

An early creation of Bawa which was completed in 1981, Heritance Ahungalla is situated on the south coast just minutes away from the historic city of Galle. The hotel is approached through a long stretch of roadway off the main Galle Road, which provides for a dramatic entrance with views across the infinity pool edging the sea. The main areas on the ground as well as upper floors are designed as linked open pavilions - all with continuous views of the sea. Bawa uses his signature architectural style that erases boundaries between the 'outside' and 'inside', resulting in plenty of access to the natural elements - the tropical sun, ocean breeze, lush greenery and flowing water. Heritance Ahungalla offers a unique experience to its guests and stands as the remarkable achievement of a seventy-five-year old architect and his team of youthful assistants



# ABSTRACTS



## Book of Abstracts

## Introduction

This section contains the abstracts of papers submitted to, double blind peer refereed and accepted for the International Conference on Building Resilience 2013.

In addition to welcoming the more traditional research paper, the International Conference on Building Resilience also invited the submission of abstracts for practice notes and case studies, particularly from Policy Makers and Practitioners who operate in related fields. Authors of accepted practice notes and case studies were invited to present the detail of their abstracts at the Conference.

The book includes 83 abstracts by scholars, policy makers and practitioners around the world. The full papers are available on an accompanying USB drive.

An index of authors is provided at the end of the book.

## Book of Abstracts

## Role of social protection in disaster management in Sri Lanka

*Wickramasinghe, K., Institute of Policy Studies of Sri Lanka, Sri Lanka, kanchana@ips.lk*

Sri Lanka has witnessed a striking increase in both the frequency and intensity of natural disasters over the last few decades. The natural disasters have caused human, physical, financial and environmental losses and thereby brought substantial impacts on the economy of Sri Lanka. The impacts of natural disasters are not homogenous across various segments of the society. The distribution of impacts depends on the degree of physical vulnerability of a particular region to natural disasters and the socio-economic vulnerability. The poor, especially those who are dependent on natural resources for their livelihoods, such as farmers and fishermen are highly vulnerable to the negative impacts of natural disasters. Given the significant economic costs of natural disasters, disaster management issues have received a high policy priority. Apart from reducing the physical vulnerability of the population, social protection systems do have an important complementary role in minimizing the effects of natural disasters. Sri Lanka is well-known to have an extensive social protection system. However, the degree to which the present system provides protection against natural disasters remains unexplored. Thus the present paper intends, to assess the degree of protection provided by the present social protection system against natural disasters, to identify gaps in doing so, and thereby to provide suitable implications to strengthen the system.

The study reveals that the social protection provided by the present system in Sri Lanka is not adequate to address the socio-economic vulnerability due to external shocks created by natural disasters. The whole disaster related socio-economic measures in place are highly skewed towards immediate relief, where long term economic well-being of the disaster vulnerable groups has received minor attention. The disaster insurance schemes are also not properly developed and the existing crop insurance schemes show a low coverage. Microfinance services also do not adequately respond to the needs of the disaster vulnerable groups. The study recommends the need for making reforms in the existing schemes and instruments, thereby to provide better protection against natural disasters, without introducing new measures and increasing the complexity of the system.

**Keywords:** social protection, natural disasters, poverty, vulnerability, Sri Lanka

**ID:** 324

## Civilizational transformation and conscious evolution

*Dhas, N., University of Peradeniya, Sri Lanka, mentor@slt.lk*

This paper seeks to demonstrate that given current trends towards the collapse of civilization and the Extinction of the human species and possibly all earthlife as is known, seeking to ensure individual survival for the entire human population is not credible while ensuring the survival of the species may be possible. It therefore explores transformative processes that may be required in order to manage the collapse of the currently global civilization of the human species, ensure the survival of numbers of human individuals sufficient and equipped to preserve the cultural, technological and perceptual knowledge that has been generated and generate a non toxic, less resource intensive, more sustainable, objective based and hence more credible civilization that is positioned in ways and in locations that minimize exposure to the hazards being generated.

It maintains that the initiation of these processes need involve only those few who perceive processes and who by virtue of this ability possibly indicate a process of speciation in progress and hence may proceed without disturbing the current context where the majority of the species rigidly, insistently, repressively and violently demands the continuance of the currently global civilization based on the Growth Model of Development and its commitment to the incredible project of generating and sustaining a projected human population of ten billion individuals which project promises the collapse of civilization and the extinction of the human species and earthlife as we know it and yet continues to enjoy the commitment of most human individuals and continues to be taught to their offspring as well.

**Keywords:** perception, potential, process, system, transformation

**ID:** 325

## Integrating disaster risk reduction in the community development projects

*Salerto, I., Fida International, Finland, isalerto@gmail.com*

The purpose of this paper is to clarify how Non Governmental Organizations (NGO), Civil Society Organizations (CSO) and Community Based Organizations (CBO) link the issue of the disaster risk reduction (DRR). There is an approach to integrate the disasters risks management and the adaptation measures to the development plans. NGOs have adapted the procedures of the analyses for their development programs to find out needed actions to determine each target location's possible hazards. The risk analyses and vulnerabilities' mapping, topographical and people's group based facts is used by development offices to design the developing programs according to local needs and requirements. Sustainability and participation is ensured using local resources and management structures as a key to determining of solutions for adaptation and mitigation measures. The aim is to build the resilience to face increased number of climate related disasters and long-term changes in weather patterns that affect people's lives and livelihoods. The work of NGO cooperation is used as a case to see the implementation steps for the communities to be able to understand the disaster history, intensity, damage caused by the occurred disasters and defining the responses to adapt to the situation and further mitigate the destruction intensity and save lives if hazardous event takes place in the vicinity.

**Keywords:** civil society, disaster, risk, reduction, response, adaptation, mitigation, resilience

**ID:** 328

## A Public-Private-People Partnership (4P) approach for post-disaster reconstruction – with a case study of the post-earthquake reconstruction in Sichuan, China

*Zhang, J., Hong Kong, jqzhang1230@gmail.com*

*Kumaraswamy, M., Hong Kong, mohan@hku.hk*

An 8.0 Richter scale earthquake struck Sichuan Province, China on May 12, 2008, resulting in over 69,000 deaths, over 18,000 missing and over 845 billion RMB (Renminbi) of direct economic losses. To explore innovative procurement methods and solutions for better post-disaster reconstruction, a case study was conducted from 2011 to 2012 to investigate a specific Sichuan reconstruction project, namely Project Mingde, along with a parallel interview survey of 13 participants from diverse sectors and professions. This helped explore Sichuan reconstruction from the following perspectives: reconstruction strategies, performance levels, outstanding features and pitfalls, as well as relevant roles played by Non-Governmental Organizations (NGOs) and the communities. They were illustrated through comparison studies of a typical paired assistant project – which is the most widely applied reconstruction mechanism in Sichuan reconstruction, a Hong Kong government supported project and an NGO-support project. Another comparison of four NGO involved projects served to further probe into NGOs' role in post-disaster reconstruction. Related questions were developed and explored in parallel, through a worldwide questionnaire survey on reconstruction performance. The results suggest that the reconstruction modalities have great potential to be improved for future vulnerability reduction, economic growth and sustainable development. These exercises also highlighted the needs for more innovative and effective procurement strategies in reconstruction, to achieve such goals. To address the above, a Public-Private-People Partnership (4P) approach is developed based on Public Private Partnership (PPP), targeting better value for money and more sustainable infrastructure reconstruction. "People" are proposed to be integrated into PPP through a formal and long-term partnership, which include local communities, NGOs, professional organizations, academia and media. Seven interviews and another questionnaire survey were conducted with PPP academia and practitioners to validate the 4P philosophy, establish 4P mechanism and further develop the 4P framework. This 4P approach was validated through a focus group meeting, which suggested that 4P has great potential to deliver more sustainable infrastructure in reconstruction scenarios, while also providing pointers for broader and more fruitful partnerships between public, private and people in other scenarios.

**Keywords:** public private partnership, 4P, Sichuan reconstruction, sustainable infrastructure reconstruction

**ID:** 329

## Leave or not? Coping with new stresses and risks of forced relocation: Lessons learnt from the Green Village Relocation settlement Galle, Sri Lanka

*Fernando, N., SPARC, University of Colombo, Sri Lanka,*

The decision taken to impose the buffer zone regulation after the 2004 tsunami to minimize fatalities and damages to properties in future tsunamis and other coastal hazards in turn forced tsunami displaced families who lived in the buffer zone before to settle down in new settlements far from their previous place of residence which were mainly built on the government provided land by various donors. Most of the displaced families wanted to live somewhere closer to their previous settlement although not in the buffer zone due to their past experience. However, most of the displaced families in the Galle city area was forcedly relocated into new settlements in Akmeemana Divisional Secretary Division (DS) which is 10-15 km far away from the city.

By giving the above background this paper explores the present situation of a relocated settlement which categorized as one of the best settlements in the Southern Province nearly six years after relocation and eight years after tsunami, 2004. Findings of this study will shed more light to the disaster induced displacement and relocation studies on one hand and assist the planners, designers, and implementers of such relocation settlements how to minimize negative impacts of such relocation not only in the planning stage but also soon after implementation on the other hand. The findings from the interviews with a sample of relocatees in the Green Village, in addition to the interviews conducted with the government and other Community based Officials confirmed that most of the original relocatees have left the new settlement due to the distance to the city, transport difficulties and lack of water although donors provided quality housing with enough space with other common resources to the location even with a community driven water project. This shows the sign of failure of disasters induced relocation.

**Keywords:** forced relocation, planned settlements, vulnerability, relocation failure, tsunami, coastal hazards.

**ID:** 330



## Building design requirements for immediate relief after disaster through collaborative actions

*Barbosa, L., FAU USP, Brazil, larabarbosa@hotmail.com*

Community participation when designing buildings for disaster relief situations is important for strategic reasons. While designers need to know the real requirements for carrying out their project, residents want a solution to their serious problems. This paper introduces the initial results of ongoing research that aims to propose shelters and temporary equipment during the rehabilitation phase that immediately follows disasters in Brazil. Our goals are to collaborate in order to diagnose, distinguish and classify design requirements, using the requests made by a group of people whose lives are periodically affected by floods.

The results come from two collaborative workshops carried out by Center for Habitat without Borders- NOAH in the city of Eldorado, Brazil, and that involve local government officials, researchers and residents who were left homeless and displaced by previous floods. Based on discussions with collaborative groups, this article outlines challenges in mediating several stakeholders, details project requirements and discusses resilience and sustainable development in the context of a community in need that is periodically affected by floods.

**Keywords:** collaborative groups, community participation, design requirements, displaced by floods, shelter after disaster

**ID:** 334

## Does post-disaster reconstruction trigger social transformations? Continuity and change in settlement patterns and housing processes in relocated villages in Maharashtra and Gujarat following the earthquakes of 1993 and 2001

*Duyne Barenstein, J. E., World Habitat Research Centre, University of Applied Sciences of Southern Switzerland, Switzerland, jennifer.duyne@supsi.ch*

The close links between social organization and the built environment have been recognized by social scientists, environmental psychologists, geographers, architects and planners for several decades. However, people do not always have control over the construction of their houses and settlements. In the aftermath of a disaster, for example, building processes are often taken over by external agencies whose approach towards reconstruction is governed by considerations such as safety, efficiency, cost-effectiveness and in some cases also by an explicit will to trigger social transformation. As a result reconstruction following disasters often entails dramatic changes in settlement location and morphologies, housing designs, building materials and construction processes. Based on an ongoing three years research project focusing on communities' long-term patterns of adaptation to post-disaster relocated settlements in Maharashtra and Gujarat the proposed paper will examine people's strategies to gain control over the socio-spatial organization of their new villages, and to transform their agency-built houses in culturally meaningful spaces. The paper will show that people are neither passive recipients nor passive victims of external agencies' project and that they have the capacity to transform externally imposed notions of appropriate housing and village organization to meet their culturally and livelihood specific needs. Based on empirical evidence it will be argued that underestimating communities capacity to rebuild their own houses and villages and the failure to recognise the inherent functionality of local housing and building practices often entails not only missing the opportunity to enhance their resilience but in some cases even may even lead to increasing their vulnerability.

**Keywords:** post-disaster reconstruction, resettlement, housing culture, housing transformations, livelihoods, social change

**ID:** 335

## Influence of strategic decision making on transport corridor planning, transport infrastructure and community resilience

*Withanaarachchi, J., RMIT, Australia, jayanthaw@geelongcity.vic.gov.au*

The frequencies of occurrences of natural disasters have increased and are getting noticed by many due to the impact on economy, society and the environment. Transport corridor planning and decision making contributes towards community and resilience of transport systems. Decisions on transport networks have an impact on society, economy; environment, travel patterns, reliability and performance of transport networks. Decisions taken to limit transport infrastructure often affect the performance of transport networks and critical infrastructure systems during disasters and during periods of peak demand.

Transport decision making on transport corridors identify to what grade the road network should be designed and constructed to provide connectivity between cities, improve efficiency, provide safety to communities and network reliability to all road users. Most of the time influence of environmental disasters on transport infrastructure is overlooked during the planning stages. This paper will examine the effect of decisions made at transport corridor planning stages on the transport infrastructure as well as community resilience through analysis of a case study. A framework to evaluate the risk of resilience of transport infrastructure will be presented. Through the analysis of the case studies, gaps in transport corridor planning are identified and strategies to address these are presented.

**Keywords:** community resilience, transport planning, sustainable transport infrastructure, decision making

**ID:** 337

## Surrogate indicators for assessing community resilience

*Ziyath, A. M., University of Peradeniya, Sri Lanka, mohamed.ziyath@qut.edu.au*

*Teo, M., Queensland University of Technology, Australia, melissa.teo@qut.edu.au*

*Goonetilleke, A., Queensland University of Technology, Australia, a.goonetilleke@qut.edu.au*

The importance of community resilience to natural disasters is being increasingly recognised. This paper presents an approach for the development of surrogate indicators for comprehensive assessment of community resilience, which is crucial in the context of predicted increase of natural disasters resulting from extreme weather events due to climate change. The use of surrogate indicators is advocated because a comprehensive assessment of community resilience across various thematic areas and associated key areas requires the measurement of a large number of resilience indicators which is not always feasible due to time and resource constraints. To overcome this, researchers tend to use secondary data sources, which are easily available but not always reliable. This highlights the need for surrogate indicators that are easy to measure from reliable primary data sources and are adequate to capture the resilience of a community.

Firstly, the paper discusses the two approaches to defining and conceptualising community resilience and the need to account for the complex interrelationships between thematic areas, key areas and resilience indicators and their implications for research. Secondly, a comprehensive framework for the assessment of community resilience is proposed and the difficulties associated with the measurement of overall resilience of the community are discussed. Thirdly, the paper explains a two-step approach to develop surrogate indicators highlighting the necessity and challenges associated with it. Finally, the proposed approach is elaborated with a simple example for better understanding.

**Keywords:** disaster resilience, surrogate indicators, resilient assessment, resilient attributes, community resilience

**ID:** 338

# The need for and appropriate application of spatial data for disaster management and strengthening community resilience

*Hayes, J., Queensland University of Technology, Australia, jf.hayes@qut.edu.au*  
*Goonetilleke, A., Queensland University of Technology, Australia, a.goonetilleke@qut.edu.au*

It is only in recent years that the critical role that spatial data can play in disaster management and strengthening community resilience has been recognised. The recognition of this importance is singularly evident from the fact that in Australia spatial data is considered as soft infrastructure. In the aftermath of every disaster this importance is being increasingly strengthened with state agencies paying greater attention to ensuring the availability of accurate spatial data based on the lessons learnt. For example, the major flooding in Queensland during the summer of 2011 resulted in a comprehensive review of responsibilities and accountability for the provision of spatial information during such natural disasters. A high level commission of enquiry completed a comprehensive investigation of the 2011 Brisbane flood inundation event and made specific recommendations concerning the collection of and accessibility to spatial information for disaster management and for strengthening community resilience during and after a natural disaster. The lessons learnt and processes implemented were subsequently tested by natural disasters during subsequent years.

This paper provides an overview of the practical implementation of the recommendations of the commission of enquiry. It focuses particularly on the measures adopted by the state agencies with the primary role for managing spatial data and the evolution of this role in Queensland State, Australia. The paper concludes with a review of the development of the role and the increasing importance of spatial data as an infrastructure for disaster planning and management which promotes the strengthening of community resilience.

**Keywords:** community resilience, spatial data, disaster management

**ID:** 339

## Participative strategies in the Neighbourhood Recovery Programme “Quiero Mi Barrio” in Chile: Contributions and key guidelines for Disaster Risk Reduction

*Moreno, J., University of Nottingham, United Kingdom, ldxjamo@nottingham.ac.uk*

This paper examines the participative strategies and the results of the Neighbourhood Recovery Programme “Quiero Mi Barrio” of the Ministry of Housing and Urban Development in two communities of Hualpén City Council, Chile. The objective of this national programme is to improve the quality of life of deprived neighbourhoods through a participative process of recuperation of deteriorated public spaces, involving community members at all stages of the programme, including design, execution and evaluation. The ultimate goal is to strengthen social networks and improve the social and urban integration of neighbourhoods through the implementation of participatory social and infrastructure projects. The main projects carried out by the communities of Hualpén were: construction of parks, street lighting, streets pavements, street greening, playgrounds, multi-purpose sports field and community centres. Neighbours formed a new organization called “The Neighbourhood Development Council” that supervised the physical progress of the works and conducted many social projects including the construction of mural mosaics in public spaces, environmental campaigns and community carnivals. The results of surveys conducted at the end of the programme with community members and control group show that the neighbours increased their social networks, their sense of community belonging and their level of participation and cooperation after concluding the execution of the programme. These findings suggest that participatory neighbourhood programmes that involve community members in all aspects of the programme may contribute to the increase of community resilience in poor neighbourhoods. The participatory design proposed by the “Quiero Mi Barrio” programme can become a useful operational tool for promoting disaster resilience in deprived neighbourhoods and planning disaster risk reduction at the local level.

**Keywords:** neighbourhood recovery programme, participation, community, disaster risk reduction, Chile

**ID:** 344

## Community engagement for sustainable resilient community: A Bangladesh perspective

*Parvez, A., Faculty of Disaster Management Patuakhali Science and Technology University, Bangladesh  
Kulatunga, U., University of Salford, United Kingdom, u.kulatunga@salford.ac.uk*

All over the world especially in the South Asian developing countries, deficiency in community engagement has been identified as a vital constrains for resilience development of the vulnerable society. For natural participation in community activities people need some understanding of his faith on interest of his own and/or his communal group. There are tools of community engagement by which we can defuse such understanding of interest to bring that faith. From the very past of the community activity such tools have been used formally and informally, however in the modern complex society organization based community involving work has to be run with selected set of tools keeping scope of alteration. To select such tools for quick, precise result of the community based work performance, research is needful for the findings/sorting the tools and set their alternatives. This research has been carried out on eight organizations of two districts Barguna and Patuakhali of Bangladesh. The researcher has applied questioner survey method for data collection from the different government and non-government organizations, to measure the effectiveness of the community engagement tools towards community capacity enhancement. The results indicates that for successful community active participation for risk management issues, Dialogue, Meeting, Campaign, Key Informant Interview (KII), Local Leader Discussion, Mixed Group Discussion, Village Disaster Management Committee formation (VDMC), Table Talk Exercise, Village Fair, Safety Point (Gender Item) etc. All the participatory tools has found the significant values depending on place, time and achieving objectives, in particular of the research area. Having all the selective items, community people can establish a paradigm shift from Cumulative Donation Management (relief based) culture to Comprehensive Disaster Management (Risk reduction) culture to have a resilient community.

**Keywords:** community engagement, sustainability, resilient, vulnerable society

**ID:** 348

## A novel approach to assess resiliency of energy systems

*Matzenberger, J., Energy Economics Group, Vienna University of Technology, Austria,  
matzenberger@eeg.tuwien.ac.at*

The scope of this document is to outline different notions of the term resilience used in the scientific literature and explore how the concept of resilience can be applied to energy systems. Thus the major questions to be addressed are: Which definitions and underlying concepts of resilience are used in the scientific literature? How can resilience be defined with respect to energy systems and which underlying principles can be identified?

Different characteristics of the resilience concept used in various contexts are outlined and a methodology for selection of an indicator set for an energy resilience assessment is presented.

Definitions of resilience, vulnerability and adaptability are very much interlinked. A novel framework is proposed to foster the understanding of the interlinkage between these three terms and to cluster indicators to assess energy system resilience. It is argued that resilience can be defined as a function of vulnerability and adaptability, therefore increasing adaptability or reducing vulnerability causes higher system resilience.

**Keywords:** resilience, assessment, energy system, adaptive capacity, vulnerability

**ID:** 349



## Colombo city without floods: Forced relocation of underserve settlers in the city of Colombo as a flood risk reduction strategy - Case of three flood risk reduction projects

*Fernando, N., SPARC, University of Colombo, Sri Lanka*

This paper examines the forced relocation process of three relocation projects (Lunawa Environmental Improvement and Community Development, Colombo City Flood Prevention and Human Environment Development Project and Sustainable Township Program) implemented since 1990's to relocate mainly poor and marginalized families who lived in unauthorized underserved settlements situated in flood prone areas in and around the city of Colombo as a strategy to reduce flood risk on one hand and rebuild their lives on secure locations on the other hand. Based on household surveys carried out in selected research locations in addition to the key informant interviews carried out with relevant government officials and community leaders stressed the need to formulate a proper relocation policy to relocate people live in natural hazards prone areas as some of the studied projects have not guided by proper policy guidelines. As a result, steps that followed to relocate families (pre-relocation phase, soon after relocation and thereafter) differs and found some improvements as well as drawbacks when compare the relocation process of studied relocations. These conditions no doubt led some relocatees to successfully cope with new stresses and risks generated as in the relocation process and some even unsuccessful who were ended up in the trap of poverty or chronic poverty situations which is noteworthy.

For instance, under the Colombo City Flood Prevention and Human Environment Project relocatees received 1 to 2 perch land from the government with Rs, 20,000 in four installments to construct the house in addition to other basic services provided for the settlements in early 1990's compared to the relocatees who received Rs, 424,000 to construct their houses under Lunawa Environmental Improvement and Community Development project which implemented by adhering to the National Involuntary Resettlement policy guidelines in 2001 with the active participation of affected people (participatory relocation). On the other hand, under the Sustainable Township Program relocatees received apartments in a 13 storied apartment complex named Sahaspura. These apartments were within the range of 300 to 600 square feet and the size of the population resettled had serious implications for the management of the scheme, provision of public amenities, social organizations and intra community relationships. However, with these identified issues and problems at Sahaspura complex, Ministry of Defense and Urban Development intend to relocate 70,000 households in the next six years into ten high rise apartment complexes similar to Sahaspura. Relocatees will receive a 450 square feet apartment with individual water and electricity facilities. This relocation project has implemented without addressing the issues and problems occurred in previous projects and less participation of relocatees into the relocation process which shows the unitary planning and implementation approach which considers only the changing of location by providing them a place to stay without addressing other issues and problems emerged after forced relocation. However, the researcher argues that this type of relocation not comes under sustainable relocation and stressed the need to formulate proper policy guidelines to relocate vulnerable communities that live in natural hazards prone areas to make them socially and economically secure after relocation other than making them more vulnerable.

**Keywords:** participatory relocation, flood risk reduction, planned urban relocation settlements, security and vulnerability

**ID:** 350

## Climate change and cultural heritage

*O'Brien, G., Northumbria University, United Kingdom, geoff.obrien@northumbria.ac.uk*

*O'Keefe, P., Northumbria University, United Kingdom, phil.okeefe@northumbria.ac.uk*

*Jayawickrama, J., Northumbria University, United Kingdom, janaka.jayawickrama@northumbria.ac.uk*

*Jigyasu, R., ICOMOS, India, rohit.jigyasu@gmail.com*

Accelerated climate change and increasing variability is the single greatest threat to the international goal of sustainable development. More than half the world's population lives in cities. Many of these are located in areas that are vulnerable to climate driven hazards. Cities represent human progress. There are not simply places we where live and work, they are symbols of the variety and depth of human culture. The loss of cities due to adverse climate events will not only undermine livelihoods, it will also undermine the human spirit. Cities are not just simply economic dormitories; they represent the development of local culture and are symbols of human development. Cultural heritage gives a sense of identity and belonging to citizens. In Europe, it also drives a considerable tourist economy. Climate change presents considerable threats to cultural heritage. This paper evaluates efforts to develop protective measures for cultural heritage by integrating Disaster Risk Reduction and Climate Change Adaptation. It proposes that an iterative approach is needed that builds from a Cultural Heritage Knowledge Base. This base brings together a range of expertise that can consider iterative steps to protect cultural heritage from the adverse effects of climate change. It concludes by arguing that an integrated approach is needed, as much of the history of a city history is layered.

**Keywords:** cities, climate change, disaster risk reduction, adaptation

**ID:** 351

## Government decentralization and disaster impact, an exploratory study

*Vaillancourt, A., HUMLOG institute, Hanken School of Economics, Canada, alain.vaillancourt@hanken.fi*

The purpose of this study is to explore the link between decentralization and the impact of natural disasters through empirical analysis. It addresses the issue of the importance of the role of local government in disaster response through different means of decentralization. By studying data available for 50 countries, it allows to develop the knowledge on the role of national government in setting policy that allows flexibility and decision making at a local level and how this devolution of power influences the outcome of disasters. The study uses Aaron Schneider's definition and rankings of decentralization, the EM-DAT database to identify the amount of people affected by disasters on average per year as well as World Bank Indicators and the Human Development Index (HDI) to model the role of local decentralization in mitigating disasters. With a multivariate regression it looks at the amount of affected people as explained by fiscal, administrative and political decentralization, government expenses, percentage of urbanization, total population, population density, the HDI and the overall Logistics Performance Indicator (LPI). The main results are that total population, the overall LPI and fiscal decentralization are all significant in relation to the amount of people affected by disasters for the countries and period studied. These findings have implication for government's policies by indicating that fiscal decentralization by allowing local governments to control a bigger proportion of the countries revenues and expenditures plays a role in reducing the amount of affected people in disasters. This can be explained by the fact that local government understand their own needs better in both disaster prevention and response which helps in taking the proper decisions to mitigate the amount of people affected in a disaster. The reduction in the implication of national government might also play a role in reducing the time of reaction to face a disaster. The main conclusion of this study is that fiscal control by local governments can help reduce the amount of people affected by disasters.

**Keywords:** disaster impact, decentralization, local government

**ID:** 352

## Disaster mitigation using participatory learning action (coping strategies) for a village, Uttarkashi, India

*Naithani, S., School of Env. Studies and Natural Resources, Doon University, India, suneetnaithani@gmail.com*

In April 2009, when we were learning the Participatory Learning and Action (PLA) approach in the village "Jamak" (Middle Himalaya) organized by, LBSNAA, Mossourie. Village had experienced a major earth quake during 1991 and a flood during 2002. In spite of big blows, the village reflects capacity of rebuilding and revival capacity. The village with 35-40 families came into light with a hole at its bottom (tunnel) and emergence of its paddy fields to Maneri- Bhali Dam Project. The objective was to assess efforts and environmental dimensions with PLA. Need assessment followed by report building with open questions were conducted. Weightage preferences and gradation of the weightages for amenities were observed but constraints were there; support system was lacking ("Eco-tone Working Zone"). Irrigation is being done with Internal Coordination System but need to catch the whole water of that drainage. A pipe line may become a lifeline for watershed management like; producing 2 KW electricity followed by water mill, agriculture and lastly as waterfall to promote eco-tourism. Destructed site has not been utilized, but villagers proposed the practices like; production of cash ropes and shops for revival. Chirpine needles i.e. Minor Forest Produce (MFP); can be used to make house hold things with other practices like; organic farming and organic manure. The certification/Intellectual Property Right (IPR) should be taken care off. The bio-gas plant, wheel carrier for the dung distribution in flat agricultural terraces should be promoted. Establishing latrine and Self Help Groups (SHGs) will improve the lifestyle. Initiatives from Govt. and NGO sector are required for man and animal conflicts. The youth and adolescents should be involved in rescue and relief trainings. Technologies can be floated in the areas; cattle farming, Dairy Development, Disease and Pest Management, e-Governance i.e. One Stop Shop and the low cost technology inputs by Govt. and NGO Sectors are also required for minimizing disasters in village "Jamak".

**Keywords:** PLA, earthquake, eco-tone working zone, NGO and SHGs

**ID:** 355

## Post-tsunami road reconstruction in Sri Lanka: Efficacy of mainstreaming disaster risk reduction

*Palliyaguru, R., Heriot-Watt University, United Kingdom, r.palliyaguru@hw.ac.uk*  
*Amaratunga, D., University of Salford, United Kingdom, r.d.g.amaratunga@salford.ac.uk*

Following the 2004 Indian Ocean tsunami all roads in the affected areas in Sri Lanka were inaccessible during the immediate aftermath of the disaster either due to the damages they sustained or poor networking of roads and lack of contingency planning within the road network systems. This paper aims at proving the necessity of effective mainstreaming of disaster risk reduction during road reconstruction as a basic precondition for reduced exposure of road structures to hazards; improved resistance of road structures; improved resilience of authorities/teams involved in road projects. It presents the experiences of the road reconstruction sector in Sri Lanka following the 2004 Indian Ocean Tsunami. The paper discusses the perceptions of the key project stakeholders on mainstreaming disaster risk reduction and the effects of mainstreaming disaster risk reduction on vulnerability reduction. The study was empirically supported by the case study approach and independent expert interviews. This paper only presents the analysis of one case study which was conducted in a post-tsunami road reconstruction project in the Southern Sri Lanka, out of two case studies conducted within the study.

The results of the study demonstrate that vulnerabilities of road project's structures and authorities/teams involved in road projects must be paid the key attention when mainstreaming disaster risk reduction. Although the disaster risk reduction strategies such as physical/technical, emergency preparedness and knowledge management strategies are considered to be very important to make road structures more disaster resistance and authorities/teams more disaster resilience, they are not integrated into the case study project up to the required level except the physical/technical strategies. The paper concludes that although the importance of effective mainstreaming of disaster risk reduction during road reconstruction has been considerably identified by the individuals, adequate attention had not been given at the project planning and design phases to make it a project priority due to a range of internal and external hindrances.

**Keywords:** road reconstruction, disaster risk reduction, vulnerability reduction

**ID:** 356

## Improving temporary shelters after flood disasters with the participation of displaced people

*Barbosa, L., School of Architecture and Urbanism, University of Sao Paulo, Brazil, barbosall@usp.br*

In 2011 many disasters reached unprecedented maximum intensity levels. Often, despite how well prepared residents and administrators are, they are still surprised by the ever greater force of natural disasters.

The research discusses ways to prevent and remediate the problems of temporary shelters, minimizing the negative consequences of rain-related disasters in Brazil. These studies are intended to result in possibilities for the deployment of temporary shelters and other necessary facilities for disaster assistance.

To achieve the desired results, this study is based on methodologies of design thinking to determine the main collection instruments that can generate inputs to the project.

Therefore, this article will present the methodology, show its application, and indicate the paths that can lead to locally engaged design. This design process, based on the needs and desires of a group of people whose life is periodically affected by floods, ensures more faithful results regarding local characteristics.

**Keywords:** homeless by flooding, participatory design workshop, temporary shelters

**ID:** 357

## Opportunity in Haiti: Women as agents of resilience in post-disaster reconstruction

*Brickman Raredon, A., Massachusetts Institution of Technology, USA, anyabr@mit.edu*

Focusing on the Haitian earthquake of January 12, 2010, this project seeks to identify and analyze the role of women, and organized women's groups, during disaster recovery processes and to highlight opportunities presented in this context to improve approaches to post-disaster reconstruction, support local initiatives for social change, and lay the foundations for future resilience. In the sixteen months following the earthquake, as international and national institutions struggled to respond in an effective and efficient manner, Haitian women, and their organizations, served a central role in cultivating stability within affected communities. As institutions and communities seek to reconstruct the material and social foundations of Haiti, focusing on the contemporary actions of Haitian women provides opportunities to further support their empowerment and to transform approaches to post-disaster reconstruction. Building on historical narratives of resilience, Haitian women's organizations can place themselves at the root of a new national narrative, one that emphasizes the centrality of their concerns to the creation of broader social stability, and leverages their ability to weave together fragmented elements of society. Additionally, as international relief and development institutions re-engage in a discussion of how to best address fundamental challenges of communication, coordination, and continuity in post-disaster reconstruction, integrating a focus on women's agency will highlight ways in which the persistence of women's networks and organizations can support an integrated, culturally appropriate and ultimately sustainable process of reconstruction.

**Keywords:** women, post-earthquake, Haiti, community resilience

**ID:** 358

## Effect of climate change induced stresses on livelihood in Southern Terai of Nepal: A case study of Nawalparasi District

*Dahal, S., Freelancer Consultant, Nepal, yse.santosh@gmail.com*

Climate change has become a burning issue of the 21st century; the underlying debates are revolving more on economic and social challenges; and less on those related to conserving livelihood of people. Studies have indicated that climate induced disaster loss would be one of the greatest challenges in the coming years when temperatures, rainfall patterns, and their consecutive impacts would be more pronounced.

The suddenness of a disaster and its destruction, especially during a very serious natural disaster, Nepal is facing a number of severe problems like: poor public awareness, low literacy rate, mass poverty, fatalistic nature of some people, difficult and undeveloped physical infrastructure, unplanned settlement, lack of political commitment, slow decision making process and so on. Water induced disasters (flood and drought) are increasing vulnerability of poor and marginalized farmers by making them less resilient to climatic shocks in different districts of terai, Nepal. The annual but erratic rainfall damages lives and means of livelihood during monsoon and the winter drought affect crops and livestock. The situation is aggravated in recent years due to Climate Change. The main objective of the research is to know the current situation of climate induced disasters and recommend that would serve as inputs for livelihood options and reduce broader rural poverty. The research methodology includes field observation, data collection from the local organization working in Disaster Risk Reduction (DRR), interviewed the key stakeholders, conducted focus group discussions with beneficiaries using standard checklist. The main findings are the results of triangulation between different methods and sources. The research interventions focus on livelihood and preparedness with equal emphasis. In terms of preparedness, the visited sites are specified VDCs of Nawalparasi district with active assistance from community people. There is a link between increasing incomes and savings and facing disasters, developing disaster risk reduced livelihoods is not very common. The holistic approach to risk reduced livelihoods or disaster resistant livelihoods is yet to be clearly established in practice.

**Keywords:** climate change, disaster risk reduction (DRR), vulnerability, income diversification, water stresses

**ID:** 359



## Disaster as an opportunity to enhance community resilience: Lesson learnt from Chilean coast

*Rahman, M. S., Lecturer, Institute of Disaster Prevention and Urban Safety, Bangladesh University of Engineering and Technology, Bangladesh, shahinoor@jdpus.buet.ac.bd*

Coastal communities in Chile are at risk to tsunamis like other coastal communities around the world. The Dichato community is one of the most affected communities by the 27 February, 2010 earthquake and following tsunami, more than seventy percent of infrastructures are washed out. The livelihood of the local people is severely damaged. The disaster recovery process is slower there than expected. The concept of resilience is normally understood as the opposite of vulnerability. This means that where vulnerability is high the level of resilience tends to be low, and vice versa. As vulnerability is the opposite of resilience, it is very much important to build a resilient community to reduce the disaster risk.

This paper focuses on how a disaster can be an opportunity to enhance community resilience to disasters. Qualitative data are collected through key informant interview. Key informants are community leaders, high officials at local and regional office and also from non-government organizations. After this devastating tsunami, Dichato community gets special attention from the government and other agencies. As a result, disaster brings opportunity for the community in the form of new vision, new relation and new idea, which may enhance community resilience in the future. Findings of this paper will open a new horizon that can help to find the strength and weakness of disaster preparedness in community level. It will also help to learn about new approach to build community capacities against disaster.

**Keywords:** tsunami, community resilience, disaster risk, vulnerability

**ID:** 360

## Coastal community resilience to tsunami: A study on planning capacity and social capacity, Dichato, Chile

*Rahman, M. S., Lecturer, BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS), Bangladesh, shahinoor@jidpus.buet.ac.bd*

Coastal communities in Chile are at risk to tsunami like other coastal communities around the world. As resilience is understood as the opposite of vulnerability, it is important to increase community resilience to reduce vulnerability. The Dichato community is one of the most affected communities by the 27 February 2010 earthquake and following tsunami in central Chile and the recovery process is slower there than expected.

This paper aims to examine planning capacity and social capacity to evaluate community resilience to tsunami. Qualitative data are collected through interview. Community leaders, high officials (e.g: regional chief of planning ministry, regional urban manager) at local and regional level and also nongovernmental organizations (Hogar de cristo, Red Cross) are interviewed. The collected data is evaluated under a framework which combines eight important resilience elements. These elements are governance, society and economy, resource management, land use and structural design, risk knowledge, warning and evacuation, emergency response and disaster recovery.

Tsunami hazard risks are not well addressed and considered in plans and programs for coastal community like Dichato. Land use and structural design are carefully considered after the tsunami in last year. Pre-established mechanisms for disaster recovery are not appropriate. Community engagement in planning and implementation procedure of these plans and programs are limited. There are very limited training program for livelihood diversification. Training and mock-drill programs for tsunami response are very limited in the community. Risk knowledge is not shared properly with the community to reduce the risks.

Findings of this paper will open a new horizon that can help to find the strength and weakness of disaster preparedness in community level. Resilience of coastal community to tsunami can be achieved through enhancing planning and social capacity.

**Keywords:** community resilience, planning capacity, social capacity, disaster risk

**ID:** 361

## Microzonation for urban planning and sustainability

*Ansal, A.*

*Tonuk, G.*

*Kurtulus, A.*

Seismic microzonation and earthquake loss estimation scenarios are needed for city planning, disaster preparedness, risk reduction and hazard mitigation decisions, and urban rehabilitation actions in earthquake prone areas. Loss estimation due to earthquakes in an urban environment is a very complex process that requires detailed building inventories, realistic estimation of earthquake characteristics on the ground surface and comprehensive assessment of building vulnerabilities.

The earthquake hazard is spatially distributed in relation to earthquake sources that need to be assessed based on the regional seismotectonic scale and local site conditions. Mapping the variation in earthquake hazard at an urban scale makes it possible to select relatively less affected zones for the allocation of appropriate land use. Urban development patterns can be oriented toward these relatively less affected zones to minimize possible earthquake damages.

The three principal factors controlling earthquake loss are earthquake source characteristics, site response and structural features. The seismic microzonation maps would indicate the distribution of site response with respect to ground shaking intensity, liquefaction and landslide susceptibility; thus providing an input for urban planning and earthquake mitigation priorities at an urban scale.

It is also possible to estimate building damage and casualties based on microzonation maps used as an input to earthquake damage scenarios. These estimates may be very approximate and may not always be on the conservative side based on the accuracy of the input data and methods of analyses. However, they can also be more realistic and more accurate when more comprehensive data and more sophisticated analysis methods are implemented. Thus one of the important issues is the estimation of the needed accuracy and corresponding level of complexity in the analytical studies.

The results obtained using different levels of seismic hazard and site characterisation data will be summarised very briefly to demonstrate the importance of the comprehensive site characterisation as well as the procedures used to estimate site effects for different levels of seismic hazard based on case studies conducted in Istanbul.

**Keywords:** seismic hazard, microzonation, site effects, site response analysis, urban planning

**ID:** 363

# Reconceptualising cultural heritage: the adaptive cycle as a means of rebranding the risk and vulnerabilities of cultural heritage in the face of natural disasters

*Mackee, J., Centre for Indisciplinary Built Environment Research, University of Newcastle, Australia,  
jamie.mackee@newcastle.edu.au*

Over the past decades, many parts of the world have been subject to various natural disasters, including the 1995 Kobe (Japan) and 2011 Christchurch (New Zealand) earthquakes; tropical cyclones Larry (2006) and Yasi (2011), Queensland (2010–11) floods, the Ash Wednesday (1983) and Black Sunday (2009) fires in Australia; hurricane Katrina (2005) in USA; and, the tsunamis in South and Southeast Asia (2004) and Japan (2011).

Natural disasters such as these appear to be a feature of the global climate and landscape, and they continue to pose economic, social and environmental challenges to many nations. Disaster responses have often focused on the built environment, health and social factors. However, as identified in a number of key reports, cultural values, such as cultural built heritage (CBH), are also likely to be affected by natural catastrophes.

Considering the historical, national and communal implications and vulnerabilities of CBH, there has been surprisingly little debate and research on the question of how to protect CBH from risks posed by changing climate and increased natural hazards.

Building upon a review of existing scholarship on CBH, disaster risk, resilience, and disaster recovery, this paper proposes an alternative model for understanding the risks and vulnerabilities of CBH. The developed model would allow for better planning for the recovery and protection of CBH in the aftermath of a disaster. The adaptive cycle is explored as a means of developing strategies for recovering and preparing the CBH.

**Keywords:** disaster risk, adaptive cycle, resilience, cultural built heritage, natural disasters

**ID:** 364

## Building resilience on the e-gov platform

*Trufanov, A., Irkutsk State Technical University, Russian Federation, troufan@istu.edu*

*Tikhomirov, A., International Informatization Academy, Russian Federation, alexei-tikhomirov@hotmail.com*

Governments, communities and international organizations are faced with the threat of disasters on a daily basis everywhere in the world. National governments, local governments, international, regional and civil society organizations, the private sector, academia and professional associations as well as every citizen needs to be engaged in actions reducing their risk to disasters. All these stakeholders have different functions and roles and have to play their part in contributing to building disaster resilient communities.

The national and local governments developing strategies to address the challenges associated with disaster risk. Authors proposed a Comprehensive Network Lace toolkit, a networking modeling approach to be used within the frameworks of these strategies and e-governance mechanisms. The approach is based on building open connected governance systems providing cross-cutting connections between all stakeholders- governments, private business, civil society organisations and citizen.

A new robust networking policy to construct resilient communities has been formulated. The multilayered Comprehensive Network Lace scope which is more sophisticated than a Complex Network one comprises strong capacities in modeling systems, jeopardized risks and planning counteractions to build an e-government platform.

**Keywords:** resilient communities, e-government, networking modeling

**ID:** 365

## Risk management in fast track projects

*Al harthi, B., Wolverhampton university, United Arab Emirates, bader303@yahoo.com*

*Oloke, D., Wolverhampton University, United Kingdom, d.a.oloke@wlv.ac.uk*

Risk management based on the fast track projects remains fundamental to not only UAE, but also all countries across the globe. In the construction industry, fast track construction projects can be attained by preparing appropriate designs as well as selecting right materials and methods. For example, the fast track design delivery technique can considerably reduce the duration of a project by about 50% depending on the project in question. Nevertheless, fast track projects are utilized for clients in need of projects in a short time possible with the aim of heightening profit or restricting loss as well as reducing service interruption. The paper seeks to review the extent to which risk management is applied in enhancing UAE projects performance' and in addition, the paper seeks to review the status of UAE risk management application on fast track projects with a view to developing a methodology for testing the significance of the impact and developing a framework for improvement. The methodology to be addressed is considered to be effectively used during execution and planning phase in construction of fast track project in United Arab Emirates.

**Keywords:** fast track, risk management, tools, techniques

**ID:** 368

## Coping with extreme weather: Strategies for construction SMEs

*Wedawatta, G., Department of Civil Engineering, Architecture and Building, Coventry University, United Kingdom, gayan.wedawatta@coventry.ac.uk*

*Ingirige, B., Centre for Disaster Resilience, School of the Built Environment, University of Salford, United Kingdom, m.j.b.ingirige@salford.ac.uk*

Weather extremes have created a considerable impact on Small and Medium-sized Enterprises (SMEs) in the UK during the recent years, especially on SMEs in the construction sector. Evidence in relation to the recent weather extremes have demonstrated that SMEs are some of the worst impacted by the Extreme Weather Events (EWEs) and have confirmed them as a highly vulnerable section of the UK economy to the impact of extreme weather. This is of particular importance to the construction industry, as an overarching majority of construction companies are SMEs who account for the majority of employment and income generation within the industry. Whilst construction has been perceived as a sector significantly vulnerable to the impacts of EWEs, there is scant evidence of how construction SMEs respond to such events and cope with their impact. Based on the evidence emerged from case studies of construction SMEs, current coping strategies of construction SMEs were identified. Some of the strategies identified were focused at organisational level whereas others were focused at project level. Further, some of the strategies were general risk management / business continuity strategies whereas others have been specifically developed to address the risk of EWEs. Accordingly, coping strategies can be broadly categorised based on their focus; i.e. those focused at project or organisational level, and based on the risks that they seek to address; i.e. business / continuity risks in general or EWE risk specifically. By overlapping these two aspects; their focus and risks that they seek to address, four categories of coping strategies can be devised. There are; general risk management strategies focused at business level, general risk management strategies focused at project level, EWE specific strategies focused at business level, and EWE specific strategies focused at project level. It is proposed that for a construction SME to effectively cope with the impact of EWEs and develop their resilience against EWEs a rich mix of these coping strategies are required to suite the particular requirements of the business.

**Keywords:** construction, coping strategies, extreme weather, resilience, SMEs

**ID:** 369

## The Buddha's Last Words: Energy, simplicity and the resilience of urban systems

*Richardson, A., School of Global, Urban and Social Studies, RMIT, Australia, anthony.richardson@rmit.edu.au*

The increasing complexity of the interconnected urban systems that make developed cities possible also poses technical and theoretical challenges to the resilience of those systems. Contributing to the wide body of work on systems theory and the complexity of systems, this paper applies the work of historian Joseph Tainter to the field of urban resilience by examining his claim that societies are problem-solving machines that meet the challenges they face by implementing increasingly complex solutions. While this approach has been, and remains, extremely successful, the path of increasing social complexity is dependent upon access to growing sources of energy without which such systems cannot increase or maintain their own complexity (1990; 1995). This is not a new discovery of course; in the final (possibly apocryphal) words of the Buddha: "All compound things decay".

Disasters can interrupt the complex networks of power generation and distribution that make possible both the maintenance of these systems and their ability to respond and adapt to such challenges. This theoretical paper posits the claim that the promotion of urban resilience must imply the recognition that at some point the complexity of urban systems becomes so costly in terms of energy inputs, and risky in terms of possible disruptions to energy supplies, that simplifying these systems offers real possibilities in terms of increased resilience to disasters.

**Keywords:** simplicity, complexity, energy

**ID:** 371



## Gender mainstreaming and sustainable post disaster reconstruction: Lesson learn from post disaster reconstruction policy in Indonesia

*Yumarni, T., University of Salford, United Kingdom, t.yumarni@edu.salford.ac.uk*  
*Amaratunga, D., University of Salford, United Kingdom, r.d.g.amaratunga@salford.ac.uk*  
*Haigh, R., University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

Gender mainstreaming is one important aspect that should be considered to enhance the sustainability of post disaster reconstruction and development. Yet, a few studies examine how gender mainstreaming can be integrated into sustainable post disaster reconstruction and development policy. Drawing from the case of Indonesia's post disaster reconstruction, this study elaborates gender mainstreaming within sustainable post disaster reconstruction and development policies in Indonesia. It discusses some policy challenges to integrate gender mainstreaming into sustainable post disaster reconstruction policies in both national and local government level. This study finds the highly decentralised structure characteristics of gender mainstreaming and post disaster reconstruction policies in Indonesia. In such structure, the central or national government has transferred most of responsibilities and authorities to sub national or local governments to decide reconstruction polices at affected regions. Local government capability is thus vital to promote gender mainstreaming within sustainable post disaster reconstruction. The local government capability means the ability of local government to organise resources, competence and knowledge to meet the needs and concerns of women and men within reconstruction, and how this has been transformed into local government ability in institutional and human resources policy and for providing financial, technical and leadership capabilities to promote gender equality into sustainable reconstruction. Lesson learn from the Indonesia post disaster reconstruction policies have shown that though most local governments have increased their awareness of the needs to integrate gender mainstreaming into sustainable post disaster reconstruction, the lack capability of local governments in terms of institution, human resources, leadership and financial and technical resources slow down such efforts.

**Keywords:** gender mainstreaming, sustainable post disaster reconstruction, Indonesia  
**ID:** 373

## Special features and experiences of the full term dispute adjudication board as an alternative dispute resolution method in the construction industry of Sri Lanka

*Abeynayake, M., University of Moratuwa Sri Lanka Institute of Architects, Sri Lanka, abey92@hotmail.com*

*Weddikkara, C., University of Moratuwa, Sri Lanka,*

Disputes in the construction industry are inevitable due to complexity and the multi-party involvement of the projects. With the increasing of the construction projects, the construction industry of Sri Lanka needs a fast and cost effective dispute resolution method. Drawbacks of litigation have opened up the 'Alternative Dispute Resolution' (ADR) methods to settle construction disputes.

Dispute Avoidance Procedures which include Dispute Review Board (DRB) and Dispute Adjudication Board (DAB) are widely used in the dispute resolution of the construction industry since those procedures are encourage to resolve construction disputes at site level. After 30 years civil war in the north and east provinces in Sri Lanka, the foreign donor agencies have funded for the economic infrastructure development projects. DAB is used in Sri Lanka under the FIDIC 1999 (Red Book) specially for the foreign funded development projects.

This research was carried out to provide suggestions to overcome barriers to implement the full term DAB practice in Sri Lanka because Sri Lankan construction industry mostly used Ad-hoc adjudication practice. Literature review was done together with the preliminary survey. The questionnaire survey and Semi structured interviews carried out among contractor and consultant organizations. The research findings revealed that a few of stakeholders knew the actual procedure of adjudication .The results of this study enable researchers to gain a deep understanding on the current DAB practice ,recognize significance of advantages and suggestions for the development of DAB in the construction industry of Sri Lanka.

**Keywords:** litigation, ADR, dispute resolution, construction industry, Sri Lanka

**ID:** 375

## Innovative solutions for the improvement of alternative dispute resolution methods in the construction industry of Sri Lanka

*Abeynayake, M., University of Moratuwa Sri Lanka Institute of Architects, Sri Lanka, abey92@hotmail.com*  
*Weddikkara, C., University of Moratuwa, Sri Lanka,*

Construction claims tend to be of the most technical nature - intensive and multifaceted than other commercial disputes. With the increase in construction activities after 30 years of civil war in the north east in Sri Lanka, the construction industry of Sri Lanka needs a fast and cost effective dispute resolution method. The litigation is the traditional method of dispute resolution. Drawbacks of litigation have opened up the Alternative Dispute Resolution (ADR) methods such as arbitration, adjudication, mediation, conciliation and negotiation.

The desirable features of ADR methods are fast, inexpensive, fair, simple, flexibility, confidentiality, minimum delay. ADR methods are also having drawbacks and pitfalls apart from their respective advantages. The aim of this research is to evaluate ADR methods and suggest improvements to the ADR methods in the Sri Lankan construction industry. This research is the result of a survey that was conducted to understand the experiences and usages of ADR method in a quantitative manner.

With reference to the literature review, it is obvious that disputes in construction projects are inevitable. The findings of this research are construction industry stakeholders prefers to use negotiation as an ADR method. Popularity, usages and, awareness about negotiation is highly appreciated by the construction professionals. Professionals have low level of satisfaction on the current practice of arbitration. It further revealed that the stair-step model of dispute resolution strategy is best. In this research it was ranked the importance of critical attributes in dispute resolution methods. It was revealed that construction industry expect quick solution than the less cost solution.

**Keywords:** disputes, ADR methods, construction industry, critical attributes

**ID:** 376

## Creating resilient places – Mobilising community resources through participatory mental health promotion

*Coffey, P., QLD Alliance for Mental Health Inc, Australia, resilience@qldalliance.org.au*

*Gibbons, N., Australia, resilience@qldalliance.org.au*

*Wilson, M., Queensland Alliance for Mental Health Inc., Australia, resilience@qldalliance.org.au*

*Bains, A., Queensland Alliance for Mental Health Inc, Australia, resilience@qldalliance.org.au*

*Benson, M., Australia, resilience@qldalliance.org.au*

The Resilient Places project used a participatory mental health promotion methodology through a micro-grant program to build capacity of communities impacted by widespread flooding and a Category 5 Cyclone which had resulted in 75% of Queensland (QLD) declared a disaster area in 2010 -2011. Operating in seventeen local government areas (LGAs) of QLD, the information was collected through self-report and digital storytelling documentation. The program was successful in mobilising community leaders, improving social cohesion and assisting with individual and community wide skill development to recognise the vulnerable within the community. An internal evaluation sought to uncover the common elements of the micro-grant program that created outcomes of greater social cohesion and foundations for health building. This paper outlines the experience of this project, its key activities and outcomes.

**Keywords:** community resilience, social capital, social cohesion, community based disaster recovery health promotion

**ID:** 379

## Breaking the cycle of risk: Cross-examining both post-typhoon Durian housing designs and their respective beneficiaries' perceptions on disaster risk in Albay province, Philippines

*Seno, S. S. D., Architecture Department, De La Salle - College of Saint Benilde, Philippines, archseno.cafa@gmail.com*

The Philippines is not stranger to natural calamities, being ranked as one of the disaster hotspots globally, claiming a number of lives and exhausting considerable government resources in rebuilding infrastructures annually. In this regard, for the study locale, the province of Albay in Bicol Region was chosen, being cited as one of the United Nations (UN) twenty-nine community exemplars for disaster risk management and reduction. This was made possible partly by active collaboration between the national government, the local government units (LGUs) and their non-governmental organizations (NGOs) counterparts, primarily on post-disaster housing units. Thus, this study explores the possible psychological self-perceived disaster-resiliency among Albay-based housing recipients, who were post-typhoon Durian survivors last 2006, in relation to natural disasters as the first variable. Moreover, the structural integrity level of their newly built homes, was also examined based from both the recipients' observations of any physical damage due to subsequent post-Durian calamities in the resettlement site as second variable, vis-à-vis engineering-oriented structural description scores of the house designs as third variable, that were donated by both government and NGO housing donors, for the period 2007 to 2012. Appropriate statistical treatments were used to determine the differences and relationship within and between the variables. The triangulated study findings indicate that there is minimal to no relationship among the variables, where housing recipients have a different perception of what a disaster-resistant housing is. This study can serve as an input for housing donors in re-orienting their views of a typical dwelling delivery, from merely a product, to a holistic process, which will minimize both the dwellers' and their houses' disaster risk.

**Keywords:** United Nations (UN), disaster risk management and reduction, local government units (LGUs), non-governmental organizations (NGOs), psychological disaster-resiliency, structural description, housing donors

**ID:** 380

# Housing reconstruction after disasters and dwellers' schema: Case study of Barehsar after 1990 Roodbar - Manjil Earthquake

*Amiri, Z., Iran, zeinab.amiri@gmail.com*

Meet people's schema of the house play a decisive role in satisfaction of their habitat. This image which is influenced by culture among residents of a community is an approximate unit. Although this incarnation is being corrupted, there are people in some regions of Iran who tolerate modern patterns and kept their image constant. This paper examines the schema of house among Barehsar residents after 1990 Roodbar - Manjil earthquake. People in this area response to reconstructed houses which were against their schema in different ways by physical change in the houses and some hidden manners. Since the main subjects of the research were the schema of houses and determination of residents' behaviour against reconstructed houses, qualitative research method have undertaken to gathering data and analyze them.

**Keywords:** housing reconstruction, schema, vernacular architecture

**ID:** 381

## Adoption of mass burials as a tool of managing dead in mass disasters - Reappraisal of Sri Lankan post-tsunami experience

*Perera, C., Faculty of Medicine, Sri Lanka, clifford.perera@gmail.com*

*Briggs, C., Dept. of Anatomy and Cell Biology Faculty of Medicine Dentistry and Health Sciences, Australia, c.briggs@unimelb.edu.au*

Sri Lanka experienced its major natural disaster in 2004 which cost around 40,000 lives. The post tsunami management demanded prompt address of two issues: the rescue and rehabilitation of the survivors and the identification and proper disposal of the deceased. Though Sri Lanka did remarkably well in the management of injured and preventing disease outbreaks in temporary settlements and camps, the management of deceased was exceptionally deficient.

Most of the affected countries adopted mass burials and mass cremations during the post tsunami period for disposal of dead. Mass burial is a potentially safe and appropriate method of disposal for a developing country if followed with proper guidelines though it is not recommended by international experts considering the ideal standards. However in Sri Lanka no such monitoring was available and statistics about mass burials are simply devastating. The main issue was the obtaining services of untrained personnel to dispose dead without supervision. Therefore the identification of deceased was not given its due consideration.

The criteria for selecting mass burial sites were not uniform throughout the affected areas. Some mass burial sites were located just opposite the community habitats. The depths of these sites were also varied and it was revealed that some of the burials were just few feet deep. The boundaries of any of the mass burial sites were indistinct when they were inspected 6 months after the disaster by a team of forensic experts. Most burial sites were utilized for reburials and some burials were done during the evening or in the night sealing off any possibility of proper documentation and leaving thousands of mourning survivors in misery for ever.

These actions not only go against the cultural and religious practices of a population, but they also have social, psychological, emotional, economic, and legal repercussions regarding the legacy of the deceased, which exacerbate the damage caused by the disaster. Any form of mass burial always has a negative psychosocial impact at the individual and community level and hence it is essential to formulate proper application guidelines for mass burials by international experts in view of structuring disaster resilience in the affected communities.

**Keywords:** mass burial, mass disaster, management, guidelines

**ID:** 383

## A trusted voice to sustain and develop community resilience in the presence of flood risk

*McNulty, A., British Red Cross, United Kingdom, amcnulty@redcross.org.uk*  
*Rennick, K., British Red Cross, United Kingdom, krennick@redcross.org.uk*

In 2010 the British Red Cross conducted research to examine, amongst other aims, how community resilience could be enhanced before, during, and after a flood event. This paper reports the findings of this study from a UK perspective, highlighting key areas of learning applicable to other urban geographies.

This study utilised a community based participatory research (CBPR) approach, and collected data via questionnaire (n67), in-depth interviews with flooded affected individuals (n72) and stakeholders (n16), focus groups (n4), and document analysis.

We found the greatest challenge to enhancing resilience in flood risk societies occurs when risk is not fully understood or appreciated. In these instances preparatory actions are largely absent and information is largely ignored until after the first flood event. This is further disabled by a reduced sense of belonging and of taking action – both fundamental features of a resilient community.

In contrast we found demonstrable benefits of having a community flood group working in partnership with institutional and charitable organisations. Such partnerships were found to; facilitate greater community engagement; act as a conduit for information (provided this is accurate, timely, and direct); utilise their collective power to promote positive change, and enhance community resilience.

Community engagement was, however, not driven in the most part by organisations but by the community, and typically community leaders. This finding brings with it challenges around how such partnerships can be established more widely and systematically.

We conclude that sustaining community resilience in flood risk societies occurs at two levels. First is the need for greater engagement between individuals and communities so as to both increase a sense of belonging to that community and to take action to help prepare and withstand disaster. Second is the increase in community and institutional partnerships.

**Keywords:** partnership development, community engagement, preparedness

**ID:** 385



## Addressing housing needs in minimising the problems of post conflict housing reconstruction

*Seneviratne, K., School of the Built Environment, University of Salford, United Kingdom,  
t.k.k.seneviratne@edu.salford.ac.uk*

*Amaratunga, D., School of the Built Environment, University of Salford, United Kingdom,  
r.d.g.amaratunga@salford.ac.uk*

*Haigh, R., School of the Built Environment, University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

Depleted human and social capital, displacement of people, destruction of property, weakened institutions and ruined economy are some of the legacies of conflicts. Within this context, post conflict reconstruction contributes to overcome the legacies of conflict through reactivating the development process that has been disrupted by the conflict. Among the post conflict reconstruction interventions, post conflict housing reconstruction is paramount important as it contributes to development and peace through restoring the economic and social life of conflict affected people. Despite the importance, the success of post conflict housing reconstruction is hindered by a number of problems such as lack of strategies to address the unique challenges faced by vulnerable households, lack of involvement of local people, lack of use of local building material and technology, lack of local economic development, lack of community linkages, lack of cultural and local consideration, overlooked socio-economic conditions of occupants, standardised housing models, housing models imported from different cultures, lack of beneficiary consultation, poor performance of agencies, bribery and corruptions and lack of post occupancy evaluation. If not properly managed, these issues lead to hinder the success of post conflict housing reconstruction and its contribution to the development and peace. This paper argues that lack of concern on housing needs has directly or indirectly given rise for most of these issues through a comprehensive literature review on post conflict housing reconstruction and housing needs. The paper establishes the link between the problems of housing reconstruction and lack of addressing housing needs. Accordingly, it concludes that adequate housing measures provide a general guideline in addressing housing needs and addressing such needs leads to minimise the problems of post conflict housing reconstruction.

**Keywords:** post conflict reconstruction, post conflict housing reconstruction, housing needs, adequate housing measures

**ID:** 388

## Architectural and urban strategies for risk management in central protected areas of cities

*Gociman, C., Romania, criba\_proiectare@yahoo.com*

Bucharest – capital of Romania is one of the European cities exposed to earthquakes and other hazards. Urban blocks of the central protected area need strategies for risk mitigation. In this area of the city was preserved a little part of the old capital who escape from the Ceausecu's demolition plan.

The research is proposing the scientific substantiation of some management operations for the reduction of disaster risk of the built space with keeping the continuity and specificity of the urban habitat, in order to preserve the feeling of civic affiliation.

Investigation and mapping of the characteristics specific for hazard of the location, the exposed risk elements, their vulnerability and the resulted risk (direct and indirect losses), as well as establishing the accepted risk and the identification of the secure habitat typology with patrimonial identity for urban development and post-disaster reconstruction.

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.

The study of different housing typologies which occur in the study area served to identify the environment the residents identify with. 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 protected knots, 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.

The result was the 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 and the identification of a post-disaster reconstruction opportunities generated by the system of the emergency habitat, having as support, the specific components of patrimony habitat.

**Keywords:** urban, architectural, strategy, risk management

**ID:** 390

## Integration of participatory approach and scientific tools to reduce disaster risk in the Jaffna District

*Yoharajan, S., CIRM, Northern Provincial Council, Sri Lanka, yohamail@yahoo.com*

Sri Lanka which is 65,610 sq.km in extent is strategically situated in the South West of the Palk Strait in the Indian Ocean. It consists of several natural resources. However, this is also subject to natural disasters from time to time. Jaffna district is one of the 25 administrative districts of the Island. The district covers 929 sq.km of land which is invariably flat in surface. This district gets affected either by severe drought or floods which are caused by nature. Relief measures are adopted only after the onset of the effects of the said natural disasters in this area. It is a fact that mitigation steps which should be systematically planned have been undertaken only on a small scale. Lack of updated data and inadequacy of scientific tools to deal with these problems are the main reasons for such state of affairs. The methodology that has been put forward in this research paper, commences with the participatory approach with indigenous knowledge and regularized with the usage of scientific tools and intertwined with information technology and geographical information system which would lead to efficient decision making. The main objective of this paper is to encourage formulating of preparedness plans with the output of the methodology and expert guidance of Specialists to enhance resilience to disasters. Moreover, the attention of the members of the various District and Divisional Coordinating committees who are already involved in the development planning activities is drawn towards this methodology. It is also stressed that the agenda of the meetings of these committees shall include subjects related to disaster preparedness and management. This has paved the way for the institutions of the Line Ministries, Provincial Council, Local Authorities and other organizations which offer the delivery services to the public at Divisional Secretariat level to effectively coordinate and carry out their functions for the benefit of the public. I strongly believe that the measure of approach on scientific methods expressed in this paper will be immense benefit to minimize the ill effects of disasters and uplift the resilience.

**Keywords:** disaster mitigation, geographical information system, scientific tools, indigenous knowledge, participatory approach

**ID:** 391

## Public-private partnership through strengthening disaster information centers

*Taj, L. N., Focus Humanitarian Assistance, Pakistan, lailanaz.taj@focushumanitarian.org*

*Nasab, N., Focus Humanitarian Assistance Pakistan, Pakistan, nusrat.nasab@focushumanitarian.org*

Pakistan is a highly disaster prone region and is impacted by a number of climate-related hazards, particularly in the Himalayan Karakorum Hindu-Kush mountain ranges. The region of Gilgit-Baltistan and Chitral is one of the most hazard-prone region in northern Pakistan, where annually, natural disasters claim many innocent lives and contribute to significant economic losses impacting public and private infrastructure and livelihoods. After October 2005 earthquake and 2010-11 floods, a dire need was felt for the development and implementation of policies and plans for the mitigation and management of natural disasters. This included an emphasis on the increased public private partnership for risk management and disaster reduction. Focus Humanitarian Assistance as an affiliate of the Aga Khan Development Network (AKDN), has an extensive history of programming in Northern Pakistan and has been working on Disaster Risk Reduction (DRR) initiatives since 1998. FOCUS proposed the ideas of strengthening the newly formed offices of District Disaster Coordinators in Hunza, Gilgit and Chitral. These offices are now Disaster Information Centres and FOCUS provided these centres with basic equipment like computers, printers, furnitures, DRR Plans and disaster reports and maps. FOCUS has also built the capacity of the local government representatives (Tehsildars and Patwaris), in disaster management. These District Information Centres will receive information from all the local representatives of government and will be the focal point for all stake holders and the NGOs/INGOs and the international relief agencies at the time of emergencies. This will empower the national and local government to incorporate disaster risk in the development plans. These centers will improve information exchange and awareness at vast level. This partnership will ensure proper coordination and response mechanism before, during and after any disaster and will be instrumental in developing and implementing a comprehensive information system and databases for systematic categorisation of information and inventories of methodologies, technologies, tools, training courses, handbooks, projects and investments in disaster reduction. These disaster centres need to be replicated in other districts of Pakistan for effective disaster relief, management and mitigation

**Keywords:** public private partnership, DRR, local governments

**ID:** 394

## Community engagement towards increasing societal resilience

*Taj, L. N., Focus Humanitarian Assistance, Pakistan, lailanaz.taj@focushumanitarian.org*

*Nasab, N., Focus Humanitarian Assistance Pakistan, Pakistan, nusrat.nasab@focushumanitarian.org*

Pakistan is faced with numerous natural and human induced hazards. The mountainous region of Gilgit-Baltistan and Chitral is prone to landslide, earthquake, flood, avalanche and rock fall. Around 2.7 million people live in hazard prone settlements. Low per-capita income, weak institutions and changing weather patterns are some of the factors increasing vulnerability of the communities.

FOCUS has been working in the regions since 1998, helping increase resilience of the community through training, establishment of stockpiles, awareness-raising, risk anticipation and non-structural mitigation. Through this paper FOCUS presents a model of Community Based Disaster Risk Management (CBDRM) which empowers and enhances the capacities of local communities to take ownership of the DRR initiatives and help in sustaining them. This model has been implemented in Gilgit-Baltistan, Chitral and Karachi and has been instrumental in preparing the communities for disaster management, reduction and preparedness.

FOCUS has established a total of 151 volunteer Community Emergency Response Teams (CERTs). These team members come from the same disaster prone regions and are involved in responding to crises situation. After giving them the necessary training FOCUS has given the ownership to the communities. FOCUS also works for the capacity building of local stakeholders including the government officials who are responsible for DRR activities. The CBDRM model of FOCUS has been effective in building resilience of the communities, through development of inclusive preparedness and response mechanisms, while ensuring community ownership and it can be replicated in other parts of the world. From the extensive experience of Focus Humanitarian Assistance Pakistan it is evident that the communities are vulnerable to natural and manmade disasters. After conducting various assessments over years Focus Humanitarian Assistance came up with the community Based Disaster Risk Management approach where the communities are involved in the risk mitigation process and are equipped with necessary trainings and stockpiles.

**Keywords:** community resilience, sustainability, DRR

**ID:** 398

## Multi-stakeholder based approaches to building community resilience towards the impacts of droughts

*Ghosh, S., TERI, India, sambita.ghosh@teri.res.in*

*Mohan, D., TERI, India, divya.mohan@teri.res.in*

Extreme events in the form of drought are among the major natural hazards, particularly in the wake of the changing climate, that bear significant impacts on human well-being. It has a direct correlation with agricultural productivity and thereby affects not only the natural resource dependent livelihoods of the local communities but also has repercussions on the economy of the country. This paper discusses the need for inclusive development for increasing resilience of such communities in the Jalna district, which lies in the drought prone Marathwada region of Maharashtra in India. Government policies and programmes as well as community engagement initiatives by other organizations are in place. However, barriers to their effective implementation still remain. Most often it is observed that development activities are undertaken on the basis of mandates that are prescribed by schemes of the central or state level government without taking into account the perspective of different stakeholders including the local government and the communities. With increasing threat to already drought prone areas like the Marathwada region, from climate change, it becomes vital to increase societal resilience of primarily farming communities. This paper proposes an approach for the engagement of multiple stakeholders from all tiers of governance that would benefit better understanding of the factors that drive vulnerability and the barriers to effective implementation. In addition to this, the paper also presents prioritized low- regret or no-regret adaptation options that are identified through a participatory approach with multiple stakeholders and also focuses on identifying channels for mainstreaming the endogenously generated adaptation options for building resilience of these vulnerable communities.

**Keywords:** drought, resilience, adaptation, climate change, participatory

**ID:** 399

## Disaster risk reduction in the built environment in Sri Lanka - an overview

*Ginige, K., School of the Built Environment, University of Salford, United Kingdom, k.n.ginige@edu.salford.ac.uk*  
*Amaratunga, D., School of the Built Environment, University of Salford, United Kingdom,*  
*r.d.g.amaratunga@salford.ac.uk*

*Haigh, R., School of the Built Environment, University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

Natural disasters have long-term implications on sustainable development. They mainly destroy the built environment thereby hindering economic and social development, and causing environment degradation. Reducing the risk of natural disasters within the built environment is therefore critical for ensuring sustainable development. The paper in this context, aims to assess the current state of disaster risk reduction in the built environment in Sri Lanka. Empirical data was collected employing semi-structured in-depth interviews which were conducted with a group of professionals who were involved in disaster risk reduction in the built environment in Sri Lanka. The data was analysed following thematic analysis. The paper reveals the current state of disaster risk reduction in the built environment requires to be improved to achieve a satisfactory level of success whilst highlighting a number of barriers that hinder the desired progress. Deficient funds and weak regulatory framework are identified as major barriers for successful implementation. Central and local government authorities are identified as the primarily responsible parties for disaster risk reduction in the built environment in Sri Lanka in the paper. The paper further presents various recommendations on how to improve the current situation.

**Keywords:** built environment, disaster risk reduction, gender mainstreaming, women, Sri Lanka  
**ID:** 401

## Opportunities and challenges of mainstreaming "disaster risk reduction" in development planning at local level: A case study of Dailekh District, Nepal

*Bhattarai, N., Narayan Municipality, Nepal, bhattarai.noshan@gmail.com*

District disaster management committee under District Administration Office (DAO) is the leading committee, institutional structure for disaster management activities in districts of Nepal. But, it is focused on response activities and functions during disaster. So, it is important that local level take initiatives. Therefore, it is necessary to study opportunities and challenges of mainstreaming disaster risk reduction in development planning at local level as mainstreaming is done through disaster interventions (preparedness, response, recovery), where DAO can play vital role and through development action (policies, frameworks and programmes), where local level can play vital role. The main objective of the project is to identify the challenges and opportunities in mainstreaming Disaster Risk Reduction into development planning at local level. The opportunities and challenges of mainstreaming disaster risk reduction in development planning, mainstreaming audit at local level are determined by using questionnaire focusing on six key areas crucial to the process of mainstreaming mainly policy, strategy, geographical planning, project cycle management, external relations and institutional capacity. From the study, it is found that the main challenges is lack of institutional capacity, institutional blockages, planning process, coordination among stakeholders, level of awareness of public on Disaster Risk Reduction and opportunity is that mainstreaming Disaster risk reduction creates a safer and resilient community from vulnerable community through community participation. Also, new draft "Disaster Management Act" (drafted in 2008) which will supersede the 1983 Act which recognizes the importance of preparedness and includes provision for the integration of disaster risk reduction into development planning with adequate institutions and resources right down to local levels need to be passed soon after current transition phase of country. Local Disaster Risk Management Plan and Community Based Disaster Risk Management Plan, with the active participation of vulnerable communities need to be prepared as a step towards mainstreaming risk reduction at development planning. These plans enable communities to prevent, reduce and effectively respond to stresses, shocks and potentially disastrous events. Community participation in the development and implementation of these plans ensures ownership which contributes to their sustainability. Indeed the implementation of such plans is an essential component of poverty reduction.

**Keywords:** mainstreaming, opportunities, challenges, local disaster risk management plan, poverty reduction

**ID:** 403



## Metabolizing metabolism: Resilience architectural reuse of Nakagin Tower, by Kisho Kurokawa, for a community in Fukushima

*Pusceddu, C., Department of Architecture, Built environment and Costruction Engineering, Politecnico di Milano, Italy, cristina.pusceddu@mail.polimi.it*

*Imperadori, M., Department of Architecture, Built environment and Costruction Engineering, Politecnico di Milano, Italy, marco.imperadpri@polimi.it*

On March 11, 2011, a natural disaster occurred in Fukushima due to Tsunami and earthquake. It killed more than 20,000 people and displaced at least 340,000 more. The World Bank estimated that Japan's calamity would cost between \$100-\$235 billion, and take 5 years to rebuild.

In Tokyo, the capsules owner of Nakagin Tower, by Kisho Kurokawa, voted to demolish this symbol of Metabolism Architecture and rebuild a new tower.

In principle with Japanese Metabolism movement, represented by Nakagin Tower, and displaced people needs originate the idea to Metabolize Metabolism capsules to create a Fisherman Village, with emergency shelter modules for displaced people after 2011 Tsunami. To the psychological aspect, in fact, the most immediate and typical reaction to disaster is shock, which at first manifests as numbness or denial, and with suicide. The combination of 4 capsules, used to family or single people, can improve socialization and help traumatized victims. The service module can be used to increase economy in the village, guarantee first needs and to stimulate common life.

The 140 capsules, which compose Nagakin Tower measure 2,5 x 4 x 2,3 meters and feature a bed, bathroom and kitchen. Modules are combined with aluminium roof, from the Souan Tea House by Toshihiko Suzuki, to create cover outside space. Each modules is improved with a new envelope layer of thermal-reflective multilayer insulation system (TRMI), to preserve lightweight aspect enhancing thermal performance. These two features are according with shelter needs and earthquake proof law.

The American Psychological Association said " living with others survivors being able to help another victim, can reduce helplessness, and may start the healing process". This Architectural reuse allows Metabolism icon to be "metabolized" in a modern safe solution, it is useful to meet Japanese requirements and a historical heritage is preserved.

**Keywords:** reuse, emergency, TRMI, psychological needs, lightweight

**ID:** 405

## A trust measurement model for disaster recovery projects

*Pan, J., Western Kentucky University, USA, jingpan@purdue.edu*

*Cox, R., Purdue University, United States, rfcox@purdue.edu*

*Rapp, R., Purdue University, United States, rrapp@purdue.edu*

*Dietz, J., Purdue University, United States, jedietz@purdue.edu*

*Hubbard, B., Purdue University, United States, bhubbard@purdue.edu*

Trust is a social capital that spreads among people via formal and informal relationships. A minimum level of trust is required to enable any economic transactions. Trust is a core factor in assess the resilience of a community. However, none quantitative studies have been conducted regarding trust or other social capital. This research proposes a trust measurement model with two layers. The first layer comprises three latent types of trust – dispositional trust, cognitive trust, and structural trust. Each type of trust is measured with multiple manifest variables that are evaluated by restoration contractors and flood survivors from 2011 major floods in the U.S. Using the principal component analysis for dimension reduction, a trust measurement is proposed and tested using the survey data from restoration contractors specialized in water damage restoration and survivors from 2011 major floods in the U.S. Such study addresses the pattern of establishing and sustaining trust in project-based team over short span of time. The survey result shows the significant role of the socio-economic status of flood survivors, the technical expertise of restoration contractors, and the referral networks of the survivors as statistically significant. The National Flood Insurance Program and the professional certifications in the U.S. are shown as less important compared to cognitive trust, which is different from the widely-held belief by emergency management practitioners. Other than the specific trust measurement parameters, the research implies the importance of trust in improving performance in the aftermath of a disaster. By adopting the set of suggested strategies, communities and business could achieve higher efficiency in resource allocation during the recovery process.

**Keywords:** disaster recovery, trust measurement, NFIP, community resilience

**ID:** 407

## Mainstreaming disaster resilience city planning into a local plan: A case of Shah Alam City local plan

*Khailani, D. K., Malaysia, dzulkhaimi@townplan.gov.my*

The planning of a resilient city is a frontline effort for city developments which are able to withstand a variety of challenges within the following frameworks which incorporated into urban metabolisms. One of the solutions is to integrate disaster risk reduction strategies and measures within the overall development framework considering disaster risk as an integral component of development process. The aim of the research is to develop an understanding on civil society's comprehension and needs to enhance the resilience of urban areas and to the extent to which urban authorities have responded to those needs in planning and development control. The secondary aims are to identify disaster resilient attributes that need to be mainstreamed into development plans for the adaptation to climate change discourse. The quantitative and qualitative survey was used involved 250 local residents and content analysis of Shah Alam Local Plan document. There are relationship between people needs and hazard sensitivity, exposure minimization and adaptive capacity in the local plans. The findings indicate that the local plans have been mostly concerned with the improvement of adaptive capacity in the settlement of Shah Alam City. This is positive direction in mainstreaming disaster resilience in local development planning. The research is restricted in so far as it only considers Shah Alam Local Plan and exploratory limited in the number of participants is only 250. A further limitation surrounds the issue of generalisability as only one city in Shah Alam was used. Further research needs to include other cities with different climate change induce disasters environments. The paper is useful to both practitioners and academics in the fields of disaster resilience planning at the local level. The research provides some initial insight into local people needs in disaster resilience in the local development plans.

**Keywords:** disaster resilient, local plan, mainstreaming

**ID:** 410

## Framework for capacity building for post disaster construction & demolition waste management at a national level

*Karunasena, G., Dept. of building economics, university of Moratuwa, Sri Lanka, gayanik@uom.lk*

*Amaratunga, D., School of the Built Environment, University of Salford, United Kingdom, r.d.g.amaratunga@salford.ac.uk*

*Haigh, R., School of the Built Environment, University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

The entire world is facing frequent and severe disasters. In a disaster, generation of waste is unavoidable and critical as it differs from a normal situation in terms of quantity and composition. Thus, improper waste management is a major environmental issue in any post-disaster scenario, specifically when it is contaminated with toxic substances leading to environmental degradation and health problems. Therefore, measures to control waste generation and management of waste are needed for proper disaster waste management, being an important aspect of the entire process of disaster management. Literature revealed capacity gaps in disaster waste management emphasizing the importance of capacity building for post disaster waste management in Sri Lanka. Thus, this paper presents framework for capacity building for post disaster waste management with special emphasis on C&D waste at national level entities in Sri Lanka. Data were gathered through semi structured interviews conducted with experts representing Government, Non government and other sector organizations involved in post disaster waste management. Capacity gaps such as fewer opportunities for career development, unawareness, lack of incentives are identified at individual level while unavailability of formal procedures for preparation, monitoring and evaluation of programmes/ projects, policy issues such as unenforceability, inadequate government support and unavailability of institutional arrangement are identified at entity level. Framework for capability building in disaster C&D waste management was presented, with suggested approaches to overcome identified capacity gaps. Framework can assist national entities involved in disaster waste management to focus on specific capacity building processes based on their institutional priorities. It contains evaluated approaches to enhance capacities, providing flexibility to initiate capacity building at different levels such as individual, team, programmes, projects, entity or network of entities and in different contexts than disaster waste management. It guides national entities involved in post disaster waste management to enhance their capacities for effective and efficient processes of post disaster waste management with special emphasis to C&D waste.

**Keywords:** disaster waste, construction & demolition waste, post disaster, capacity building

**ID:** 411

## Disaster affected community's perspectives on post disaster reconstruction

*Thurairajah, N., School of the Built Environment, University of Salford, United Kingdom,  
n.thurairajah1@salford.ac.uk*

*Amaratunga, D., School of the Built Environment, University of Salford, United Kingdom,  
r.d.g.amaratunga@salford.ac.uk*

*Haigh, R., School of the Built Environment, University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

The increasing global temperature which is currently projected to rise up to 6.3 degrees Fahrenheit by the end of the century has been a major indicator for increase in future occurrences of disasters. UN warned the countries that even if they achieve their most ambitious climate promises they will not be able to reduce the temperature rise. This reveals the fact that there will be increase in the occurrence of tropical cyclones and heavy rainfall. In addition, it is predicted that the sea level may rise by up to nearly a metre. Currently, it can be evidenced by the number of occurrences of natural disasters and the scale of their damage it caused. This draws the attention of various sessions and meetings around the world and bespeaks the need to build disaster resilient communities.

Post disaster reconstruction is a long-term process and it focuses more on human and material resource development, coordinated effort towards independence and sustainability. The reconstruction is a rebuilding measure which involves building the confidence, self-respect, self-esteem, self-dependency, mutual support and mutual trust and rebuilding of communities. In order to have a successful completion of disaster reconstruction it is important to include the participation of social actors of the community. However, it was noted that though disaster reconstruction was intended to bring in opportunities and empower disaster affected community, the actual practices does not show similarly. The study noted a mix of opinions on this issue within reconstruction. Hence, this paper aims to present the disaster affected community's perspective on whether post disaster reconstruction empower them and how they feel as it has been delivered to them. In addition, the study also compares the views from professionals who work in post disaster reconstruction. This study has been based on a theoretical as well as practical views obtained through a comprehensive literature review and interviews carried out among disaster affected communities and experts in Sri Lanka.

**Keywords:** community, empowerment, post disaster reconstruction, Sri Lanka, women

**ID:** 422

## Organising the management of disaster recovery and construction: A built environment perspective

*Gajendran, T., University of Newcastle, Australia, thayaparan.gajendran@newcastle.edu.au*

*Mackee, J., University of Newcastle, Australia, jamie.mackee@newcastle.edu.au*

*Brewer, G., University of Newcastle, Australia, thayaparan.gajendran@newcastle.edu.au*

*Giggins, H., University of Newcastle, Australia, helen.giggins@newcastle.edu.au*

*LeGoff, R., University of Newcastle, Australia, raichel.legoff@newcastle.edu.au*

Post-disaster recovery and reconstruction is a complex process. Complicated social, political, technical and legal aspects impact upon the recovery course of action. Generally, recovery and redevelopment phases require multi-sector engagement, a wide range of distinct skills and significant resource commitment. These requirements are usually satisfied through involving different organisations. Among others, built environment-associated skills and resources have an important role to play in the recovery and reconstruction. It is proposed that holistic and systematic organisation of a post disaster recovery management plan is critical for successful redevelopment. This paper presents a discourse on post disaster recovery experiences and identifies key issues impacting on the organising of management of the post disaster recovery/reconstruction. This paper analyses semi-structured interviews, conducted with professionals from government, built environment and humanitarian organisations. Interview data is coded and thematically analysed to identify the key themes. The findings suggest that creation of Temporary Organisations with specific aims, managed by different levels of government and community, enable enhanced coordination of permanent organisations/agencies, stakeholders and other resources assisting reconstruction. Therefore, this paper contributes in developing further understanding into the 'organisation' of the management of disaster recovery and construction.

**Keywords:** built environment, reconstruction, skills, organisation

**ID:** 425

## The impact of governance: collision of the social and political dimensions on sustainable post disaster redevelopment

*Gajendran, T., University of Newcastle, Australia, thayaparan.gajendran@newcastle.edu.au*

*Mackee, J., University of Newcastle, Australia, jamie.mackee@newcastle.edu.au*

*Brewer, G., University of Newcastle, Australia, thayaparan.gajendran@newcastle.edu.au*

*Giggins, H., University of Newcastle, Australia, helen.giggins@newcastle.edu.au*

*LeGoff, R., University of Newcastle, Australia, raichel.legoff@newcastle.edu.au*

Post disaster redevelopment is generally surrounded by socio-political encounters, which could present different opportunities/threats to the various stakeholder groups. Notwithstanding the merits of rapid and community-based response to disaster recovery, at times, the situational conditions could create complex interactions between social and political domains that impact upon governance issues and lead to a less than desirable level of sustainable redevelopment. This paper focuses on a case study understanding of a post disaster emergent governance structure and its influence on the approach to redevelopment. This research takes a constructive worldview acknowledging multiple social realities. Semi-structured interviews with the stakeholders were conducted to collect data. Interview data was transcribed and analysed to identify nascent themes. The findings contribute to further understanding on the evolving governance issues associated to post disaster redevelopment. It suggests that over-engagement of the community by different public and private entities in the decision-making process can contribute to contradictory redevelopment priorities and impact on long-term sustainability and resilience of the region.

**Keywords:** governance, social, political, emergence, redevelopment

**ID:** 426

## Why (shelter) innovation in the humanitarian sector is scarce: Integrate building resilience in the emergency and recovery response

*de Haas, T. C. A., Eindhoven University of Technology, The Netherlands, t.c.a.d.haas@tue.nl*

*Cox, M. G. D. M., Eindhoven University of Technology, The Netherlands, m.g.d.m.cox@tue.nl*

*Gijsbers, R., Eindhoven University of Technology, The Netherlands, r.gijsbers@tue.nl*

Items that bring relief after a war or disaster, such as shelters, often find their origin in other industries. In the last years the SRG did a number of product developments of disaster response items. At the same time, they did dozens of product development trajectories for the building industry. In this paper the product development for the building industry is compared with the shelter industry, with the aim to find the similarities and differences and to learn from it. The goal is to give the reader insight into the specific conditions that apply to product development for the humanitarian sector and especially in sheltering and housing. Due to the complexity not all aspects are discussed, also not all knowledge or all cases are written down in respect to the paper length. The results show that “why (shelter) innovation in the humanitarian sector is scarce” is mostly of non-technical nature.

**Keywords:** innovation, product development process, disaster response, role of the NGO

**ID:** 428



## Analysing and predicting of land slide prone areas using remote sensing and GIS techniques

*Thudugalage Don, C. P., University of Moratuwa, Sri Lanka, pushpakumara@uom.lk*

Landslide is the major natural disaster in hill country of Sri Lanka. There are ample examples for losses from landslides to human lives, agriculture, economic properties and transportation. Therefore, identification of landslide prone areas plays an important role in avoiding or minimizing the hazards. Among the factors affecting landslides, land use is the foremost controllable and highly floating factor over time. Obtaining land use data using manual techniques is very tricky in slope areas. Therefore the importance of using remote sensing techniques is emerged. This study leads to identification and prediction of landslide prone areas with the variance of land use using geospatial techniques. This research is based on the data collected from Elapatha, Ratnapura district, Sri Lanka. Field data and remotely sensed data such as satellite images, survey data and GPS data are collected and subsequently analyzed using remote sensing and GIS software. In this work, a methodology has been developed to generate a landslide susceptibility potential map of the selected area considering the factors which are causing landslides in Sri Lanka by using remote sensing and GIS techniques.

**Keywords:** landslide susceptibility potential map, GIS, GPS

**ID:** 429

## Green buildings, resilience ability and the challenge of disaster risk

*Mallawarachchi, H., Department of Building Economics, University of Moratuwa, Sri Lanka,  
hmallawarachchi@gmail.com*

*De Silva, L., Department of Building Economics, University of Moratuwa, Sri Lanka,  
lalith.consultantarch@hotmail.com*

*Rameezdeen, R., Department of Building Economics, University of Moratuwa, Sri Lanka,  
Rameez.Rameezdeen@unisa.edu.au*

An ever increasing trend in the occurrence of natural disasters is expected that climate change will aggravate the devastating impacts of disasters. As there is growing evidence of the intensity and frequency of climate related extreme events, it is therefore critical that disasters be seen through the lens of reducing risk of and building resilience to disasters, rather than just a response to a one-off disaster event. Current attention given to climate change and its impact on social and economic development is also contributing to accelerating the recognition that natural disasters are a critical factor affecting health, safety and productivity of the building occupants.

Hence, it is important to develop and enforce safe built environment to make occupants more resilient, and to protect lives and property in times of disaster. Further, disaster risk due to changing climate presents a challenge to the planners and designers of the built environment to make them high resilient for disasters because, inappropriate construction puts millions lives and properties needlessly in danger. Therefore, this paper is mainly focused on evaluating the resilience ability of green buildings to facing the challenge of disaster risk due to uncertain climatic changes. In considering the ways to improve resilience ability of buildings, green building concept has gaining momentum in minds of planners and designers of built environment, as green buildings are generally designed and built more carefully. According to the reviewed research papers, the resilience ability of green buildings may achieve by two ways; reducing the initial damage to building systems and infrastructure and using passive design principles to increase building resilience. Hence, there are many passive design features existed in green buildings can be identified as renewable energy, natural ventilation, rain water harvesting, day lighting etc. These passive design principles and other adaptive strategies can be applied to ensure the high resilience ability.

**Keywords:** green building, building resilience, disaster risk, passive design

**ID:** 430

## Community-based organisations: developing organisational resilience to build back better

*Bains, A., Queensland Alliance for Mental Health, Australia, abains@qldalliance.org.au  
Durham, J., University of Queensland, Australia, m.durham@uq.edu.au*

Most community disaster management plans include reference to an important role for community based organisations (CBOs), yet there is little published information about how resilient these organisations are - an essential capability that enables them to participate in meeting community needs during both acute and recovery phases. The advantage of CBOs, that is, being community-based, is also their vulnerability, as in all likelihood they too are affected by the disaster. While organisational resilience is often used synonymously with business continuity, for these groups working at grass-roots level, organisational resilience goes beyond business continuity. It includes the ability for an organisation to continue its day-to-day business and meet a surge in the demand for services it may not normally provide, as well as the ability stay connected to the community so that it remains a viable entity within the community for building resilience. Therefore, organisational resilience in this context refers to CBOs' capacity to adapt to the needs post-disaster and manage its own organisational transformation post-disaster in order to 'build back better' and preserve its role in building and promoting community resilience. Despite the crucial role CBOs play in all stages of the disaster management process, there is limited understanding of how to evaluate and develop CBOs resilience. The purpose of this paper is to begin to promote debate and begin to address this crucial gap in the literature.

Drawing on a qualitative analysis of the published and the authors' experience, this paper uses a systems approach to analyse CBO resilience. We highlight critical gaps in our knowledge base and discuss how a focus on adaptive capacities can help identify a CBO's disaster management capabilities and identify potential areas of focus for strengthening the organisation's resiliency. The paper contributes to the resilience literature in identifying some of the critical characteristics of CBO resilience and offering lessons to enhance CBO resilience.

**Keywords:** community-based organisation, resilience, transformational change

**ID:** 431

## Understanding the resilience of construction organisations

*Sapeciay, Z., New Zealand, zsap711@aucklanduni.ac.nz*

*Wilkinson, S., New Zealand*

*Costello, S., New Zealand*

Since 2004, the New Zealand Government, via Resilient Organisations (ResOrgs), has conducted public good research programmes to review and increase the resilience of organisations within New Zealand. A number of organisations from a range of industry sectors, types of business, and localities, were investigated to identify problems and common issues, quantify resilient indicators, and to develop a methodology and survey tools for measuring and benchmarking organisational resilience. However, little attention has been paid to organisations from the construction sector such as architects, consulting engineers, general contractors and construction material suppliers. Construction organisations are critical organizations, especially in post-disaster reconstruction programmes. In reconstruction programmes, communities rely on services provided by construction organisations in planning, design, construction and maintaining the infrastructure, to enable them to recover from emergencies and crises. Therefore, in order to ensure that the disaster recovery and reconstruction programs are successfully implemented, it is necessary for construction organisations to be resilient and able to respond, and recover from an event. To improve the resilience of the construction sector demands an in-depth understanding of expertise, and knowledge needed to avoid and mitigate the effects of disasters. The purpose of this paper is to present a review of the literature to discuss the resilience issues for construction organisations and their capability in increasing resilience. This will contribute to ResOrgs in general and the built environment discipline in the development of society's resilience to disaster.

**Keywords:** construction organisations, post-disaster reconstruction, resilience

**ID:** 435

## Human resource capacity development for fire safety in industrial buildings

*Dissanayake, D. M. P. P., University of Moratuwa, Sri Lanka*  
*Fernando, N. G., University of Moratuwa, Sri Lanka*

Business continuity and emergency preparedness have often been overlooked and sometimes even ignored. Building owners could have been excused for thinking 'it won't happen here'. However, tragic disasters such as fire accidents have made organisations to devote greater attention to emergency preparedness in order to protect employees, customers, properties and business. Achieving this goal requires that management and information systems are available to facilitate the recovery of core business operations. While safeguarding systems and arranging for substitutes is vital, it is equally important to ensure the proper availability of human resource capacity to operate these systems under adverse emergency conditions. This paper therefore aimed to investigate the current status of human resource capacity development for fire safety in industrial buildings. This paper focused on literature review and case study on previous incidence to investigate the root causes for casualty in case of fire in a building and status of human resource capacity developments to operate under the adverse emergency conditions.

The research findings highlighted that many buildings such as factories do not arrange regular drill; therefore the workers discover themselves in an alien situation whenever an emergency situation arises, causing panic, stampede etc. that further escalate the degree of casualty. Further, accidents are caused mainly due to technical failures and human failures where human failures include lack of awareness of the safety precautions required, inadequate expert knowledge and qualifications in accident prevention. Failure to appreciate the importance of human resource capacity development for fire safety in buildings can hinder the recovery process whereas recognition of its importance leads to more efficient use of resources in the wake of emergencies.

**Keywords:** human resource, capacity development, fire safety, industrial buildings

**ID:** 436

## Social capital and collective resilience following mine clearance: The case of Kurdish Iraq

*Durham, J., University of Queensland, School of Population Health, Australia, durhamjo@yahoo.com*

*Fielding, A., Curtin University, Western Australia, Australia, a.fielding@curtin.edu.au*

*White, R., MAG, United Kingdom, robwhite2006@gmail.com*

Prolonged exposure to violent conflict and forced displacement is detrimental to well-being. It can deplete individual and community resilience and social capital. Rebuilding social capital and resilience is an important factor in recovering from the trauma of violent conflict.

This study was undertaken in mid-2009 in the Kurdish Region of Iraq, one of the most landmine contaminated regions in the world. It formed part of a larger multiple case mixed method study. The objective was to identify the impacts of landmine clearance on household livelihoods. Unanticipated social benefits emerged during the thematic analysis of the participants qualitative narratives (N = 5 households, N = 4 programme staff, N = 2 community leaders) in the Kurdish Region of Iraq. The data was then re-analysed using a narrative framework. Using a social constructionist thread to examine meanings of social capital and resilience, this paper examines the role of demining in building social capital and collective resilience. The participants' narratives tell of resilience resulting from negotiation with the environment and the importance of regaining one's identity and hope in order to heal in the face of adversity. The paper is rare in illustrating the social benefits of post-conflict demining and its links with social capital and collective resilience. It contributes to the literature on collective resilience and its role in improving the well-being of communities displaced by violent conflict.

**Keywords:** Kurdish region of Iraq, internally displaced persons (IDPs), armed conflict, social capital, collective resilience, demining

**ID:** 437

## Building disaster resilience within the Emirati energy sector through a comprehensive strategic mitigation plan

*Al Khaili, K., University of Salford, United Kingdom, k.s.k.h.b.al-khaili@edu.salford.ac.uk*

*Pathirage, C., University of Salford, United Kingdom, c.p.pathirage@salford.ac.uk*

*Amaratunga, D., University of Salford, United Kingdom, r.d.g.amaratunga@salford.ac.uk*

Disasters, both natural and man-made, have been occurring with increasing frequency and effect in recent decades in many countries around the world. Such threats have been shown to result in a loss of life, property and income and all of which have an impact on the country's socio-economic structure and geo-political positioning. The UAE is steadily adapting its policies and practices to manage any potential disaster, whether natural or man-made. However, evidently the UAE is exposed and vulnerable to tectonic activity from a number of sources and yet there is little in the form of seismic detection, protection, resistance or design for some of the newest and tallest structures in the world. The paper highlights the importance of the strategic mitigation planning for disaster resilience within the Emirati Energy sector. It discusses the issue of disaster globally and then specifically with regards to the UAE, forming a critical analysis on crisis and its management. A broad literature review of the problems readily associated within the discourse is undertaken so that the definition, classification and the application of the disaster and its management cycle are appropriately contextualised in regards to the Emirati problem. The window of opportunity that the UAE has for improvement is emphasised by the findings of this paper.

**Keywords:** disaster cycle, disaster management, mitigation, UAE

**ID:** 438

## Human-elephant conflict in Hambegamuwa, Sri Lanka: From vulnerability to resilience

*Jayantha, D., University of Colombo and Born Free Sri Lanka, Sri Lanka, jayantha.deepani@gmail.com  
Dunusinghe, P., University of Colombo, Sri Lanka, pmdunu@yahoo.com*

A number of factors such as atmospheric, hydrological, geological, biological, socio-political, technological and economic events affect the vulnerability of underprivileged communities in developing countries. In the current case study, we attempted at examining the effect of human-elephant conflict on socio-economic vulnerability of a selected community in remote Sri Lanka and to identify measures in enhancing community's resilience through several cost-effective measures. The study focuses on Hambegamuwa area in Monaragala District, Sri Lanka. Hambegamuwa bounds to the Udawalawa National Park which supports over one thousand wild elephants. Neighboring villages of the park are frequented by the elephants year round and subsequent crop, property and life damage is inevitable. We estimated direct and indirect farmer costs associated both with elephant damage and reducing the risk of elephant presence in the area. The study shows that direct and indirect costs associated with mitigating human-elephant conflict, including risk reduction, are substantial. The volatility in farmer income and employment resulting from elephant raids not only increase their vulnerability to socio-economic hardships (short-run welfare loses), but also generate several adverse long-run socio-economic impacts affecting health and education of the children (long-run welfare loses). Moreover, we found that existing mechanism for compensating households affected by elephants only covers a fraction of the damage while it totally neglects the farmer costs associated with risk reduction such as investment in guarding crops and property. We suggest varied approaches for conflict resilience which brings direct and indirect financial benefits for the affected and vulnerable farmers. Farming crops that are not predated by elephants, erecting community-based electric fences to protect farm plots and home gardens from elephants and strengthening local irrigation systems to increase farmer products are a few direct approaches to augment farmer income. Indirect strategies are with long-run effects and include supporting school infra-structure and in-class needs, raising conservation awareness among the community and empowering women for better rural lives.

**Keywords:** human-elephant conflict, vulnerability, resilience, conflict mitigation, risk reduction

**ID:** 443



## Evaluating disaster resilience of bridge infrastructure when exposed to extreme natural events

*Lokuge, W., University of Southern Queensland, Australia, weena.lokuge@usq.edu.au*  
*Setunge, S., RMIT University, Australia, sujeeva.setunge@rmit.edu.au*

Disasters can be natural or human made, predictable or totally unexpected and can be of any size. However, they cause considerable damage to the built environment. Disaster resilience of a society mainly depends on the physical robustness of structures and infrastructure and resilience of the community. This research paper focuses on the damage caused by the recent floods in Queensland, Australia on the bridge infrastructure. Bridges in one council area were selected as a case study. For the damaged bridges, data such as level of damage, material used in these bridges, type of bridge (girder/precast/insitu), age of the bridge, annual average daily traffic, heavy vehicles and inspection data before and after the flood were collected and analysed. In structural engineering, vulnerability is a term used to define the damage tolerance of structures.

This case study is used to find a relationship between the collected data and the vulnerability of the bridges. It is interesting to observe that there is an inverse relationship between the age of the bridge and the damage level. The reasons for this could be due to different construction practices adopted in the past or they had been rehabilitated after previous disaster event. However these reasons should be further analysed for confirmation. It can be concluded that the bridges on arterial roads, which are normally designed for heavy load platform loadings, are more resilient than those on the rural collector roads during an extreme flood event. However since arterial roads may have some redundancy during a flood event, rural roads may become the only means of traffic movement. The resilience of the community will depend on the resilience of the bridges on rural roads which are at the moment vulnerable in extreme flood events. Therefore when classifying roads for design, it is necessary to consider the impact on the community during and after an extreme event.

**Keywords:** disaster, resilience, vulnerability, bridge

**ID:** 444

## Community strategies to enhance flood risk communication in the Zambezi Valley, Zimbabwe

*Mavhura, E., Geography Department Bindura University of Science Education, Zimbabwe,  
edmavhura@gmail.com*

*Manyena, B. S., Northumbria University, United Kingdom, bernmanyena03@gmail.com*

Vulnerability to river flooding exists in the Zambezi Valley partly due to lack of risk communication. This study explores the social vulnerability related to risk communication gaps at the community level and discusses the creation of strategies to enhance information sharing, bottom up activities and partnership development. These objectives were achieved using mixed methods, including interviews, surveys and a workshop discussion. The study identified potential physical and socio-political vulnerabilities from all hazards occurring in the valley and reviewed that the valley residents were affected by lack of communication regarding forecasted information and emergency plans and procedure during the 2008 flood disaster. The results also highlight a number of external pressures exerted by national flood plain policies and procedures that restrict risk communication and affect social vulnerability in the Zambezi Valley. The failures of a top-down approach to flood plain management have impacted on communities' abilities to address flood risk, have amplified risks, and have decreased community cooperation in flood plain management initiatives since the 2008 flood event. Recommended strategies promote the establishment of community standards to compensate for gaps in risk communication and the development of partnerships between flood plain communities. Therefore this paper is valuable to policy making process as it provides measures to improve communication of flood risk.

**Keywords:** risk communication, risk management strategies, social vulnerability, flooding

**ID:** 445

## Availability and access to potable water in 'post-conflict' regions of Sri Lanka

*Sivarajah, P., Dept. of Agricultural Economics, Eastern University, Sri Lanka, sivaponniah@yahoo.com*

The Eastern Province of Sri Lanka has been severely affected by an 'armed internal conflict' for over three decades and it had a devastating impact on the water resources. Drinking water is grossly inadequate in the region and at present the population mainly relies on dug wells, tube wells, lakes and river for their water needs. A household survey using a questionnaire among randomly selected 3,000 families was conducted in the Batticaloa and Trincomalee districts of the Eastern Province to assess the availability and access to water facilities of resettled IDP's.

Water availability throughout the year is a major problem in both districts. Most of the households had access to semi-protected wells as the main water source, but many (more than 85%) of these households reported that wells went dry for about 6 to 7 months of the year causing water shortage. Private ownership of the water sources was common. The distance to water sources from home was far (avg. 580 m) for residents of Batticaloa district, while in Trincomalee district this ranged from 112 m to 307 m. This indicated the need for people to travel long distances to fetch water for domestic purposes. Water collection is done by woman who collected around 16 to 20 liters of water per visit, resulting in 50 to 80 liters/day.

Access to sufficient potable water throughout the year among households was critical in Batticaloa district. All households were using storage containers, mostly plastic jerry cans and aluminum cans with lids, to store water for domestic use. About 71% of HHs reported that water available was good for all purposes, while it was found that only a few households (13% HHs) used water for all purposes. The provision of access to water sources for the households in both districts during the dry season is crucial in the regions studied. Establishment of community water access points at the village level or construction of water supply scheme could help mitigate water shortages.

**Keywords:** water, households, access points, IDPs, water sources

**ID:** 446

## Putting people in places: Housing farming communities in 'post-conflict' resettlement programs in Sri Lanka

*Sivarajah, P., Dept. of Agricultural Economics, Eastern University, Sri Lanka, sivaponniah@yahoo.com*

Sri Lanka's Eastern province was devastated by the 'internal conflict' for over three decades. It had caused a massive level of displacement, destruction of homes and loss of livelihoods to a large population. The Internally Displaced Persons (IDPs) have been resettled partially under various housing programs of the government in the Eastern Province. This paper addresses the issues related to housing displaced farm families in the Ampara district of Sri Lanka. A field survey was conducted in the Ampara district using a questionnaire on 1,400 IDPs resettled in 16 Divisional Secretariat areas, whose main livelihood activity was farming.

The households surveyed had been at least displaced once (>90%) from their traditional homes/villages. Over 45% of the households were below the poverty line and depended on state welfare support. Data revealed that more than 80% of farm households had own houses. These houses were their traditional homes or recently constructed houses. The type of houses occupied varied from shack (20%), traditional (18%), modern incomplete (35%), modern completed (18%), and mixed type (9%). A few households had made extensions (12%) to their existing houses, constructed surrounding walls (25%) and completion of roofing (15%), while about 45% households had focused on painting their homes. Only a few (1.5%) households focused on constructing water and sanitation facilities in their homes. Almost 89% of homes had no toilets constructed, while the rest had pit type toilets. The study revealed the need for a clear policy on supporting resettling households in reconstructing their damaged/destroyed homes to help rejuvenate their livelihood activities in their traditional villages. Provision of concessionary loans or subsidized building materials could help improve housing conditions in future.

**Keywords:** housing, farming communities, IDPs, resettlement, Sri Lanka

**ID:** 448

## The role of technology in building the resilience of cities

*Alzahmi, M., United Arab Emirates, matter-76@hotmail.com*

*Fernando, T., Centre for Disaster Resilience, University of Salford, United Kingdom,*

*Ingrige, B., Centre for Disaster Resilience, University of Salford, United Kingdom,*

Throughout the past century the occurrence of natural and man-made disasters has steadily increased with a significant loss of life, damage to infrastructure and property, and destruction of the environment. Disasters appear to be increasing in both rate of occurrence and intensity (Sahani and Ariyabandu, 2003) and, there is much evidence that natural disasters are growing on a global level (Warren, 2010). For instance, in the years 1900 to 1909 73 occurrences of natural disaster were recorded; however the number of incidences in 2000-2005 increased to 2,788 (Kusumasari et al., 2010). Such a fact has brought an impetus to the area of disaster management with a view to understanding the vulnerability of cities and to developing better technology and processes for creating resilient cities. The purpose of this paper is to review the type of technologies that are being developed to respond to disasters with the view to creating resilient cities. It starts with an analysis of disasters and then explores potential technologies and their role in building resilient cities. The conclusion reached is that integrating these technologies could enhance the resilience of cities in a variety of ways, such as raising awareness, communicating risks, assessing potential damage and testing evacuation procedures.

**Keywords:** technologies, disaster types, resilient cities, vulnerability, resilience

**ID:** 449

# Enhancing societal resilience from an understanding of how vulnerable people strengthen community resilience to extreme shocks and stresses

*Oxley, M., Global Network of Civil Society Organisations for Disaster Reduction, United Kingdom,  
Marcus.oxley@globalnetwork-dr.org*

The purpose of the paper is to share ideas on how societal resilience can be enhanced by developing strategies and tools that are informed by and adequately represent the local realities and priorities of those people most-affected by disasters, notably low-income households in low income countries where state institutions are weak. The paper builds on the experiences and insights of how vulnerable people cope with and adapt to multiple shocks and stresses of all kinds in the context of poverty, informality, fragility and uncertainty.

Within a resource-scare environment, effective public policies and strategies to strengthen societal resilience must take existing local capacities or sources of resilience as the starting point. The approach builds on the innate strengths of individuals, households and local institutions, whilst making maximum use of opportunities created by changes in the environment. Pooling all available resources requires being able to act collaboratively amongst different actors, to observe changes in the environment, to learn and create new knowledge, to share decision-making and self-organise for joint actions.

Accordingly, strengthening community resilience is a dynamic social change process that connects and is embedded within the day to day realities of people lives. It involves a series of contextualised actions to enhance local absorption and adaptive capabilities to respond and adjust to an increasing and unpredictable array of short terms shocks and long term stresses. Observing how communities self-manage when subjected to extreme shocks and stresses provides a unique insight into the principles that makes communities either fragile or resilient. Whilst actions and capacities differ according to the local context they are underpinned by common principles of preparedness, responsiveness, inclusion, connectivity, learning, self-organisation, diversity and social cohesion.

Community resilience is the basic building block and foundation of national resilience. Given communities represent a microcosm of the inequalities, injustices and power dynamics at play within the broader society it follows that the principles underpinning community resilience are similar to those that need to be adopted within the wider society to build national resilience. Building a resilient nation involves embedding resilience principles across the different social-economic sub-systems and scales that constitute the core elements within a country.

**Keywords:** disasters, society, community, resilience, principles

**ID:** 450

## Emerging issues in disaster management - Significance of local self government and community participation

*Rajeev, M. M., Dept of Social Work, Amrita Vishwa Vidya Peetham (University), Sri Lanka, rajeevnambiarmm@gmail.com*

The scale, frequency and complexity of disasters as physical and social phenomena can only be addressed by deploying a wide range of knowledge, skills, methods and resources, both in development and emergency programming. This means that post disaster initiatives such as rehabilitation, relocation and resettlement Initiatives must be multi-disciplinary partnerships involving a range of stakeholders. However, even as the need for such multi-stakeholder cooperation is generally acknowledged, there is little guidance available on how to create effective community based partnerships. The paper is discussed in connection with the close review of various studies pertaining to the 2004 Asian Tsunami especially in South India and specifically the lessons learned from the Landslide disasters in various parts of Kerala during the period of 2010 and 2012. Specifically, the two major research objectives of the study were to: (a) examine the various short and long term issues pertaining to the disaster Management; and (b) explore possible ways through which government systems and the local community can be optimally involved in tackling issues related to the disaster management. The respondents of the study are govt officials working in the field of disaster amangement, acadmeicians, field experets, policy makes, community leaders and the disaster survior's. The investigator used purposive sampling method to recruit the required number of respondents for the study. An interview guide was prepared which contained questions specifically intended to capture the perceptions of the respondents towards the emerging issues in the field of disaster management. In-depth qualitative interviews were conducted with 25 participants. All the interviews were audio-taped and later transcribed for data analysis. Qualitative analysis of the data using Axial Coding revealed the following major themes for the research objectives: effective governmental involvement in disaster operations, redefining NGO's roles, Educating the public, Strong enforcement of laws, a case for interstate collaboration, paradigm shift from disaster response to preparedness, being prepared; effective collaboration; need for attitudinal change; and sustainable livelihood practices. The paper concludes that the effective collaboration with both governmental and non-governmental people centric effective intervention is not only a need but it is integral part of any intervention. Findings imply that in disaster contexts, developmental organizations and professionals have the potential to assume leadership role and help empower local communities to respond effectively to disasters.

**Keywords:** multidisciplinary partnerships, 2004 Asian Tsunami, landslides, in-depth qualitative interviews, axial coding

**ID:** 451

## Climate change and livelihood in Bangladesh: Experiences of people living in coastal regions

*Nasreen, M., Institute of Disaster Management and Vulnerability Studies, University of Dhaka, Bangladesh, mahbubadu@yahoo.com*

*Mokaddem Hossain, K., Institute of Disaster Management and Vulnerability Studies, University of Dhaka, Bangladesh, mokaddemdu@yahoo.com*

*Abul Kalam, M., Institute of Disaster Management and Vulnerability Studies, University of Dhaka, Bangladesh, azad.socio@gmail.com*

Bangladesh is vulnerable to disasters mainly due to her geographic location. Disasters such as floods, river bank erosion, cyclone, tornado, cold waves, arsenic contamination in ground water, water logging, salinity intrusion etc. are gradually intensifying by climate change and composing risks for the coastal people in Bangladesh. The present study is concerned with climate change related risks and hazards that affects the inhabitants of coastal Bangladesh. The study findings demonstrated that the climate change has affected the livelihood of coastal people in many folds including scarcity of pure drinking water, malnutrition, extreme poverty, health problems, losses and damage in crop cultivation, fisheries, poultry, vegetables garden etc. It has also created a state of unemployment among the people of coastal communities. As a result, the affected people are losing their means of livelihoods and forced to take several alternative means of livelihoods to cope with the adverse impact of climate change related disasters. The study identifies the alternative adaptation strategies adapted by the affected coastal women and men in coastal Bangladesh. The present paper exhibits that the coastal community people try to solve their problems through adopting and exploring alternative employments.

**Keywords:** climatic variability, disasters, social implications, economic implications, alternative livelihood

**ID:** 454



## Towards measuring resilience of low income settlements in cities: the case of Mumbai

*Andharia, J., Tata Institute of Social Sciences, India, andharia@tiss.edu*  
*Lakhani, V., Gujarat State Disaster Management Authority, India, vikas.tiss@gmail.com*

Different dimensions of resilience are needed to deal with different kinds and severities of risk, shock, stress or environmental change. How resilience can be assessed, measured or mapped has not been explored adequately. This paper is based on a study conducted in 5 disaster prone low income settlements of Mumbai city. It proposes a methodology or an approach to measuring resilience using a conceptual framework which helps identify indicators. The paper also offers a critique of the construct of resilience which poses several challenges. For example the concept of community or social resilience is relative and one has to ask what individuals, communities and systems are vulnerable or resilient to, and to what extent. Variations in extent and patterns of resilience and coping are a function of several factors. While it is generally agreed that a resilient community is one that is able to prepare for, adapt to and live through shocks, while preserving its basic assets, the criteria that make communities resilient differs from place to place. The meaning of the concept has to be adapted at local levels and translated into concrete, specific indicators for each community. Ideally specific contexts, struggles and choices available to a community or a household must be specified in order to operationalize the concept of resilience. There is a danger that the idea of community or social resilience could inadvertently place upon the community, which may be already experiencing poverty, deprivation and marginalization, the onus of absorbing impacts of decisions and actions of others over which the community has little control. Glorifying or celebrating resilience of a society which struggles for survival and has limited choices, is a pitfall that must be avoided by managers of institutions or governments which need to focus on disaster risk reduction. The idea of how resilience may be increased by improving standards of living, social infrastructure, enhancing coping capacities and investments in social protection measures is important especially in poorer settlements of cities. By proposing a methodology for measurement of resilience the paper suggests how areas where investments are needed on an urgent basis may be identified.

**Keywords:** measuring, resilience, indicators, cities, community

**ID:** 455

## Fuzzy expert systems in qualitative risk assessment for disaster risk reduction

*Mendis, D. S. K., Department of Information Technology, Advanced Technological Institute, Sri Lanka, kalanaatil@mail.com*

*Karunananda, A. S., Faculty of Information Technology, University of Moratuwa, Sri Lanka, asoka@itfac.mrt.ac.lk  
Samaratunga, U., Gampaha Wickramarchi Ayurvedic Institute, University of Kelaniya, Sri Lanka, udayasamaratunga@gmail.com*

*Rathnayake, U., Department of Electrical & Computer Engineering, Open University of Sri Lanka, Sri Lanka, udithaw@ou.ac.lk*

Tacit knowledge is the key issue of knowledge modelling aspect because all knowledge is rooted in tacit knowledge. Much knowledge management research has focused on identifying, storing, and disseminating process related knowledge in an organized manner. Applying knowledge to decision making has a significant impact on organizational performance than solely processing transactions for knowledge management. Constructions of risk assessment using spatial data for disaster management have a problem of effective communication because of tacit knowledge. Risk assessment is a step in a risk management process. Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized hazard. Quantitative risk assessment requires commonsense knowledge related with the hazard. This complicates the effective communication of data to the user in real-time machine processing in support of disaster management. Policy-makers and planners in communities have to make decisions in the face of varying degree of uncertainty and risk. Intelligent computing systems were designed to address these problems explicitly. However, fuzzy logic and expert systems of the fundamental approaches that can be used to improve decision-making in relation to conditions of high levels of uncertainty, subjectively in data and inexact reasoning. The aim of the approach is to identify the influences of developing fuzzy expert systems to understand the nature of qualitative risk for disaster risk reduction.

This paper presents a research, which is incorporated of modelling of tacit knowledge for qualitative risk assessment in disaster risk reduction. Here we have used fuzzy expert system for developing an approach for modelling tacit knowledge. We primarily used fuzzy logic together with statistical technique of principal component analysis as techniques for modelling tacit domains. Tacit knowledge in Ayurvedic sub-domain of individual classification has been acquired through a questionnaire and analysed to identify the dependencies, which lead to make tacit knowledge in the particular domain. The result of the modelling of Ayurvedic domain using fuzzy logic has been compatible with the experiences of the Ayurvedic experts. It has shown 77% accuracy in using the tacit knowledge for reasoning in the relevant domain.

**Keywords:** qualitative risk assessment, disaster risk reduction, tacit knowledge, fuzzy logic, expert system, Ayurvedic medicine

**ID:** 456

## An approach to improve coastal community resilience through design of a recreational trail: A master plan for the Mississippi Coastal Heritage Trail

*Parfenova, T., Ohio State University, USA, tatiana.v.parfenova@gmail.com*

This research presents an approach to systematic design of a recreational trail with a goal to improve coastal community resilience. In a time when coastal populations are growing and the number of coastal disasters is escalating, communities are beginning to look for ways to increase coastal resilience following catastrophic events. This is especially true in places where hard infrastructural barriers, have failed in the midst of a disaster, e.g. New Orleans' flood wall during Katrina. Using the Mississippi Coastal Heritage Trail (MCHT) as a model, the goal of this research is to illustrate ways to achieve recreational goals while enhancing coastal community resilience through the design of a recreational trail. In an effort to achieve this goal the study employs a sequential mixed methods approach. The first, qualitative, phase of this project occurred in the summer of 2011 through fall of 2012 and consisted of community engagement and literature review to understand both the needs of stakeholders and theoretical framework of the subject. This phase identified the MCHT as a community priority site. The second, quantitative, phase involved spatial data gathering and analysis using geographic information systems (GIS) software in order to assist in trail alignment with consideration to socially, ecologically and culturally significant areas of the region. The Ohio State University Alumni Grant for Graduate Research allowed a subsequent visit to conduct field assessment of the conditions along the trail. A final, qualitative stage involved a design proposal, based on the previous research, followed by expert evaluation by a panel of local Mississippi and academic experts. The panel determined the potential of the plan to improve coastal community resilience and suitability for the MCHT. The methodology, explored in the study, can provide an efficient way for landscape architects and planners to take larger regional interests of stimulating coastal resilience during design phase of a trail, without complicating the process. This research provides helpful knowledge on the incorporation of environmental, economic, and social factors within the study area into a design response. Local organizations will use the materials and master plan in community engagement activities, seeking funds and subsequent implementation.

**Keywords:** design, planning, community

**ID:** 457

## The necessary for building performance evaluation: lessons learned from post-tsunami reconstruction of buildings in Aceh, Indonesia

*Aulina, A., School of Housing, Building, and Planning, University of Science Malaysia, Malaysia,  
aulinaadamy@gmail.com*

*Abu Hassan, A. B., School of Housing, Building, and Planning, University of Science Malaysia, Malaysia  
Teuku, H., School of Housing, Building, and Planning, University of Science Malaysia, Malaysia*

The Reconstruction and Rehabilitation Bureau (BRR) Aceh – Nias was established by central government of Indonesia as coordinator and executor for recovering the region of post-tsunami in Aceh province and Nias Island over four years since 2004. About US\$2.6 billion was allocated from international and national funds for projects that BRR directly implemented. BRR only allowed to build projects that owned by Aceh-Indonesia government except houses. Based on Indonesia regulations, since BRR represents central government then projects they built categorized as central government projects and later after finished are noted as central government assets. Those projects must completed before April 2009 and those that owned by local government must transferred procedurally by BRR to Aceh government. In 2009 Aceh governor has formed a team supported by UNDP to assess post-disaster reconstruction assets documentations and problems built by BRR. They found after years passed and BRR terminated, those assets have not been handover officially until now. Assets are used by local government with unclear ownership documentation that influenced unclear building operational and maintenance system technically and financially. The team discovered why BRR not able to handover the asset because they do not have completed documents that required by building and asset regulations. These standard documents should attach with any building project during handover such as contract and as built drawing. Moreover, after many critiques rose for BRR low quality projects related with corruption, they refused to conduct external project evaluation.

Now Aceh government facing this problem alone as BRR does not exist anymore and most of donors have left Aceh. Lesson learned here is how aid agency including international organization or institution underestimates handover process that is part of building or project life-cycle. Handover here is not only documentation matter but also assisting future owners able to operate the building by capacity in financial and technical. This problem impact the sustainable and vulnerability of the buildings. The team suggested conducting building performance evaluation (BPE) to justify the quality of the buildings in order to replace documents that are not available. Further study regarding BPE method specifically for post-disaster reconstruction buildings is essential.

**Keywords:** post-disaster, reconstruction, handover, building performance evaluation (BPE), Aceh  
**ID:** 459

## Prospects and problems of decentralized disaster risk management

*Perera, I. R., Practical Action, Sri Lanka, ranasinghe.perera@practicalaction.org.lk*

This paper is a result of an investigation conducted on the application of Decentralized Disaster Risk Management (DDRM) approach in South Asia. The paper was prepared by analyzing the information collected from a range of discussions with policy people, community members, and local government representatives and using a variety of other sources such as documentary sources, the internet and email conversations. The investigation found that the existing socioeconomic and power context of the South Asian region is not congruent with the expectations of DDRM. Although official names of the government of South Asia represent devolved power systems, except India, they all are functionally unitary governments. By nature, unitary governments make no efforts to strengthen the peripheries. Hence, smooth operation of DDRM is constrained by a number of key factors. Although the vehicle of DDRM, the LGs were hypothesized to be community oriented authorities characterized by institutional strength, managerial effectiveness, political receptiveness etc., these traits were not verified by this investigation as ground realities of LGs. On the whole, LGs are not embodied with required qualities for their effective operation. LGs have become just ornamental democratic features of the governments of South Asian region rather than practical apparatuses of devolution. The investigation discovered that in many instances, LGs have been given an adequate freedom and constitutional backing for decentralized decision making but, there is no reason in decentralizing decision making powers to LGs, if LGs have no capacity to implement their own decisions. LGs of South Asia are resource starved organizations too. Resource allocations from central to LGs are quite negligible and many LGs find difficulty in surviving and therefore, delivering services to communities. On the contrary, in some occasions, LGs do not utilize even the meager resource allocated for them from the central governments. As revealed in this investigation, visibility of the central government is a big concern for all the regimes of the region for their political survival. The obvious result of this is the creation of weaker or mediocre LGs which can't be used as leading vehicles for DDRM.

**Keywords:** decentralized disaster risk management

**ID:** 460

## Productive application of the disaster resilience subsidy: A case study based on war induced IDPs temporarily located in Kalpitiya in the District of Puttlam, Sri Lanka

*Marincioni, F., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, fausto.marincioni@gmail.com*

*Jayawardana, J., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, jaya.ybjn@yahoo.com*

*Samarasingha, W., Freelance Researcher, Sri Lanka, wrsappu123@gmail.com*

*Rajapakse, H., Department of English, University of Peradeniya, Sri Lanka, hiruni.rajapakse@gmail.com*

This paper examines the life style of the war induced IDPs temporarily located in Kalipitiya in the District of Puttlam, Sri Lanka, after they have been offered a government subsidy of LKR 35,000 for their relocation. Without proper guidance and support, these IDPs initiated their resettlement process in a haphazard manner and ultimately faced adverse outcomes. For example, the IDPs relocated themselves in slum-like temporary shelters which were built on disaster prone land areas, moreover, they failed to resume their original occupations after relocation, and did not mingle well with the locals with whom they had many confrontations. Also the rural administration did not recognize the relocated IDPs as a part of their administration system, therefore the IDPs were denied of the benefits they were entitled to. Based on the data collected through interviews with IDPs selected through disproportionate simple random sampling and cluster population methods, this study clarifies how their capacity for physical, economic and social resilience was inhibited by the subsidy given by the Sri Lankan government. In conclusion, reconstruction and relocation programmes must be accurately planned, through IDPs' involvement and responsibilities in order to spur their resilience and avoid unexpected turn of events, that could, on the contrary, expose them to new risks.

**Keywords:** internally displaced persons, resilience, resettlement, disaster resilience subsidy

**ID:** 461

## Computing the seismic vulnerability of buildings to enhance the community resilience

*Marconi, M., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, mahsas59@yahoo.com*

*Magni, M., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, magni.michele@gmail.com*

*Bartolucci, A., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, andrea.bartolucci@univpm.it*

*Jayawardana, J., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, jaya.ybjn@yahoo.com*

*Marincioni, F., Department of Life and Environmental Sciences, Polytechnic University of Marche, Italy, fausto.marincioni@gmail.com*

Community, seen as a set of shared and blended individuals' adaptive capacities, is a key resilience feature in the post-disaster reconstruction and adaptation process. Yet, when people are displaced or forced to forsake areas in which they are deeply rooted (spirit of place and geographical inertia), such capacity is dramatically decreased. Reducing displacement in case of disaster is a way to preserve community resilience. This work, developing a method to assess seismic structural vulnerability in small urban areas, tries to enhance the overall resilience process by assigning priority to which buildings should be retrofitted first in order to avoid displacement of residents. The method has been developed collecting georeferenced data on damages reported in a medium-size earthquake that hit two regions of central Italy, Umbria and Marche in 1997. A set of theoretical Peak Ground Accelerations (PGAs) of expected events were calculated for each municipality; such PGAs have been derived applying the attenuation law of Sabetta and Pugliese relating magnitude of the event and distance from the epicentre. Concurrently, buildings' vulnerability data were collected from census databases, containing factors such as buildings' age, contiguity, number of storey, construction materials, etc.. Finally, a multivariate analysis was run using PGAs and building vulnerability data as explanatory variables and historical damages as predicted variable. The calculated function link between damages and characteristics of PGAs and buildings vulnerability was then used to map the risk of future earthquakes, and estimate the number of individuals which could be displaced. Therefore, assigning high retrofitting priority to the most vulnerable buildings could directly reduce one of the stress variables that lower community resilience. Concisely, the proposed method to pinpoint structural vulnerability is not only a key to minimize damages and loss of livelihoods, but also pivotal to safeguard community resilience and speed up the recovery process.

**Keywords:** resilience, earthquakes, vulnerability, buildings

**ID:** 462

## Pre hospital Care Review 2005-2011: Sri Lanka

*Ekanayaka, N. C., Sri Lanka, ncekanayaka@gmail.com*

*Raheem, S., Sri Lanka, sanoozarm@yahoo.com*

Developments of pre hospital care system in Sri Lanka started after the Tsunami in year 2004. The system mainly functions under the Fire brigades, Hospitals and Regional Director of Health Services. "1-1-0" is the national (non-centralized) three-digit number that the public uses to contact established pre-hospital care services in Sri Lanka. Pre hospital care review was conducted from November 2010 to January 2011. The main objectives were to assess the current situation, to verify the achievements in pre-hospital care development since 2005 and to determine the areas needing further improvements. Fourteen assessment tools were used to assess Emergency Medical Technicians, Emergency Medical Dispatchers (EMTs and EMDs), physical resources, and efficiency of the service. Seven cities with established and two cities with non-established pre hospital care systems participated in the review. During the review it was found that each and every system was functional to varying degrees and even the two cities without established systems were using their EMTs to provide ambulance services. These systems have responded 46% Trauma, 27% Medical and 27% of other emergencies during their five years of service. The main gaps identified were: lack of public awareness, communication lapse and lack of opportunity to continue education for pre hospital care providers. None of the pre-hospital care systems have conducted any public awareness campaigns after the launch of 1-1-0. Only less than 25% public knew about the pre hospital care systems. Due to the technical issues there were communication gaps, when a person dial 1-1-0 the call is transferred to a wrong dispatch centre. More than 90% of pre hospital care providers faced inadequacy of enough opportunities for training, continuing and advanced education. Based on the results of the review the following actions are recommended: Increase the public awareness; expand the pre hospital care service island-wide as a combined service of fire brigades, general hospitals and RDHS services; initiate a national communication centre which will receive all 1-1-0 calls and dispatch the appropriate pre-hospital care unit; and create a regulatory body/registry to oversee the EMS education and services.

**Keywords:** pre hospital care system development

**ID:** 463



## CERT-Youth

*Ekanayaka, N. C., CERT-Youth, Sri Lanka, ncekanayaka@gmail.com*

CERT-Youth; Community Emergency Response Teams-Youth is a project which will be launched in Sri Lanka on September 2013 by United States Exchange Alumni's of Sri Lanka. CERT-Youth is designed with the goal of increasing community resilience in rural communities of Sri Lanka via providing professional training in emergency response/techniques and encouraging volunteerism among youth in the rural communities. CERT-Youth project will design a national CERT curriculum for Sri Lankan context and project team will train 600 youth in 12 rural communities in Sri Lanka and will train 50 master trainers to conduct future trainings. CERT-youth curriculum will include trainings in Disaster preparedness; Fire safety and utility control; Disaster medical operations; Light search and rescue operations; Disaster psychology and Operation for terrorism. Sri Lanka being a country which has only 21 fire brigades which serve only 13 out of 335 local authorities, and only having 11 developed EMS systems in those local authorities which only serve 07% of the population of the country, with minimum supervision and proper coordination CERT-Youth volunteers can be used to serve in day to day emergency situations. This will also allow CERT-Youth volunteers to use their knowledge and skills in practical situations which will help them in responding to major disasters. CERT-Youth project team have started discussions with community based organizations and government authorities to launch this as partnership project and looking forward to handover it's operations and management to ministry of disaster management at the completion of the first year activities. CERT-Youth program will be available online. CERT youth curriculum and resources will be available for non-governmental organizations; community based organizations and or any other interested parties to be included in their community trainings. CERT-Youth program concept and resources can adapt in to any rural setting at any country which has limited professional resources for initial responses during emergencies and disasters.

**Keywords:** youth community emergency response teams

**ID:** 464

## A stakeholder approach to building community resilience: From awareness to implementation

*Burnside-Lawry, J., RMIT University, Australia, judy.burnside-lawry@rmit.edu.au*  
*Carvalho, L., Civil Protection Service, Municipality of Amadora, Portugal*

In an era of change and uncertainty, policy makers recognize the need to engage community voices to pave the way to develop shared strategies for creating even stronger communities. Recently, public participation has been recognized as a vital component for establishing effective partnerships to strengthen resilience within communities (Attorney General's Department, 2012). The term 'resilience' has been adopted by scientists and policy makers in an attempt to describe the way in which they would like to reduce a nation's susceptibility to major incidents of all kinds, by reducing their probability of occurring and their likely effects, and by building institutions and structures in such a way as to minimize any possible effects of disruption upon them. Community resilience is described as 'the ability to maintain, renew or reorganize' (Varghese et al, 2006, p.508), 'the ability to accommodate abnormal or periodic threats and disruptive events' (Amaratunga & Haigh 2011, p.7). There is increasing recognition that emergency and disaster preparedness will not be effective without the engagement of vulnerable communities. The prime component is to involve the vulnerable community in the mitigation and preparedness process. Building capacities in coping mechanisms and involvement creates confidence within a community, paving the way for a self-reliant community. Hence, mitigation and preparedness have to be supported by public participation in operational planning, education and training of vulnerable groups and related formal and informal institutions (Amaratunga & Haigh, 2011). A review of literature within a variety of fields, including management, politics, community development and communication found a multiplicity of terms used to describe public participation. Some of the most frequently used include: 'community consultation', 'citizen engagement', 'stakeholder engagement', 'community engagement' and 'democratic participation'. In spite of the variety of definitions and terms used, the central premise retains a belief in the transformative potential of citizen participation and a view that engaging citizens in policy making is not only beneficial but essential in seeking solutions to major challenges, including issues of disaster risk reduction and sustainable development.

**Keywords:** disaster risk reduction, stakeholder engagement, participatory communication, community resilience

**ID:** 466

## Climate-related disasters in Asia and the Pacific

*Thomas, V., Asian Development Bank, India, vthomas@adb.org*

*Albert, J. R., National Statistical Coordination Board, Philippines, jrgalbert@gmail.com*

*Perez, R., Manila Observatory, Philippines, rtperez1@yahoo.com*

Natural disasters are on the rise worldwide. There are more and more intense natural disasters—which are defined to cause at least 100 deaths or to affect the basic survival needs of at least 1,000 people—resulting from floods and storms as well as droughts and heat waves. The Asia and the Pacific region has experienced some of the most damaging disasters in recent decades, with alarming consequences for human welfare. At the same time, the climate in the region has been changing. Temperatures have been higher, on average, and also more variable and more extreme. Rainfall has also been more variable and more extreme.

Is there a relationship between these changes in climate and the increase in natural disasters in Asia and the Pacific? This paper considers three main disaster risk factors—rising population exposure, greater population vulnerability, and increasing climate-related hazards—behind the increased frequency of intense natural disasters.

In a regression analysis within a model of disaster risk determination, there is a significant association between the increase in natural disasters and population exposure, represented by population densities. Population vulnerability also matters, but increasing incomes seem to be associated first with greater and then lesser vulnerability. Finally, there is a significant association between climate-related hazards (greater precipitation linked to floods and storms and especially higher temperature linked to droughts and heat waves) and the frequency of intense natural disasters in Asia and the Pacific and its subregions during 1971–2010.

Along with the scientific association between greenhouse gases and the changes in the climate, the findings in this paper suggest a connection between increasing natural disasters in Asia and the Pacific and man-made emissions of greenhouse gases in the atmosphere.

**Keywords:** natural disasters, intense disaster climate change, hazard, exposure, vulnerability, precipitation, temperature, tropical cyclone, typhoon, Philippines

**ID:** 468

## Empowering local governments to make a disaster resilient built environment within Sri Lankan cities

*Malalgoda, C. I., Centre for Disaster Resilience, University of Salford, United Kingdom,  
c.i.malalgoda@edu.salford.ac.uk*

*Amaratunga, D., Centre for Disaster Resilience, University of Salford, United Kingdom,  
r.d.g.amaratunga@salford.ac.uk*

*Haigh, R., Centre for Disaster Resilience, University of Salford, United Kingdom, r.p.haigh@salford.ac.uk*

Urban areas are growing very rapidly all over the world, particularly in developing countries. As a result of rapid urbanisation, the world's population is increasingly concentrated in large cities leading to unplanned urban development with inappropriate and poor quality housing, infrastructure and services. This excessive unplanned urban growth leads to various physical, social and economic vulnerabilities. As a result, the consequences of disasters are highly detrimental when they occur in urban environments. Thus, it has become necessary to strengthen the resilience of cities to disasters. The built environment provides a core to many human activities and plays a critical role in any city. Thus, it is necessary to develop the built environment with an effective degree of resilience, in order to withstand and adapt to the threats of disasters. This requires a serious effort to be made by various stakeholders including governmental and non-governmental institutions. As local governments are responsible for local area development, they have a key role to play in achieving the resilience of the cities under their jurisdiction. Even though there is a growing concern on the role of the local governments in making cities resilient, several incidents have been reported on the inadequate contribution of local governments in taking the lead role of initiating risk reduction. In this context, the research aims to explore and propose mechanisms to empower the local governments to make cities resilient to disasters within the context of the built environment. Accordingly this paper intends to analyse the challenges faced by the Sri Lankan local governments in creating a disaster resilient built environment within their cities and to propose the ways and means of addressing the challenges faced by the local governments. As such, the paper proposes a set of recommendations to empower the Sri Lankan local governments in facilitating city resilience building initiatives in the built environment context.

**Keywords:** cities, local government, disaster resilient cities, built environment, Sri Lanka

**ID:** 469

## Project risk management for community-based post-disaster housing reconstruction project

*Ophiyandri, T., Centre for Disaster Resilience, University of Salford, United Kingdom  
Amaratunga, D., Centre for Disaster Resilience, University of Salford, United Kingdom,  
r.d.g.amaratunga@salford.ac.uk*

*Pathirage, C., Centre for Disaster Resilience, University of Salford, United Kingdom, c.p.pathirage@salford.ac.uk*

Indonesia is a highly disaster prone country, particularly to earthquakes. In the last decade, Indonesia has been hit by three large earthquakes; Aceh in December 2004, Yogyakarta in May 2006, and West Sumatra in September 2009. These earthquakes have created considerable losses to Indonesian communities, lead to 130,000 fatalities, US\$10.3 billions economic losses, and 500,000 of heavily damaged houses. The massive housing reconstruction has been found to be the most problematic sector of housing reconstruction programme. Although community-based post-disaster housing reconstruction project (CPHRP) has been implemented, nevertheless the outcome was still overshadowed by the delay in delivery, cost escalation, unexpected quality, and community dissatisfaction. The implementation of good practice of project risk management in construction industry is expected to enhance the success of CPHRP. Accordingly, this study aims to develop a risk management model for community-based post-disaster housing reconstruction approach.

In order to achieve the aim and objective of the research, multiple case studies is selected as research strategies. This study implements the sequential mixed method application, started with semi-structure interview and followed by questionnaire survey as the primary method. Content analysis was used to analyse qualitative data, whilst descriptive and inferential statistics were deployed to analyse quantitative data.

This study reveals the importance of the understanding on community-based approach in post-disaster housing reconstruction. Four highly significant advantages of CPHRP have been discovered, with 'create sense of ownership' of beneficiaries to the project as the most significant advantage. It was also found that the psychological advantage of CPHRP is more dominant compare to the construction advantage. Further, the risk assessment has discovered some high risk events during the pre-construction stage of CPHRP. The most affected project objective by them is project time completion. Risk response document has also been proposed. Moreover, this study found twelve critical success factors (CSFs) of CPHRP, with the highest CSFs is 'transparency and accountability'. With careful attention on the above findings, it is expected the success of the implementation of CPHRP can be increased.

**Keywords:** project risk management, community-based, housing reconstruction

**ID:** 470

## Use of social media for improved disaster resilience

*Keraminiyage, K., Centre for Disaster Resilience, University of Salford, United Kingdom*

A well-networked society is likely to produce well-integrated and closely linked communities. This is important from the disaster management point of view as closely linked and well-integrated communities often show better resilience to disasters, compared to their counter parts.

Social media such as Facebook, Twitter and You Tube provide valuable infrastructure for effective social networking. Hence, such social media can play a vital role in improving disaster resilience. Disaster resilience within this context can be defined as the capacity of disaster prone communities to withstand (cope) future disaster events. It is expected that, by improving the resilience of disaster prone communities, the impact of disasters can be minimized, hence, better managed.

There are number of studies which investigated *how* the social media can be used effectively to manage disasters. However, generally the focus of those studies has been the immediate relief stage of the disaster management lifecycle and in some cases resettlements. This leaves a gap in exciting body of knowledge on how best the social media can be used to improve the resilience of disaster-affected communities.

Considering the scope of social media usage within different communities, it is hard to define a definitive list of effective (popular) social media. Within some settings the well-established internet based services such as Facebook and Twitter can make a significant contribution (in developed countries for example), while this may have comparatively a low impact in some other settings (for example, in developing countries where the internet service provisions are not mature). However, there may be other social networking platforms that are not being recognized or explored extensively as social networking platforms, but has the potential to be used for such purposes. For example, in Sri Lanka, one of the counties affected severely by the Boxing Day Tsunami, Short Message Services- SMS though mobiles are used extensively for social networking purposes. Based on the above an initial conceptual research framework has been developed to achieve the following:

1. To evaluate different social media usage patterns within different settings.
2. To evaluate the means of improving disaster resilience and the role of social networking infrastructure in achieving those improvements.
3. Evaluate the main social networking technologies for their functionalities and usage patterns to determine how best those technologies can be used to improve disaster resilience.
4. Identify any functionality gaps of existing major social media platforms and develop applications (as plugins) to improve those technologies.

**Keywords:** disaster resilience, social media, SMS, social networking

**ID:** 472

## Book of Abstracts





## Book of Abstracts

## INDEX OF AUTHORS

- A**
- Abeynayake, 35, 36  
Abu Hassan, 77  
Abul Kalam, 73  
Al harthi, 31  
Al Khaili, 64  
Albert, 84  
Alzahmi, 70  
Amaratunga, 22, 34, 42, 48, 53, 54, 64, 83, 85, 86  
Amiri, 39  
Andharia, 74  
Ansal, 28  
Aulina, 77
- B**
- Bains, 37, 60  
Barbosa, 10, 23  
Bartolucci, 80  
Benson, 37  
Bhattarai, 49  
Brewer, 55, 56  
Brickman Raredon, 24  
Briggs, 40  
Burnside-Lawry, 83
- C**
- Carvalho, 83  
Coffey, 37  
Costello, 61  
Cox, 51, 57
- D**
- Dahal, 25  
de Haas, 57  
De Silva, 59  
Dhas, 6  
Dietz, 51  
Dissanayake, 62  
Dunusinghe, 65  
Durham, 60, 63  
Duyne Barenstein, 11
- E**
- Ekanayaka, 81, 82
- F**
- Fernando, 9, 18, 62, 70
- Fielding, 63
- G**
- Gajendran, 55, 56  
Ghosh, 47  
Gibbons, 37  
Giggins, 55, 56  
Gijbers, 57  
Ginige, 48  
Gociman, 43  
Goonetilleke, 13, 14
- H**
- Haigh, 34, 42, 48, 53, 54, 83, 85  
Hayes, 14  
Hubbard, 51
- I**
- Imperadori, 50  
Ingirige, 32, 70
- J**
- Jayantha, 65  
Jayawardana, 79, 80  
Jayawickrama, 19  
Jigyasu, 19
- K**
- Karunananda, 75  
Karunasena, 53  
Keraminiyage, 87  
Khailani, 52  
Kulatunga, I, 16  
Kumaraswamy, 8  
Kurtulus, 28
- L**
- Lakhani, 74  
LeGoff, 55, 56  
Lokuge, 66
- M**
- MacKee, 29  
Magni, 80  
Malalgoda, 85  
Mallawarachchi, 59

## Index

Manyena, 67  
Marconi, 80  
Marincioni, 79, 80  
Matzenberger, 17  
Mavhura, 67  
McNulty, 41  
Mendis, 75  
Mohan, 47  
Mokaddem Hossain, 73  
Moreno, 15

### N

Naithani, 21  
Nasab, 45, 46  
Nasreen, 73

### O

O'Brien, 19  
O'Keefe, 19  
Oloke, 31  
Ophiyandri, 86  
Oxley, 71

### P

Palliyaguru, 22  
Pan, 51  
Parfenova, 76  
Parvez, 16  
Pathirage, 64, 86  
Perera, 40, 78  
Perez, 84  
Pusceddu, 50

### R

Raheem, 81  
Rahman, 26, 27  
Rajapakse, 79  
Rajeev, 72  
Rameezdeen, 59  
Rapp, 51  
Rathnayake, 75  
Rennick, 41  
Richardson, 33

### S

Salerto, 7  
Samarasingha, 79  
Samaratunga, 75  
Sapeciay, 61  
Seneviratne, 42  
Seno, 38  
Setunge, 66  
Sivarajah, 68, 69

### T

Taj, 45, 46  
Teo, 13  
Teuku, 77  
Thomas, 84  
Thudugalage Don, 58  
Thurairajah, 54  
Tikhomirov, 30  
Tonuk, 28  
Trufanov, 30

### V

Vaillancourt, 20

### W

Wedawatta, 32  
Weddikkara, 35, 36  
White, 63  
Wickramasinghe, 5  
Wilkinson, 61  
Wilson, 37  
Withanaarachchi, 12

### Y

Yoharajan, 44  
Yumarni, 34

### Z

Zhang, 8  
Ziyath, 13



## Index